



ACADEMY OF SCIENCES OF MOLDOVA
SECTION OF NATURAL AND EXACT SCIENCES
INSTITUTE OF ZOOLOGY



VIII-th International Conference of Zoologists

**ACTUAL PROBLEMS OF PROTECTION
AND SUSTAINABLE USE OF THE
ANIMAL WORLD DIVERSITY**



10-12 OCTOBER 2013

Book of Abstract



Chisinau – 2013





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The materials of VIII-th International Conference of Zoologists „**Actual problems of protection and sustainable use of animal world diversity**” organized by the Institute of Zoology of the Academy of Sciences of Moldova are a generalization of the latest scientific researches in the country and abroad concerning the diversity of aquatic and terrestrial animal communities, molecular-genetic methods in systematics, phylogeny, phylogeography and ecology of animals, taxonomy and evolution of animals, structure and dynamics of animal populations from natural and anthropized ecosystems, population functioning and animal role in ecological equilibrium maintenance, monitoring, evaluation of threats, and assessment of risks of aquatic ecosystems, biological control in regulation of pests number, invasive animal species, their ecological and socio-economic impact, protection of rare, endangered and vulnerable animal species under conditions of anthropogenic pressing intensification

The proceedings are destined for zoologists, ecologists, ethologists and for professionals in the field of protection and sustainable use of natural patrimony.

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PLENARY**THE GENETIC VARIABILITY WITHIN DIFFERENT FOOD PARASITES STRAINS AND GENOTYPES, IN GEO-CLIMATE CONDITIONS FROM ROMANIA**Cozma Vasile², Iovu Anamaria¹, Onac Diana¹, Oltean Miruna¹

¹University of Agricultural Science and Veterinary Medicine Cluj-Napoca, Romania; ²Academy of Agricultural and Forestry Science, Bucharest, Romania
cozmavasile@yahoo.com

The aim of this study is the transfer of information regarding genetic variability within the same species, with different strains and genotypes isolates in geo-climate conditions from Romania. *Toxoplasma gondii*, *Echinococcus spp* and *Trichinella spp.* are going to be presented. This three parasitic and bacterial agents have a high impact over health of human population worldwide by consuming contaminated food (*Trichinella spp.*, *Toxoplasma gondii*), by contact with definitive hosts (*Echinococcus, spp.*).

T. gondii is prevalent in most areas of the world, in animals and humans and is of veterinary and medical importance, because it may cause abortion or congenital disease in its intermediate hosts. Felids are the key animal species in the life cycle of this parasite because they are the hosts that can excrete the environmentally- resistant stage, the oocyst. In the last 10 years, in Romania, were made sero-epidemiological studies on *T. gondii* infection in intermediate hosts (humans and domestic animals) and in definitive host (cats), which revealed a high seroprevalence of specific antibodies (Coroiu et of., 2009; Iovu et al., 2009; Györke et al., 2011), but weren't made studies regarding the genotypes of *T. gondii* circulating in our country. Investigating a large number of samples, will help optimize the diagnosis, identify genotype *T.gondii* (by studying of nucleotide polymorphism - SAG1, SAG2, SAG3, SAG4, SAG5, GRA1, GRA2, GRA3, GRA4, GRA5, GRA6, ROP1 and by studying of microsatellites - TUB2, TGM-A, W35, B17, B18, ESTs, M6, M33, M48, M95, M163, cB21-4), establishing morbidity of toxoplasmic infection. Also, the studies on risk foods (meat), will permit us to determine the risk factors and the main sources of human contamination. Based on the results that will be obtained, will be proposed a national program of surveillance of infection with *T. gondii*, correlated with veterinary surveillance of animals and with surveillance of the food risk.

Echinococcus granulosus, etiological agent of cystic echinococcosis is a cosmopolitan parasite spread worldwide with a maximum prevalence in some areas from Europe, Asia, Africa, Australia and South America. The high prevalence of echinococcosis/hydatidosis in animals and human population places Romania on the top of the European countries and among the first from the world. *Echinococcus multilocularis*, etiological agent of alveolar echinococcosis is spread in the northern hemisphere and also some endemic areas exist in Centre of Europe,

North and Central Eurasia and some parts of North America (Eckert and Deplazes, 2004). The presence of *E. multilocularis* in Romania has been described before in rodents and in two human cases (Panaitescu and Pop 1999; Savlovski, 2000; Sikó, 1992, 1993; Sikó et al. 1995), but these cases weren't confirmed by specific diagnosis tests. In 2010, respectively 2011, *Echinococcus multilocularis* was confirmed in Romania using molecular biology methods in definitive hosts – red foxes (*Vulpes vulpes*) and in intermediate hosts – wild rodents (Sikó Barabási et al., 2010a; 2010b; Sikó Barabási et al., 2011). Taking in consideration the situation of echinococcosis/hydatidosis in Romania (Iacobiciu et al., 2005), regarding its prevalence in humans and animals, epidemiological data on prevalence in domestic and wild carnivores is necessary as they are the main sources for this zoonosis, and in order to determine the human risk for infection with different genotypes/species. In the last decade many programs for controlling the cystic echinococcosis in humans and animals as intermediate hosts and also for intestinal echinococcosis in domestic and wild carnivores were improved, but with limited results. The presence of *Echinococcus multilocularis* in Romania has been described before in rodents and in human cases and in 2010, respectively 2011 it has been confirmed in definitive and intermediate hosts. Because of the lack of real evidence of *Echinococcus multilocularis* in our country it remains unclear if Romania is a new endemic area and if the parasite was introduced recently or was not detected before. The prevalence of this zoonosis might increase in the future being an indicator for an existing infection risk for human population in Romania. The intra-specific variation in nominal *Echinococcus granulosus* may influence life cycle patterns, host specificity, development rate, antigenicity, transmission dynamics and chemotherapeutic agents (Thompson and Lymbery, 1988; Thompson and McManus, 2001, 2002). Genetic variations in *Echinococcus* have been investigated in both the nuclear and mitochondrial genomes. Comparison of nucleotides sequences mostly fragments of mitochondrial DNA (cox1 and NADH1) were very useful in genotypes identification (Bowles, Blair and McManus, 1992; Bowles and McManus, 1993a). In Romania a few studies regarding genotypes involved in animals and humans disease exist, only G1, G2 and G7 being identified (J.M.Bart et al., 2006).

Trichinellosis is a zoonosis acquired by ingesting raw meat containing encysted larvae of *Trichinella*. Is an emergent/re-emergent disease in different world areas, being correlated with different food habits. With an incidence of 51 cases for one million man-year and a prevalence of 8 cases in 10.000 tested pigs, 10 cases for 1000 tested wild boars and 10 cases for 100 bears, Romania represents the country with the most extensive *Trichinella* infection in the world. A semnificative increase of the number of human cases, in Romania, was observed in 1990-2004 comparative with 1980-1989 (Blaga et al., 2007). Romania has the most cases of *Trichinella* infection in animals and in humans, in the world. During 1980-2004, in Romania were recorded 28.293 human cases which mean

51.1 annual cases in 1 million inhabitants (Blaga et al., 2007). In Romania, for the moment, two of the species are present: usually *T. spiralis* in domestic animals and *T. britovi* in wild animals (Blaga et al., 2009). The principal contamination source for humans is represented by raw meat consumption from pigs and wild boars. Pretty rare other infestation sources are documented, such as horse meat. Therefore a sound base research with field collection samples, extraction of DNA and amplification by PCR is needed for the Romanian isolates. The *Trichinella* species identified will be compared to the last taxonomic and geographic revision of the genus. A genetic comparison will be performed for the 5S ribosomal DNA intergenic spacer for the different *Trichinella* isolates. Human trichinellosis was reported in 55 countries in the entire world (27.8%), even if the presence of *Trichinella* in wild animals is not always correlated with human infection (Pozio, 2007). In trichinellosis, the molecular biology research allowed the structuring of the genus in 8 different species and 4 other genotypes (Pozio et al., 2009).

HISTORICAL FILES FROM THE BOOK OF BIODIVERSITY

Marian-Traian Gomoiu

*R & D National Research Institute for Marine Geology and
Geocokogy - GeoEcoMar*

*Bvd. Mamaia nr.304, RO-900 581 Constanta, Romania –
e-mail: mtgomoiu@gmail.com*

The paper is a plea for understanding, conserving and sustainably using biodiversity everywhere where we live on this planet. Considering that the history of each science represents one of the fundamental disciplines in any specialist's training, the author is open to young biologists, briefly presenting them, as a challenge, some pieces of the early knowledge of "biodiversity" in the territories that were to become, along the passage of time, present-day Romania.

Based on the literature consulted and the extensive voyages on the internet oceans, the author holds some very important pieces of information and synthesizes them to give the students an impulse to learning. The paper refers to three names of famous scholars, whose reputation has never eroded, and their literary or scientific work contains early records on the fauna and flora of the territories they visited during their travels through Europe. These scholars were:

Publius Ovidius Naso (43 B.C. – 17/18 A.D.) – Roman poet, well-known for his literary writings (among which "Triste", "Epistulae ex Ponto"). In his "Ponic" works the poet refers to the nature of the exile places, and Pliny the Elder mentions the poem "Halieutica" ("On Fishing") composed by Ovid towards the end of his life at Tomis; modern researchers consider that Pliny erroneously attributed this poem to Ovid. The Romanian historian Ioan Micu published a paper on "Halieutica", which is less known by biologists.

Luigi Ferdinando Marsigli (1658 – 1730) – Italian Count, officer and naturalist, the father of oceanography. Slightly mentioned in Romanian sources, he is known as one of the most brilliant men of his time in Europe, leaving us a legacy of great value, a work of more than 20 books, among which: “Interior Osservazioni Bosforo Tracio”, “Histoire physique de la Mer”, “Danubius Pannonico-Mysicus Observationibus geographicis, astronomicis, hydrographicis, historicis, physicis” - a richly illustrated work in six volumes containing much valuable historic and scientific information on the river Danubius, and “*L’Etat militaire de l’empire ottoman*”.

The life of Marsigli – “soldier and virtuoso” is well depicted in a book published in 1994 (John Stoye: Marsigli’s Europe. Yale University Press, New Haven, N.J. 1994)

Anatole N. Demidoff (1813 – 1870) - Anatole N. Demidoff (1812 – 1870), First Prince of San Donato, Russian industrialist and Maecenas, one of the most talented, energetic, and extravagant of the Demidoffs – a rich family ennobled by Peter 1st.

At the age of 24 he organized a scientific expedition under the scientific leadership of the French sociologist Frédéric Le Play. The expedition comprised 22 scientists, writers and painters, among them Alexander von Nordmann - zoologist, Auguste Raffet – painter, Jules Janin - the writer who chronicled the voyage through Southern Russia, Crimea, Hungary, Wallachia, Moldavia and Turkey in the year 1837.

The results of this expedition, whose cost rose up to 500,000 Francs, were published under the title “Voyage dans la Russie méridionale et la Crimée par la Hongrie, la Valachie & la Moldavie“ (4 vol., 1840-1842), with hundreds of superb original lithographies by Raffet. The four volumes of this work can be seen in the Library of the Romanian Academy and should be seen by every naturalist.

In the modern conditions of development and progress of biology on infinitesimal scale, supporting *classic biology* remains a debt of honor for all biologists; the author believes that, in this way, we become a vivid interface between natural systems and human-social systems. Unreservedly admiring the progress / achievements of cell biology, we must remain firmly anchored in «*Darwin Biosphere*” and strive for understanding it, to fully meet the imperatives required by the Convention on Biological Diversity, the chief scientific book of humanity today, tomorrow and always. Following this path the author wants to remind you of a few pages which illustrate great interest for biodiversity knowledge over time.

The paper is accompanied by original illustrations of the presented authors.

RECENT CHANGES IN THE STRUCTURE OF THE ROMANIAN BIRDFAUNA

Dan Munteanu

Romanian Academy

Changes in the components and abundance of local or regional faunas are frequent phenomena and they very often represent subject of scientific research. However, if the registration of such changes is not very difficult, the explanation of their causes are usually subject of theories and suppositions.

Extensions of the distribution area in some bird species and their spreading across the Romanian territory have been reported in several publications during the last 60-70 years, or even early. The presentation of this global trend is the subject of our paper.

First of all, we discuss about the birds that spread or are spreading across our country from south to north.

The „heros” of the most ample phenomena in the field of bird expansion over the territory of Romania are the Collared Dove (*Streptopelia decaocto*) and the Syrian Woodpecker (*Dendrocopos syriacus*), two species originated from the Middle East, that occupied the whole territory of the country within a period of about 30-40 years during the XXth century. Both of them are synanthropic resident species, initially reported in south Romania after they crossed the Danube, probably at the beginning of the XXth century. Afterwards they spread to the north following two main directions: to north-west across the Carpathians and over Transylvania, and to the north-east over the territory of Moldavia. However, the expansion of the Syrian woodpecker was faster towards the north-west than towards north-east. Finally, both species reached the northern border of the country in the decade 1950-1960 and now they are common birds in all human settlements and their neighbourhoods.

Another species that has extended its distribution range on a large area over the south of Romania is the Spanish Sparrow (*Passer hispaniolensis*). It firstly occurred in the Dobrudja, probably between 1950-1960. Afterwards it had a relatively rapid expansion that has stopped for several decades at a geographical limit that Spanish Sparrow could not passed beyond, followed by a slight regression (numerically, at least).

The expansion of other southern bird species over Romania had a more limited amplitude.

In some of them, a peculiar aspect should be stressed from the beginning: they lived or were discovered in south Romania a long time ago, they bred there several decades on limited areas, and only recently they have been subjects of clear range extension.

Two main patterns of expansion can be recorded.

1. Expansion from the south-western part of the country, after crossing the „Iron Gates” of the Danube; some of these species also entered Romania through the Dobrudja. I mention as main examples the following species.

The Alpine Swift (*Apus melba*) was initially found in southern Dobrudja and South Banat immediately after 1960. While its distribution area remained very limited in Dobrudja, the western population gradually expanded northwards (exclusively over mountain areas), then crossed the river Mureş and reached the Apuseni Mountains (1990-2000).

The Red-rumped Swallow (*Hirundo (Cecropis) daurica*) is in a similar situation: it entered Romania in the same areas (southern Banat and Dobrudja), but a little later (years 1970-1980). Its spreading seems to be very slow and the species occupies limited areas in the south-eastern part of the country and Dobrudja.

Another swallow, the Crag martin (*Ptyonoprogne rupestris*) followed almost the same pattern of expansion. It was firstly reported in 1968 in southern Banat. Afterwards it was found in other sites in the SW part of the country, but in the same time it extended eastwards more than 300 km along the Southern Carpathians, and northwards just to the Apuseni Mountains.

The Cirl Bunting (*Emberiza cirrus*) was known for quite a long time in the southern part of the Banat province, but after 1960 it slowly spread to the north-east, alongside the southern slope of the Southern Carpathians.

2. Bird species primarily occurring in the Dobrudja; few of them occurs outside this region.

The Isabelline Wheatear (*Oenanthe isabellina*) was reported in 1883 in the Dobrodja and was recorded in the same region after 1970. Its breeding was ascertained here in 1999-2000.

The Woodchat Shrike (*Lanius senator*) is a rare winter visitor firstly reported in the Dobrudja in 1964-1965. Afterwards it was several times recorded in the area, and its breeding has been recently confirmed (1999).

The Cattle Egret (*Bubulcus ibis*) is a summer visitor, formerly considered a vagrant bird in Romania. Since 1996 it has become a (rare) breeding species of the Danube Delta.

The White-tailed Plover (*Chettusia (Vanellochettusia) leucura*), known as a very rare vagrant bird, bred in the Danube Delta and the lagoons Razim-Sinoe in 2000-2002 (less than 20 pairs), but no longer after this period.

The Black-headed Bunting (*Emberiza melanocephala*) was reported in the past as a vagrant bird. Its breeding has recently been confirmed in the Dobrudja (after 2000), but in the same time few pairs were recorded during summer in the plain of Banat.

The Long-legged Buzzard (*Buteo rufinus*) has become a breeding bird of the Dobrudja about 20 years ago, but in the last period the species distribution range has extended beyond the border of this province; it is now a breeding species in Moldavia, at least between the rivers Siret and Prut.

Besides these southern species, the range of two northern birds has spread throughout Romania. The most representative species is the Fieldfare (*Turdus pilaris*). It was initially found as a breeding bird in Bukowina in 1966. Its spreading had a very fast course and now the Fieldfare breeds in large numbers across the whole area covered by the Carpathian Mountains, in high hilly areas besides mountains and just in some lowlands in south and east Romania. I finally mention the Common Rosefinch (*Carpodacus erythrinus*), another northern species, that locally breeds also in Romania, in mountains, at least since 1978 (the first record of a breeding pair).

Conclusions.

- Regarding the dates/years of the first records, most species were reported in the second half of the XXth century, and only two bird species were found breeding at the beginning of our century (*Chettusia leucura*, *Emberiza melanocephala*).
- Concerning the geographical origin, some species proceed from the Mediterranean/Balkan area; other species arrived in Romania after crossing the Balkan peninsula from Asia Minor or the Middle East; two specie originate from northern Europe.
- Regarding the speed of the expansion, two extreme categories could be distinguished: species with a rapid expansion (*Streptopelia decaocto*, *Dendrocopos syriacus*) and species with a very slow expansion, such as the Cirl Bunting. All the other species have an intermediary position.
- The spatial amplitude of expansion covers a large scale of situations.
- There are also situations of reversible phenomena (*Chettusia leucura*, that dissappeared after a short period of breeding).

It is possible that the recent northwards expansion of the southern bird species is encouraged by the global heating of the climate.

THE BIODIVERSITY EPOS

Murariu Dumitru

*National Museum of Natural History "Gr. Antipa", Bucharest, Romania
dmurariu@antipa.ro*

The attribute of life – biodiversity – is a new, modern concept firstly used in 1986 in the National Forum of Biodiversity – Washington D.C. The official use of term was in 1988 on the occasion of the publication of «Biodiversity», resumed in 1992 in Rio de Janeiro, for the definition of creature variability of all ecosystems.

Biodiversity epopée refers to its transformations, powdered with atmospheric, geological, paleoclimatic and paleoecological “episodes” of crisis and flourishing of different groups of beings. These “episodes” started 3.8 billion years ago and continued with their evolution along geological periods up to what we

understand today as biodiversity. Out of review of hypothesis and theories on the origin of life on Earth, to understand biodiversity evolution we need paleontological, systematic, biogeography, paleoecology, microbiology, botany and zoological data. On the background of basic knowledge in biology, such an approach may allow to develop new topics for future biological research, to develop new concepts and principles of the field.

Among the many theories and hypotheses on the origin of life on Earth those drawn from the field of genetics are not absent (e.g., ribotype and progenote theories), according to which either precellular, protocellular and cell stages or hypothetical structure (progenote) in which the hereditary information was determined by ribonucleic acids distinguish.

If we accept as reasonable the scenarios of the occurrence of the first vital structures (as individual unstable systems) on Earth, later episodes (capture energy, metabolism and reproduction) were “heroic” moments in the evolution of those macromolecular complexes to coacervates or microspheres as well as in the evolution of eubacteria and archaeobacteria. For approximately 300,000 years (between 3.8 – 3.5 billion years), the paleontological proves – fossils – were absent. In the next billion of year (between 3.5 – 2.5 billions) there were only prokaryotes: cyanobacteria, gram-negative and gram-positive bacteria, purple bacteria, archaeobacteria – all of them without sexual reproduction, but with a lateral transfer of genes, which determined that different sets of subdivisions to contain gene sets of other subdivisions, and so it was estimated that the concept of biological species is excluded. But taxonomists still consider archaeobacteria different from the other prokaryotes due to the structure of the cellular wall and by the ribosome structure. Cavalier Smith (1998) classified archaeobacteria as one of the four large subdivisions of bacteria.

Accepting that the first eukaryotes arose from a symbiosis of an archaeobacteria with an eubacteria, on the one side, we find the explanations why there are combinations of the features of the two symbionts in eukaryotes, and on the other side, we understand the phenomenon of acquiring additional genomes (in primitive eukaryotes), by the unilateral transfer of genes (Margulis & col., 2000).

Therefore, we can say that the emergence of eukaryotes by structuring nucleated cells, the acquisition of sexual reproduction by meiosis was the most dramatic and the most important event in the history of life on Earth, after a billion years of life, exclusively bacterial. In their turn, primitive eukaryotes or protists had to get cellular organelles: mitochondria – from α subdivision of the purple bacteria, and chloroplasts (in the case of plants) from cyanobacteria. On the other side, protists still have the cellular organelles absent because they lost them along evolution. About 2.5 billion years ago, it was firstly a spectacular diversification of protists. Among them, Margulis and col. (1998) recognized 36 phyla: amoebae, microsporidia, myxomycetes, dinoflagellates, ciliates, sporezoans, cryptomonas, flagellates, xanthophyta, diatoms, brown algae (some even

multicellular), oomycetes, red algae, green algae, radiolaria, etc., describing three new phyla from them (Deinococci, Pirellulaceae, Thermotogae), which some authors consider them classes.

From the aggregation of the unicellular forms (according to some scientists, bacteria have also aggregated) resulted multicellular species, with their development climax in the three large kingdoms: Metaphyta, Fungi and Metazoa. Since Precambrian (about 635 - 542 mil. years ago) there was an explosion of biodiversity, while after the huge marinoean glaciation a strong greenhouse effect developed, the O₂ increased in the ocean as well as the availability of nutrients resulted from the tectonics of the continental plates. Cambrian (542 mil. years) was a unique period taking into consideration the diversification of animal world, remaining as a significant episode of the diversity epos.

In Cambrian, marine world enriched with new forms of creatures, which gave rise to the current fauna: 13% sponge species; 8% species of priapulid worms, then brachiopods, molluscs, chordates – ancestors of vertebrates. The identification of some predators among them demonstrates the presence of some complex trophic relationships, since then; their morphology shows a motor and sensory high capacity. In that diversification of biodiversity, preys have evolved under pressure of predators, and predators evolved according to the available food resources; this tide interaction favoured the so-called Cambrian explosion of biodiversity.

Since there is no fossil of the animal ancestors with bilateral symmetry, it was made the reference to the plathelminth *Convolutriloba longifissura*, oval shaped with a vivid colour, which lived in shallow marine waters with sandy bottom. It was an acoelomate, with a simple anatomy (without head and mouth, the opening of the digestive system without a fixed position, and a diffused nervous system), but with cilia on the epidermis to move in water; today, it is represented by around 100 species. But, according to other scientists, the ancestor of bilateral animals had to be more complex than acoelomates. Therefore, it is not sure if bilateral animals resulted from a plathelminth or from an annelid – also – without condensed nervous system, a complete digestive tube, but with a distinct oral and anal openings.

By analyzing and comparing the genes of the current animal assembly, molecular phylogeny leads us to the simple reasoning, according to which the closer genetic structures of two species, the closely related respective species have to be. Thus, at the base of the phylogenetic tree there are sponges (without true tissues and body symmetry plan), followed by cnidarians, devoid of organs, but with distinct tissues (diploblastic) and radial symmetry. Bilateral animals (triploblastic) include protostomes (with the gastrular blastopore transformed in oral opening) and deuterostomes (including vertebrates) in which blastopore transforms in anal orifice.

Entering Phanerozoic era (between Cambrian and Holocene) it has to be remarked mass extinction and biodiversity damage from late Permian, and another extinction, from late Cretacic. Gnathostome fish occurred since Ordovician (450 mil. years). Sarcopterygians – since Silurian (410 mil. years). Moss and amphibians date since Devonian (370 mil. years). Reptiles, since Carboniferous (310 mil. years). Angyosperms, birds and mammals – since upper Triassic (225 mil. years).

At present, 320.000 plant species, 300.000 - algae and 500.000 fungus species are described. Protozoans are mentioned with 100.000 species, and animal kingdom, with 5,570,000 species, of which 4 million are insects. The total of about 7 million species of the current living world seems to be 1/3 of all species estimated to live on Earth.

On the one hand, specialists in systematic still have a huge work to do in order to inventory unknown species, and on the other one, after gloriously overcome crises along geological eras, today, biodiversity is subject to a new crisis, accelerated by humans' activities, who are like a virus for the entire planetary organism. Prevention or early treatment of «illness» of the Earth will provide a long perspective of evolution of biodiversity, with epic stories.

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SPECIES LIKE A SWARM OF SWARMS IN THE INTERRELATIONS ESTABLISHED WITH OTHER SPECIES

Gheorghe Mustață, Mariana Mustață

University „Alexandru Ioan Cuza”, Faculty of Biology, Iași, Romania

In nature works an ecological principle according to which **all depends on everything**. Biosphere is a unitary whole in which all the species depend in their existence on each other. No species can live in isolation. The relationships that are established among species are different: trophic, of reproduction, probiotic (cooperation, symbiosis, commensalism, ammensalism, etc). and antibiotic (competition, predatorism, parasitism or parasitism). From a trophic point of view, living beings are divided into three ecological categories: producers, consumers (phytophagous and zoophagous species) and decomposers. No link can miss in nature. In nature, every species depends in its existence on a multitude of other species that controls its existence and ensures their survival. In the place of its origin, each new appeared species entered into interrelationships with other species of the successive biocoenoses, and they could not have survived and evolved if there had not worked some self-adjustment mechanisms that do not allow the exponential growth of a species and the excision of others.

The great geneticist Vavilov Nicholas considered that the **world genetic centre** of a species is the area in which the respective species occurred and could evolve with all the pressure exercised by other species. If a species of **producer** becomes the target of a swarm of phytophagous species, these cannot eliminate it from nature because they would put in danger their own existence on the one hand, and on the other hand, the populations of phytophagous species are also controlled by swarms of zoophagous species, ensuring a balance in nature. In other words, a species cannot live alone; it is surrounded by swarms of swarms of other species that control its existence and the individuals of that species depend in their turn on the respective species.

In this respect, we bring evidences in this paper obtained from our research of nearly half a century referring to some pest species attacking the crops of *Brassica oleracea* var. *capitata* and the complexes of entomophages that control their population.

According to the biosemiotic principle of Jasper Hoffmeyer a pluricellular organism is a swarm of swarms of cells that form a unitary whole, so a species is formed of a swarm of swarms that forms a unitary whole depending in their existence on each other.

THERE ARE BORN GREAT PEOPLE TOO, IN MOLDOVA
PROFESSOR DR.SERGIU CĂRĂUȘU (1907 - 1997)

Mustață Gheorghe

University „Alexandru Ioan Cuza”, Faculty of Biology, Iași, Romania

There are some places blessed by God, from which great personalities are rising for the science and culture of a nation. These places were named by the eminent parasitologist and professor Nicolaie Leon as being the locus geniuses. From such places, from the territory of Orhei, with great Stefanian resonance, the illustrious professor Sergiu Căraușu was raised, who entered into the gallery of great biologists of our nation.

He was born on 15 February, 1907, in the Isnovat Commune, Orhei County, in a family of intellectuals, as a small child who came in contact with great personalities of culture, who have made their mark on his formation. He was a first cousin, according to his mother, with Alexei Mateevici, the author of the memorable ode «Our language» and he grew up under his influence. He attended the primary school in his native village and the High School studies at the «B.P. Hașdeu» High School in Chișinău. He then became a student of the Faculty of Sciences at the Mihăileană University, Iași, where he formed himself at the school of great professors and scientists, among which: Paul Bujor, Ioan Borcea, Jean Athanasiu, Constantin Motaș etc. As a student in the final year of studies, he was appointed as a junior teaching assistant at the Laboratory of Zoology, led by the Titan of the Romanian Zoology, Professor Ioan Borcea. Then, he was transferred as a junior teaching assistant and then as lecturer to the «King Ferdinand I» Maritime Zoological Station from Agigea, the creation of Professor Ioan Borcea, where he worked for over 30 years and led it as Director.

As a disciple of Professor Ioan Borcea, Professor Sergiu Căraușu became one of the great Hydrobiologists of Romania. He defended the doctorate with the title: „The Amphipods of Romania. Gamarids of Caspian type”. In the 1953 - 1960 period, he became director of the «Prof.dr.Ioan Borcea Marine Biological Station and managed to raise this institution of marine researches at the level of stations of similar research of world value. In 1953, he became a Reader and then Professor at the Faculty of Fisheries and Aquaculture in Constanța, he then moved to Galați. Here, he worked as Head of Department, then as Dean and received the right to supervise the doctorate in the field of fisheries and pisciculture.

He published the big Treatise of Ichtiology, unique in the Romanian scientific literature for which he received the State Prize.

Since 1960, he has become professor at the Faculty of Biology - Geography of the «Alexandru Ioan Cuza» University of Iași. Here, he was also chief of the Department of Zoology.

The scientific activity of the professor Sergiu Căraușu developed on several directions: Carcinology (Amphipoda, Isopoda and Caprellidae), Malacology and Ichthyology.

Professor Sergiu Căraușu has devoted his life to the research of marine Biology and contributed to the raising of the prestige of the «Prof.dr.Ioan Borcea» Marine Biological Station and the Romanian school of Hydrobiology.

On May 3, 1997, Professor Sergiu Căraușu passed in the world of spirits, leaving a scientific and didactic work of great value and countless generations of disciples who honour him.

SUSTAINABLE USE OF AQUATIC ANIMAL RESOURCES

Laszlo Varadi

*Research Institute for Fisheries, Aquaculture and Irrigation, HAKI
Szarvas, Hungary, varadil@haki.hu*

Aquaculture has been the fastest growing food production sector of the world in the past decade. Further increase of the aquaculture production is expected in the future due to the increasing needs for healthy aquatic products by the growing population. Capture fisheries will not be able to provide more fish to the people mainly due to the full and sometimes overexploitation of marine resources. Thus the development of aquaculture contributes not only to better food supply of the growing population but also to the protection of aquatic (mainly marine) resources.

As a result of extensive research work all over the world that was aiming at the development of sustainable aquaculture, water efficient and environment friendly systems and technologies are available for the aquaculture industry in order to produce high quality and healthy aquatic food. The sustainability of marine cage fish culture has been improved in the past years, however the use of off-shore cages will offer great potential in increasing marine fish production. Recirculating aquaculture systems (RAS) will be important contributors to the development of marine and freshwater aquaculture since these systems don't have negative environmental impact and use water very efficiently that is a crucial issue in freshwater aquaculture. The role of integrated aquaculture systems (e.g. Integrated Multi Trophic Aquaculture) will also be more important in the future. In integrated systems the organic waste from one sub-system is an input (nutrient source) for another sub-system. In such systems non-conventional aquatic products can also be produced (e.g. algae, plants, freshwater molluscs) both for human and industrial use.

In the Eastern European region, where pond fish culture is a dominant form of aquaculture the application of combined intensive-extensive (CIE) systems offers new opportunities to increase growth of aquaculture. In such systems a smaller intensive unit is linked to a larger extensive pond making possible this way the sustainable intensification and also contributing to the "blue economy".

The extensive fish ponds will continue to provide valuable environmental and ecological services by maintaining the aquatic habitat for wild species, trapping and processing the organic wastes from the surrounding areas, contributing to the improvement of water- and landscape management besides the production of fish species that feed low on the food chain.

In order to utilize the great potential that aquaculture has in better food supply of the growing population there is a need for political will, research and innovation and social acceptance.

SECTION 1

TERRESTRIAL VERTEBRATES

THE DIVERSITY OF THE AVIFAUNA OF THE BOTANICAL GARDEN GALATI (GALATI COUNTY, ROMANIA)

Arcan Viorica

Natural Sciences Museum Complex Galati, Romania

e-mail: viorik_arcan@yahoo.com

The Botanical Garden Galati is placed in the NV of Galati city, near The Danube River. It is part of Natural Sciences Museum Complex Galati, which was founded in 1990. The Botanical Garden has 6 sectors: Flora and vegetation of Romania, Useful Flora, Ornamental Flora, Flora of the Globe, the Rose Garden and Glasshouses. All this arrangement has attracted numerous categories of birds which have adapted well to the conditions in this location. The climate is typical of steppe with pontus-mediterranean influences.

The aim of this research was to complete the already existing information referring to the birds from the Botanical Garden Galati. There is only one published data about birds from some anthropic ecosystems from Galati city (Glăvan, 2001).

The observations were done between 2010 and 2012. We used the direct observation with binoculars and the transect methods. A binocular 10x50 and a Hamlin guide (Brunn et al., 1999) were used.

The present study has been done during the period 2010-2012. The list of recorded bird's fauna in this area includes 72 species. They belong to 9 orders: Falconiformes (6 species), Galliformes (2 species), Columbiformes (2 species), Cuculiformes (1 specie), Strigiformes (1 specie), Apodiformes (1 specie), Coraciiformes (2 species), Piciformes (6 species), Paseriformes (51 species). Habitat diversity, anthropogenic pressure relatively low, and the surface stretched to this area (18 ha) are the main factors which determine the presence of the large number of species of birds. The sector with the highest diversity of birds is the Flora and vegetation of Romania. Here we can find large areas of forest as well as open areas, covered only by herbaceous plants and bushes.

Most of the observed species are residents and summer visitors. A species can belong to many phonological categories, but only their main category was took into consideration. Although the number of winter visitors is very small, I have found great numbers of *Turdus pilaris* followed closely by *Turdus viscivorus*.

According to the methodology of the Atlas of the Romanian Breeding Birds (Ciochia, 1999), 49 breeding species were identified, 7 of them being characteristically for the human settlements (*Hirundo rustica*, *Apus apus*, *Streptopelia decaocto*, *Delichon urbica*, *Passer domesticus*, *Corvus monedula*, *Turdus merula*).

The Botanical Garden Galati is an anthropogenic ecosystem, relatively young, with young trees. Considering the reduced number of old and hollow trees, only few species have been found nesting in hollows (*Dendrocopos syriacus*, *Picus viridis*, *Parus major*, *Sitta europaea* etc).

From the point of view of conservation and protection of the birds species found in the studied area, were consulted the following legislative acts: Birds' Directive (2009), Bonn Convention (1979) and Berna Convention (1979):

- **Birds' Directive** (2009): Annex I – 3 species (*Falco vespertinus*, *Dendrocopos syriacus*, *Lullula arborea*, *Lanius collurio*); Annex IIA – 2 species (*Perdix perdix*, *Phasianus colchicus*); Annex IIB – 12 species (*Streptopelia decaocto*, *Alauda arvensis*, *Sturnus vulgaris*, *Garrulus glandarius*, *Pica pica*, *Corvus monedula*, *Corvus corone cornix*, *Corvus frugilegus*, *Turdus merula*, *Turdus pilaris*, *Turdus Philomelos*, *Turdus viscivorus*).
- **Bonn Convention** (1979): Annex II – 16 species (*Sylvia atricapilla*, *Sylvia borin*, *Sylvia communis*, *Sylvia curruca*, *Phyloscopus collybita*, *Phyloscopus sibilatrix*, *Phyloscopus trochilus*, *Regulus regulus*, *Muscicapa striata*).
- **Bern Convention** (1979): Annex II – 44 species (*Buteo buteo*, *Accipiter nisus*, *Falco tinnunculus*, *Oriolus oriolus*, *Picus viridis*, *Nucifraga caryocatactes* etc); Annex III – 19 species (*Phasianus colchicus*, *Cuculus canorus*, *Apus apus*, *Fringilla montifringilla* etc.)

The Botanical Garden Galati represents a zone with a great variety of trees and shrubs, propitious to the breeding, nutrition and temporary stay of birds. The general environmental conditions and the high variety of the habitats permit the presence of an enough high diversity of the bird's fauna.

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THE DYNAMICS OF IMMUNOGLOBULINS IN PREGNANT SOWS DURING LACTATION UNDER THE ACTION OF ORGANIC SELENIUM (SEL-PLEX)

Balanescu Sava

Agrarian State University of Moldova

E-mail: savva-balanescu@mail.ru

In some countries was implemented the use of organic selenium (Sel-Plex) containing amino acids, selenomethionine and selenocysteine, which increases the bioavailability of the body during use of selenium, compared with inorganic forms - selenite or sodium selenite.

In our previous research has shown that at birth, during growth, weaning of piglets can be installed critical periods, which can occur by the birth of piglets dead, poorly developed (underweight) with a high percentage of gastrointestinal diseases and sudden death. In sows may be installed mastitis.

The use of organic form of Se (Sel-Plex) during critical periods can prevent some pathologies encountered in suckling piglets.

It was reported that selenomethionine can transfer the placental barrier during pregnancy and thus raise selenium status at parturition (P.Surai, 2006). In some researches in recent years it is noted that selenium that came in the body following administration of Sel-Plex is accumulated in the mammary gland, and then having a high level is in milk, and therefore piglets will receive an organic form of selenium with breast milk and raising the status before weaning during growth. Initial research were aimed to evidence the action of organic selenium (Sel-Plex) on indices of morbidity, mortality of piglets in the period 0-45 days and immunological indices- Ig A, Ig G, Ig M.

The research was conducted on 10 pregnant sows (10-14 days antipartum), divided into two similar groups.

In experimental group of sows 10-14 days antipartum and over the course of 45 days postpartum in the composition of the ration was administered (through a mixture at the feed block) the product Sel-Plex in the proportion of 1 kg / ton (100 g at 100 kg feed).

The control group, 5 sows, were fed with the same feed, except for the product Sel-Plex. Sows in both groups received daily mixed fodder in two portions to an animal. Blood samples were taken 7 days antipartum, 12-14 and 40-42 days postpartum.

The results obtained allow us to mention that the product Sel-Plex during the study (over 55 days) caused no adverse deviations in growing of pigs maintained under these sows. The biochemical investigations performed in pregnant sows by 7-10 days antipartum both groups showed that animals initially had a rather high immunological status. The IgA concentration constituted 71.2 mg/dl in the experimental group and 71.4 mg/dl in the control group. IgG level in this period was higher by 9.67% (P1, 2 <0.001) significantly distinct from sows in the control group.

At the following survey (14 days postpartum) the IgG level in pigs from the experimental group was 1361.0 ± 14.8 mg / dl and 1312.0 ± 13.4 mg / dl in the control group, which is 3, 68% higher and the difference between groups (P1, 2 <0.05) is significant. IgA level was insignificant (P1, 2 > 0.05) higher in the experimental group by 5.92%.

IgM - are represented by heterofile, rheumatoid factor and part in antibacterial immunity. Initially, 7 days antipartum in both groups have been shown by unreliable statistical level (P1, 2 > .05). However, the level of IgM from serum of sows in the control group was 80.7% higher. In the 14 days postpartum, was

observed an increase of IgM level equal to 14.7% in animals from the experimental group, but the results obtained have a low significance level ($P_1, 2 > 0,05$).

On the 40th day postpartum was observed tendency of increasing the concentrations of IgA, IgG, IgM at sows that received in the feed the organic selenium. The IgA level constituted 59.00 ± 2.41 mg/dl in the experimental group and 24.80 ± 1.5 mg/dl in the control group ($P_1, 2 < 0.001$).

The concentration of of IgG in sows from the experimental group was higher ($P_1, 2 < 0.001$). A similar modifier was also observed in IgM level, which consists of 215.0 ± 4.1 mg/dl and 131.6 ± 33.0 mg/dl in animals from the experimental group and control group, respectively ($P_1, 2 < 0.05$), so being by 39.06% greater in the experimental group.

The positive effect of supplementation of the ration by organic selenium on the of piglets growth and development is confirmed by a higher percentage of retention - 97.82% in the experimental group, and 95.6% at the control group.

The total gain and average daily gain in piglets from the experimental group was 6.83% higher than at the control group. The specific mixed fodder consumption has decreased from 4.71 kg per 1 kg of weight gain in control group up to 4.3 kg in the experimental group, or 8.7% less.

Based on investigations, we can conclude that the organic selenium is able to enhance the immune status indices, positive impact being confirmed by improving of bioproductive indices.

ECOLOGICAL ASPECTS REGARDING THE MATING AND NESTING PERIODS OF GREAT CORMORANT (*PHALACROCORAX CARBO*) IN THE LOWER PRUT RIVER

Bogdea Larisa, Cojan Constantin, Gache Carmen,
Munteanu Andrei, Zubcov Nicolai

Institute of Zoology of Academy of Sciences of Moldova
e-mail: larius421@gmail.com

Phalacrocorax carbo L. (1766), is a species as a summer visitor for Moldova point of view phenological, which breeding in colonies in wetlands. It can often be seen in winter, feeding on unfrozen waters of the Lower Prut River and its ponds.

In this paper we present observations on the species *Phalacrocorax carbo* during mating and nesting.

Phalacrocorax carbo - during the annual cycle, depending on as external factors such as temperature, precipitation, photoperiod, and so on, as well as internal factors - hormone, presents a series of distinct ethological manifestations, events that allow us to divide the cycle into the following periods: - period of pre-copulation; period copulation and nesting; moulting and change feathers; period of flock .

The observations were made with binoculars systematically for 6 years (2006-2012) installed on a colony poplar and willows in the scientific reserve «Lower Prut».

It was noted that the mating of Great Cormorant is closely linked to meteorological factors such as temperature and photoperiod. In years with mild winters and dry and warm spring the courtships' dances and mating begin much sooner. Thus in 2006, when already on 17 March, at a temperature of + 12 ° C, there was a lively agitation and even fights between the individuals for occupying the nest.

At the beginning of the breeding period the older pairs arranged their nests and clean them of dirt and defend them fiercely. The nest is located in the most enjoyable sites, at the limit of 1.5 m up to 13-18 m in height. Most often, the nests are placed in the tall old trees and *Salix sp.* and *Populus sp.*, there is a certain preference for places in the center of the colony that are protected from predators and are less vulnerable. The site selection for nest is dialed by male, which makes very cautiously. Of the 179 identified nests of Great Cormorant 68 % pairs preferred to place the nest in the willows. In poplar canopy nests were installed 29% and only 3% were found nesting in crack willows and underbrush trees.

The laying of eggs occurs differently at the pairs of great cormorant. The beginning clutch is conditioned by meteorological factors. Usual the first clutch have found at the end of April. The eggs are elliptical, greenish-white and are filed every day by one, usually 4-6 eggs are found in most clutches. Hatching takes 25-28 days, the chicks are hatched nidicolous type, requiring parental care. The feeding doing both parents and the number of flights with food is higher in the first days of life. Feeding activity of chickens occurs most intense in the morning (8-11 am) and afternoon (17-18 hours). The low feeding activity of the offspring takes place around noon (12-14 hours). After bringing food for chickens, the parents go out with faeces in their beak, we have observed in the nest a special cleaning.

Chickens are very responsive to the touch the rump that immediately throws excrement and perhaps parents when they appear to take the excrements in their beak directly from chicks' cloaca. The tree which is placed colony is easily identifiable because the acid bird excrements disposed of offspring and adults, leading to fast drying of the tree. After leaving the nest, the juveniles associate in small groups with other chicks in the colony and are accompanied by a few adult birds to help them gather food and protection by enemies.

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MECHANICAL GRASS CUTTING, HABITAT FRAGMENTATION AND SMALL MAMMAL POPULATION DYNAMICS ON WETLANDS

Borowski Zbigniew

*Department of Forest Ecology, Forest Research Institute, Braci Lesnej 3,
05-090 Raszyn, Poland, e-mail: Z.Borowski@ibles.waw.pl*

After 1980 in many regions in Poland, such as Biebrza valley (present land of the Biebrza National Park BNP), traditional extensive farming gradually lost its economic viability due to low accessibility and productivity. It had the impact on the landscape and resulted in dramatic reduction of its biodiversity. Abandonment initiated ecological succession, which reduced the density of breeding waders and other species of low-productive vegetation. Due to problem with tree secondary succession in 2010 in the BNP started the special program aimed at preventing succession by mechanical grass cutting on the landscape scale (over 15 000 ha in each year) by special rattracks. However, the scale, time and precision of this methodology may generate strong negative impact on many animal species, such as small mammals living in the meadow. That is why, I tried to estimate the impact of mechanical grass cutting on small mammal community which lives on the non-cut areas. Capture recapture (CMR) methodology was applied on two permanent trapping grids (0,6 ha each) located on non-cut meadow. I analyzed following components before and after disturbance: species composition in the small mammal community, their population density, sex ratio and age structure. Obtained results indicate, that mechanical large scale grass cutting generates also important impact on small mammal community in non-cut areas. After cutting the root vole (*Microtus oeconomus*) population density decreased from five to fifteen times. Additionally, it prolonged the low phase of the root vole population cycles and in consequences changed composition of the small mammal community. There are two main probable reasons of such results: destroying local refuges (source habitats) and disturbing habitat connectivity (ecological corridors). It suggests that existing farming practice for active open meadow protection should be changed in the way to minimize the impact on small mammals population dynamics. Additionally, it seems too, that observed changes in small mammal population structure have important impact on local population of avian predators.

**FAUNISTIC AND ECOLOGICAL PECULIARITIES OF SMALL
MAMMAL RESERVOIR SPECIES IN THE NORTHERN ZONE OF
THE REPUBLIC OF MOLDOVA**

Burlacu Victoria¹, Gheorghita Stela¹, Caraman Natalia^{1,2},
Nistoreanu Victoria², Larion Alina², Cirlig Tatiana³

¹*National Centre of Public Health, Chisinau, biology@cnspl.md*

²*Institute of Zoology of ASM, Chisinau, vicnistreanu@gmail.com*

³*Tiraspol State University from Chisinau*

One of the most important elements in epizootic monitoring activity of natural outbreaks is the systematic evidence of rodent species number, especially of the main species and of other pathogen carrier species during appropriate phenological periods.

The studies were performed during 2011-2012 in the northern zone of the republic of Moldova. Several types of ecosystems were selected for investigations: forest, forest edge, forest shelter belts, abandoned orchards, paludous, rural as well as recreational biotopes located in woods, where the contact between people and small mammals is higher. The small mammals were caught with snap traps, placed in 2 and 4 lines by 25 or 50 traps per line, depending on biotope, at the distance of 5 m between traps and 20 m between lines. The ecological analysis of small mammal populations was performed using the indexes of trappability, abundance and diversity (Shannon).

During the study period 3787 trap/nights were processed and 760 individuals were caught. There were identified 15 species of small mammals – 13 rodent species (*Muscardinus avellanarius*, *Clethrionomys glareolus*, *Arvicola terrestris*, *Microtus sp*, *Microtus subteraneus*, *Apodemus uralensis*, *Apodemus sylvaticus*, *Apodemus flavicollis*, *Apodemus agrarius*, *Mus musculus*, *Mus spicilegus*, *Micromys minutus*, *Rattus norvegicus*) and two insectivore species (*Sorex minutus*, *Sorex araneus*).

The most abundant species were *Apodemus sylvaticus* (21,4%), *A. agrarius* (20,3%), *C. glareolus* (17,9%), *A. flavicollis* (16,6%), followed by *A. uralensis* (7,4%) and *Microtus sp.* (5,4%). Other species had low abundance – less than 2%: *M. musculus* (1,6%), *M. subteraneus* (0,5%), *S. araneus* (0,4%) and in very low number (0,3%) were recorded *M. avellanarius*, *A. terrestris*, *M. spicilegus*, *R. norvegicus* and *S. minutus*.

The highest diversity (1,91) was registered in camps placed in forests – 11 species. This type of biotope represents a major epidemiological importance, because during summer period a high number of children from various localities are present here and the risk of contacts between man and reservoir id extremely high. Therefore, the monitoring of these biotopes was permanent in the studied period. In forest ecosystems 9 micromammal species were recorded (1,66), in abandoned orchards (1,66) and in forest shelter belts (1,57) – 7 species, at forest edge (1,58) and in paludous biotopes (1,4) – 6 species.

The species and individual number distribution is different in the studied ecosystems. Out of the total number of caught individuals in woods was recorded the highest abundance 44,3% in comparison to other natural ecosystems. At forest edge the micromammal abundance was 16,8%, in children camps placed in wood – 13,4%, in shelter belts and abandoned orchards – 9,2%, while in paludous biotopes was registered the lowest abundance – 6,7%.

The analysis of small mammal activity showed that in 2011 the highest trappability index was in shelter belts – 25,9%, followed by forest edge – 22,3%, children camps placed in wood – 21,6% and in forest biotopes – 18,1%. In abandoned orchards (13,7%) and paludous biotopes (7,0%) this index was much lower. The highest trappability index in 2012 was registered at forest edge – 31,0%, followed by paludous biotopes – 23,7% and forests – 22,0%. By comparing with 2011 in abandoned orchards the index increased (19,0%) and decreased in shelter belts (17,0%) and children camps placed in wood – 14,2%.

Thus, the trappability index is varying depending on the year, study period, reproductive activity, climatic conditions etc. The small mammal fauna evaluation in particular ecosystems allow to obtain data about actual state of reservoir species number. These studies are important for determining the „risk territories”, which are natural outbreaks of various infections and include the co-existence in certain biotope of the pathogen agent and of reservoir species.

Due to the fact, that many of the studied biotopes represent recreational zones for the population, their permanent monitoring is of major importance for public health. At forest edge and in forest ecosystems the trappability index and small mammal abundance is higher than in other biotopes. These ecosystems are frequently visited by man mainly for recreational purpose and for domestic animal grazing. The household and alimentary waste remained after the recreational and agricultural activities create favorable conditions for the occurrence of many rodent species. All these factors determine the contact between man and pathogen agents of various diseases.

Therefore the faunistic and ecological studies of reservoir species represent an important element in pathogen agents monitoring in nature and allow the prognosis of outbreak activation in natural environment.

DEMOGRAPHIC STRUCTURE OF SMALL RODENT POPULATIONS FROM URBAN ECOSYSTEMS OF CHISINAU CITY, REPUBLIC OF MOLDOVA

Caraman Natalia^{1,2}, Nistreanu Victoria¹, Larion Alina¹,
Burlacu Victoria², Cirlig V³. David V¹.

¹*Institute of Zoology of ASM, Chisinau, CNatusea@yahoo.com*

²*National Centre of Public Health, Chisinau*

³*Tiraspol State University from Chisinau*

The age and sex structure of rodent populations are important demographic indexes that characterize the population state and evolution tendencies. These parameters are varying within large limits in relation to biotic and abiotic factors and development cycle of each species. In urban environment the animal species are subjected to strong anthropic pressure, therefore the study of demographic structure populations from urban areas will allow emphasizing some adaptive peculiarities of rodent species in specific conditions and the prognosis in development trends of species populations.

The studies were performed in 2011-2012 in urban area of Chisinau city and in adjacent ecosystems, represented by agrocenoses, fallow grounds, natural woods, forest shelter belts palustre and natural open type biotopes. The material was collected during the whole year, with traps placed in lines at 5 m distance between the traps in various types of biotopes. In caught animals the following parameters were registered: species, age, sex, reproductive status.

In the study period 13 rodents species were registered in Chisinau urban area and in adjacent ecosystems, of which 9 species of small rodents (*Apodemus sylvaticus*, *A. uralensis*, *A. flavicollis*, *A. agrarius*, *Mus musculus*, *M. spicilegus*, *Microtus sp.*, *Clethrionomys glareolus*, *Cricetulus migratorius*) were caught with traps.

Sex ratio of rodent dominant species during the first half of 2011-2012 in most cases shows the prevalence of females, while males disperse in search of new territories for breeding. In forest ecosystems the sex ratio is slightly oscillating around 1:1 value in wood mouse (*A. sylvaticus*) and field vole (*Microtus sp.*), in yellow-necked mouse (*A. flavicollis*) a slight female predominance was observed, while in pigmy field mouse (*A. uralensis*) meadow mouse the female number was significantly higher than that of the males (3:1).

In wet biotopes the sex ration of wood mouse is 3:1 with male prevalence, while in yellow-necked mouse is 3:1 with female prevalence. In open land biotopes (meadows, pastures, grasslands, fallow ground) the sex ratio of dominant species (*M. spicilegus* and *Microtus sp.*) is approximately 1:1. At wood mouse and pigmy field mouse the females dominate and in yellow-necked mouse the males are more numerous.

In agrocenoses only in doar wood mouse the males were more numerous (54% vs 46%), while the rest of species the females are dominant: in pigmy field

mouse – 67%, in striped field mouse – 80%, in field vole – 71%, the differences being significant.

In the second half of the year the sex ratio shows that the females are more abundant in the optimal habitats, while the males disperse more actively. In forest ecosystems the males dominate in bank vole and female's number decreased to 35%. The rest of species have the sex ratio around 1:1, except pigmy field mouse with sex ratio 1:7 with female prevalence. In paludous biotopes the females are more numerous in the majority of species except pigmy field mouse, where the males dominate. In open land biotopes the males of *Microtus sp.* dominate 67% vs. 33% of females; in other species the females are slightly dominant. In agrocenoses the sex ratio in striped field mouse is around 1:1, in other species the females dominate.

In general, in optimal conditions the sex ratio slightly oscillates around 1:1 value in the majority of the species, with the prevalence of males in spring and increasing of female's number toward autumn.

As to the age structure, at the beginning of spring the rodent populations are formed only by adult individuals, the majority being involved in reproduction process. Toward the end of spring the proportion of subadult individuals reaches 10-35% from species population number. The highest ratio of subadult and juvenile individuals was registered in open biotope species field vole – about 20%, grey hamster – 34% and pigmy field mouse – about 14%, due to their intense breeding and abundant trophic resources in inhabited biotopes. The forest species begin to reproduce later and by the end of spring there only one generation of subadult individuals, representing 3-5% from *A. flavicollis* population, 8-10% from *A. sylvaticus* and 1-3% from bank vole populations. The spring generations of small rodents quickly mature and begin to reproduce in early summer. During the summer period the reproduction continues and toward autumn the subadults constitute more than 70% from small rodent population number. In this period the majority of overwintered individuals disappear from the population, being substituted by adult ones born in the current year. Therefore at the end of autumn the rodent populations are completely renewed.

In urban conditions the synanthropic species (rat and house mouse) and sometimes the field vole can reproduce the whole year, therefore in their populations always exist young individuals even in winter period, although their proportion is rather low.

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NATURAL AREA BIODIVERSITY RESEARCH OF THE LOWER COURSE BASIN OF ICHEL RIVER

Cârlig Veaceslav, Nedbaliuc Boris, Chiriac Eugenia,
Cârlig Tatiana, Coadă Viorica, Pelin Ana

*State University of Tiraspol, Chisinau, Republic of Moldova,
e-mail: veaceslavcarlig@gmail.com*

Natural area in the lower course of the river Ichel is a complex system of geo-hydrological objects, varied habitat for unique plant and animal world. As a result of this research biodiversity in three types of habitat were identified 300 plant species and 314 animal species. Plants belong to 9 phyla and 20 families, and animals to 5 phyla, 12 classes, 36 orders and 119 families. In the Red Book of the Republic of Moldova, of this diversity are included by 9 species of plants and animals. This element of national heritage needs special protection from the state.

As a result of investigations carried out on periphytic and planktonic algal communities, in the lower course of Ikel river, have been highlighted 178 species and varieties of algae belonging to 6 phylum. Terrestrial plants reported in the sector studied present a diversity of 122 species, belonging to 3 phylum. In the Red Book of the Republic of Moldova are included 9 species of plants. In the sector studied were identified 221 species of invertebrates, belonging to 4 phyla, 8 classes, 19 orders, 73 families. The most representative species are insects with 180 species, followed by mollusks and arachnids, with 19 and 15 species. The vertebrates detected at this stage lists 93 species belonging to 4 classes, 17 orders and 46 families. In the Red Book of the Republic of Moldova includes 9 species: *Iphiclides podalirius*, *Zetynthia polyxena*, *Xylocopa valga*, *Bombus argillaceus*, *Bombus fragrans*, *Bombus paradoxus*, *Oricetes nasicornis*, *Coluber jugularis*, *Serinus serinus*. În cadrul stației cercetate a fost identificată o specie de limax - *Tandonia kusceri*. In the investigated station was identified species of slug - *Tandonia kusceri*, new for Moldova. Also a special significance presents the species *Rana dalmatina*, the eastern border of the European area thus extended from the area of Central Codri to the bed lower course of the river Ichel.

ON THE CONSERVATIVENESS OF ORIENTATION-EXPLORATORY BEHAVIOR OF RODENTS

Cemirtan Nelli, Nistreanu Victoria, Larion Alina, Sitnic Veaceslav

Institute of Zoology of ASM, Chisinau, vicnistreanu@gmail.com

The aim of this study was to identify the evolutionary adaptations of the animals. As a model subject the mound building mouse *Mus spicilegus* was chosen, which is widespread in Moldova in both natural and anthropogenic landscapes, and as study object – the orientation – exploratory behavior - one of the most important complexes of behavior. The mentioned behavior complex was studied by open field method. In order to identify the evolutionary adaptations the

research data of the last two years were compared with the same parameters obtained in studies of 20 years ago. The animals were caught in the spring, summer and autumn. The most numerous were the spring catches directly from mounds (overwintered individuals) and autumn catches (young animals from the last generations of the year). On the whole the data from 63 males and 97 females were processed. During the time the animals spending in «open field» chamber the following parameters were recorded: horizontal and vertical activity, duration of grooming, of freezing and latent period – the time of entering from the portable cage into open field chamber. The data processing allowed to emphasize the peculiarities of behavioral elements and to compare the data with the results obtained in the previous years.

Latent period in all the animals was rather low: in males it varied between 94,77 sec. to 145,43 sec., while in females – between 66,2 sec. to 115,09 sec. and the highest values of this parameter were registered in the last year of studies. All *Mus spicilegus* individuals entered in the open field chamber independently.

The dynamics of male and female horizontal activity in all the studied periods is similar: the highest values are registered in the first minutes and decrease at the end of the experiment, showing a gradual attenuation of the emotional reaction to novelty and adaptation to the new environment. At the same time, the parameter values at 3 and 6 minutes of animal activity in open field are different: in males and females studied in the past years they are significantly lower than in animals studied at present, thus their level of emotional reaction in the first minutes of the experiment was higher. The parameter values at 12 and 15 minutes in all the animals during all the study period were similar. Apparently, despite the higher emotionality of «modern» animals, in order to adapt to new environment, they need the same time, as *Mus spicilegus*, who lived in corresponding temporal and spatial periods 20 years ago.

The vertical activity characterizes the proper exploratory behavior of small rodents. The dynamics of this parameter is similar in all the animals in all the studied periods. The values of the index on the 6, 9, 12, 15 minutes in open field in male and female are similar, and the values of 3 minute were significantly different from all the other minutes and were different in males and females. The total values of the parameter didn't register significant sex differences in all investigated periods.

Grooming occupied a small time amount in the general characteristics of *M. spicilegus* behavior of in all periods of the study. Its character changed randomly, both in males and females, although there was a general tendency to increase the duration of grooming with the increase of the time spent in open field.

The element of freezing was practically absent in the behavior of *M. spicilegus* representatives in recent studies and had low values in the early years of mound building mouse studies. Both in females and males, the tendency to increase the freezing duration toward the end of the experiment was also registered.

Therefore, the absence of significant differences in the values and the dynamics of the above studied parameters in the representatives of *M. spicilegus* in time and space indicates, in our opinion, on the conservativeness of orientation-exploratory behavior that allows the animal to easily adapt to changing environmental conditions.

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ECOLOGICAL FEATURES AND DIVERSITY OF HELMINTH FAUNA OF HOST SPECIES *APODEMUS FLAVICOLLIS* IN REPUBLIC OF MOLDOVA

Chihai Oleg¹, Romashov Boris³, Romashova Natalia³, Nisteanu Victoria¹, Lariion Alina¹, Erhan Dumitru¹, Talambuța Nina², Rusu Ștefan¹, Savin Anatolie¹, Satnic Veaceslav¹

¹*Institute of Zoology of ASM, Chisinau Moldova*

²*Free International University of Moldova, Chisinau, Republic of Moldova*

³*Voronezh State Nature Biosphere Reserve, Russia*
olegchihai@yahoo.com

The rodent species are carriers of many infections, including parasitic ones, and most frequent the agricultural environment is the origin of contacts between man and animal carriers, which make the human exposed to parasitic diseases transmitted by wild rodents. The small rodents are in permanent contact with domestic and wild animals, especially through trophic chains and due to their activity. They are considered as main vectors in transmitting many serious infectious contagious diseases, especially parasitic ones.

The yellow necked mouse (*Apodemus flavicollis* Melchior, 1834) is one of the dominant rodent species among small mammal fauna for the republic, especially in forest ecosystems. The studies were performed during 2010-2012 in the central part of the Republic of Moldova in various types of ecosystems: forest, forest edge, shelter belts, agricultural, fallow ground, and meadows. The animals were caught with snap traps placed in lines at 5 m distance between the traps during 2-3 days consecutively in different seasons. In caught animals the following parameters were registered: age, sex, reproductive and physiological status.

The ecological analysis of the material revealed the following features of the studied species: it was dominant in many of the investigated biotopes, with the abundance of about 39%-55% in forest ecosystems, of 28%-52% at forest edge and of 27%-43% in shelter belts. The species had a lower abundance (8%-12%) in agricultural ecosystems and in fallow ground, which is rather high for a forest species. In general, in the last years can be observed an increase of this species abundance in agricultural ecosystems, even in those situated rather far from any arboreal biotopes. After the ecological significance the species is constant in for-

est ecosystems, is constant and characteristic at forest edge and in shelter belts and is characteristic or accessory in open type biotopes.

Therefore, the yellow necked mouse, with high species number in forest ecosystems and frequent occurrence in open land biotopes, being host species for many parasite infections, was chosen for parasitological studies, in order to reveal the diversity of its helminth fauna.

The parasitological research was conducted at the laboratory of Parasitology and Helminthology of the Institute of Zoology of ASM, by total dissection, for the examination of the muscles (masseters, front limb muscles, diaphragm) and internal organs (trachea, lungs, oesophagus, stomach, small bowel, large bowel, liver, spleen, kidneys, urinary bladder), in order to determine the parasitological qualitative and quantitative indices.

In the case of the host *Apodemus flavicollis* the prevalence of *Mesocestoides lineatus* * is 4,0%, the intensity is 2 exemplar (ex), the abundance is 0,08 ex, the respective indices for *Hydatigera taeniaformis* * are 8,0%, 1ex and 0,08 ex, for *Skrjabinotaenia lobata* 8,0%, 11,5 ex and 0,92 ex, for *Capilaria hepatica** – 12,0% and 46,6%(of the liver), for *Syphacia stroma** 16,0%, 78,8 ex and 12,6 ex, for *Syphacia obvelata** – 32,0%, 74,0 ex and 23,6 ex, for *Heligmosomoides polygirus* – 8,0%, 22,5 ex and 1,8 ex, the prevalence for *Trichocephalus muris* is 24,0%, the intensity is 4,2 ex and the abundance is 1,0 ex. Thus, the prevalence of cestode species (*Skrjabinotaenia lobata*, *Hydatigera taeniaformis*, *Mesocestoides lineatus*) is 20,0%, the intensity is 5,4 ex and the abundance is 1,1 ex, the prevalence of the nematode species (*Syphacia stroma*, *Syphacia obvelata*, *Capilaria hepatica*, *Trichocephalus muris*) is 48,0%, the intensity is 48,7 ex and the abundance is 42,9 ex, the total invasive index is 52,0%.

The obtained results see 3 species of Cestoda and 4 specii of Nematoda, from which a **zoonotic*** impact was seen in 2 species of Nematoda, an **epizootic** impact was seen in 1 species of Cestoda, a **mix** impact (zoonotic+epizootic) was seen in 2 species of Cestoda and 1 species of Nematoda. The **rodent specific** species, (*Apodemus flavicollis*), were found to be 1 species of Cestoda and 2 species of Nematoda.

In conclusion we note a rich parasitofauna in the wild rodent specimens, therefore the research will be continued for the sanologic evaluation of the various natural and anthropised ecosystems of the Republic of Moldova.

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ROLE OF ANIMALS FOR SOILS AND IN THE PROCESS OF SOIL FORMATION

Cojocaru Olesia, Kuharuk Ecaterina

Institute Pedology, Agrochemistry and Soil Protection «N. Dimo», Chisinau, Moldova

E-mail: olesea.cojocaru@bk.ru

Fauna of soil's is plentiful and diverse. Zoological data are important for soil science, the main ones are: 1) Analysis of the composition and origin of the fauna of the study area gives a description of the conditions of soil formation; 2) The method of zoological diagnosis needs to justify and clarify the new taxonomic units of soil (urban soil, etc.); 3) Animals, both vertebrates and invertebrates living in the soil are influenced by the structure of its profile and many properties (wormhole, biogenic emissions coprolites etc.); 4) The ecological condition of the soil is determined by the presence of the dominant organisms.

For example, the mole rats are very active in the soil. Monitoring the activities of small mole rat *Spalax leucodon* Nordmann (Vulcanesti district, forest edge), which is a distance of 60 m recorded progress mole rat, where 32 of his recent release (emission limits variations in weight from 8 to 17 kg of soil. The total weight of all emissions for a small portion of the length of 60 m is almost 400 kg. Such emissions play a major role in the movement of soil material. Considerable work carried out in the soils of Moldova gophers and rodents. A rummaged soil profile southwestern black soil molehill always attracts attention in field descriptions of cuts. They are found to a depth of 1.5 m. Strong molehill increases water permeability of the soil. Wormhole effect on soil physics and moisturizing, and are centers of high nutrient content in the lower layers of the soil. Observations show that the wormhole focused more roots than in the surrounding less humified soil mass. Also, many researchers proved useful activity of earthworms, which are not only loosen the soil, creating coprolites, but carbonates and transported from the lower to the upper soil layers.

Field Studies conclusions can be drawn: I. Zoogeographical show the contrast and the transitional nature of the conditions of soil formation on the territory of Moldova, would support the considerable difference between the Balti and Bugeac steppes. II. In soils of Moldova diverse and effectively manifested activity of burrowing animals - vertebrates and invertebrates.

Thus, the role of animals that inhabit the soil in the process of soil formation is positive, and its quality is increasing.

**ECOLOGICAL PARTICULARITIES OF THE *BUFO BUFO*
POPULATION REPRODUCTION IN THE ECOSYSTEMS OF
“CODRII” REZERVATION**

Cozari Tudor^{1,2}, Plop Larisa¹, Jalbă Liliana¹, Gherasim Elena², Silitrari Andrei²

¹*Tiraspol State University (located in Chisinau), Republic of Moldova*

²*Institute of Zoology of Academy of Sciences of Moldova*

e-mail:cozaritudor@gmail.com

Common Toad frog (*Bufo bufo* L.) is one of amphibian species of the reservation fund, the population estimated to several thousand individuals and it's reproducing within 1-2 lakes in the Bicovat tributary valley. In order to assess the reproductive potential and its achievement of high fluctuating environmental conditions, we have realized the multi-annual monitoring of this population. It was established that the two sexes of the species have a different sexual maturation period. Thus, the majority of males – up to 75% and a part of the female (15%) are getting mature in the 3 year of life, and the rest of the individuals of both sexes are getting mature on the 4 year. Another important reproductive particularity of the species is relatively high prolificacy of the females, ranging between 2652-7202 eggs, this population parameter essentially is increasing with the body size (with age). It was established that the average absolute prolificacy of female population from Central Forest is 6830 eggs (N=68), being higher than that of females of other populations in other parts of the area: 3109 eggs – in Scandinavia (Hemelaar, 1983), 5600 – in Romania (Ardelean, Bereş, 2000). The parental contribution and multi-annual reproductive success of *Bufo bufo* population in the “Codrii” Reservation are shown in Table 1. The data in Table 1 it is observed that, unlike the years 1987 and 1996, in 2005 the population studied reproductive success was minimal: the number of juvenile shore exit was 1,4% of the eggs laid by the whole population or equal to 85 juveniles that returned to a spawning female. In this context, we believe that in addition to some natural factors that cause a certain pattern of multi-annual fluctuations in larval populations of the species (such as nutritional resources, lowering water levels leading to increased larval density, predators, etc.), one of the main causes of somewhat decrease the reproductive success of the population in that year was also damage reproductive native basin placed near tree line forest sector nr. 10 and colonization by these population of another water basin, built on the edge of the forest sector nr. 5. Besides the fact that the water basin with a fairly large (about 5400 m²) has fewer sectors with ecological conditions necessary for reproduction of the species - appropriate depths, submerged vegetation, sufficient enough nutritional resources and so on, he, in addition, have some concrete banks which do not allow the use of the water sector banks as ovipositor stations or land out of juveniles in this area. However, this artificial lake has no natural drainage that would allow a portion of larvae, still in premetamorphic development stage to enter the given water stream and to be carried by water to the forest land areas located

downstream of reproduction Lake. Therefore, the majority of juveniles during their postmetamorphic migrations are entering in one of the forest flowing streams into the western sector of the lake and then moves upstream by brook, and along its banks. However, it should be mentioned that the species *Bufo bufo*, having a high level of ecological adaptability, they successfully colonized the breeding basin and despite some less favorable ecological conditions as they were in the previously breeding basin, they obtained, for a moment, a relatively good reproductive success, which, once again, proves that this species incidentally is one of the species of batracofauna of the “Codrii” Reservation. As proof of this serve data on reproductive success obtained by Common Toad frog in 2009, equal to 1,8% or 110 juveniles for each breeding female, the reproductive success, as seen from the data in the Table 1, is already higher than that achieved in 2005. We can presume that with the redevelopment of a new water basin instead of what previously existed near the forest sector nr. 10 (which is now in its 2 year of existence), the species *Bufo bufo* will use again for breeding and, thereby, the number of population in the coming years they will increase obviously.

Table 1

The parental contribution and reproductive success of the Bufo bufo population from “Codrii” Reservation

Years	Number of breeding females	Absolute prolificacy average pcs.	Total of eggs laid by the female population pcs.	Number of juveniles out on land:		
				Total	Reported to the number of eggs laid, %	Reported to a breeding female, pcs.
1987	458	7 211	3 302 638	56 144	1,7	122
1996	611	7 289	4 453 579	93 525	2,1	153
2005	384	6 101	2 342 784	32 798	1,4	85
2009	412	6 112	2 518 144	45 326	1,8	110
Media:	467	6 678	3 154 286	56 948	1,8	118

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PHENOLOGY OF REPRODUCTION OF THE GREEN RANIDS IN THE ECOSYSTEMS OF CODRII CENTRALI IN REPUBLIC OF MOLDOVA

Cozari Tudor¹, Gherasim Elena¹, Rusu Vadim^{1,2}

¹*Institute of Zoology of Academy of Sciences of Moldova*

²*State University of Moldova*

e-mail: gherasimlenuta@gmail.com

In the animal world, amphibians are one of the essential components of the ecosystems as they are populating various natural and anthropogenic habitat types which can be terrestrial or aquatic. Unfortunately, from our of 3,000 known amphybian species on Earth at this moment, about 2% are endangered as a result of multiple causes (Lebedinsky, 1995).

Out of the 13 species of caudat and ecaudat amphibians in Republica Moldova at the present time green ranids (*Rana ridibunda* Pallas 1771, *Rana lessonae* Camerano 1882) have a very wide spread and are not included in the category of critically endangered species (Vladimirov, 2003 et. al.).

From the facts related above we can observe that among the species that require a special protection status green ranids are missing, which indicates that they are a good subject for research with the aim of a possible evaluation of the real ecological situation of the amphybian species and the development of adequate and efficient measures for their monitorisation and conservation.

For amphybians, in relation with their amphybiont lifestyle, is characteristic an original life cycle. We can notice some phenological phases of green ranids such as reproductive migrations, reproduction, the process of indwelling habitats and going into the hibernation phase, all of which depends in a large measure on the temperature of the air and soil (Cozari, 2009; Garanin, 1983; Piculic, 1985). Rainfall, relative humidity of the air, distribution and distance between breeding habitats and nutritional habitats, rest and hibernation have a secondary or smaller importance for amphybians (Cozari, 1987; Popa, 1982).

As a result of the assessments that were conducted in the ecosystems of Codrii Centrali this year it was determined that the firts phase of the annual cycle of green ranids (*Rana ridibunda*, *R. lessonae*), is the coming of the mature specimens out of hibernation in the first half of April, when the average temperature of air reached values of +10 +15C, which allowed getters of these species to start the reproductive process in an operative and efficient way. One of the peculiarities of the original breeding of these species is the moving of the breeders to breeding pools. This makes the males the first among ecaudats that are moving toward the breeding pools and form numerous groups on the water table. The breeding sites represent groups formed out of 5-6 males placed in sections named „nuptial arenas” with an area of 5-8 m where males had their individual protected teritory. Males were placed at a distance of 15-20 cm and 2-3 m apart from each other. Males have conflicting interactions that are taking place

through sounds or by direct collision. After the physical interaction through „direct clashes” males withdraw at a distance of 20-25 cm, back to back. Besides the males’ tactic based on employment and protection of the territory they have an efficient strategy which consists in a vocalization behavior. Vocalization occurs with the change of posture at every 3-5 minutes so that the sound is emitted in different directions to attract females. Vocalization is periodic and goes for 15-20 minutes under the form of waves of sound „activity – rest” which allows customisation of the breeding area. Males of these species have resonators that amplify the sound. Based on this specific feature of vocalization of the species it can be concluded that the sounds produced by males not only aim to attract suitable females but also to attract females ready for reproduction. This way breeding areas that have stronger choruses are more attractive for females and will benefit from a greater number of females, respectively.

Females do not rush to the breeding areas but one by one toward the noisy „male orchestras”, always having the possibility to choose the most appropriate partner from all the candidates. During the formation of the conjugal couples males attach to the back of females and cling with anterior paws which have fingers with „nuptial warts” that stick firmly to females’ armpit. After pairing females lay eggs whose number can vary from species to species and the age of female so that *Rana ridibunda* can lay 6000 – 9000 eggs, *Rana lessonae* up to 3000 eggs and *Rana esculenta* up to 5000 eggs (Cozari, 2003).

An exclusive case in Republic of Moldova is that during mating *Rana ridibunda* forms mixed populations with breeders of *Rana lessonae* species, and as a result of their pairing prolific hybrids are formed. After the formation of the conjugal couples is taking place the laying of the eggs and their further development. Therefore, the results that we obtained display that phenology of *Rana ridibunda* and *Rana lessonae* species during their active period of life is completely in accordance with the establishment of certain climatic conditions – temperature and humidity, rhythm and duration with which they get out of hibernation (average temperature of the air is between the values of +10 +15C), the migration pre- and postreproduction, the process of coupling (temperature of the air +25C, temperature of the water +15C), laying of the eggs with embryonic and larva development that follows, are all subject to seasonal and daytime variations of reproduction and relative humidity.

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PHYLOGENY AND GENETIC VARIATION OF THE EUROPEAN BISON *BISON BONASUS* BASED ON MITOCHONDRIAL CYT B, COX I AND D-LOOP BARCODING GENES

Druică Radu¹, Dragoş Lucian Gorgan¹, Răzvan Deju², Sebastian Cătănoiu²

¹*Faculty of Biology, "Alexandru Ioan Cuza" University of Iasi, Str. Carol I 20 A, 700505 Iasi, Romania, e-mail: lucian.gorgan@uaic.ro*

²*Vânători-Neamţ Nature Park Administration*

Vânători Neamţ Natural Park and Neagra Bucaşani Reservation are two protected areas established in 1999, as a site of the Nature 2000 ecological network, with both communitary and avi-faunistic protection importance, one of its main purpose being the release of the bisons in its natural milieu. Nowadays, in Romania, about 73% of the total number of bisons live in these main reservations.

The aim of this study was to evaluate the inter- and intraspecific polymorphisms in the sample of European bison from Vânători-Neamţ and Neagra Bucaşani Romanian National Parks population in order to provide new information on the genetic diversity within the species, and to compare sequences with the existing database.

The European bison is characterized by a low level of genetic diversity, and became extinct 90 years ago. To describe genetic variability and population diversity of *Bison bonasus* in Vânători Neamţ and Neagra Bucaşani National Parks, we performed a phylogenetic analysis of representatives of those breeds by employing mitochondrial gene polymorphism.

We used analysis of the mitochondrial cytochrome b, cytochrome oxidase subunit I and d-loop genes sequences, determined for a total of 16 individuals. The study includes also 4 NCBI reference sequences, used for inferring the phylogeny.

The sampling process refers to blood samples loaded in Queen's lysis buffer and stored in 98% ethanol for DNA isolation and purification performed using the DNA IQ kit (Promega). The total DNA was resuspended in 50µl Tris-EDTA and was quantitatively and qualitatively determined by spectrophotometry and electrophoresis in 1% agarose gel, stained with ethidium bromide and visualised under UV light.

PCR was performed in 25µl reaction volume containing GoTaq Green Master Mix (Promega), direct and reverse primers, DNA and nuclease free water to 25µl. The sequencing process was performed using the Beckman Coulter CEQ 8000 Genetic Analysis System.

The study includes also 4 NCBI reference sequences, used to infer the phylogeny. The phylogenetic relationships between them were determined by the Neighbour-Joining method (Saitou 1987). The evolutionary history was inferred by using the Maximum Composite Likelihood method. Evolutionary analyses were conducted in MEGA5 (Tamura 2007).

The genetic variability identified through the similarity percentage between the 20 sequences and the variability coefficients of the haplotype nucleotides are small but, on the other hand, the absence of a 100% similarity may point to a future rise in diversity of the populations.

The presence of mutations associated with differentiation processes may indicate a future increase in the level of genetic diversity at this species. Phylogenetic analysis shows a total number of 11 haplotypes, two of them shared between populations. The Vânători Neamț individuals have a high level of variability, containing 8 haplotypes. This data is valuable for conservation strategies of this impressive species, especially for the control of breeding success of these animals.

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HERPETOFAUNA OF THE ISLAND ECOSYSTEMS NORTHWESTERN PART OF THE BLACK SEA

S.V. Gavrylyuk^{1,2}, Z.V. Selyunina³

¹ – *Kherson state agricultural university, Kherson, Ukraine;*

² – *National natural park «Oleshkivski piski», Kherson region, Ukraine;*

³ – *Black Sea biosphere reserve of the National academy of sciences
of Ukraine,*

Kherson region. serpentology.info@gmail.com; scirtopoda@mail.ru

The article discusses a promising line of research - herpetofauna island ecosystems north-western part of the Black Sea - the species composition and ecological characteristics of reptiles.

Herpetofauna of the south of Ukraine is described in some detail (Borkin, Darevskii, 1987; Kotenko, 1977, 1983, 1993, 1996, 2000, 2008, 2013). However, remain poorly understood ways of formation and functioning of island ecosystems north-western Black Sea.

The species composition of reptiles described only for some islands – Dzharylgach, Tendra, Orlov-island, Dolgi-island, Kruglui-island (Table1). In addition, environmental features of island's fauna complexes have always been interested in how biologists and ecologists from the point of view of the influence of isolation on the microevolutionary processes. Insular populations are particularly vulnerable to any environmental changes due to territorial restrictions and the small size, and much defenseless man-made threats to the mainland. Currently, anthropogenic impacts on coastal systems: development of recreation, attempts to strengthen the coasts, the removal of sand, coquina, modification of the hy-

drological regime of the coasts of the river flow reduction and other, are a direct threat to the existence of the Islands themselves and the island faunistic complexes. Virtually all members of the herpetofauna of the islands, as well as the region as a whole, are rare protected species. The study of the species composition, morphology and ecology of reptiles island ecosystems will provide an opportunity to trace the microevolution process on the islands, and to develop recommendations for the conservation of island fragmented populations of rare and protected species.

Table 1*The species composition of reptiles on islands north-western Black Sea*

Water area	№	Islands	Species of reptiles								All species of reptiles	
			<i>Vipera renardi</i> (Christoph, 1861)	<i>Coronella austriaca</i> (Laurenti, 1768)	<i>Elaphe sauromates</i> (Pallas, 1814)	<i>Hierophis caspius</i> (Gmelin, 1789)	<i>Natrix natrix</i> (L., 1758)	<i>N. tessellata</i> (Laurenti, 1768)	<i>Emys o. orbicularis</i> (L., 1758)	<i>Eremias arguta deserti</i> (Gmelin, 1789)		<i>Lacerta agilis</i> (L., 1758)
Yagorlytsky bay	1	Orlinuy-island (p-in Kinburn)	+	+	+	+	+	+	-	+	+	8
	2	Dolgi-island	+	-	+	+	+	-	-	-	+	5
	3	Kruglui-island	-	-	-	-	-	-	-	-	-	
	4	Konkskie-islands	-	+	-	+	-	-	-	-	-	2
	5	Egipetskie-islands	-	-	-	-	+	-	-	-	-	1
	6	Novue	-	-	-	-	-	-	-	-	-	
Tendrovsky bay	7	Orlov	+	-	-	-	-	-	-	-	+	2
	8	Tendrovsky spit	+	+	+	+	+	-	-	+	+	7
	9	Babin	-	-	+	+	-	-	-	-	-	2
	10	Smalenuy	-	-	-	-	-	-	-	-	-	
Dzharylgach bay	11	Dzharylgach	+	+	+	+	+	?	+	+	+	8
Karzhinsky bay	12	Karzhynskye-islands	-	-	-	-	?	?	-	-	-	
Karkinitsky bay	13	Kalanchakskye-islands	-	-	-	-	?	-	-	-	-	

Water area	№	Islands	Species of reptiles									All species of reptiles
			<i>Vipera renardi</i> (Christoph, 1861)	<i>Coronella austriaca</i> (Laurenti, 1768)	<i>Elaphe sauromates</i> (Pallas, 1814)	<i>Hierophis caspius</i> (Gmelin, 1789)	<i>Natrix natrix</i> (L., 1758)	<i>N. tessellata</i> (Laurenti, 1768)	<i>Emys o. orbicularis</i> (L., 1758)	<i>Eremias arguta deserti</i> (Gmelin, 1789)	<i>Lacerta agilis</i> (L., 1758)	
Shiroki bay	14	Ustrichnue-islands	-	-	-	-	?	?	-	-	-	
	15	Peninsula-Khorly	+	-	+	?	+	?	-	+	+	5
Dnipro bay	16	Maysky	?	?	?	?	?	?	?	?	?	
Open sea	17	Berezan	?	?	?	?	?	?	?	?	?	
Open sea	18	Zmeinui	?	?	?	?	?	+	?	?	?	1

– Red Book of Ukraine,

– The Berne Convention for the protection of wild flora and fauna

DAMAGE CAUSED BY ANIMALS IN RELATIONSHIP WITH FOREST STAND CHARACTERISTICS IN POLAND

Gil Wojciech¹, Pudelko Marek²

¹*Department of Silviculture and Tree Genetics, Forest Research Institute, Braci Lesnej 3, 05-090 Raszyn, Poland, W.Gil@ibles.waw.pl*

²*Department of Forest Ecology, Forest Research Institute, Braci Lesnej 3, 05-090 Raszyn, Poland, M.Pudelko@ibles.waw.pl*

Forests cover nearly 30% of the Polands area. Most of them (77,4%) are managed by State Forests Enterprise. The structure by dominant species shows a preponderance of coniferous species, with broadleaves accounting for only c.a. 30% of the forest area. The clear prevalence of poor coniferous forest sites is underlined by the permanent character of the even-aged coniferous stands occupying them (Scots pine stands in lowlands and Norway spruce stands in the mountains). Many of them, especially at a young age, is seriously damaged by game, mainly red deers (*Cervus elaphus*), although locally there are also a large damage caused by roe deers (*Capreolus capreolus*), elks (*Alces alces*), fallow deers (*Dama dama*) and even small mammals.

Poster shows the scale of damage caused by animals in forest cultures, thickets and older stands. The analysis covers the period 2003-2012. The largest area of damage occurred in forest cultures – 237,5 thous. of ha. Regionalization of the damage occurred - those of the largest size were located in mountainous regions and in the north-western part of the country. Damaged area in the thickets in the

same period was 204,7 thous. of ha. Regionalization of damage was similar to that in the case of forest cultures. Damage area in older stands was 129,7 thous. of ha. 82% of them occurred in south-western part of Poland (Regional Directorate of State Forests in Wroclaw). For this area data on damage caused by rodents are presented.

Extent of the damage is shown in relation to characteristics of forests in terms of age structure and species composition and in relation to the number of selected animal species in the different regions of the country.

STATE CADASTRE OF THE ANIMAL WORLD OF THE REPUBLIC OF BELARUS

Glushtsov Alexei

State Scientific And Production Amalgamation "The Scientific and Practical Center for Bioresources", Minsk, Republic of Belarus, glushtsov@gmail.com

The cadastre is the systematized, officially made on the basis of periodic or continuous observations set of basic information about the economic resources of the country. The game animals, as well as animals in general and as well as other kinds of biological resources, are an important component of national wealth, the systematic monitoring of their condition with the purpose of efficient use is an important element of economic activity.

Maintaining the state cadastre of fauna is provided with the accounting of wild animals and the reporting of subjects of the managing which is carrying out using fauna. The state accounting of wild animals is obligatory for all users of resources of fauna.

For the operational analysis of big arrays of information accumulated in the course of maintaining the cadastre of hunting animal species, it is extremely important to create databanks and information systems which would characterize a condition of resources of fauna. These data have to become a basis for the subsequent modeling of dynamics of number of separate types, groups of animals and as a whole communities, expert and projections of their condition.

For this purpose during performance of work on maintaining the State cadastre of fauna the system the information retrieval system which main objectives are is developed: accumulation, storage and operational information support of employees of the relevant nature protection services and administrative bodies at decision-making concerning fauna resources.

The structure of a database represents set of the tables connected among themselves on key fields to identifiers. Storage of information is organized according to hierarchical structure of administrative-territorial and okhotkhozyaystvenny division of the territory.

Communication between tables is carried out on the basis of assignment to each structural unit of a unique identification code. The structure of creation of

a code answers hierarchical structure of administrative-territorial and okhotk-hokhyaystvenny units.

Storage of the main information on specific structure, number both gender and age structure and production of wild animals within hunting economy, and also about the area and structure of hunting grounds and the main economic indicators of activity of hunting economy is carried out in the tables organized according to accepted forms of the reporting about activity of the okhotkhozyaystvenny organizations.

The structure of a database allows to organize independent filling of each of the provided tables. Absence or incompleteness of data on separate positions don't interfere with base work as a whole and to use of known data.

On the basis of information system the workplace охотоведа the regional level, including is developed. opportunity to carry out comparative estimates of stocks of number of hunting animals, to trace dynamics of hunting types for certain periods of time, to give projections of changes of number for the next 2-3 years, to trace dynamics of use of resources of hunting animals. This workplace is focused on employees of republican nature user and nature protection bodies.

Thus, created information system and a databank allow to solve rather wide range of tasks of estimates of a condition, extent of use and to planning of optimum withdrawal of resource (hunting) animal species.

The analysis of data, are systematized during work, I revealed a number of shortcomings of maintaining the state cadastre on the basis of system of administrative-territorial and economic units. Need of transition to maintaining the cadastre on the basis of natural and territorial division was revealed. GIS can be the tool for implementation of such transition and effective maintaining the natural and territorial cadastre.

Use of GIS-technologies will allow to pass from use in an assessment of dynamics of number of animal data in a section of administrative-territorial or economic units to the data received on the scale of natural and territorial units, and an assessment of populations within characteristic for it dwelling conditions. Definition and association of natural and territorial units when maintaining the cadastre can be carried out with use of a geobinding, definition of smezhestvo and other tools of GIS-applications.

The nowday of the cadastre of fauna of Republic of Belarus as a whole both according to the contents, and in a form answers the purposes of rational use of fauna. The electronic system of maintaining the cadastre represents the effective and flexible instrument of expeditious data acquisition and management of populations of the wild animals being objects of hunting.

ACCUMULATION Cs IN AN ORGANISM OF THE WILD BOAR

Gulakov Andrey

*Establishment of education «Francisk Skorina Gomel State University»,
Gomel, Belarus, Gulakov@gsu.by*

During the time of the nuclear power development there have been some nuclear disasters but the Chernobyl accident is the most severe among them. Ecological problems that followed the disaster are very diverse.

For conducting the hunting economy on it is radioactive the polluted terrain especially important the question bound to accumulation of radionuclides in an organism of wild mammals is. Therefore for the years which have passed after failure, the special attention it was given to studying of levels of accumulation of radionuclide's by species which are objects of sports hunting, and also resource value, and production from them have or is used in nutrition, or used for reception of the goods of light industry.

Radio ecological monitoring of separate populations of wild trade animals was made in territory of the Belarus Polesye. The most contaminated area is situated in the Alienation Zone near the villages of Borshevka, Molochki, Pogonnoe, Radin, Arevichi, Droniki. The villages lie on Choyniki district, Gomel region. The Cs contamination level here is 1100 – 8184 kBq/ mand Sr – 185 – 1633 kBq/ m. The territory where samples were collected is situated between the rivers the Prypyat and the Dnieper that is 10 – 35 km from Chernobyl Nuclear Power Station.

The basic object of researches was the wild boar (*Sus scrofa* L.), dwelling in territory with various density of radioactive contamination. For the whole period of testing we took samples from 111 animals found on the territory with various densities of radioactive contamination.

We took the samples on the tested territory twice a year – in winter (December – February) and in summer (July – August). These periods show the most obvious seasonal changes in the levels of containing radioactive elements in the food and bodies of wild ungulates.

In winter we got all the animals in the morning before noon. If there was not much snow, the animals were brought to bay or were shot when approaching. In summer the animals were killed mainly at night or early in the morning while feeding.

From wildings manufactured sampling of a muscular and bone tissues (rib), hearts, lungs, a liver, nephroses, spleen, generative organs, skins. Samples were culled by mass 0,1 – 0,5 kg. Maintenance definition Cs in hallmarks of organs and tissues of animals made on gamma-beta spectrometer MKC-AT1315.

In the season with 1991 for 2008 years we had been tracked dynamics of accumulation Cs in a muscular tissue of the wild boar, dwelling in territory with various density of radioactive contamination.

The average value of accumulation of the radionuclide in a muscular tissue of the wild boar got in a region of alienation, fluctuated from 9,99 kBq/kg to 242,90 kBq/kg, that is distinctions have compounded more than in 24,0 times. The content minimum level Cs in an organism of animals in investigated terrain, compounded 1,15 kBq/kg, and maximum – 661,0 kBq/kg. It is bound first of all to significant heterogeneity of level of radioactive contamination of terrain and, accordingly, food supply in an alienation region, and also high migratory ability of animals. Last year's researches the content Cs in an organism of animals was at level of 30,02 kBq/kg – 36,59 kBq/kg. The average value of the content of radionuclide in a muscular tissue of the wild boar got in terrain of a region of alienation, for all season of supervision has compounded $49,66 \pm 15,40$ kBq/kg. The coefficient of variation of the sign was in limens from 13,95 % to 170,24 %.

As the absolute data of specific activity of the content Cs in a muscular tissue of a wild boar does not yield possibility to judge about laws of accumulation (distribution curves are not normal owing to a wide spacing of the data) us was made normalization of the curve by taking the logarithm.

Taking the logarithm initial indexes has allowed to approach essentially their allocation to the normal. The variation factor in absolute values was from 15,02 % in region of alienation. Average values of specific activity of the radionuclide for all time of supervision in a muscular tissue of the wild boar got in terrain of a region of alienation, have compounded $4,12 \pm 0,08$ logBq/kg.

The made dispersion analysis has shown that during supervision is noted authentic change of accumulation Cs in a muscular tissue of the wild boar dwelling in terrain with various density of radioactive contamination. Absence of the expressed decrease in the content Cs in a muscular tissue is caused by stable character of level of radioactive contamination of food supply of animals.

As a result of the made researches it has been positioned that major factors which define content level Cs in a muscular tissue of an animal, the density of contamination and allocation of radionuclide to locality terrains is. At a wild boar authentic change of the content Cs in an organism, depending on density of contamination of terrain of a locality is observed.

DISTRIBUTION OF Cs IN THE BODY OF THE WILD BOAR (*SUS SCROFA* L.) FOUND ON THE TERRITORY WITH RADIOACTIVE CONTAMINATION

Gulakov Andrey

*Establishment of education «Francisk Skorina Gomel State University»,
Gomel, Belarus, Gulakov@gsu.by*

Features of receipt of radionuclides in an organism of animals, and their allocation between organs and tissues, speed of deducing from an organism – major factors which define dose commitment from an intrinsic irradiating and along with a choronomic irradiating influence size of radiating effect.

Thus the quantitative interrelation of arriving radionuclide's is defined by level of their content in environment and ecology-biological features of species of the animal different regular and ecological bunches which specific diversity causes very wide spectrum of paths of receipt of radionuclide's in an organism. Carrying out of researches on allocation of radionuclides in an organism of the wildings that are objects of sports and trade hunting for terrains of republic, exposing to radioactive contamination is especially important.

The most contaminated area is situated in the Alienation Zone near the villages of Borshevka, Molochki, Pogonnoe, Radin, Arevichi, Droniki. The villages lie on Choyniki district, Gomel region. The Cs contamination level here is 1100 – 8184 kBq/ mand Sr – 185 – 1633 kBq/ m. The territory where samples were collected is situated between the rivers the Prypyat and the Dnieper that is 10 – 35 km from Chernobyl Nuclear Power Station.

There we have also taken samples in the Permanent Control zone in Bragin district, Gomel region near the villages of Savichi, Puchin, Zherdnoe. The contamination density off this land is - Cs – 185 – 1480 kBq/ mand Sr – 74 – 420 kBq/ m. This territory is situated between the rivers the Prypyat and the Dnieper that is 30 – 35 km from Chernobyl Nuclear Power Station.

The Periodic Control zone is the territory of the Gomel district near the village of Kravtsovka lying on the border with Chernigov region, the Ukraine on the river Sozh that is a tributary of the river Dnieper. This territory lies at a distance of 40 km from the city of Gomel and approximately 100 km from Chernobyl Nuclear Power Station. The contamination level is – Cs – 18.5 – 37.0 kBq/ mand Sr – 1.0 – 1.85 kBq/ m.

The basic object of researches was the wild boar (*Sus scrofa* L.), dwelling in territory with various density of radioactive contamination. For the whole period of testing we took samples from 188 animals found on the territory with various densities of radioactive contamination. Among these 111 animals were shot in the Alienation Zone, 41 – in the Permanent Control zone and 36 – in the Periodic Control zone.

From wildings manufactured sampling of a muscular and bone tissues (rib), hearts, lungs, a liver, nephroses, spleen, generative organs, skins. Samples were culled by mass 0,1 – 0,5 kg. Maintenance definition Cs in hallmarks of organs and tissues of animals made on gamma-beta spectrometer MKC-AT1315.

As the data of specific activity of allocation Cs on organs and tissues of a wild boar has a wide spacing of values, we as had been made their normalization by a path taking the logarithm.

The greatest specific activity of radionuclide was observed in a muscular tissue and nephroses where it at separate animals reached more 660 kBq/kg. Besides, at the species of hoofed animals the radionuclide high level was marked as in heart and generative organs. Accumulation Cs in the this organs compounded 4,66 logBq/kg and 4,64 logBq/kg at the animals got in a region of alienation

and 3,97 - 3,98 logBq/kg at a wild boar in terrain of a region of eviction. The least content Cs is noted in lungs and a skin of the animals dwelling in terrain of radioactive contamination.

It is necessary to notice that Cs organs had the greatest level of the content and tissues of the animals got in a region of alienation, follow further regions of eviction and control area. On degree of contamination of organs and tissues of a wild boar this radionuclide it is possible to compound the following series in decreasing order: muscular tissue > nephros > heart > liver > generative organs > lien > lungs > skin.

We had been made correlation analysis under the content Cs in a muscular tissue and the basic internals of the wild boar dwelling in terrain with various density of radioactive contamination. In wild boar between specific activity indexes in a muscular tissue and an internal also has close correlative dependences. Values of quotients of a linear correlation for the this species of animals are in limens from 0,750 to 0,961 at 5 % level of significance that specifies in unimodal character of allocation Cs on organs and tissues of an animal.

Thus, as a result of carrying out of correlation analysis at one of the most widespread species of hunting-trade hoofs in terrain of Byelorussia, high correlative dependences between the content Cs in a muscular tissue of animals and the basic internal that specifies in unimodal character of allocation and a metabolism of the this radionuclide in an organism of an investigated species of mammals are positioned.

EVOLUTIONARY ECOLOGICAL FEATURES OF THE REPRODUCTIVE STRATEGIES OF THE CAUDATE AND ECAUDATE AMPHIBIANS IN THE ECOSYSTEMS OF THE CENTRAL FOREST

Jalbă Liliana¹, Cozari Tudor¹, Plop Larisa¹, Gherasim Elena², Rusu Vadim³

¹Tiraspol State University (located in Chisinau), Republic of Moldova

¹Institute of Zoology of ASM, Chisinau

³State University of Moldova

The subject that served as a research topic of amphibian species are representatives of the «Codrii» Reservation - *Triturus vulgaris*, *T. cristatus*, *Bufo bufo*, *Rana dalmatina*, *Hyla arborea* populations which have undergone for a long-term monitoring throughout the annual reproductive cycle (March-August) [1].

Analysis of obtained results show that, depending on the morpho-functional organization and the specific conditions of life, assessed amphibian species during evolution, have developed a particular reproductive behavior ensures that an expected reproductive success [2]. The amphibian species examined are characterized by the following features specio-specific behavior and reproductive strategies:

a) The behavior and reproductive strategy of common newt and creative newt is based on early reproduction and lengthy courtship, territorial and females

courtship by males, care manifestation for successor by the female, population differentiation in several generations after larval development rate, using an ecological niche different from that of other syntopic species of amphibians: this allowing them to achieve a relatively high reproductive success - up to 5.3%. Species *Triturus vulgaris*, also, syntopic conditions during reproduction is suppressed to some extent by *Triturus cristatus* both in terms of territory, as well as food, which leads to lower reproductive success population;

b) For species *Bufo bufo* and *Rana dalmatina* is specific early and short reproduction, it forces the emergence and assertion of local populations of breeding strategies based on intense competition between males for females conquest: males do not have individual territories therefore actively are seeking for females in the breeding stations and they are getting in to intrasexual conflict for conquest. La *Rana dalmatina*, along with the behavioral strategy for copulation, is reported and vocalization behavior of males, which, in our opinion, has a role to attract females in the reproduction stations, being one of the complementary Suite system of the species;

c) the reproductive behavior of the species *Hyla arborea* is based on males territory and attract females by issuing the complaint songs, females being able to determine body size and morpho-functional qualities of the spouses in the acoustic features of their songs complaint. For this species of *Hylidae*, while, for a part of males it is specific the phenomenon «*satellite behavior*» - which is a form of alternative male reproductive strategy; depending upon the degree of manifestation than dimensional structure and the spatial for breeders in the reproduction stations;

d) For the ecaudata amphibian species listed is specific association with body size couples close partners, allowing them to provide a high level of fertilization of eggs. This fosters the full realization of the reproductive potential of the species in the first stage of reproduction - that of ovipositor and fecundity. In addition, fertilization is based on the formation of so-called «*bucket*», where products are made of both sexual and conjugal partners, owing to limited water space, meeting place of the sperm and ova guaranteed and insurance, thereby, complete fertilization of eggs;

e) The caudate amphibians, as precopulate important mechanism for achieving the fecundation, suite evaluates for selection and courtship behavior of the partners, the complexity and high degree of stereotyping of which do not allow intra specific crosses of two syntopic species of newts [3] ;

f) For ecaudata amphibian species is characteristic of a complex mechanism of fertilization ovipositor and consists of various phases morpho-functional and stereotyped behaviors based on synchronized collaboration between the two partners during simultaneous and successive eggs depositing and their fertilization, these processes are secured by certain sensory systems (tactile and auditory perception);

g) Due to reproductive behaviors evaluated based on providing couples meeting and joint partners, and efficient implementation of the processes of ovipositor and fertilization, amphibians are able to fully realize its potential reproductive and obtain, as a result, a expected reproductive success, which ensures their perpetuation and specific.

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ABOUT FAUNA OF DABBLING DUCKS OF MOLDOVA

Jurminsky S.

*Institute of Zoology, Academy of Sciences of Moldova, Chisinau,
Ecological society "BIOTICA"*

Fauna of nesting dabbling ducks of Moldova has 5 species - *Anas crecca*, *A.platyrhynchos*, *A.strepera*, *A.querquedula*, *A.clypeata*. Earlier, in the mid-twentieth century, they were the usual nesting and differed only in the size of populations. The most widespread were *A.platyrhynchos* and *A.strepera*, the less widespread – *A.crecca*. Later, people, transforming the landscape of their interest, have changed the terms of habitable space and perturbed the state of their populations. The first damage bird fauna has suffered because of reconstruction of water reservoirs, the second – because of the exploitation of their breeding resources.

Organizational habitat units. The events and consequences

The upper level of the organization of the environment are types of different water reservoirs. Among them lakes, marshes, rivers, streams, temporary ponds are of natural origin, but reservoirs, ponds and their complexes, man-made bodies of water – artificial. The second level consists of nested resources and conditions (micro-relief objects, vegetation, forage and nesting spots, the compatibility of component composition, etc.).

Activities. Formation of bulk shafts along the banks of large rivers. Irrigation engineering in the river valleys. Creation the extensive network of artificial unsuitable for nesting ducks river basins. Regulation of runoff of large and small rivers. Use of the coast in agricultural purposes often up to the water's edge.

Grazing. Mowing and burning of grasses and reeds. Cutting of trees and bushes. Recreation. Poaching. Pollution of basins and coastal with industrial and household waste.

General negative. Changed the ratio in favor of the latter between the natural and the artificial, shallow and relatively deep, ponds and other types of water features. The volumes and variety of resources are reduced. Thinned out water-bearing network. In fact, the marshes have disappeared. Reduced numbers of nesting ducks. There was a spatial redistribution of their population material.

General positive. The number of units of water increased thanks to man-made reservoirs (this is the opportunity for a wider dispersal). Structured and rich in fish complexes ponds have appeared as well as attractive for a range of species man-made reservoirs (there are formed the core zone, of the ducks fauna).

Water unit and typical situations

- Reduced the area of flood plains and flood waters - the classic and basic nesting places of dabbling ducks, which led to a reduction in the number of species, among which the most affected are *A.querquedula* and *A.clypeata*, but *A.strepera* almost completely disappeared.
- Thinned and weakened water-bearing net, decreased flow-through of standing water reservoirs, many of them have become filled with silt, overgrown, turn into swamp, shrink, but some of them have disappeared. They began to decline of the bird's population, but in some places fauna again enriched by the species *A.platyrhynchos*, *A.querquedula*, *A.clypeata*.
- Reduced the number of wetlands with forest vegetation, as a result *A.crecca* is no more nesting there.
- Increased a number of water reservoirs in the folded areas, which are relatively deep and have a pronounced slope of the coastal slopes, creating a shortage of nesting resources for all species except *A.platyrhynchos*.
- Ponds became the dominant type of water reservoirs with low environmental capacity, where conditions are sometimes stored only in their head parts and less in bays, which are favorable for *A.platyrhynchos* and with varying degrees of success for *A.querquedula* and *A.clypeata*.
- Most of the water reservoirs often do not contain areas, structured according to the principles of shallow nesting. Here is common such species like *A.platyrhynchos* and less often others.
- Complexes of ponds of fish plants usually contain a variety structure of the nesting component and can be attractive for different types of ducks.
- Man-made reservoirs in the form of tanks, channels and networks are sometimes suitable for nesting *A.platyrhynchos* and *A.querquedula*.
- River banks with weak currents are often inhabits with *A.platyrhynchos* and less with *A.querquedula*, but in their quiet backwaters can also settle *A.clypeata* and *A.crecca*.

Is reduced a number of nesting ducks of all kinds, among them the least affected is *A.platyrrhynchos*. *A.strepera* can be considered a disappeared in the status of breeding species, because of the destruction of floodplains, and *A.crecca* because of lack of forested wetlands. *A.clypeata* and *A.querquedula* are rare, but spontaneously appearing on abandoned ponds. Transformation of wet ecosystems in general affected a lot the fauna of dabbling ducks, because of the destruction of their natural habitat and formation of artificial unattractive ponds. Experience of the errors must be taken in consideration in the future.

PROCESS AND PATTERN IN SMALL MAMMAL DIVERSITY ON THE CONTACT POINT BETWEEN SOUTHEASTERN EUROPE AND ASIA MINOR

Kryštufek Boris

Slovenian Museum of Natural History, Slovenia;
email: boris.krystufek@zrs.upr.si

South-eastern Europe (surface area of 788,689 km) and Asia Minor (755,688 km) are occupied by 88 species of small terrestrial mammals (body mass < 1 kg): 13 shrews (Soricidae), six moles (Talpidae), and 60 rodents (Rodentia). Species-area curve for Asia Minor rises at a faster rate than for SE Europe, and Asiatic range retrieves significantly higher scores for endemism. High endemism is indicative of small ranges, i.e. of at least one form of rarity of Rabinowitz's 'seven forms of rarity' model. Seventeen species from the total of 88 (= 19.3%) occupy ranges <10 km and 40 species (= 45.5%) are specific regarding their habitat. A remarkably high proportion of species (seven) is strictly rock-dwelling which is in sharp contrast with situation in Europe.

Over the last two million years of Quaternary climatic oscillations, both areas were among major refugia for temperate biota in the western Palaearctic. The climatic changes during the glacial-interglacial cycles of the Pleistocene epoch have caused repeated range shifts in most European taxa. Due to the limitation of suitable habitat during glacial maxima, temperate species must have endured such periods in geographically restricted refugial areas. At the end of the Last Glacial Maximum (LGM), some refugial populations with divergent genomes remained restricted to their former glacial refugia, whereas others expanded. A traditional explanation advocates a crucial role of Mediterranean refugia and south-to-north oriented postglacial recolonization routes. The competing hypothesis points out the role of Mediterranean refugia as sites of endemism and the importance of refugia in central and eastern Europe in the recolonization process. Majority of recent phylogeographic studies provide supportive evidence for later hypothesis. Both regions harbour endemic phylogeographic lineages for various ecological groups, therefore suggesting considerable habitat heterogeneity throughout the last 2 Myr of glacial-interglacial dynamics.

Another dispute relates the impact of glaciations on speciation. While some studies suggest that the entire Pleistocene, including the last two glacial cycles, was important for speciation, others claim that speciation and extinction rates remained constant and that speciation events extended over the past 5 Myr. Application of molecular clock on genetic evidence for sister species of small mammals suggests that their divergences predate the onset of Quaternary glaciations. The impact of the intermitent land bridge on the Bosphorous and Marmara straits was not uniform and there is convincing evidence available on uni- and bidirectional migrations between the Balkans and Anatolia.

Since the LGM at least three species showed a significant long-term decline in their ranges: Père David's mole (*Talpa davidiana*), Martino's vole (*Dinaromys bogdanovi*) and Roach's mouse-tailed dormouse (*Myomimus roachi*).

INFLUENCE OF CLIMATIC CONDITIONS UPON THE ABUNDANCE DYNAMICS OF *MUS SPICILEGUS* PETENYI 1882 SPECIES (RODENTIA, MURIDAE) IN THE REPUBLIC OF MOLDOVA

Larion Alina, Nisteanu Victoria, Sîtnic Veaceslav, Savin Anatolie

Institute of Zoology, ASM, Chisinau, e-mail: vicnisteanu@gmail.com

The mound building mouse (*Mus spicilegus*) is one of the dominant rodent species in the republic agricultural ecosystems. This species is sensible to the direct influence of climatic factors. The studies were performed during 2008 – 2012 in spring, summer and autumn seasons on cultivated lands and fallow grounds.

There were analyzed the climatic conditions in the period 2008 – 2012 in order to emphasize their influence upon the mound building mouse populations. Thus, 2008 and 2009 were quite similar: the average annual temperature was varying between +9.6°C - +11.8°C and rather low quantity of precipitation (annual mean – 391-540 mm). In 2010 the climatic conditions were favorable with mean annual temperature of +8.9°C - +11.2°C and higher quantity of precipitations (annual mean – 615-790 mm). The year of 2011 **was hot** for the Republic of Moldova and high rainfall deficit in more than 60% of the country (average annual rainfall 400 mm). The winter season 2011-2012 was slightly cold and rainy. Abnormally cold weather has occurred during the first two decades of February 2012. The average temperature was by 7-12°C below normal. 2012 was mostly warm (mean annual temperature being 9.3°C - + 11.7°C) with significantly deficient rainfall during June to September (average annual rainfall 400 mm). The annual average temperature was higher and amounted to +21.7°C - 24.8°C, while average annual rainfall was only 70 – 145 mm (tab. 1).

These conditions *have contributed to the maintenance of very strong atmospheric and soil drought. Considering the affected area, the droughts of 2012 was classified as catastrophic drought and negatively influenced on the population of M. spicilegus species.*

*Characteristics of climatic conditions during 2008 – 2012
(data from Hidrometeo station, Chisinau)*

Years	Temp., annual mean, °C	Precipit- at. annu- al mean, mm	Spring		Summer		Autumn	
			Mean temp. °C	Precipit. mean, mm	Mean temp. °C	Precipit. mean, mm	Mean temp. °C	Precipit. mean, mm
2008	+9,7.. +11,8	391-888	+9,8.. +11,8	100-230	+19,8.. +22,5	170-480	+9,4.. +11,7	95-180
2009	+9,6.. +11,8	300-440	+9,5.. +11,1	65-90	+20,1.. +23,1	68-170	+10,5.. +12,6	44-85
2010	+8,9.. +11,2	615-790	+9,8.. +11,1	100-170	+21,2.. +23,7	200-270	+9,3.. +12,3	110-193
2011	+9,1.. +10,7	400	+9,1.. +10,5	90-140	+20,1.. +22,2	170-235	+8,9.. +11,0	35-60
2012	+9,3.. +11,7	444-704	+10,9.. +12,6	88-160	+21,7.. +24,8	70-145	+10,9.. +13,6	90-140

Taking into account the climatic conditions the seasonal and annual abundance dynamics of the studied species was analysed. Thus in 2008 in spring the mound building mouse abundance in various agrocenoses was 12% - 33,3%, in summer – 13,8% - 18,9%, in autumn – 6,8% - 27,5%. In 2009 in spring the abundance was varying between 5,6% - 46,4% , in summer – 10% - 26,7%, in autumn – 6,9% - 26,1%. In 2010: in spring – 8,7% - 66,7%, in summer – 18,2% - 66,7%, in autumn – 12% - 20%. In 2011: in spring – 12,5% - 40,5%, in summer – 7,0% - 16,1%, in autumn – 19,2% - 22,9%. In 2012: in spring – 12,9% - 37,5%, in summer – 12,5% - 12,9%, in autumn - 6,4% - 58,5%. It can be seen that the species abundance in the years with favorable climatic conditions (2008 – 2011) was higher than in 2012 with very dry climate, when species abundance during summer season was significantly lower than in same period of the previous years, varying between 6,4% - 12,9%. The mound building mouse feed on seeds of spontaneous and cultivated plants, therefore the difficult conditions from summer of 2012 had negatively influenced upon species abundance, its ecological significance being rather low - between 3,69 - 4,2 and this species was an accessory one in its typical biotopes. Toward autumn the mound building mouse population restored its number and in November its abundance reached 58,5% with ecological significance of 43,9% (constant species).

M. spicilegus is unevenly spread within the area, populating only open biotope. The highest density is recorded on cultivated land, mainly in the corn, the abundance ranging from 20% - 59.2% in grain - 18.6% - 38.6%, in alfalfa - 16.7% - 30.7%, in sunflower crops - 5.8% - 25.6%, and in fallow grounds - 2.3% - 19.6%. The lowest density was recorded in the orchard - 3.9% - 4.2%. This species is characteristic or constant in these types of habitats, with ecological significance varying from 7.9 to 44.4 (characteristic to constant).

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THE EFFECTS OF THE BIOR REMEDY ON CERTAIN PARAMETERS OF ENDOTOXICOSIS AND HISTIDINE DIPEPTIDES IN BROILERS TREATED WITH BIOR STARTING WITH THE 9 DAY OF LIFE

Macari Ana¹, Putin Victor¹, Macari Vasile¹, Gudumac Valentin²

¹*State Agrarian University of Moldova*

²*State University of Medicine and Pharmacy "Nicolae Testimianu"*

e-mail: ana.macari1987@gmail.com

According to current concepts the animal production aims to be natural, organic and harmless. Our previous studies showed hepatoprotective and antistress effects of the bioactive substances of cyanobacterial origin, improving the erythropoiesis, and other processes. While in this study, we aim at elucidating the impact of the BioR remedy on the marker indices of endotoximosi: Middle Molecular substances, Necrotic Substances and the histidine dipeptide concentration - Carnosin in broilers bred and raised in farm conditions. The present study was performed on a total of 150 broilers divided into 5 groups of 30 broilers each. The remedy proposed for testing was administered to birds from 4 experimental groups in different doses (0,3 – 1,0 ml/head), and to the control group – 0,4 – 0,6 ml 0.9% sol. NaCl 2 times consecutively: on the 9, and on the 21 day of life. During the research, the broilers were constantly examined, and blood was collected for biochemical tests from 5 broilers each group: on the 9 day of life until the administration of the remedy, and on the 41 day of life, at the end of the cycle, before slaughter.

The obtained results allow us to state that the BioR remedy, during a period of over 30 days, highlighted the fact that there were no adverse reactions of the whole body, or development abnormalities. The biochemical tests performed on broilers showed that the highest values of peptides with middle molecular mass were recorded at the beginning of the study, on the 9 day of life, with an average of $43,95 \pm 3,67$ u/c, parameter which decreases with age, in all the groups included in this study, reaching in the control group, the value of $30,10 \pm 5,23$ u/c at the end of the study. In the groups treated with the BioR remedy, at the end of the study shows also a decrease of this index, but more pronounced. Thus the value of this index, in the groups treated with the BioR remedy, decreased by 2,6 – 2,1 times as compared to the beginning of the study. The results of the research showed a new positive aspect regarding the impact of the BioR remedy on the broilers' metabolism. Thus at the end of the study the serum level of MMS in the lots of broilers treated with BioR is lower by 1,4 – 1,8 times compared to the control group. Another marker of endotoximosi is the biochemical index - necrotic substances (NS) which at the beginning of the study recorded the average value of $5,42 \pm 0,5$ u/c, technological period in which the highest value of the investigated parameter was reported. It is noted that the level of the serum NS analyzed decreased with age in broilers from all groups, at the end of the study showing a value, in the control group, of $3,68 \pm 0,46$ u/c, value that de-

creased by 32,1% at the beginning of the study ($p < 0,05$). It notes that the BioR remedy determined a more pronounced decrease of the investigated parameter at the experimental lots by 1,9 – 2,6 times, or by 48,5 – 61,4% compared to the values reported at the beginning of the study. It is important the analysis and the evolution of the investigated parameter at the end of the study, as there was registered a decrease of necrotic substances in the blood serum of broilers, from all experimental groups, by 24,2 – 43,2% compared to the control group, results that highlight the positive effect of the tested remedy, obviously reflecting the significant contribution to the improvement of the broilers' metabolism in the period of their growth. It all was reflected in a decrease of the catabolic processes which probably had a positive impact on the broilers' welfare. We mention that the dynamics of necrotic substances (NS) was similar to the one of the middle molecular mass peptides, both in intact and in broilers treated with the BioR remedy. The research data revealed higher values of both investigated indices at the beginning of the study, on the 9 day of life of broilers, effects that could be explained by the fact that during the post - hatching period, the decomposing and the absorption of the yolk bag take place, and obviously the catabolic processes clearly intensify. An important criterion in the metabolism assessment and especially its anabolic side represents the serum level of histidine dipeptides – carnosin considered as a marker of the body's anabolic processes. The study reveals that the value of the investigated index, with age, at end of the technological cycle, decreases, mostly in broilers from the control group, down to $204,8 \pm 12,08 \mu\text{mol/l}$ (by 1,4 times, $p < 0,001$ in comparison to the beginning of the study). The administration of the BioR remedy determines an inconclusive increase of histidine dipeptides by 5,5 – 13,4% in the experimental groups 2, 3 and 4 as compared to the reference group. At the same time, under the influence of the BioR remedy in dose of 0,3 ml/head, at the first administration, and 0,4 ml/head at the second administration, which were the minimal doses, it reveals a statistically reliable increase of histidine dipeptides levels by 27,0% ($p < 0,05$) compared to the control group, and respectively by 20,1- 12,0% as compared to broilers also treated with the BioR remedy.

Taking in consideration the obtained results, it can be sustained that the administration of the BioR remedy to clinically healthy broilers induces a decrease of the marker indices of endotoxiosis: Middle Molecular substances and Necrotic substances and a tendency of histidine dipeptides increase – the serum Carnosin in broilers bred in farm conditions.

THE CHANGES OF CERTAIN PARAMETERS OF THE PROTEIN METABOLISM IN BLOOD SERUM IN QUAILS UNDER THE INFLUENCE OF AN AUTOCHTHON BIOACTIVE REMEDY

Macari V., Pavlicenco N., Macari A., Băț V.

Agrarian State University of Moldova

Email: macvasile@mail.ru

In industrial aviculture, the poultry health issues (morbidity and mortality) depend first of all not on contagious and infectious diseases, but on noninfectious, especially metabolic ones, which in turn depend on the overdosed, and often unbalanced food, as well as on the microclimate, and stressogenic factors. Therefore in modern zootechny more often is required the usage of substances with antistress, and adaptive properties, and obviously growth stimulators. One of the substances with such properties is the BioR remedy, a natural, algal product, which has been extensively studied on pigs and broilers.

Our study's purpose was the usage of this remedy on adult quails, especially after removing them from the technological group - laying birds - and transferring them into another category - fattening or reconditioning.

The researches were conducted in a quail farm, on 200 birds bred in intensive production system, at the age of 197 days. The birds were divided into 5 groups: the control group (n = 40), and 4 experimental groups of 40 birds each.

The BioR remedy was administered to quails from 4 experimental groups, in different intramuscular doses (0,25; 0,5; 1,0; 1,5 ml/head), 2 times consecutively: the first administration - at the beginning of the study, and the second one - 7-10 days after the first administration. To the control group was administrated - 0,5 ml of 0.9% sol. NaCl in the same consecutiveness. During the researches, the birds were constantly examined, and blood was collected for biochemical tests, from 5 quails at the beginning of the study, till the administration of the tested remedy, and after that, twice from 5 birds each group.

During the monitoring of birds, along the period of the experiment of about 40 days, no abnormalities in the birds health were reported, and the tested product caused no adverse reactions. At the same time, at the birds from the experimental groups, were recorded lower temperature values, which at the end of the study are by 0,22 – 0,44° C lower than the ones registered in the control group, results that reflect the antistress, and adaptive action of the tested remedy. The respiratory frequency values fall within the physiological limits, and at the end of the study do not differ practically in all experimental groups, which shows the harmlessness of the tested product, and the same clinical status in all the birds.

The biochemical tests performed in all birds, showed that the highest values of the total serum protein were recorded in the experimental groups that were administrated the tested remedy. Thus, the increase of the total protein serum level was, at the first blood sampling, by 7,6 – 34,8%, and at the second blood sampling, by 6,0 – 22,8% compared to the control group. According to the obtained

data, in the groups treated with the BioR remedy, at the first blood sampling, there is a tendency of serum albumin decrease by 0,2 – 6,8%, while at the end of the study, on the contrary, an increase of this index, by 4,8 – 7,1% compared to the control group, except the experimental group 3. It is noted that the tested product induced a decrease of the serum urea level, at the first blood sampling, in the 3 experimental groups treated with higher doses of BioR, by 12,9 – 22,6%, while at the end of the study, this tendency persists in all experimental groups, and the investigated parameter is lower by 36,9 – 50,7% compared to the control group. We mention that the value of the serum uric acid, in quails, at the beginning of the study was $397,03 \pm 13,19 \mu\text{mol/l}$. Later on, this index, at the first blood sampling, increased by 6,4 – 8,5%, while at the end of the study, decreased by 3,5 – 11,0% compared to the control group.

The influence of the prophylactic treatment with the tested product, on quails, reflected also on another parameter marker of the protein metabolism - creatinine. Thus, the tested product induced initially a decrease of this index by 9,2 – 25,4%, except for the experimental group 2 (the dose of 0,5 ml/head), in which this index increased by 4,2% as compared to the control group. The analysis of the results of the creatinine dynamic, in the birds from the experimental groups, showed that the tested product determined at the end of the study, the increase of this index in three of four groups, by 14,3 – 25,5% as compared to the control group. In the birds from the control group was reported, on the contrary, a strong tendency of decrease of the creatinine level, by 16,9%, as compared to data reported in the first research, and by 19,7% as compared to the beginning of the study.

Finally it should be mentioned that the studied bioremedy manages to improve the state of health indices, the parameters that reflect the protein metabolism, and the functional state of the liver, especially in birds treated with lower doses of the BioR remedy.

THE IMPACT OF THE BIOR REMEDY ON THE SERUM BILIRUBIN AND ITS FRACTIONS IN YOUNG RABBITS

Macari V., Iacub N., Mațencu D., Macari A., Didoruc S.

Agrarian State University of Moldova
e-mail: v.macari@uasm.md; macvasile@mail.ru

Cuniculture in recent years has become a perspective business as more companies prefer to raise rabbits in order to obtain dietetic meat and a good profit. To achieve such performances, and in order to remove various obstacles in exploiting these species susceptible to stressogenic factors, especially in semi-intensive or intensive production conditions, it requires the usage of drugs. It is noted that in the context of the prohibition of antibiotics as growth promoters in the EU, it is necessary to develop and to test new remedies with antistress and growth stimulating properties. In this context, our aim was to elucidate the impact of the

BioR remedy, obtained from *Spirulina platensis*, and administrated in different doses to youth rabbits, on their state of health, and on certain biochemical indices which mainly reflect the functional state of the liver.

The researches carried out to highlight the impact of the BioR remedy on the functional state of the liver involved 28 rabbits, divided into 4 groups, 7 rabbits each. The tested product was administered in different doses to the experimental groups (0,5-1,0-1,5 ml/head), and to whose from the control group – 1,0 ml of 0.9% sol. NaCl, 3 times in a row: on the day of weaning, on the 14, and on the 26 day after weaning. The animals were constantly monitored, and periodically, during the study, rabbits from all the groups were individually weighed to determine the body temperature, and the respiratory frequency. At the beginning of the study, before the administration of the BioR remedy, for the biochemical research, blood had been collected, randomly from 5 rabbits, and after the administration of the BioR remedy, blood was collected twice, from 5 animals each group. The obtained results allow us to mention that the BioR remedy, during the period of the study of over 90 days, caused no side effects, no health or development deviations in young rabbits. The biochemical tests, performed on young rabbits, showed that the highest level of total bilirubin was recorded at the beginning of the study ($4,76 \pm 0,71 \mu\text{mol/l}$) and at the control group, both in the first and in the second research, conducted at the end of the study, values that don't differ much from those reported at the beginning of the study. According to the data of our study, in rabbits treated with the BioR remedy, the value of the investigated parameter decreased, at the first blood test, by 10,2 – 19,1%, and respectively, at the 2 blood test, at the end of the study, by 15,9 – 20,4% compared to the reference group. The low level of this parameter indicates among others, and the antitoxic action of the BioR remedy, and its effect on erythrocytes, increasing their lifespan and resistance to various harmful factors. To assess the metabolic function of the liver, has been investigated and the serum level of the conjugated bilirubin, which value at the beginning of the study was of an average of $0,67 \pm 0,21 \mu\text{mol/l}$. The level of his index, both at the first blood sampling, as well as at the end of the study, at the animals from the control group, increased by 41,8 – 44,8% compared to the beginning of the study. It is noted that the tested remedy contributed to a significant reduction of the conjugated bilirubin reflected in both blood sampling results. Thus, this index decreased, at the first blood sampling, by 1,8-2,2 times, and at the second blood sampling, at the end of the study, by 1,1 – 2,6 times compared to the control group, reflecting the positive effect of the BioR remedy. An important marker in assessing the functional status of the liver is also the free bilirubin. This index, at the beginning of the study, has the value of $4,09 \pm 0,79 \mu\text{mol/l}$, with age showing a tendency of decrease in all groups, more pronounced in the groups treated with the BioR remedy. Thus, at the first blood sampling, the investigated index decreased in two experimental groups, by 5,5 – 10,7% compared to the control group, tendency that persists during the

research carried out at the end of the study. The biochemical results we have obtained reveal the positive impact of the remedy BioR on the functional status of the liver. Moreover, the tested remedy has positively influenced the growth and the development of youth rabbits. Thus, at the end of the study, the rabbits from the experimental groups, to whom the BioR remedy was administrated, registered a bigger body weight, by 140,0 – 328,0 g, or by 5,1 – 11,9% compared to the reference group.

Based on the researches carried out we are able to conclude that the tested bioremedy improves the indices that characterize the functional state of the liver, a positive impact also confirmed by better bioproductive indices, especially in animals treated with the dose of 1,0 ml/head.

DISTRIBUTION AND NUMBERS OF WOLVES (CANIS LUPUS) IN BULGARIA: WHAT IS GOING ON?

Markov Georgi Georgiev

*Institute of Biodiversity and Ecosystem Research,
Bulgarian Academy of Sciences
Sofia, Bulgaria, e-mail: georgimar@gmail.com*

This report is an attempt to provide an updated snapshot of the current knowledge of the gray wolf (*Canis lupus*) in Bulgaria aiming to find the geographical distribution and the recent trends in wolf's numbers in the country in the beginning of 21 century. The scientific information available for the gray wolves in Bulgaria is very limited. The most applicable approach, was to analyze the temporal variation of the population dynamics of wolves using the available data from the official results of spring game counts carried for the period 2002-2012 of the National wolves population monitoring schemes initiated by the Executive Agency for Forests of Republic of Bulgaria. The approach that we have applied represents the population development of wolves, measured as an intrinsic rate of increase, or $R = \ln(N_t/N_0)/t$, where N_t is the population count at time t , and N_0 is the initial population size. This estimate covers the numbers data both from the whole country and from the territory of State hunting areas, where the game is managed by the structures of the Executive Agency for Forests with pronounced professional approach, as well as from the Submitted hunting economic areas, managed by the game association, where the wolves are supposed to develop under weaker anthropogenic pressure.

According to the historical records, the gray wolf is an autochthone species in Bulgarian mammals' fauna. The quality of the available data on wolf numbers and distribution varies widely over the years, but they clearly represent certain periods of dramatic change of the wolf numbers in the country.

The large-scaled and drastic control exercised in 1950s and 1960s over the predators' numbers, including organized at national level poisoning with strychnine and awards for killed animals, strongly reduced the wolves' numbers and

only small groups have survived in the border zones in Kraishte, Rhodopes and Strandzha Mountains.

When in the early 1980s it was forbidden to kill the predators by poisoning with strychnine, the numbers of the species has begun to increase. It is assumed that during this period the distribution area of the wolves has covered about 25% of the country, and the official "census" assessed the numbers of the species over the country between 2000 and 2300 individuals.

The analysis of the information about the population dynamics of the wolf in Bulgaria, showed that during the period 2002-2012 the population has become stable with regard to the dynamic parameters. The mean general numbers of the wolves in Bulgaria during this period was 2200 animals with maximum value of 2561 animals in 2008 and minimum of 2005 animals in 2003. In this period the mean numbers of wolf's population over the territories managed by the Regional Directorate of Forestry of the Executive Agency of Forests was 737 animals (min 605 and max 934), and in Submitted hunting economic areas, managed by the game association the mean numbers was 1462 (min 1235 and max 1673)

The population development of wolves during the last decade measured as an intrinsic rate of increase, based on the changes in species numbers in two consecutive years throughout the country shows average positive value of 0.0116. In the State hunting areas, where the game is managed with pronounced professional approach, the mean value of the intrinsic rate of increase was negative (-0.0258) and in the Submitted hunting economic areas, where the wolves were supposed to develop under weaker anthropogenic pressure, it was positive 0.0322. This data suggested that the population growth of wolves was limited and increased very slightly. It seems that in the recent days the Bulgarian population of the wolf is the one with the highest density among the European populations and is widespread throughout the country, in the mountainous and some semi-mountainous parts of the hunting regions.

The negative attitude of Bulgarian rural people towards wolves roots in two main conflicts with: (1) the hunting-economic functionaries (blame wolves for reducing game abundance and availability) and (2) livestock breeders (blame wolves for livestock depredation). The lack of acceptance of wolves appears to be the major problem for their intensive population development and shouldn't be underestimated. As the wolves' numbers in Bulgaria retains its trend to increase, adequate measures for regulation of the normal coexistence of the human and the wolf are needed in regions with proven harm of wolf on game and domestic animals and human health. Preservation and stable presence of the wolves in Bulgaria could be achieved through perceiving it as normal wild species and treating it as native species of Bulgarian mammal fauna.

THE ROLE OF ANTHROPOGENIC FACTOR IN THE BOVINE LEUKEMIA SPREAD AND ERADICATION

Moskalik Roman¹, Gangal Nicolae², Balov Svetlana²

¹*Scientific Practical Institute for Biotechnologies and Zootechny and Veterinary Medicine (SPIBZVM), Chisinau, Moldova*

²*Republican Center for Veterinary Diagnostic, Chisinau, Moldova svetlanabalova@googlegmail.com*

Bovine leukemia is registered in the Republic of Moldova since 1965. The viral etiology of this disease was set in 1969. (Miller J.M. et al.). Absence of sufficient knowledge for a long time of the mechanism of leukemia virus (BLV) transmission have facilitated a significant and rapid spread of leukemia in conditions of intensive dairy farming in many countries around the world. For this reason, in 1990-1991 Moldova has become the most dysfunctional in the world for leukemia - infection of cattle has reached almost 50%, and among cows - 70-80% or more. Every year, for this reason, are rejected for slaughter 5-10 thousands of milking cows.

Moldovan science pioneered the study of the disease in terms of its viral nature. During 1981-2010 years researches carried out by SPIBZVM have allowed decipher for a maximum the mechanism of virus leukemia spread and prove that this process is «hand-made» and it is associated with violations of human (professional) ethics in process of animals care, with animal reliable identification. We (Moskalik R. et al., 1988) were first in the world, who has established the most dangerous way of BLV transmission: through the mammary gland during mechanical milking using one milking unit for healthy and BLV infected cows. At the same time we proved absence of BLV transmission by contacts, through the air, water and food.

Preventive measures for these factors allowed reliably to prevent transmission of the leukemia virus, which served for as in 1989 as a base for development of Moldovan system of leukemia eradication, on the base of which in 2008 we have developed and approved by the Government decision No.473 from 26.03.2008 the «Program for bovine leucosis eradication and prophylactic for 2008-2015». Using the scientific developments SPIBZVM has managed to reduce the contamination of cattle by BLV in Moldova in 5.7 times (from 48.8% to 8.5%). In 4 (10.8%) regions leukemia is eliminated, in 5 – infection is 0.2%-4%, in 7 - up to 5%, in 5 - 10% and in 10 – more than 10-15%. From 8 pedigree farms 4 (50%) are free of leukemia. But in other pedigree and commercial farms, where mechanical milking is conducted with violations, more than 30% of cattle are infected by BLV.

Thus, it was found that the same anthropogenic factor plays a crucial role in spreading (with an uncontrollable situation) and eradication (subject to professional ethics) bovine leukemia.

CONTRIBUTIONS OF STUDYING THE NESTING OF COLLARED FLYCATCHER (*FICEDULA ALBICOLLIS*) IN THE CENTRAL CODRII

Munteanu Andrei, Bogdea Larisa, Buciuceanu Ludmila,
Ceban Alin, Zubcov Nicolai

Institute of Zoology, AS of Moldova, Chişinău
e-mail: larus421@gmail.com

Structural and functional amendments in bird communities, which are manifested by the emergence and dominance of species and reducing the others, are determined by biotope diversity, adaptability of the species or other ecological peculiarities. D. Lack (1944) researching Passeriformes fauna in England found that between species of the same genus is the phenomenon of mutual exclusion. Coexistence of some bird species in the same forest areas is possible only because of specialization in ecological niches. The territory of Republic of Moldova were recorded 4 species of Flycatchers: spotted flycatcher (*Muscicapa striata* Pall.), pied flycatcher (*Ficedula hypoleuca* Pall.), collared flycatcher (*F.albicollis* Temm), red-breasted flycatcher (*F.parva* Bechst.)(Ganea, Litvak,1961). In the genus *Ficedula* all three species inhabit the Central Codri. Collared flycatcher was recorded by the 60s of sec. XX as the rare species nesting in Codri. Since the 70s of XX century collared flycatcher species increases its number and becomes common, gradually displaced Pied Flycatcher. Thus the last species from common category becomes rare.

What are the causes of this phenomenon? According to information from the literature (Nicola Saino, Roberto Ambrosini, Diego Rubolini et all, 2011) *F.hypoleuca* of common species in the north of Western Europe in the last decades reduces its number. The authors argue that climate change phenomenon causes by the appearance of early spring in insect development. About two weeks quicker to arrive at nesting species, which has not changed the terms of migration. The food deficit has become the main factor reduction of species density. The published data regarding the nesting of Collared Flycatcher are few in the country. The paper presents a short information about nesting species in the Central Codri. The researches were performed in the scientific reserve «Plaiul Fagului» and Străşeni Forest in 2009-2013. In the country collared flycatcher arrives in the second decade of April (16-21.04), terms that coincide with Pied flycatcher. They are birds of deciduous woodlands, parks and gardens, with a preference for old trees with cavities in which it nests. They build an open nest in a tree hole, or man-made nest-boxes. Beginning of the reproduction period Flycatcher species was recorded in the first decade of May, but it is very large (14.05-04.06), some pairs were still at the stage of laying eggs and incubation of eggs in the third decade of May. The clutch of flycatchers consists of 5-7 blue eggs. This species as compared to other species that nest in hollows show a high level occupancy artificial box. According to the observations we obtained an occupancy rate of artificial boxes in forest plots - 57.9% of the total. In city parks and forest flycat-

cher found during spring migration, in the second decade of April. There is met *Ficedula albicollis* and *Ficedula hypoleuca* during the spring passage in parks and open areas with hollow trees, poorly developed undergrowth and bushes. eg. Public Garden «Stefan cel Mare», the Rose Valley, green areas peripheral urban areas recorded lower densities. Under the our conditions that the appearance of species as possible *F.albicollis*, which for nesting uses the same natural and artificial hollows, and in poor nesting conditions, has become the key factor to the decline of species density *F.hypoleuca*.

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PRELIMINARY DATA ON HIBERNATION PECULIARITIES OF BATS (MAMMALIA, CHIROPTERA) IN ABANDONED STONE QUARRIES NEAR CRICOVA VILLAGE

Nistreanu Victoria¹, Caldari Vlad¹, Andreev Sergiu²,
Larion Alina¹, Postolachi Vlad¹

¹*Institute of Zoology, ASM, Chisnau, vicnistreanu@gmail.com*

²*NGO WISDOM*

The abandoned stone queries represent important bat hibernation sites. Various bat species find favorable wintering conditions in such habitats due to low antropogenic disturbances, large surfaces and presence of high number of suitable shelters. The bats usually form mixed hibernation colonies.

The studies were performed at the end of hibernation period – in March 2013 at the abandoned stone queries near Cricova village of Chisinau district (4709.0403 N, 2851.449 E, altitude – 87 m). At the end of 90's – beginning of 2000 in this stone queries were recorded several bat species at hibernation and the site was proposed to be declared as protected area (Andreev, pers. comm.), but till now this fact wasn't yet realized. At least we found that metal grilles installed at that time to a several entries were also partially preserved and limit public access. The queries ceiling height varies between 0.5-2.5 m, in some places it is knocked down.

Immediately after the quarries entry, about 4-5 m, the first specimens of bats were found. Most individuals were found in the holes remained after the supports used to sustain the mine roof during the work. The holes are relatively small, with a diameter between 3 and 10 cm and a depth of 5 to 20 cm. In total about 3 km of underground passages were passed and about 30 individuals belonging to 5 species were registered (*Myotis daubentonii*, *M. dasycneme*, *M. mystacinus*, *M. bechshteini* and *Plecotus austriacus*).

The dominant species was *M. daubentonii*, which constituted more than half of all registered individuals, followed by *M. dasycneme*, which constituted about 30% of all bats. *P. austriacus* was recorded at a rate of about 15%, while *M. mystacinus* and *M. bechshteini* individuals were found in very low number,

representing 2.44% each. It should be mentioned that the last two species are very rare for the fauna of the republic. Furthermore, *M. bechshteini* is a critically endangered species and the abandoned quarries near Cricova is the only known hibernation place of this species on the republic territory.

Most of the individuals were found in hollows solitarily, but in some deeper and larger holes several individuals were found together. All individuals found in a single hole were *M. daubentonii*, and their number varied between 1 and 4 per hole. Other species were found exclusively solitarily.

Unlike the other four species, gray long-eared bat hasn't been found in holes in the ceiling, but only on the edges, in cracks side of the corbels, niches or recesses in the ceiling side. All individuals were found to be solitary. In spatially aspect *P. austriacus* was located in the output area of the mine, all individuals have been found up to a distance of 30 m from one of the exits.

Cricova mines are important places for hibernation of bats in the central zone of Moldova. Mixed colonies of hundred individuals of about 5 species hibernate here, including some rare species, and these habitats must be protected.

The study was performed under the project for young researchers 12.819.18.06A financed by the Academy of Sciences of Moldova.

DISTRIBUTION, KARYOLOGY AND GENETICS OF *MUSTELA NIVALIS* LINNAEUS, 1766 (MAMMALIA: CARNIVORA) IN TURKEY

Sakir Önder Özkurt¹, İrfan Kandemir², ReyhanÇolak²,ERCÜMENT ÇOLAK²

¹*Ahi Evran University Faculty of Education Department
of Science Education Kırşehir, Turkey*

²*Ankara University, Faculty of Science Department
of Biology, Tandoğan, Ankara, Turkey
e-mail: onderozkurt64@gmail.com*

Mustela nivalis is distributed all around the Turkey in various habitats. We collected 24 *Mustela nivalis* specimens from 14 localities throughout Turkey and karyotyped two of specimens by cell culture. Karyological and morphological characteristics of *Mustela nivalis* captured from Edirne and Ankara were examined. There are no chromosomal differences between Edirne and Ankara specimens. Edirne is European and Ankara is Anatolian part of Turkey which have seen on the distribution map. The diploid number of chromosomes ($2n$) = 42 fundamental number (FN) = 79, and the number of autosomal arms (NFa) 76. The X chromosome is large-sized submetacentric, Y chromosome is acrocentric.

Additionally, we assessed molecular systematics of *Mustela nivalis* using the mitochondrial d-loop region from 7 samples along with 36 samples obtained from Genbank and two outgroup species. DNA sequences were tested by BIC and found that K2+G is the best substitution model for the analyses. Out of 544 bp DNA sequences, 432 were conserved, 109 were variable and among variable sequences 54 were parsimony informative. In an average 517 identical

pairs (no substitution) were found in the analyzed sequences, 11 transitional pairs were obtained along with 3 transversional pairs. The transition/transversion ratio was 3.45. Current samples showed close resemblance to Kars sample from Turkey in Genbank, other than that samples showed close proximity to Georgian, Ukrainian and Serbian samples as it is seen in the phylogenetic tree constructed by NJ in MEGA5.2.

DIMENSIONAL AND AGE STRUCTURES ANALYSIS OF THE COMMON NEWT BREEDERS (*TRITURUS VULGARIS* L.) IN ECOSYSTEMS OF “CODRII” RESERVATION

Plop Larisa¹, Cozari Tudor¹, Jalbă Liliana¹, Silitrari A.²

¹*Tiraspol State University (Chisinau), Republic of Moldova*
e-mail: larisaplop@yahoo.com

²*Institute of Zoology, ASM, Chisinau, Republic of Moldova*

Dimensional structure analysis of the common newt population of the reservation was made based on data measuring body length with 0.1 mm precision. In total there were analyzed dimensional structure of the 118 individuals, including 74 males and 42 females. The material was collected during the breeding period of the species - March-April 2008 in breeding ponds located Bicovat tributary valley of the reserve. After making the necessary measurements, individuals were set free in aquatic habitats of origin.

Dimensional and demographic composition of the analyzed breeding species population was established by analyzing the adult body size of the 116 individuals (74 males and 42 females) collected throughout the reproductive period (March-May 2008) of the common newt population in the “Codrii” Reservation (Figure 1). According to this figure, the size of breeders varies between: males - 50.2 to 81.9 mm. ($M \pm m = 70.7 \pm 0.7$), females - 53.2 to 77.9 mm ($M \pm m = 66.9 \pm 0.9$), which meant that males are larger than females. As with the Ukrainian transcarpathian population [1] and with those of the Poland [2], sexual dimorphism of the common newt population of the Central Forests is expressed by larger body size of males. According to our data, maturation of the males occurs when they are 2 years old, and females - 3 years old, their total length being 50-56 mm at maturity, similar data were obtained in other parts of the area - Ukraine, Romania, Poland [1, 2, 3], except for populations in Scandinavia, where the process of sexual maturation occurs at the 5-6 year of life [4]. Dimensional structure of the breeding population in the Central Forests for males and females group consists of four dimensions: first - 50-60 mm, second - 61-70 mm, the third - 71-80 mm, and fourth - 81 -90 mm. Most of these groups have the dimensions of the second and third groups, which are consisted, respectively, from 33.9 and 60.8% males and 57.2 and 26.2% of females. The lower dimensional group (first) consisted of 4.0% of males and 16.6% females, while the highest dimensional group (fourth group) is represented by the male (1.3%). In general, the character size distribu-

tion of the two sexes is similar, females outweigh males in the third group, and males prevail over females in the fourth group, those dimensional differences are probably due to different rates of growth and sexual maturation of both sexes. This dimensional structure, however, is one characteristic of species with an effective relative constant and optimal, which suggests that this population is in favorable ecological conditions of existence.

After analyzing the degree of development of the gonads and sex differences exist in body size, we determined that groups' dimensional analysis are corresponding, in fact, individuals at the age 2-5 years for males and 3-6 years for females. Overall sex ratio of individuals analyzed is 1,7:1,0 in favor of males, this ratio is very similar (1,6:1,0) with those of slotted triton populations previously analyzed [5].

We would like to extend our appreciation to Supreme Council for Sciences and Technological Development of ASM for funding (projects 11.817.08.14F and 11.817.08.40F)

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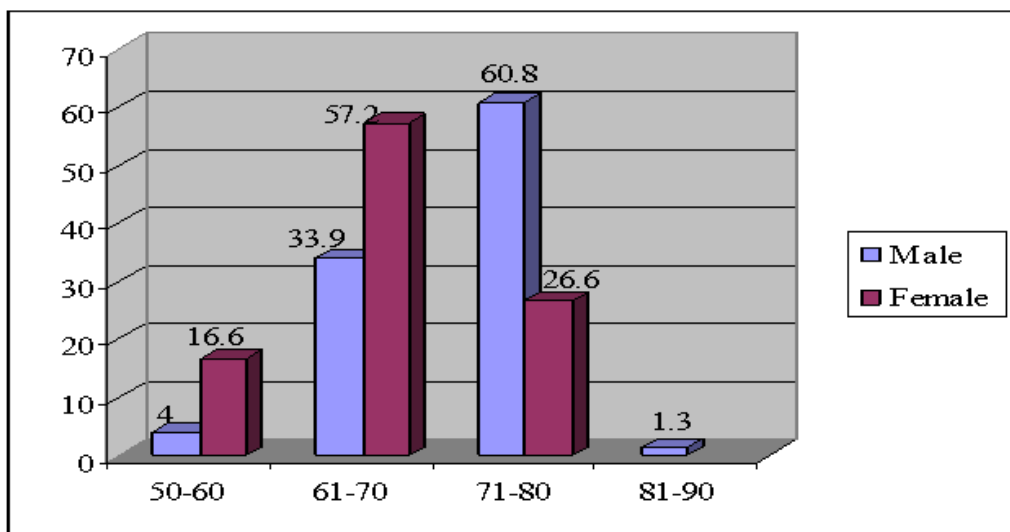


Figure 1. Dimensional structure of common newt breeders in the ecosystems Central Forest ("Codrii" Reservation, March-April 2008; males - 74, females - 42)

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BIOCENOTIC RELATIONS OF COMMON VIPER (*VIPERA BERUS*) IN CONDITIONS OF REPUBLIC OF MOLDOVA

Postolachi Vlad

Institute of Zoology of the ASM, Chisinau, Republic of Moldova
e-mail: vpostolachi @ rambler.ru

It is known that the activity and life of vipers is closely related to other species of animals and plants. The vipers activity have been influenced by physical factors of the environment as well as biotic factors. For his part, snakes, influenced by external environment conditions are able to act indirectly upon him. The highlight of these reciprocal influences between the common vipers and the environment is one of the basic premises of the understanding the legalities of biogenesis. Some special features that reflect the biocenotic relationships of viper have been described in a number of national and international papers (*Țurcanu 2002, Копосов 2003, Бакуев 2008, Postolachi 2013*). Our research results partly reflect the trophic relationships, relationships of competition, prey-abductor and superficial host parasite relationships.

Under the conditions of our Republic the vipers inhabit forests and meadows inside them. More often they are found in the “Codrii” area and floodplain forests of Middle Dniester.

For the study of biocenotic relations the classical methods were used, which do not require animal’s killing, the dissections were performed only in three cases — when the bodies were found.

During the analysis of vipers stomach there was found that their diet consists of mammals, usually rodents (6 sp.) and only in one case the remnants of *Sorex araneus* had been detected. Seldom the bird scraps (2 sp.), also the reptiles (1 sp.) and amphibians (4 sp.) were found. List of food items can be complemented with potential species (12 sp.), which for some reason were not registered in our samples.

In terms of ecological competition, near the vipers the consumers of rodents are highlighted, which quite often are found in the biotope. Primarily the carnivorous mammals are highlighted, in the top of the list being the fox (*Vulpes vulpes*), whose diet is quite varied, but first of all it is the most common consumer of rodents. The fox is followed by *Mustela nivalis*, *Martes foina*, *Martes martes* – whose basic food is also the rodents- and *Meles meles* whose their diet is also filled with rodents. Among the birds in ecological competition, against the vipers, there are also *Buteo buteo*, *Asio otus*, *Athene noctua*.

At the same time the common viper can serve as food for a number of predators, such as *Buteo buteo*, *Athene noctua* and *Meles meles*.

The helminthofauna of *Vipera* genus consists of 54 species of parasitic worms. The helminthofauna of *Vipera berus* consists of only 23 species, of which 13 species of Trematodes, 2 species of Cestodes, 2 species of Acanthocephales and 6 species of Nematodes. Among these species, only 5 species are obligatory parasites of the common viper (4 species of Trematodes and one species of Nematodes).

Population status of the common viper, on the territory of the our country, is quite alarming and requires more detailed study of various biological and ecological aspects, which would reflect the basic directions necessary for the protection of this animal.

The study was performed within the project 11.817.08.16A financed by the Academy of Sciences of Moldova.

ABOUT VARIABILITY OF OS BREGMATICUM IN THE SKULL OF THE NORTHERN WHITE-BREASTED HEDGEHOG INHABITING THE TERRITORY OF BELARUS

Savarin A.

Gomel State University "F. Scorina", Gomel, Republic of Belarus
e-mail: a_savarin@mail.ru

The analysis of the additional bone's variability of the northern white-breasted hedgehog (*Erinaceus concolor roumanicus* Barrett-Hamilton, 1900), inhabiting the territory of Belarus was made. Data of Pucek (1962) who learned additional bones of the hedgehogs from Belorussian and Polish Polesie were taken for comparison. Revealed features (Table 1) of the additional bone's variability: the increase in frequency of occurrence, considerable quantity of separate bones in its plural form (fig. 1), various structural variants of the plural form also is abnormal the big maximum sizes (fig. 2) – confirm its pathophysiologic formation during postnatal period.

Table 1.

Variability of os bregmaticum of northern white-breasted hedgehogs

Characteristic	Sample	
	Belarus (our data)	Poland and Belarus (Pucek,1962)
Frequency of occurrence of <i>os bregmaticum</i> , %	> 90 (adults) 98 (age till 3 months)	58
Maximum quantity of bones in the plural form of <i>os bregmaticum</i>	9-10, probably more	4
Structural features of the plural form of a bone	Various variants, including several big bones	One big bone and a little smaller

Characteristic	Sample	
	Belarus (our data)	Poland and Belarus (Pucek, 1962)
The maximum sizes of the bone (length/width, mm)	14,8/8,8	11,1/6,00

Formation of new points of ossification and development of the *os bregmaticum* are forms of compensatory processes on reduction of intracranial pressure. Taxonomic value cannot be given to additional bones.

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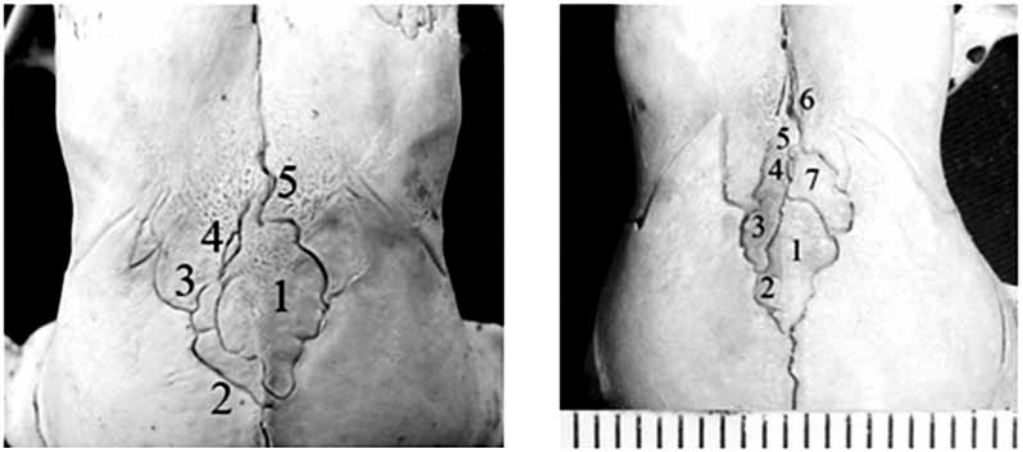


Figure 1. Skulls with a considerable quantity of the *os bregmaticum*

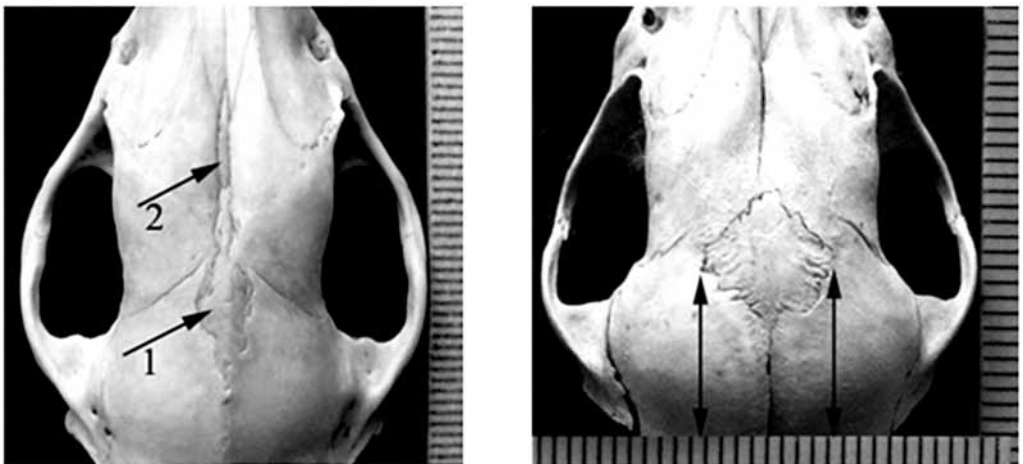


Figure 2. The maximum sizes of the *os bregmaticum*:
at the left – length, on the right – width
Designations: 1 – *os bregmaticum*, 2 – additional bone of unclear
classification accessory

ROLE OF TERRESTRIAL VERTEBRATES IN NUMBER REGULATION OF PESTS IN AGRARIAN ECOSYSTEMS OF CENTRAL ZONE OF MOLDOVA

Savin A., Nistreanu Victoria, Munteanu A., Țurcanu V., Sâtnic V., Larion Alina

*Institute of Zoology of A.S.M, Chișinău, R. Moldova,
e-mail: savin.an1948@mail.ru*

The necessity to study the diversity and assess the role of terrestrial vertebrates species in number control of pest species populations is dictated both by the problem of faunal community diversity maintaining in contemporary agricultural landscape, as well as by the fact that most of these species are important links within the trophic chains of various types of ecosystems.

The material collected during 2006-2010 at the research stations “Peresecina” and “Trebujeni” from the central zone of R. Moldova served as basis for quantitative analysis of trophic ratios between prey and predator. The *efficacy of prey removal from ecosystem was established by applying the formula* $E_f = mx100/M$, where m – mass of prey removed from the biotope and M – total mass of prey (pest) inhabiting the biotope. The aim of the study was to determine the complex of terrestrial vertebrates able to regulate the number dynamics of pest species and the peculiarities of various taxonomic groups in the dynamics of this process.

The study of trophic relations within faunistic communities prove the regulation efficiency by some mammal, bird and reptile species in agricultural and natural cenoses of rodent, insect and other invertebrate's number – pest species of agriculture and forestry.

Among mammals were studied the fox, the badger, the least weasel, the frequency and abundance of which is sufficient (32-48 ind./1000 ha) in biocenoses in order to control the prey populations at different phases of its number dynamics. It was established that among small rodents in forest ecosystems more intense is removed the bank vole (*Clethrionomys glareolus*), the density of which toward November at Trebujeni decreases by 4 times. *In the immediate vicinity of predator's shelters this species is very rare, the abundance of other species is also very low (2-3% of trappability at 100 snap traps). In open land biotopes the field voles (Microtus sp.) are more efficiently removed, due to their colonial way of life and their poly-phasic activity during the year.*

The analysis of seasonal dynamics of prey removal and predator density in various ecosystems emphasized a rather strong positive correlation ($r = 0.95$) among these parameters. The prey removal is much more efficient in the ecosystems of Trebujeni ($E_f = 17-65\%$), where the predator density reaches 17-31 ind./100 ha. The lower percent of rodent removal during spring and at the beginning of summer is explained by the fact that in this period the predators feed mostly on fruits (cherries) and insects. At the same time the rodent density and the peculiarities of their activity don't allow an effective hunting. Starting with

August the rodents ratio in predator's diet increases, reaching 100 % in September even in badger.

Bird communities from agroecosystems with noticeable impact in reducing crop pests are insectivorous, insectivores and prey ones (26-33 species). After the species number and density, the entomophagous birds are of primary importance in regulating the number of agricultural pests. The insectivorous species during the nesting period have the density of 878 ind./km and can consume up to 7.01 kg/km of invertebrates in 24 hours, especially during the feeding of chicks, when the intensity of collecting trophic objects is 3-4 times higher.

Among predatory birds that feed exclusively on rodents the common buzzard (*Buteo buteo*) and the long-eared owl (*Asio otus*) dominate. About 71% of buzzard diet and 88% of long-eared owl's diet consist of small rodents. During nesting period the common buzzard can use for food up to 20 kg of biomass/km and the long-eared owl – up to 18 kg.

Taking into account the trophic specificity and the biomass ratio of herpetofauna in studied biocenoses 4 reptile species were identified (*Elaphe longissima*; *Vipera berus*, *Lacerta agilis*, *L. viridis*) and 2 amphibian species (*Pelobates fuscus*, *Bufo viridis*) that have an important role in pest control. In the diet of lizards and amphibians the pest invertebrates constitute about 70%, of which 81,5% are insects, 18,5% arachnids and other groups. The highest quantity of biomass removed annually from a hectare of agroecosystem is consumed by the species *B. viridis* (24,2 kg), *L. viridis* (23,3 kg) and *L. agilis* (17,8 kg). In the ecotone between forest sectors and agricultural lands the common viper and Aesculapian snake have an important role in regulation of rodent density consuming annually 5,1 kg and 13,9 kg/ha respectively. Depending in density, demographic structure and trophic spectrum, these species differ after the quantity of used biomass that serves for determining their role within the trophic relation of an ecosystem. The annual biomass consumed by herpetofaunistic complex species from "Trebutjen" natural landscape is of 50,53 kg/ha. In agroecosystems these species also have a huge importance in pest control, especially *Bufo viridis* and *Pelobates fuscus*, which regulates the density of nocturnal harmful insects. In the studied agroecosystems they remove annually up to 36,8 kg/ha of biomass.

The concentration of nocturnal and diurnal predatory species in the outbreaks of crop pest breeding occurs; therefore we can talk about their effectiveness in pest control. The efficiency of agricultural pests' removal by terrestrial vertebrates varies during the year: it is maximum at peak phases of pest number dynamics, significantly correlates with predator density and this correlation have an impact on a wider range of species in ecotone areas.

The work was performed within the projects 11.817.08.13F and 11.817.08.15A.

**RADIUS OF REPRODUCTIVE ACTIVITY AND ITS IMPORTANCE
IN THE MINIMUM VIABLE POPULATION PARAMETERS
DETERMINATION IN LEPUS EUROPAEUS PALLAS**

Savin Anatolie

*Institute of Zoology of A.S.M, Chişinău,
R. Moldova_e-mail: savin.an1948@mail.ru*

The degree of population stability under anthropogenic pressures is largely determined by species ability to keep and maintain within the optimal limits the structural parameters of the population. Anthropogenic factors on the background of climate changes can de-structure the populations, often fragmenting them, which leads to the decreasing the viability of these structures irreversible genetic and morphological changes being inadmissible. In small populations the rare alleles may be lost that leads to homozygosity of population and loss of species ability to adapt to changing environmental conditions. The population as a natural-historical structure can exist in certain quantity-space limits. Maximum levels are important in population determining as genetic system with theoretical value, while the determining of numerical and space minimum limits is decisive in knowing the adaptability of species to extreme living conditions. Inbreeding is destructive for reproduction and survival, influences growth rhythm and body mass and the population of each species has its minimal number when it can counter these effects, often by decreasing reproduction and survival. Fragmentation and isolation of populations has a role in the evolutionary process as a factor that secures and amplifies the initial stages of genetic drift.

In the last years, under the pressure of anthropic and climatic factors, the population of European hare – the main game species on the territory of the republic, has suffered structural and functional changes resulted in general numeric decline and population fragmentation with maintaining of optimum density only on limited areas with favorable conditions. Therefore, the necessity to determine the essential parameters comes, when a minimal fragmented population structure could retain genetic integrity and adaptive capacity for a long period. These priorities have been studied by several researchers (Berry, 1971, Franklin, 1980, 1983; Soule, 1985; Shaffer, 1981; Яблоков, 1987), which, for the assessment of minimum viable population, recommended to determine the minimum number of individuals, the minimum reproductive number of these territorial groups and the minimum area that could be occupied by this group.

Shaffer (1981) determined what is the minimum species number for certain population to have 99% chances of survival during a long time period regardless of stressful environmental conditions, and proposed the following formula for *calculating the minimum viable population*: $1/N_m = 1/t (1/N_1 + 1/N_2 + \dots + 1/N_t)$ (1), where N_1, N_2, N_t are the population number at different phases of number dynamics. Iablokov (1987) noted that this rule should actually be two times greater than the amplitude of observed numerical oscillations. Franklin (1983) and Iablokov

(1987) claim that the actual numerical value of the population is determined by the sex structure and can be calculated by applying the formula (2) $1/Ne = 1/4 Nm + 1/4 Nf$, which usually constitute 60-85% from the actual population number (J. Crow, N. Morton, 1955).

The notion of minimum spatial group is determined by the radius of reproductive activity (**RAR**) – the distance from the birth place to the breeding place for 95% of the population individuals (Яблоков, 1987) and usually this group individuals have frequent genetic connection (exchange of alleles).

Analyzing the spatial reproductive activity of the European hare in different zones (Kronig, 1940; Parkes, 1984; Grant, 1985 Плакса, 2008) of its spreading area and in R. Moldova it was concluded that for this species the range of reproductive activity may be considered to fall within 3000 m.

The minimum area of a viable population is proposed (Яблоков, 1987) to be determined according to formula $S(\min) = 3,14 \times RAR$. For the hare in the conditions of the republic this area is $S_p(\min) = 3,14 \times 3000m = 28260000 m$ and could represent a population group. *Therefore it is proposed that a hunting ground, where the European hare is the main game species, would have an area not less than 3000 ha.*

In Moldova the fluctuations in hare numbers fall in the range from 20 ind./1000 ha. (min) to 80 ind./ha 1000. (max), diapason = 60 ind. (same values also obtained according to form. 1). Since the minimal possible viable population must contain the double diapason of the fluctuations (Яблоков, 1987) this value is determined at 120 specimens.

The area calculated above (2826 ha) must be inhabited by 120 specimens. Thus, the minimum density, in order to not affect the population, is $120 \times 100 / 2826 = 42.5$ ind./1000 ha. The calculations according to equation 2 mentioned above shows that the minimum reproductive number must be no less than 29.7 ind./1000 ha – about 70% of the minimum possible density (Crow, Morton, 1955).

In conclusion it should be noted that the work is an attempt to determine the parameters of the possible minimum viable population of a species of economic importance and numerical investigations under extreme dynamics of species, spatial parameters of the activity, including reproductive ones will allow to determine the species occurring at limits of their existence and the areas necessary for their protection.

The work was performed within the project 11.817.08.15A.

REPRODUCTION OF MICROTUS ARVALIS AND MICROTUS ROSSIAEMERIDIONALIS SPECIES (RODENTIA, CRICETIDAE) IN THE REPUBLIC OF MOLDOVA

Veaceslav Sîtnic, Victoria Nistreanu, Anatolie Savin, Alina Larion

*Institute of Zoology of the Academy of Sciences of Moldova,
Chişinău, Republic of Moldova, sitnicv@gmail.com*

The intensity of the reproductive process is conditioned by the wintering period of time, the primary population density and the physiological state of the individuals who wintered. It is worth mentioning that the intensity of reproduction represents an essential parameter of the population. This depends on many biological peculiarities: age and sex structure, weight of breeding females, the average number of embryos. Reproductive intensity is often appreciated only by the percentage of pregnant females and number of embryos. But this is insufficient because it doesn't allow us to estimate the number of potential offspring on which the population fluctuation depends. We can certainly say that the intensity of reproduction resides in the number of embryos per 100 individuals over a certain period of time.

The huge reproductive potential of *Microtine* species depends on the maturity age, period of pregnancy, offspring size, period of time between two pregnancies and number of offspring a female can produce. As far as fertility is concerned, females of *M.arvalis* species, under favourable conditions, give birth to 6-8 juveniles and sometimes to 11-12 juveniles. When they are 3 weeks old they become adults and females start breeding. They can reproduce during the whole year, giving birth to up to 5 offspring. That is why their number is so large. If the microtines reproduce in agricultural fields where conditions are not favourable, they migrate to refuge habitats like forest belts, unprocessed agricultural lands on which ruderal plants grow (the case of *M.arvalis* species) or inhabit people's homes and warehouses (the case of *M.rossiaemeridionalis* species).

Microtines reproduce under favourable conditions only in certain seasons while during the rest of the year, when the conditions for reproduction are not favourable, they are greatly influenced by the biotic and non-biotic factors and, as a consequence, their number reduces. Favourable conditions for reproduction vary from year to year. To a great extent, these circumstances explain the annual fluctuations of the microtines. They survive in those biotopes where, during favourable periods of the year, they increase in number and strengthen their physiological state to such a degree, that the living conditions from the unfavourable period of the year do not make them completely disappear. The number of individuals in the explored habitats depends both on the period and territory the conditions for reproduction are created in favourable seasons and on the number of refuge habitats that allow individuals survive.

A more intense reproduction of *M.arvalis* females was registered when the number of individuals increases in the wheat fields in fall season and a reverse

phenomenon was registered in the depression phase. The significant difference in the number of reproducing females at these two phases is $t=3.16$. In the fields with perennial plants the reproduction took place a year earlier than in the fields with fall wheat and coincided in time with the intense increase in number, especially during summer-fall period. Starting reproduction during the growth phase was registered in January-February. In the decline and depression phase the individuals who wintered usually start reproducing later and the quota of reproductive females is smaller than in the phase of growth in number.

The reproduction intensity of *M.rossiaemeridionalis* in the forest belts and straw piles is smaller than that of *M.arvalis* in the cultivated wheat and perennial plants fields in autumn. The significant difference at the peak phase in the number of reproducing *M.arvalis* females from cereal fields and *M.rossiaemeridionalis* from forest belts is $t=3.24$. Fecundity of *M.arvalis* females that inhabit the cereal fields in autumn at the peak phase is significantly higher than the fecundity of *M.rossiaemeridionalis* females from the forest belts ($t = 2.96$), and the fecundity of *M. arvalis* females in the perennial plants fields at the same phase – than that of *M.rossiaemeridionalis* from the straw piles - $t=3.14$. *M.arvalis* fecundity is significantly higher than that for *M.rossiaemeridionalis* ($t=3.42, 3.25$) in the depression phase for the same biotopes. The decline in fecundity is noticed at individuals from the fields with perennial plants while passing from the peak phase through the decline phase to the depression phase. Comparing the reproduction intensity for both species, we mention that *M.arvalis* reproduces more intensively than *M.rossiaemeridionalis*. The average size of *M.arvalis* offspring is significantly bigger than the size of a *M.rossiaemeridionalis* ($t=3.67$).

The summer generations are more prolific and reproduce more intensively at the growth phase than in the years of depression and the pace they get mature is faster compared with the spring generations (23-25 and 28-30 days respectively). There is a great difference of *M. arvalis* and *M.rossiaemeridionalis* generations fecundity in winter, spring and summer ($t=3.25, 3.36, 2.87$), this parameter being bigger for *M.arvalis*. The successful reproduction of summer generations in autumn, the nourishment and climatic conditions being favourable, lead to a sudden growth in number (sometimes up to 750-800 col/ha).

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INTERPOPULATION AND INTERSPECIFIC RIVAL RELATIONS OF MICROMAMMALIAN SPECIES

Veaceslav Sîtnic, Victoria Nistreanu, Anatolie Savin, Alina Larion

Institute of Zoology of the Academy of Sciences of Moldova, Chişinău, Republic of Moldova, sitnicv@gmail.com

The relations between the sedentary individuals of the micromammalian populations, their behaviour, as well as their migrational activity determine the community organisation which has an important role in regulating the number of population. The need for territory is greatly manifested in the population of rodents in their reproduction period, thus regulating the population density. The variation of the population density leads to important changes of its ethological structure. In a small number of individuals an adult occupies an optimal individual territory, large enough and relatively separated where he is ensured with food and shelter. All the individuals are viable to a great extent and the structure of the whole community is simple. The raise in number is accompanied by the intraspecific competition for territory, shelter and food. There is a specific relation of subordination of certain individuals, their heterogeneity rises as well. Their individual sectors become smaller; the amplitude of their dimension oscillation and the overlapping degree rises too. The solitary way of using the territory becomes colonial.

The multigradual hierarchic system becomes more complicated at the peak phase. Stronger individuals become dominators. They have the advantage of using territory, marginalising and subordinating the weaker individuals. This hierarchy is obvious in adult individuals. Juveniles are on a lower stage, having bad living conditions. The bigger the number of adults is, the more subdued are the subadults. The hierarchical ranking of individuals of each later generation decreases due to the increase in number of the population during the summer period. The hierarchical relations among individuals and intrapopulation groups determine the type of the strictly determined spatial structure. This system of intrapopulation relations contributes to the selection of strongly reproducing individuals and to the exclusion of the weaker individuals from the reproducing system; it also regulates the dispersion of the subadults and the completion of the population with these individuals.

The increase in number of micromammalian species is accompanied by a reorganisation of the population's structure. The most obvious transformations are recorded in those species like *Microtus arvalis* that massively reproduce. Antagonism and the protection of the territory highly manifests at the peak phase. The individual sectors overlap to a great extent even at reproducing females. This fact conditions a considerable growth in number of *M. arvalis* individuals.

Interspecific competition appears at species of rodents resembling according to their ecological peculiarities, those that inhabit one and the same biotope and,

to a great extent, the same environmental resources. The interspecific competition becomes more acute at the peak phase, when the environmental resources are insufficient for the full satisfaction of the vital necessities of the populations. The way the rival species behave, from avoiding each other of being aggressive, makes up the basic mechanism of both spatial and ecologic differentiation of populations as well as the limitation of their number, which diminishes the level of competition. Relations of dominance-subordination appear among *Apodemus sylvaticus*, *Apodemus uralensis*, *M. arvalis* and *Mus spicilegus* species that inhabit the same areas where the basic population develops autonomously in relation with the more reduced in number species. The number of the basic species is regulated, preponderantly, via intraspecific relations. Due to interspecific competition, different adaptations appear at these species that allow the slowing down of competition and their survival in conditions of strong influence.

Research in the 1.5 ha marked off territory of uncultivated land showed that *A. uralensis* species – 37.5% and *A. sylvaticus* species – 50% of *Apodemus* genus dominated in March. *Mus spicilegus* that had an abundance of 12.5% was suppressed. The weighting factor of recaptured individuals in the previous month was of 11.1%. The dominant species is *A. sylvaticus* (66,6%), followed by *A. uralensis* (22,3%) and *M. specilegus* (11,1%). Two intrapopulation groups appear in May – one made up of *A. uralensis* subadult females, situated at a 20 m distance from each other, and the second group made up of *A. sylvaticus* adult males. The weighting factor of the marked and recaptured individuals in the previous month was of 28.6%. *M. arvalis* individuals represent 14.2% of the total number of captured individuals. 33.3% of individuals from the previous period were recaptured in July. *A. sylvaticus* and *A. uralensis* species also predominate, constituting 33.3% and 25% respectively. *M. arvalis* individuals were temporarily eliminated from the population group. A demographic boom occurred in September when the density of rodents grew 12.5-fold on the account of *A. sylvaticus* and *A. uralensis* species with an abundance of 72,8% and 17,6% respectively. *M. spicilegus* make up 7,2% of the captured individuals, *M. arvalis* – 1,6%, and *A. flavicollis* – 0,8%. *A. sylvaticus* form 5 population groups while *A. uralensis* – 3.

The interspecific competition contributes to the dynamic balance maintenance between the populations of rodent species and the environmental resources. The first type of competition for the subordinate species and the second one for the dominant species plays a great role in regulating the population number. The study was accomplished on the account of fundamental 11.817.08.14F and applied 11.817.08.16A projects financed by ASM.

**REGULATION OF THE POPULATION NUMBER OF
MICROTUS ARVALIS (RODENTIA, CRICETIDAE) SPECIES
IN THE REPUBLIC OF MOLDOVA**

Veaceslav Sîtnic, Victoria Nistreanu, Anatolie Savin, Alina Larion

Institute of Zoology of the Academy of Sciences of Moldova, Chişinău, Republic of Moldova e-mail: sitnicv@gmail.com

The results of the actions of the regulating mechanisms of *Microtus arvalis* species have been analysed according to the data accumulated in the marked off field. The abundance of this species varied from 7% to 85% in different years. The competition with other species was not significant. The influence of the climate factors and food resources is obvious. The snow layer had a great importance in wintertime, while the sudden weather cooling, very low temperatures during the day and at night and the wind speed was characteristic of the end of spring. Birds of prey and animals droppings were noted in the area. Under these conditions, the maintenance of the population homeostasis via population regulation is distinctly expressed. Studies over many years have enabled differentiation of *M. arvalis* population adaptation, which correlates with changes of climatic factors and food resources or with changes in population density. Thus, we have clarified the peculiarity of the autoregulatory mechanisms of the population adaptation in concrete environmental conditions.

The peculiarities of the numerical density dynamics of microtines in agrocenosis differ from those that have been recorded in natural biotopes and are characterised by a certain frequency which was not recorded in agrocenosis conditions. The natural frequency of the numerical density occurs only in undeveloped biotopes and the peak phase in crop fields has a separate and local character that disappears relatively quickly.

A tendency of cyclical development of the species is noticed in the antropicised territory that is diminished by the human activity. As a result, the number of population increases in 4-5 years time, but the peak phases are not similar. The small number of males registered during intensive reproduction is a sign of increasing in number of juveniles.

In case more breeding females survived in spring (85%) the number of individuals grew 1,5-3- fold, the highest index being in July. If during this period the number of population was low, it grew towards autumn 10-13- fold. Microtines' death in winter and towards spring, when the population does not have enough juveniles, is compensated for in spring, summer and wintertime. Stabilizing the population herd is ensured by complex mechanisms. In order to elucidate them it was necessary to analyse the spatial and demographic population structure as well as the processes of reproduction and mortality of the population. These parameters that characterize the microtine populations varied during different phases of the oscillation of population number depending on the initial spring number of individuals who have wintered.

The multiannual cycle of microtines reflects the population number and the survival of animals. In the depression phase, the individuals are more frequently captured in refuge habitats like forest belts where they survive, and where the living conditions are adverse in this period of time. Microtines' frequency on the field of perennial plants, which is adjacent to the refuge habitats, is minimal in summer months (1-2 colonies/ha with 3-4 exit holes). Reproduction manifests weakly at this phase. The population number in the depression phase depends on the refuge areas surface. Groups of individuals are represented by colonies which are distributed at random, the majority of which being situated on the crops field borders. The survival index for the summer generation is of 13%, while for the spring generation it is of 22% in summertime.

The phase of growth in number of population succeeds the depression phase after the improvement of living conditions inside and outside refuge areas. This is a premise of population viability increase in the refuge areas and the increase of groups' density that leads to dispersion stimulation. Outside refuge areas, favourable conditions ensure the survival and reproduction of individuals that dispersed. At this phase, the groups on the perennial plants fields are constitute 2-3 colonies that do not overlap. At the end of summer and beginning of autumn the population density on the perennial plants fields increases up to 80-100 colonies per ha and then – up to 200-300 colonies per ha. The survival index increases from $33.7 \pm 5.4.0\%$ in September to $58.6 \pm 6.3\%$ in October, and the number of reproductive females of the old summer generation ($67.4 \pm 8.2\%$) exceeds the spring index ($35.1 \pm 3.6\%$). As a result, the groups disperse on the adjacent cereal crops fields where a density of 10-15 colonies per ha was registered. The increase of reproduction intensity and the optimal environmental conditions can favour the undermining factors of viability at the peak phase. The frequent offspring attended by increased energy consumption during gestation and lactation weaken the females. This fact leads to a decrease in female number as well as in descendants' survival. All these factors prepare the ground for the transition to the depression phase. Reproduction manifests in wintertime with an intensity of 8-10% if there are good weather conditions. The colonies practically cover the field, *M. arvalis* being the main species on the perennial and cereal crops fields. At the beginning of winter the female number exceeds 2-3-fold the male number, while juveniles make up 61.1%.

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**FEATURES OF THE FELIS SILVESTRIS CATUS
(CAT DOMESTIC) POPULATION DYNAMICS IN THE PARK
SYSTEM CONDITIONS OF KHERSON**

Sobol Olga

*Kherson State Agrarian University, Kherson,
Ukraine, kafedra_odzp@mail.ru*

In spite of the fact that cats were domesticated a long ago enough, most cats are able to survive in the conditions being out of human accommodation, filling up the rows of the second time run-wild cats, although survival on the streets of cities of pedigree -cats or those that never were outside, problematic.

Researches were conducted on an example three – parcell population of specie existing on territory of park. The area of park makes 28.5 ga and general population quantity is 22 -23 individuals of adult and young animals from 2 – months age. An average annual structure included 5 age groups (old, adults, young, teenagers and new-born). Age pyramid studied population is stable that is confirmed by the calculations. For 4 years of researches of oscillation 30.0 – 100.0% made on different age-dependent groups, the general rejections of quantity did not exceed 8,0%. In our researches most numerous were groups of adults and teenagers (41.7 and 57.1%, accordingly).

Post-home animals play an important role in the formation of this population. Specific weight of knocked (lost) up made: on the group of new-born kittens (1.5 – 2 months) – from 9.1 to 44.4%; on teenagers (4 – 6 months) – 17.7 to 83.3%; on semi - adult (6 – 8 months) – 0 to 33.3%, on adults – from 0 to 30.0% and on the group of old cats – from 0 to 50.0%.

The widest quantity rejections differed for young and semi-adults animals, the least – for new-born kittens. Possibly, it is related to that, whatever the vibrations of amount of fertile lady-cats exceeded $\pm 11.1\%$. Their specific population gravity hesitated within the limits of 33,3 – 40,0%, that was maximal for covey predators – mammals. From them about 40% remain without kittens – for diverse reasons: competition with leading lady-cats, losses of kittens at birth, death of nursing kittens from super cooling, hunger, illnesses and stranger cats – males.

In our research 1 fertile cat brings in an average of 2 kittens, from them 75.6% are remaining in shelters (basements), slightly higher than in studies of American and Russian populations, approximately 60% of there kittens do not survive beyond 2 months.

Mortality of kittens to the half year is 47.8%, to the year is up to 8 months and to the age of sexual maturity is 63.1%.

BIRD COMMUNITIES FROM URBAN AND ANTHROPOGENIC BIOTOPES

Sochircă Natalia, Bogdea Larisa, Crudu Vasile, Cojan Constantin

Institute of Zoology of ASM, Chisinau

Birds occupy an important place in nature and human life. Ecosystems existence is unthinkable without the presence of birds – one of the basic elements of maintaining biological diversity, which by their activity maintain the ecological balance in nature, regulates the number of pest species for agriculture and forestry.

Urban ecosystems have substantial importance by creating special ambiance in the occupied territory, which creates advantageous conditions for birds with high adaptive potential. The diversity of birds from anthropic territories is conditioned mostly by the phytocenotic structure of green spaces.

The work relates about birds species that live in different anthropogenic ecosystems of the North, Centre and South of the country. Thus, there were studied the following parks from the urban areas «Botanical Garden», «La Izvor», «Valea trandafirilor» from Chisinau, the park «Victoria» and «Andries» from Balti, «Gr Vieru «and» White Water Lily «from Cahul, natural forests near settlements Durlesti, Dănceni, Băcioi, Suruceni, Sociteni, Vadul lui Voda.

Observations on bird populations in the research areas allow to present an actual characteristic of the distribution and density of bird populations in urban and recreational areas.

The total length of the routes established for bird's estimation was about 20 km. It was made an inventory of vernal, summer and autumn bird species. As working methods were used method itineraries and direct observations fixed to par.

There were selected parks from different sectors of the city, consisting of trees, bushes, lawns, decorative flower plantations etc. This variety allows the presence of a rich bird population rather than in squares, alleys, residential neighborhoods. The parks have a positive influence on temperature, retain and bind the poisonous substances, raises humidity and serve as places of entertainment.

The most representative is the ornithofauna from the green area of cities, for example, the parks from Chisinau were recorded: 64 species in forest park «The Spring», 54species in the botanical garden, the lowest number of species was recorded in the Public Garden «Stefan cel Mare» - 16species. This is due to certain factors: location in the downtown area, the influence of the disturbance factor, small size, poorer plant structure, lack of aquatic biotope, all these factors have led to limiting the number of species in the park. Thus Public Garden «Stefan cel Mare» is more similar with residential neighborhoods than with the other parks by the number of species. This fact was nominated in other urban centers we have

researched. There were recorded 52 species in the park «Gr Vieru from Cahul, and in the park» Victory «from Balti only (28), thus the small number of species is determined by the high anthropogenic influence.

The research on bird populations from different biotypes shows that there are many species in the suburb of cities than in the central part of the city - *Corvus corax*, *Corvus monedula*, *Junco torquilla*, *Luscinia luscinia*, *Lanius colurio*, *Saxicola torquata* etc. More often birds are attracted by forest plantations that blend with urban parks such as forest parks with a large area and with a variety of biotopes.

Our ornithofaunistic observations allowed us to present an actual characteristic of the distribution of bird communities from urban and recreational areas. The total number of bird species recorded in the studied cities' biotopes is estimated at 117 species. The largest number of species were recorded in forest parks that with their relatively high diversity of habitat provides nesting and feeding conditions for a greater number of species than central areas of the city parks. Their territory are playgrounds for children, coffee, etc., which raises their inconvenience factor, so limiting the number of species in these biotopes. Regarding the situation of birds found in natural and recreation habitats is more stable.

The forest park is outstanding through the specific diversity of avifauna. The small density of birds from The Spring is caused by the diversity and vegetation structure. According to the analysis of ecological diversity indices was found that the highest diversity was recorded in the park «The spring» (Shannon = 3.02), followed by the park «Gr Vieru» (2.44) from Cahul, scientific reservation «Plaiul Fagului» (2.43) and the lowest values - in the park «Victoria» (1.94) from Balti and neighborhoods with 5-storey blocks (1.24). This is due to the diversity of the habitats (tree growing sector, open lands, aquatic biota, recreation area, etc.) of Forest Park «The Spring», which allows populating of a large number of birds, but with a low density. Also, vegetation structure both vertically and horizontally, its age, creates good conditions for a higher number of birds compared with natural habitat «Plaiul Fagului» that has a uniform phytocenotic composition and specific diversity of communities of small birds. An opposite picture of the park was observed in residential neighborhoods where tree vegetation is young, where the herbaceous cover is poorly developed, where the high disturbance factor contributed to population of a small number of species of birds from that habitat.

According to the floristic structure of the investigated areas in different parts of town, we noticed that the forest parks are the main link in the training, development and conservation of urban ornithofauna in comparison with the green spaces of residential areas where development conditions of birds are limited. Regarding the recreative biotopes (forest strips, orchards, vineyards, agricultural fields) that plays an important role in the formation of penetration corridors of bird species from natural areas to urban areas. As a result, the

parks, botanical gardens, squares, cities serve as an island of hope for many species of animals and birds.

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DISTRIBUTION OF BIRDS IN SIERRA MORENA MOUNTAINS (SPAIN)

Țibuleac T.¹, Calvo J. F.²

¹*Institute of Zoology of ASM, Chisinau, Republic of Moldova,
e-mail: ttibuleac@yahoo.es*

²*Department of Ecology and Hydrology, University
of Murcia, Spain: jfcalvo@um.es*

Sierra Morena mountain range hosts the last origin biotypes of dehesas (thinned forest with multiple use, agro-forestry-pastoral), emblematic for the Iberian Peninsula. For understanding the evolution of their avifauna under the influence of human activities its study both in dehesa and in its origin forest is appropriate. The large space of about 100 x 400 km extends south of the Iberian Peninsula in a Mediterranean, subtropical area. It's an old mountain system with average heights (1200 - 1300 m) with relatively well preserved landscape, almost entirely covered with trees and shrubs. Predominant stands are *Quercus ilex* and sometimes - *Q. suber*. There are groves *Q. faginea*, along rivers - strips of *Alnus glutinosa*, *Salix sp.* and *Populus sp.* Pine and eucalyptus plantations are common. Shrub diversity is really great: *Arbutus unedo*, *Q. coccifera*; *Retama sp.*; *Myrtus communis*; *Cistus sp.*; *Erica sp.* and others. The purpose of this study was to reveal the factors determining the distribution of birds, both the structure of the vegetation, as well as relief and landscape.

This study was conducted by the method avifauna evaluation at listening points and habitat description by standard methods. Thus, in total 214 listening points were made 15 minutes each repeated twice in middle breeding period in 2007 - 2008. Their distribution was relatively uniform on the territory with a minimum separation of 1 km including the main habitats in proportion to their spread. The results were subjected to a multiple regression analysis using the R statistical package (Maindonald & Braun, 2010).

As a result, it was determined that both the total abundance and species diversity of bird communities, primarily depends positively on the height of arboreal vegetation, then on the quota of *Q. ilex* in it and vicinity of rare forest sectors, is correlated negatively with the amount of rocky areas. Thus, unlike the dehesa, where these features depend, first of all, on the diameter of the tree stem, here their height is the main factor. The fact is probably related to poor variation of tree height in Dehesa. In mountain the finch presence is related with arbo-

real layer (positively with stem diameter), blue tit (positive with their height) and *Sylvia melanocephala* (negatively with stem diameter). Otherwise the most species are related to certain tree species. For example the chaffinch prefer the stands of *Q. faginea* and *Q. Ilex*; the blackbird prefer the alder, the jay avoid eucalyptus, the nuthatch prefers *Q. pyrenaica*, *Fraxinus sp.*, *Alnus glutinosa*, the robin prefer *Arbutus unedo* and avoid *Q. ilex*, the common wood pigeon prefer stands of *Pinus sp*, *Eucalyptus globulus*, *Q. faginea* and *Q. Ilex*. vegetation and relief. Thus, the birds, who went from forests in dehesa within their antropogenic use, such as chaffinch, blue tit, blackbird, and others have had to adjust their ecological niche to the new habitat possibilities, but remaining within the limits of their biocenotic tolerance. For example, if in mountains the blackbird prefer dense alder and shrubs in Dehesa it avoid rare and grass sectors and also prefers the dense ones.

If we consider the number of bird species, showing evident statistical relationships with environmental factors we obtain the following hierarchy. In mountain area the priority factors proved to be the landscape ones, followed by arboreal layer structure, relief, herbaceous and shrub layer. In Dehesa a similar hierarchy was observed: landscape - trees - shrubs - grass - relief. Because the landscape factors comprise the same arboreal, shrub, herbaceous layers and relief only from neighboring areas, they can be excluded from the scheme. In the arboreal layer a hierarchy reveals identical in both habitats: stem diameter – height of trees - crown density - height of the stem. In the shrub layer we obtain a similar hierarchy. In mountains: density – coverage degree - height of shrubs, and dehesa: density - height - cover. Within the herbaceous layer we get a reverse hierarchy. In mountains: density - height – coverage, in dehesa: coverage - height - density. This approximated hierarchy of environmental factors explain the avifaunistic tableau of given area. Taking into consideration, however, that ambient gradients may have a non-linear action on the distribution of birds in this area there are requires further studies in this domain.

ADAPTATION OF AMPHIBIANS AND REPTILES POPULATIONS TO THE PREZENT CONDITIONS OF LANDSCAPE OF MOLDOVA.

Tsurcan Vladimir

Institut of Zoology of A.S.M., Chishinau, som@as.md

The aim of our study was to assess the current status, trends, and capacity for adaptation in amphibians and reptiles populations to habitat changes caused by current climatic and socio-economic processes. The relevance of this problem is the need to develop measures to preserve the diversity of herpetofauna in the existing environment.

Analysis of the distribution of species in today's changed the landscape showed that most of them range has narrowed considerably over the past decade.

Reduction of habitats is typical for most species of snakes except for ordinary grass snake (*Natrix natrix*), which inhabits various types of biotopes and distributed throughout the territory of the republic. Reduction of areas is caused by the destruction and degradation of potential habitats. These factors also led to the degradation of the population *Emys orbicularis*. Despite the fact that it is widespread throughout the territory of the Republic, this was due to the reduction and fragmentation of wetland habitats as a result of the expansion of industrial facilities, drainage and pollution of natural waters, the destruction of suitable places for reproduction (egg incubation). Stable populations of this species have survived in some areas of the lower Dniester, in natural reserves, «Iagorlic» and «Lower Prut». Study of the distribution of three species of lizards (*Lacerta agilis*, *L. viridis*, *Podarcis taurica*) showed that these species have declining habitats and/or mutual exclusion. These processes are caused by changes in habitat conditions, under the influence of various biotic and abiotic factors. Comparative analysis of data on the distribution and dynamics of habitats, allows us to identify the trend of development of populations of these species in modern times. In this sense they can be divided into three categories (table).

Thus, the dynamics of habitats reflects the result of the adaptation of populations of amphibians and reptiles at the antropic and climatic changes of environment. Reaction of adaptation to climatic changes may manifest itself through reduction, increase or shift in timing of breeding periods. Endangered and rare species are less tolerant to changes in Habitat. Some factors (drought, flood, lumbering, etc. p. such actions raise short-term) Adaptive reaction as a seasonal surge of local habitats, mutual exclusion, modification of breeding sites and. t. d. Seasonal surge of local habitats characteristic of terrestrial amphibian species (*Bufo bufo*, *Rana dalmatina*, *Rana temporaria*, etc) and is caused by dry periods, when due to lack of moisture they are concentrated in wet river canyons. The adaptive response is more typical of Dniester Valley. Mutual exclusion is caused by factors favourable to one type and negative for the other. Characteristic of lizards *Lacerta agilis* and *L. viridis*. The first species prefers open prairie land, the second populates the forest biotopes, bushland and rocky areas. Displace each other when deforestation and afforestation of the steppe lands.

Table 1.

The tendency of some species under the influence of current factors.

The spread tendency	Species	Influencing factors
Species with the reducing habitats tendency	<i>Emys orbicularis</i> , <i>Coluber caspius</i> , <i>Zamenis longissimus</i> , <i>Coronella austriaca</i> , <i>Vipera berus</i> , <i>Bufo bufo</i> , <i>Rana dalmatina</i> , <i>Rana temporaria</i> .	Reduction of suitable habitats and breeding. Increased drought periods.
Species with stable habitat.	<i>Natrix natrix</i> , <i>Natrix tessellate</i> , <i>Bufo viridis</i>	A wider range of biotopic preference.

The spread tendency	Species	Influencing factors
Species with the expansion habitats tendency.	<i>Lacerta viridis</i> , <i>Podarcis taurica</i>	Afforestation of steppe lands. Aridization of territories.
Species with reciprocal destitution	<i>Lacerta viridis-Lacerta agilis</i> . <i>Lacerta agilis-Podarcis taurica</i>	Afforestation of steppe lands. Aridization of territories. Deforestation.
Endangered species	<i>Elaphe quatuorlineata</i> , <i>Vipera ursini</i> , <i>Eremias arguta</i>	Reduction and degradation of the steppe lands.

In the South of the Republic as a result of the appearance of aridization the sand lizard (*L. agilis*) is destitution by other species *Podarcis taurica*. Another adaptive response is reflected in changes in the trophic spectrum, when in the food appear not preferred objects.

For the genus *Natrix* such reaction is typical. In both species (grass and dice) snakes trophic spectrum essentially consists of 80-90% of the fish and green frogs, respectively. In case of insufficient number of such objects, they turn to food frogs, fire-bellied toads, newts.

Another adaptive response is the transition from the uniform distribution to the formation of temporary «patches». This response occurs as result of intensive grazing where the animals are concentrated in areas with more favorable (spots with ruderal vegetation, ruins of farm buildings etc.). Under the influence of long-term factors the adaptive strategies can be formed on the morpho-physiological level. For example, a reduction of reproductive age or phenetic structure may be the result of water pollution, food insufficiency, vegetal cover change etc. In steppe zone with increased aridity the population of *L. agilis* distinguishes by greater share (10-15%) of *erythronotus* and *immaculata* morphs, compared with the populations in the area of Codri, where these morphs are quite rare. One of the main factors determining the structural-functional stability and diversity of reptiles and amphibians populations is the degree of ecosystem heterogeneity, which determines the food basis, microclimatic and reproductions condition.

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ECO-MORPHOLOGICAL ASPECTS OF SOME SPECIES OF REPTILES IN THE REPUBLIC OF MOLDOVA

Tsurcan Vladimir

Institute of Zoology, ASM, Chisinau, R. Moldova, som@as.md

The aim of present study is the variability of morphological characteristics of reptiles from local populations and their ecological features as adaptive reaction due to the changes in environmental conditions. The prediction fauna development direction, structure of communities and variability of some phenotypes of

reptiles, the measures for the conservation of species diversity occurring in the changing socio-economic and climatic processes are very actual.

The phenotypic changes as adaptive modification of local populations of some species of lizards and snakes were studied on the basis of faunistic material collected from habitats with varying degrees of influence of abiotic and biotic environmental factors and human activities for long time. The scientific findings on phenotypic plasticity of local populations of some lizards and snakes species provide the comparative morphological characters of local populations on the base of pholidosis and color morphs. It is possible that some environmental factors could be able to determine the dominance of reptiles individuals with specific colors and asymmetry of scutes/ shields. Interpopulation variability by these characters is more typical for such species as *Natrix natrix*, *N. tessellata*, *Vipera berus*, *Lacerta agilis*, however it may also occur in other species.

The received results show that the proportion of individuals by color features of different populations is varied and apparently depends on the conditions of environment. Thus, in the population of sand lizard from the degraded steppe areas in the south of R.Moldova the proportion of brown specimens without drawings was more numerous than in habitats with dense grass vegetation where the specimens with green color were dominated. The high proportion of specimens with melanocytic color is common for populations of *Vipera berus* in forests "Codru" and water snake (*Nerodia* sp.) on the coast of Black Sea which may be determined by the various factors of microclimate in which the melanin apparently serves the different functions.

At higher elevations in forests of "Codri" (more than 200 m above sea level) the populations of *Vipera berus* consist of 50-90% of the melanistic individuals, however in the same species populations located below the melanistic individuals are absent. Therefore the melanin increases the efficiency of heat accumulation, whereas the water grass-snake has the function of protection from ultraviolet rays. The melanism appears at keeping animals in moist and poorly lit places. Thus the morphological structure of local populations of reptiles depends on many factors and is the result of environmental conditions.

The study was accomplished on the account of fundamental 11.817.08.14F project financed by ASM.

**CHROMOSOME INSTABILITY IN DYNAMIC POPULATION OF THE
BANK VOLE (CLETHRIONOMYS, ARVICOLINAE, RODENTIA)
FROM THE MIDDLE URALS**

Yalkovskaya Lidia E., Davydova Yulia A.

*Institute of Plant and Animal Ecology,
Ural Division of RAS, Ekaterinburg, Russia
e-mail: lida@ipae.uran.ru*

The studies of population structure and dynamics and their role in shaping patterns of variation at different levels of biological organization are important from both theoretical and practical points of view, in particular, when considering anthropogenic influence on ecosystems. Consistent assessment of the effects revealed in anthropogenically stressed populations could only be undertaken when compared to the data of long-term observations on model populations in natural environments. The territories of nature reserves provide the possibility to study long-term dynamics in animal population in natural or nearly natural environments and to obtain comparative data for complex studies of the population-level response to anthropogenic impact.

The results of seven-year study of chromosome instability levels in dynamic population of the bank vole (*Clethrionomys glareolus* Schreber, 1780) from the **Visimskiy** UNESCO-MAB Biosphere **Reserve (the Middle Urals) are presented.**

We investigated 135 bank voles which were captured in 2005, 2006, 2008-2012 in stationary locality in the native forests of south taiga (57°22' N, 59°50' E). All individuals were young of the current year. For each individual sex and reproductive status were fixed. The pregnant/parous females, males with the testes weight between 50 and 150 mg and with mature epididymides formed the sexually mature group. Method of metaphase chromosome was used for chromosome instability analysis (Macgregor, Varley, 1986). 50 cells per individual were analyzed. Frequency of cells with chromosome aberrations and gaps, aneuploid and polyploid cells were used as the markers of chromosome instability.

Three-year population cycles with the phase's alternation of high, growing and low density are found in Visim bank vole population that is usual for this species in Middle Urals (Gileva et al., 2006).

Neither seasonal variability of cytogenetic characters nor differences between males and females or between individuals of different reproductive status were found. There were significant between-year differences of chromosome instability levels ($\chi^2(df=7)=36,16$; $p<0,0001$). That was determined by the very high frequency of cells with chromosome aberrations - 5,18% in 2008 (the year of high population density). In other years the frequency of that was not higher than 2,80%. However there was not significant correlation between cytogenetic damages and the relative population density ($R_s=0,42$; $p=0,301$), i.e. the changes in chromosome instability were not caused by high-density stress, as it was revealed for *Clethrionomys glareolus* (Dmitriev et al., 1997; Gileva et al., 2006).

There were some between-year differences in types of chromosome damage. In 2008, the significantly higher portion of individuals with more than one aberrant cell was found - 53% (in other years it was not higher than 33 %). 2008 was the first year when the cells with multiple damages of chromatid type were found in this population; there were 15% of voles with such cells (up to six per cell). In following two years only 12% of animals had cells with multiple damages and numbers of aberrations were not higher than three per cell. Such pattern of chromosome damages with pronounced clastogenic effect is a peculiar marker of viral infection (Buzhievskaya, 1984; Gileva et al., 2001). Probably, sharp increase of chromosome instability in dynamic population of the bank vole from *Visimskiy Reserve in 2008 was related with the spread of contagions in the year of high population density*.

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THE EFFECTS OF CHLORELLA SUSPENSION ON THE BIOPRODUCTIVE AND HEMATOLOGICAL PARAMETERS IN BROILER CHICKENS

Zaitseva Diana

Agrarian State University of Moldova, email: icemoon@gmail.com

The purpose of this work was to study the effect of the Chlorella green algae suspension on broiler chickens. Chlorella is known for its intense photosynthesis, due to which it generates large amounts of organic matter. The dry matter contains 50 complete proteins, fatty oils, vitamins B, C and K. The most common in nature variety is a genus of single-celled green alga *Chlorella vulgaris*. Chlorella strains have a high biological activity, a curative and preventive action

and can be used in the treatment of metabolic disorders and gastro-intestinal disorders.

The *Chlorella* suspension should be considered as factor of powerful effect on the whole body, thanks to the unique biochemical composition, allowing to achieve high rates of growth and viability in broiler chickens, which is an important task in the intensive poultry industry.

The experimental part of the work has been carried out in the clinic of the Veterinary Department on KOB-500 broiler chickens. Two groups were created within the day-age on the basis of analog pairs, a control group and an experimental group, 40 chickens in each group. The control group received the basic diet, applied in the poultry farms of the republic with the nutritional parameters according to appropriate standards.

At 15 days of age immunization of chickens against infectious bursal disease was performed by using the live vaccine watering method (Vintorfeld 2512).

During the experiment, the chickens in the experimental group, in addition to the basic diet were given daily *Chlorella* suspension in the volume of 5 ml/head in the first 7 days, 15 ml /head from 8 to 21 day and 30 ml/head on days 22 to 42.

The chickens in the experimental and control groups were kept in the same conditions, in compliance with the best zoohygienic microclimate standards. During the experiment, the live weight and the condition of chickens was kept track of. At 20 and 42 days of age, blood samples were taken to determine a number of hematological and biochemical parameters, according to the generally applied methods.

The rate of growth in broilers is an important indicator of meat productivity. The higher it is, the less time should be spent on rearing the chickens to the slaughter age.

In the first three weeks, the dynamics of the average live weight of chickens in both groups did not show any significant differences. By the end of 4 weeks of life, the chickens in the experimental group, who were given *Chlorella* suspension in a dose of 30 ml/head, showed an increase in body weight of 4.6%, compared with the control group.

It should be noted that *Chlorella* suspension had a positive impact on water consumption, the general health status, and behavioral activity of the chickens in the experimental group. When *Chlorella* suspension was given to chickens, it was noticed that chickens intuitively felt the usefulness of *Chlorella*, were waiting for it, and did not start eating until they drank their normal dose of the microalgae suspension. On average, the group of 40 broiler chickens drank their dose in less than 30-40 minutes.

By 42 days of age, chickens in both groups were well developed, showing no signs of gastro-intestinal disorders or any communicable diseases. The live weight in the control group was $2,260 \pm 0,016$ kg and $2,292 \pm 0,016$ kg in the experimental group, which is 32 g higher. By the end of the growth period (day50),

the average live weight of broilers in the experimental group was 1.24% higher ($P_m < 0.05$) than in the control group ($2,745 \pm 0,017$ vs. $2,779$ kg).

The Viability of chickens at the end of the growth period was 100% in the experimental group and 95% in the control group.

The effect of *Chlorella* suspension on resistance of broiler chickens was determined by the hematological parameters. During the 1-st experiment no significant difference was recorded in 20-day-old chicken between the two groups in terms of the hematological parameters. At 42 days of age, the chickens in the experimental group had by 5.2% more red cells in blood ($p > 0.05$) and a hemoglobin concentration by 6.08 ($P > 0.05$) higher than the chickens in the control group, and the total number of lymphocytes compared with the first study - by 12.4% higher, whereas the number of lymphocytes in control group chickens decreased by 2.59%.

It has been found that the level of total protein in the 1-st study (21 days of age) was 9.6% higher ($P_{1,2} < 0.001$) in chickens in the experimental group, and by 42 days of age, the level of total protein was 11.71% higher in this group of chickens ($P_{1,2} < 0.005$).

The results of research showed an increase in the total protein level in both the first and the second experiment, i.e. it can be argued that *Chlorella* suspension in the dose of 5 and 15ml/head, and then 30 ml/head beneficially affects the body's defenses mechanisms in chickens in the experimental group.

The blood glucose levels in chickens of both groups were within the physiological norms and no significant differences were revealed between the first and the second experiment ($P_{1,2} > 0.05$). Second study revealed ($P_{1,2} > 0.05$).

Chlorella suspension had a positive effect on the producing quality, namely the live weight gain of chickens, which in broilers in the experimental group was 1.22% higher than in the control group. The viability of broilers in the experimental group in the growth period was 5% higher than in the control group. Thus, administration of *Chlorella* in water, 5 ml, 15 ml and then 30 ml per head had a positive effect on resistance, viability and productivity of broilers.

THE ACTION OF ORGANIC SELENIUM (SEL-PLEX) ON PRO-AND ANTIOXIDANT STATUS OF BROILERS

Zaitceva Diana, Bălănescu Sava

Agrarian State University of Moldova,

email: icemoon@gmail.com

The biological role of selenium was discovered in 1957 by K. Schwarz and Foletz M. (1958). It has been observed that Se is a component of factor 3, which is found in yeast and possess a therapeutic effect on hepatic necrosis in rats. Today it is known that in case of insufficiency in Se, can be triggered about 20 diseases that are characterized by dysfunction of blood microcirculation and by increasing the permeability on capillary and cell membrane level.

Selenium enters the body through the consumption of animal feeding stuffs and water in two forms: 1. inorganic-form of Selenate (H_2SeO_4 selenic acid salt), Selenite (H_2SeO_3 selenious acid salt) and Selenide (selenhydric acid salt); 2. Organic - selenium-containing proteins and amino acids (selenomethionine and selenocysteine).

Experimental studies in Brazil, the U.S., South Korea showed that the use of organic selenium acted more significant impact on productive indices in broilers compared to inorganic form (P. Sura, 2006).

Previous research carried out by us in industrial conditions of swine breeding, showed clear that resulting from the increased bioavailability and biological activity, the organic selenium (Sel-Plex) has advantages compared to inorganic forms (sodium selenite) (S. Balanescu, 2001, 2007, 2012).

In order to finding some ways to improve the productive performances and antioxidant status at broiler chickens, caused us to study some variants of pharmaceutical products containing selenium.

The scientific study was carried out in a vivarium with 80 chickens Cross COB 500 in age from 1 day up to 42-50 days.

The experiment was aimed to study the action of product (Sel-Plex) containing organic selenium on clinical status, bio indices, hematological and biochemical indices (pro- and antioxidant system).

The selection was made from healthy chickens hatched from eggs of the same Cross - COB 500, same age and same body weight. The chickens were divided into 2 similar groups, 40 chicken in each group.

Group I (control) - 40 chickens served as control group.

Group II (Experimental) - throughout growth (1-50 days) in the feed was added Selenium organic (Sel-Plex) the proportion 0.4 mg per 1 kg of feed.

In course of the experiment was ensured the optimal microclimate, feeding and watering as hygienic norms. The shelter temperature has been respected: 1-st day constituted 33 °C and then decreased every three days with each 3 °C, until the house temperature constituted 18 °C.

The feeding of chickens began once they had introduced in the cages and have been divided in 4 periods: I (1-10 days) - fodder type Start (producer SRL «Larsan-cloud»); II (11-20 days) - fodder type Growth 1; III (21 -35 days) - fodder type Growth 2; IV (36 -50 days) - mixed fodder type Finish.

On the way we noted all data concerning the evolution of feed consumption, weight gain, and in the 20-th and 42 day of life were taken blood samples from chickens of both groups and were appreciated some hematological and biochemical indices.

The results obtained allow to note that during the administration of organic selenium (Sel-Plex) with feed in a dose of 0.4 mg /kg, were not observed undesirable effects and deviations in the development or health of broiler chickens.

Performed biochemical investigations concerning total antioxidant activity in plasma (serum), it showed the common tendency for both groups, the increase of total antioxidant capacity in blood plasma, compared to the value established at the first investigation. Thereby, the initial value in the control group was 1.15 ± 0.2 mM/sl, and at the end of research reached to 1.59 ± 0.31 mM/sl; in experimental group from 1.82 ± 0.33 mM/sl increased insignificantly to 1.86 ± 0.34 mM/sl;

Total antioxidant activity (AAT) shows summary content of compounds with antioxidant properties in blood plasma. Another indicator appreciated - total oxidative activity (AOT) shows summary content of compounds with prooxidative properties in blood plasma. The obtained data reflects the common tendency of decrease of the value of AOT in 20th day of life at chickens from experimental group. In the control group the AOT value was $38.38 \pm 7.01\%$ and in experimental group - $35.6 \pm 1.91\%$. In second investigation was detected a reversal of AOT value: in the control group the AOT index was $23.74 \pm 8.85\%$, and $37.0 \pm 8.04\%$ in the experimental group. Maintaining of AOT in high value may be the result of the metabolic processes intensification.

In lipidic metabolism processes, in particular by oxidation, in the body are accumulated a series of intermediate compounds and final products of their peroxidation. Among them are found malonic dialdehyde (DAM). At first research DAM content was $16.56 \pm 1.18 \mu\text{m/l}$ in the control group, and $14.98 \pm 0.62 \mu\text{m/l}$ in the experimental group. At the end of the experience (42 days) DAM content has reached values of $19.98 \pm 1.44 \mu\text{m/l}$ in the control group, and 18.28 ± 1.87 in the experimental group.

The biochemical results obtained highlight the positive impact of product Sel-Plex containing organic Selenium. It reveals the dynamics of glutathione peroxidase (GSH-Px) activity, seleno-dependent enzyme, which increase at experimental group in both investigations.

Activity dynamics of glutathione peroxidase (GSH-Px) in plasma was higher in the experimental group - 2.71 up mKM/sl, compared to 1.65 mKM/sl in the control group, which is 60.8% more in experimental group. Thus, relating to activity of enzymes, especially catalase (CAT), which was monitored in plasma, it may be mentioned that there was an increasing trend of CAT level as compared to control group ($p < 0.05$).

At the age of 50 days old chickens from the control group reached a weight of 2745 g, those in the experimental group II - 2872 g, which is 4.6% more ($p < 0.01$).

Based on the research we mention that the administration of organic Selenium helps to relieve the indices that characterize the antioxidant system, and also direct productive indices.

ON THE STATE OF RARE AND ENDANGERED SPECIES OF PREY BIRDS IN MOLDOVA

Zubcov Nicolai, Munteanu Andrei, Crudu Vasile,
Bogdea Larisa, Sochircă Natalia

Institute of Zoology, ASM, Chisinau, som@as.md

The degradation of populations of rare and endangered species of birds of prey and not only them is a worldwide problem. According to some reports in the past 500 years in the world died out about 150 species of birds, as shown by recent studies, the process continues at the present time. In Moldova the situation today with this group of birds is very depressing. When looking through the literature, you do not believe your eyes that at the beginning of the last century on our territory have been nested Black Vulture, Griffon Vulture, Serpent Eagle, Golden Eagle, Eastern Imperial Eagle, Red Kite, and large numbers of nesting birds of prey, such as Greater Spotted Eagle and Lesser Spotted Eagles, Booted Eagle was from 20 to 30 pairs (Аверин, Ганя, Успенский, 1971; Ганя, Зубков, 1989). Other common species of birds of prey were distributed in almost all the forests of Moldova, in Central part and “Codrii Tigechi”, in the floodplain and island forests, in forest and small forest curtains.

At the beginning of the last century the species Black Vulture, White-backed Vulture, Egyptian Vulture have nested on hilly coasts of Dniester River, on the rocky banks of Dniester and Reut Rivers. At present there is no information on the meeting of these birds in Moldova. Since that time, there is no reliable information about breeding and meetings of Black Vulture in Moldova. Now there are no records about the meeting with Egyptian Vulture on our territory.

The Golden Eagle and Imperial Eagle are previously breeding species, they were recorded very rarely during last five years in the nest period, and also in the passage through the central part of Codrii. The Steppe Eagle was observed in our country as a „flying in” species in later years. The Spotted Eagle is currently very rare, including nesting period in the vicinity of the reserves “Pădurea Domnească” and “Plaiul Fagului”, in the Central part of Codrii, in the large forests on the Dniester River and south of the country. However, reliable data on the breeding of the Spotted Eagle in Moldova is currently unknown. About Short-toed Eagle has repeatedly observed in the forests along the Dniester, in Codrii, in the lower reaches of the Prut as during migration and during the nesting period. However, there is not reliable data on the nesting of this species. In the following years the Red Kite was seen very rarely during migration. About the Booted Eagle in later years, the number continued to decline, and by the beginning of this century, it ceased to nest in many forests along the Dniester and Prut, in Codrii. Now no more than 15-25 pairs nest in Moldova (Munteanu, Zubcov, 2010). Honey Buzzard - very rare breeding species, In the late 1970s the density of Honey Buzzard nesting in Codrii was 0.3 pairs per 100 sq. km,

now the population is decreasing. This is probably due to the deforestation of tall trees in floodplain and island forests, as well with the decreasing of the number of Hymenoptera – main food for feeding of nestlings. In the middle of last century in Moldova White-tailed Eagle has continued to decline, 1970s' only 3 pairs were nesting in our territory. In 2011 White-tailed Eagle was re-discovered during its' nesting. Found item was a nest with 2 chicks and in 2012 – with one chick within the reserve “Padurea Domneasca”.

The Saker Falcon was found overall redistribution of the nesting places for the period from 2000 to the present. During 2005-2011 the number of species had decreased to 2 nesting pairs, which were located in the South of Moldova on the electric main poles. Today's rate of decline in the number of rare and endangered birds is only increasing. The reason for this is human activity: the destruction of natural habitats and pollution, excessive hunting, direct persecution etc.

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SECTION 2
INVERTEBRATES

APOIDEA OF MOLDOVA IN THE CONTEXTS OF CLIMATE CHANGE AND LANDSCAPE DEGRADATION

Andreev Alexei, Stratan Veniamin, Gargalic Svetlana

Institute of Zoology, Academy of Sciences of Moldova, Chisinau

E-mail.: alexei.andreev@mail.ru

Assessment of major wild pollinators Apoidea is done in the context of Convention on Biological Diversity (COP Decision V/5, etc.) because this is one of the key taxa for ecosystem sustainability and existence. It is done also in the context of landscape changes during the last 20 years of extensive agriculture followed the structural agri-landscape degradation of the intensification period. These changes move away recent land use in Moldova of best practices reflected by concept of High Nature Value farmland and directives of European Union (Andreev et. al, 2007). The assessment is done in the context of climate change, which presupposes: (a) growth of average annual temperature in Moldova for 1,6° C to 2039 under the best scenario (Corobov, 2011) that corresponds to forecasts for overall Europe; (b) shifts in ecosystem state (Andreev, 2011) worsening the life conditions of Apoidea; (c) growth of extinction likelihood for plants, invertebrates, etc. (Biodiversity and climate change ..., 2012); (d) formation, in mid-terms, of the vegetative period climate, modelled by disastrous drought of 2012 (started in 2011).

Data set at the basis of this contribution includes 14 samples taken on the same alfalfa field in 1990 (disastrous drought) and 1991 (after it), and 32 samples from alfalfa fields, steppe plots and forest glades in non-dry years, and during the drought of 2012. Samples from alfalfa are taken on the fields of 2-3 years of blossoming that provides comparability of the data.

Patterns of population dynamics on the alfalfa fields in the contrast 1990 and 1991 are: (1) stable, despite of the drought, seasonal growth in 1990 and relatively numerous population; (2) low population at the beginning of 1991 due to previous drought, but high population on the whole; (3) a significant difference in maximal numbers of 1990 and 1991 was caused mainly by mass immigration of species-colonist *Andrena flavipes* Pz. from outside.

Table shows aggregate data from major habitat types where wild bees concentrate, reproduce or survive. There is no a big difference between the data of 1990 and of years without droughts. Data of 2012 are clearly distinguished by decreased figures related to the all habitat types and it is the unique in Europe demonstration of future trend of the key pollinators.

Situation in Bujec Reserve gives a notable example. Steppe vegetation was so dry that wild bees were absent being conserved on a weed plot in relief depression and concentrated on the small alfalfa field at hill foot (that explains relevant extreme in the table).

Let's note that deficit of trophic resources (blossoming plants are scarce and nectar production is minimal) enforced the leaving of wild bees from the steppe plot.

Table. 1

Diapasons of numbers (average quantity of specimens in standard sampling unit) of Apoidea in major habitat types.

General conditions	Alfalfa	Steppe	Glades
Drought of 1990	1.25-6.7	1.5-10.4	2.5-8.2
No drought (1991, 2002, 2006, 2009, 2010)	4.5-10.3 (17.2)	3.7-10.6	3.6-13.0
Drought of 2012	0.75-1.5 (3.5)	0-1.75	1.5
Note: extremes associated with special conditions are in brackets.			

It is conditioned also by absent water origins while bees cannot compensate it using the early dew. In natural steppe wild bees concentrate during droughts on plots near streamlets. Land use in Moldova excludes usually such opportunity for faunas of small refuges.

Data of the last 10 years demonstrate the important change in fauna on alfalfa in comparison with 80 and begging of 90 years of the 20 century. Earlier the most numerous species *Rophites canus* (Eversman) is not registered now on the fields being found rarely in natural habitats (as it was during the past period also). Earlier the second by number species *Melitta leporina* Pz. became rare in the fields. The both are species-residents accumulating during the field succession and linked trophically with plants of *Fabacea* family, which disappear from grassland communities at different stages of digression of grazing lands and are deficient on the major part of pastures of the country. Geographical areas of these two species exclude possibility to consider that their population trends are tied with climate change.

The study was performed within the project 11.817.08.16A.

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Andreev Nadejda, Toderas Ion, Zubcov Elena

Institute of Zoology, Academy of Sciences of Moldova, Chisinau

e-mail: n.andreev@unesco-ihe.org,

iontoderas@yahoo.com, elzubcov@mail.ru

Helix pomatia L. species is characterized by large morphologic variations. Numerous studies have documented geographic variability of shell size and coloration in *Helix pomatia* L., 1758 (Andreikevici, 1969; Grosu, 1983). Morphometric analysis of 700 specimens collected in different districts of Moldova showed that shell sizes ranged as follows: SH (shell height) - 30-50 mm, SW (shell width) - 29-50 mm, SE (spire height) - 13 to 29 mm, AH (aperture height) - 21-35 mm, AW (aperture width) - 15-33 mm.

Evaluating the size of several shells of *Helix pomatia* L. specimens collected in different biotopes, we could assign them to two categories: individuals of open and shady biotopes: 42.1 ± 2.8 - 42.2 ± 2.8 SH and SW - for shady areas and 36.8 ± 2.5 and 37.2 ± 2 - for open sites. Goodfriend (1986) indicated the influence increased humidity, such as in shaded biotopes on shell dimension, which is related to the extended periods of activity, increased rates of nutrition and growth. It is also important to note that high humidity can lead to whorl expansion and thus to larger shells. Under high humidity conditions, natural selection favors sexual maturation at a larger size of the shell, and it confers a reproductive advantage (Goodfriend, 1986).

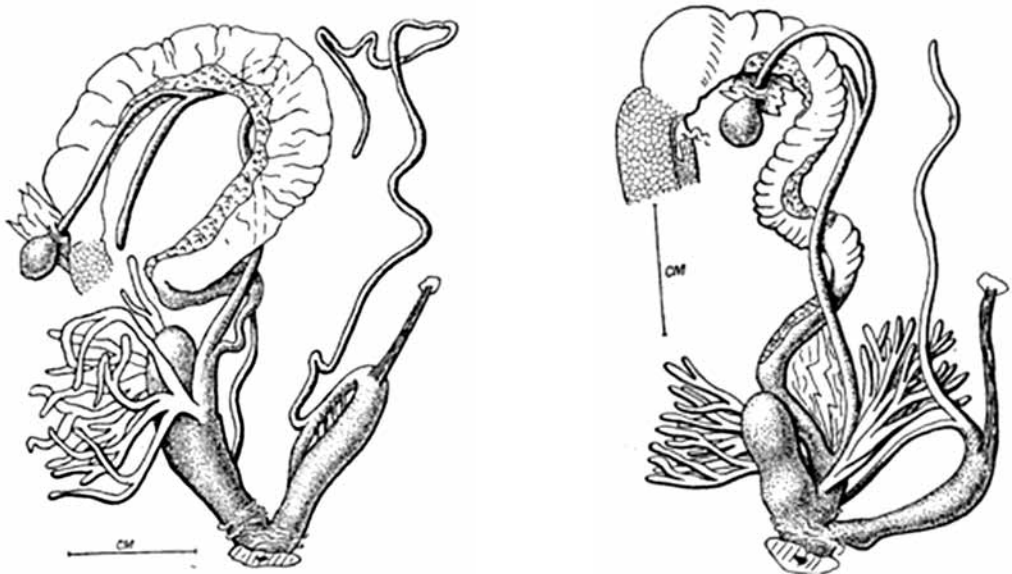


Figure 1. The structure of genital system in *Helix albescens* Rossm. (a) and *Helix pomatia* L. (b) (Shileiko, 1978).

Given the high variability of shell color and size of *Helix pomatia* L., it is possible to commit errors in taxonomic identification. Thus, we might assume that this has led to erroneous indication of the presence of species *H. albescens* (*vulgaris*) Rossm. (Bolocan et al., 1984) on the territory of Moldova. Therefore, it is recommended that along with conchological characters, other features such as anatomical characteristics would be important. Shileiko (1978) indicated structure of genital system as one of the basic criteria for specimen identification of Helicoidea suprafamily. As can be seen from Figure 1 a and b, the genital system of *Helix pomatia* L. differs from that of *H. albescens* Rossm. species by a number of features such as stronger branching of mucigene glands, the shape of the stilophore, presence of a penial bump, elongated flagella of the penis, short diverticulum of the seminal receptacle or its lacking. Individuals dissected by us, were always without a diverticulum. *H. albescens* Rossm. has a longer diverticulum of the seminal receptacle and this is always present.

Thus, we can conclude that given the high variability of the size and shell color of *Helix pomatia* L., for correct identification it would be important that along with conchological features to take into consideration the anatomical characters, such as the genital structure.

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THE DIVERSITY OF COLEOPTERAS (COLEOPTERA: CARABIDAE, SILPHIDAE, SACARABIDAE CERAMBYCIDAE) FROM THE FOREST ECOSYSTEMS OF CENTRAL MOLDAVIAN PLATEAU

Baban Elena

*Institute of Zoology, Academy of Sciences of Moldova, Chisinau,
ilenuta2003@yahoo.com*

This paper is dedicated to the research of the present state of the fauna and diversity of coleopterans from the forest ecosystems from Central Moldavian Plateau, the trophical spectrum and geographical spread. The studies were ac-

completed in vegetation period of 2004-2008 in various types of biotopes, using standard entomological methods: collection with insect net, manual gathering from different plant species (trees, bushes, herbaceous vegetation), from litter and soil.

As a result of the research on the area of the Central Moldavian Plateau, there were identified 469 species belonging to 140 genera and 6 families. Faunistic material included species from families *Carabidae*, *Silphidae*, *Scarabaeidae*, *Lucanidae*, *Cucujidae* and *Cerambycidae*. The most frequent were the species from family *Carabidae* (243 species), *Cerambycidae* (99 species), *Scarabaeidae* (76 species), *Silphidae* (17 species). Family *Lucanidae* was represented by 3 species, and family *Cucujidae* – only by 2 species. Concerning the trophical spectrum, it was established that the majority of the species are phytofagous (40%) and zoofagous (36%). Coprofagous species constitute 11%, mixofagous – 9% and necrofagous – 4%.

There were identified the prevailing zoogeographical elements, the origin and the ways of how the present coleopteran fauna was made up in the investigated area. Entomocenoses of the coleopterans from the forests ecosystems of the Central Moldavian Plateau are formed of species belonging to 12 geographical groups: cosmopolitan (2 species), holarctic (19), transpalearctical (72), westpalearctical (38), eurosiberian (92), european (96), eurocaucasian (33), euroasiatic (13), euromediterranean (34), mediterranean (36), and pontical – 13 species.

During the reasearshes in the Central Moldavian Plateau, 19 rare and threatened coleopteran species were registred. Among these, the species: *Calosoma sycophanta* L., *Oryctes nasicornis* L., *Cerambyx cerdo* L. and *Morimus funereus* (Muls.) are included in the second edition of the Red Book of Moldova and the species *Cerambyx cerdo* L., and *Lucanus cervus* L. are protected in Europe, being included in annex II and III of Bern Convention. As to the rest of mentioned species, they were proposed to be included in the 3 edition of the Red Book of Moldova. The study was performed within the project 11.817.08.14F financed by ASM.

OCCURRENCE OF EPIGEIC BEETLES (COLEOPTERA) IN ALFALFA CROPS AND ADJACENT FOREST STRIPS IN THE REPUBLIC OF MOLDOVA

Bacal Svetlana, Munteanu Natalia, Moldovan Anna

Institute of Zoology, Academy of Sciences of Moldova, Chisinau
svetabacal@yahoo.com, munteanu_natalia_v@yahoo.com

Beetles are the predominant group of epigeic arthropod fauna in agricultural lands, they are abundant in crop fields, and many of them being predators contribute to the control of agricultural pests. Intensive management of agricultural landscapes can negatively affect their abundance, diversity and activity. Also, frequent disturbances such as repeated cultivation and other management prac-

tices are known to be deleterious to epigeic beetles. Protection and promotion of natural enemies in agroecosystems depend on the information about their phenology, habitat preferences, and behavior.

In order to provide a sustainability of the agroecosystems it is important to gather knowledge about epigeic beetle communities in ecosystems constantly affected by human activity and in adjacent forest belts, to reveal significant species and their biology and ecology peculiarities, to estimate the influence of different ecological factors on both harmful and beneficial fauna; to determine the character of communities succession and the ecological state of habitats.

Faunistic material was collected from the alfalfa fields (*Medicago* sp.) and adjacent forest strips near Trebujeni (47°19'0»N, 28°58'0»E) and Leuntea (46°39'46»N, 29°35'16»E), on the territory of the Republic of Moldova. Beetles were collected using pitfall traps, every 10 days at each site, during summer of 2011 and 2012 years. To process the data on collected materials different ecological parameters have been used: abundance, dominance, richness and diversity indexes.

Voucher specimens were deposited in the collection of the Entomological Museum, Institute of Zoology of the Academy of Sciences of Moldova.

In total, 390 specimens representing 9 families, 43 genera and 60 species were collected from the adjacent forest strips. The most abundant family was Carabidae (45%), followed by Staphylinidae (21.66%), Scarabaeidae and Silphidae (10% each). Families Trogidae, Tenebrionidae, Cerambycidae, Lucanidae and Elateridae represented less than 3.33% of the total abundance. In the alfalfa crops 276 specimens representing 19 species from 6 families and 16 genera were collected. The most abundant family was Chrysomelidae (31.57%), followed by Scarabaeidae and Coccinelidae (15.78% each), Silphidae and Curculionidae (10.52% each), Trogidae, Tenebrionidae and Cerambycidae (5.26% each).

The most abundant, dominant and characteristic species for the alfalfa culture were *Gonioctena fornicata* (12.31%), *Opatrum sabulosum* and *Cryptocephalus octacosmus* (by 6.75%), *Hypera postica* (7.20%) and *Gastrophysa viridula* (4.8%), while other species were accidental. In forest strips the most abundant, dominant and characteristic were species: *Harpalus rufipes* and *Carabus convexus* (by 9.45%), *C. cancelatus* (6.9%), *Nicrophorus fossor* (7.05%) and *N. humator* (2.55%).

Collected beetles from all investigated localities were compared and Shannon indices were calculated as a measure of diversity within the habitat. The Shannon diversity index has been found maximum in forest strips for both localities Trebujeni (1.09) and Leuntea (1.08). Concerning investigated alfalfa crops, the index has not exceeded the value 1, and the highest value was 0.624 in Trebujeni and 0.56 in Leuntea. The Simpson and Margalef indices, highlight Trebujeni alfalfa crops with the highest value (0.28 and 34.42), followed by Leuntea alfalfa crops (0.3 and 34.06). While in forest strips, the maximum value showed Simp-

son index for Trebujeni (0.13) and Margalef for Leuntea (33.37), and the lowest value Simpson (0.15) for Leuntea and Margalef (30.76) for Trebujeni.

The beetle community of the alfalfa crops, according to trophic regime, was represented by 11 phytophagous species, 4 necrophagous, 3 predators and 2 coprophagous. In the adjacent forest strips 18 predators, 12 phytophagous, 11 saprophagous, 4 coprophagous, 5 mixophagous, 3 necrophagous and 1 microphagous species were registered. Within the Carabidae family predatory species prevail representing 22.22% in alfalfa crops and 44.7% in adjacent forest strips.

Study results have shown that the structure of epigeic beetle communities in investigated agroecosystems is close to critical; species diversity is very low, practically being replaced by harmful phytophagous species that occur in high numbers. Management of agrocenoses reduces the influence of such determinative factors as food resources, intraspecific and interspecific competition on formation and functioning of insect communities.

Further researches are needed to estimate the role of these factors on composition of epigeic beetle community in agrocenoses.

SPECIES DIVERSITY OF COLLEMBOLA AND COLEOPTERA FROM THE ECOSYSTEMS OF ORHEIUL VECHI HISTORICAL COMPLEX

Buşmachiu Galina, Bacal Svetlana

*Institute of Zoology, Academy of Sciences of Moldova, Chisinau,
e-mail: bushmakiu@yahoo.com, svetabacal@yahoo.com*

The soil is the habitat of a wide variety of invertebrates, which have an important role - not only as pests but also in soil formation. They take part in the transformation of organic matter, in its humification and mineralization, in biological cycle of substances, in formation of the soil profile, in the creation of structure and porosity of the soil. In nature, there is no "necessary" and "unnecessary" organisms, each of the group occupy its ecological niche and are important component of the food chains.

The ancient city Orheiul Vechi is a unique natural and historical complex in the open air. It organically combines the natural landscape and vestiges of ancient civilizations and located in Trebujeni, at 60 kilometers north-east of Chişinău, on the Răut River. The complex includes several types of ecosystems such as natural deciduous forest, calcareous soil and litter under low shrubs, petrofite vegetations, shelter belts, agricultural fields and soil from the banks of river.

The studies of invertebrates (Collembola and Coleoptera) inhabiting the soil and litter were carried out in the different types of ecosystems during 2009-2012 years. The collection of material was performed by classical methods: Collembola with metal frames 5 x 5 and 10 x 10 cm, the beetles using Barber traps and hands. The species of small invertebrates were identified by microscopic preparations, using the modified method of their preparation. The coleopterans were determined by morphological characteristics with binoculars.

As a result of investigation a total number of 78 species belonging to 53 genera and 16 families of invertebrates were identified. The complex include 47 collembolan species from 31 genera, 10 families and 236 collected coleopteran specimens belong to 31 species, 22 genera and 6 families.

The zoogeographic analysis revealed that Collembolan and Coleopteran species from Orheiul Vechi ecosystems belong to 9 groups: Cosmopolite, Holarctic, Trans-Palaeartic, Euro-Siberian, Euro-Mediterranean, Euro-Caucasian, European, Mediterranean and also having a large number of collembolans with restricted range.

On the territory of Moldova Orheiul Vechi was established as area, where inhabit rare species and those with restricted range, being considered unique habitats that need to be preserved and protected.

NEW RECORDS OF COLLEMBOLA FROM THE GUMALAU SCIENTIFIC RESERVE

Buşmachiu Galina¹, Weiner Wanda Maria², Ciucula Andrei³

¹*Institute of Zoology of AŞM, Chişinău, Republica Moldova, bushmakiu@yahoo.com;*

²*Institute of Systematics and Evolution of Animals PAS, Kraków, Poland weiner@isez.pan.krakow.pl;*

³*Stefan cel Mare University of Suceava, Romania, ciucula_andrei@yahoo.com*

The study of Collembola from the Romania begins in XIX century. Since then, many researchers have been studied this group of invertebrates from the country. First checklist of Collembola from Romania was published only in 2007 and includes 388 species, 8 of which are problematic (Fiera, 2007).

The Codrii Seculari Giumalău Reserve (with a surface area of 309.50 ha) is a mountainous area with several types of habitats situated in the northern part of South-Eastern Carpathians mountains at the latitude N 46°26' and longitude E 25°30'. Primeval spruce forest dominated by *Picea abies* located in Suceava district, Pojorata locality of Romania acquired the status of the scientific forest reserve in 1941. The samples of soil, litter and dead woods were collected in this reserve during a week in May, 2012. The collembolan species from soil and litter were extracted using flotation method and from fallen stumps were collected manually.

Only one Collembola investigation in the Giumalău Scientific Reserve using pitfalls method was carried out until now (Nitu et al., 2009), where were collected and identified 70 species of Collembola (3 Orders, 11 families).

At the result of our investigation a total number of 57 collembolan species from 3 order, 11 families and 40 genera was revealed. Between identified species - 30 are new for Giumalău Scientific Reserve and 6 species new for Romanian fauna. The distribution of species according to families was following: Neanuriidae (11 species from 8 genera), Onychiuridae (10 species from 6 genera), Iso-

tomidae (9 species from 7 genera), Entomobryidae (9 species from 5 genera), Tomoceridae (5 species from 3 genera), Hypogastruridae (3 species from 3 genera), Tullbergiidae (3 species from 2 genera), Sminthuridae and Dicyrtomidae (2 species from 2 genera), Katiannidae (2 species from one genus), Arrhopalites (one species from one genus).

Among the identified collembolans species - *Stenaphorura japygiformis* Absolon, 1900 was recorded for the first time in Romania, being very rare species in Europe. Also new for Romanian fauna were such species as: *Endonura incolorata* (Stach, 1951), *Protaphorura saltuaria* Pomorski, Kaprus, 2007, *Desoria tigrina* Nicolet, 1842, *Sminthurinus gisini* Gama, 1965, *Dicyrtomina flavosignata* (Tullberg, 1871) and *Hymenaphorura* sp. n.

DIVERSITY OF THE LEAF BEETLES (COLEOPTERA, CHRYSOMELIDAE) IN THE REPUBLIC OF MOLDOVA

Calestru Livia

Institute of Zoology, Academy of Sciences of Moldova, Chisinau
e-mail: lcalestru@yahoo.com

The leaf beetles (Coleoptera, *Chrysomelidae*) family is one of the biggest of the order Coleoptera. According to some bibliographical sources, from 35 to 50 thousand of species are known in the world.

Moldova comprises the territory between the Prut and the Dniester rivers and a thin belt on the left bank of the Dniester. The country is situated on the area of interference of several biogeographic regions (Central European, Eurasian and Mediterranean regions), the territory being influenced by different climatic conditions.

According to the results of research performed and the data of current resources, there are 176 species of Chrysomelidae (except the subfamily *Halticinae*) belonging to 47 genera of 11 subfamilies known within Moldova.

It was established that *Chrysomelidae* of Moldova are trophically associated with plants of 49 families. The highest number of species inhabit on *Salicaceae*, *Asteraceae*, and *Fagaceae*. Most species inhabit on grassy plants (60%), the others - on the woody ones.

In the regional fauna of *Chrysomelidae*, 8 zoogeographical groups are distinguished: Holarctic, Trans-Palaearctic, Euro-Siberian, West-Palaearctic, European, Euro-Mediterranean, Euro-Caucasian and Mediterranean.

The great majority of the revealed species are an important link in the trophic chain of the biocenoses, having a great significance for biodiversity preservation of the region.

Some of the *Chrysomelidae* are pest insects of the farm and forestry. Their economic importance is often not evaluated, since the damage caused rarely leads to the total extinction of the plant. Frequently, the feeding on green parts

of the plant leads to the worsening of the physiological condition of the plant attacked and, consequently, to the decrease of either harvest or plant growth.

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LEAF BEETLE BIODIVERSITY (COLEOPTERA, CHRYSOMELIDAE) ON CENTRAL MOLDAVIAN PLATEAU

Calestru Livia

*Institute of Zoology, Academy of Sciences of Moldova, Chisinau
e-mail: lcalestru@yahoo.com*

Insects belonging to the family *Chrysomelidae* (Coleoptera) play an important role in formation and functioning of ecosystems. Being almost all of them phytophagous species, larvae of leaf beetles have usually an open lifestyle on host plant leaves. Many species in imago stage have more trophic connections than in the larva stage.

The Moldovan central plateau is located in the central part of the country and covers an area of about 550 thousand hectares. This area is characterized by well-preserved broadleaf forests of middle European type, where the main forest forming species are the sessile oak, English oak, and beech forest.

Currently, the fauna of leaf beetles on the Central Moldavian Plateau includes 101 species belonging to the following subfamilies: *Donaciinae* (1), *Criocerinae* (7), *Orsodacninae* (1), *Clytrinae* (8), *Cryptocephalinae* (23), *Eumolpinae* (1), *Chrysomelinae* (31), *Galerucinae* (12), *Hispininae* (1), *Cassidinae* (16). It is necessary to note that in the Central Moldavian Plateau ecosystems, as compared to others in the country, there are created the best conditions for the conservation of biodiversity not only for leaf beetles, but for all the entomofauna. Of the highlighted quantitative - the dominant species are *Oulema melanopus* (L.), *Labidostomis longimana* L., *Clytra laeviuscula* (Ratz.), *Cryptocephalus flavipes* F., *C. sericeus* L., *C. hypochoeridis* (L.), *C. bipunctatus* (L.), *Chrysolina fastuosa* Scop., *Ch. herbacea* (Duft.), *Galericella luteola* Müll., *Hypocassida subferruginea* (Schrnk.), *Cassida viridis* L.

The core fauna of leaf beetles of Central Moldavian Plateau formed from dendrofile species that inhabit different trees and shrubs. However, the proximity to the northern and southern steppe area strongly influenced the composition of fauna. It is significant the presence of meadow and steppe species, especially of those mesophilic.

The core fauna of leaf beetles in the central part of the Republic of Moldova is formed mainly of species from Transpalearctic and Holarctic areas. There are also largely represented European and Euro-Siberian species.

The study was performed within the project 11.817.08.16A financed by ASM.

**INVASION OF *VARROA JACOBSONI* PARASITE
IN *APIS MELLIFERA CARPATICA* BEE COLONIES**

Cebotari Valentina, Toderaş Ion, Buzu Ion, Postolachi Olga

Institute of Zoology, Academy of Sciences of Moldova, Chisinau
e-mail: valentinaceb@yahoo.com

Research purpose was: to identify the extension and intensity degree of *Varroa jacobsoni* invasion in different areas (districts) of the country, to determine the created impact of this invasive species of mites on the *Apis mellifera* Carpatica bee colonies.

Research has been done on a group of 105 families of bee colonies at different apiaries from North and central zones of the Republic of Moldova. In these apiaries, at each bee colony were examined the number of mites per 100 cells with uncapped drone brood (feature no. 1), the number of mites located on the body of working bees, counted at 100 bees (feature no. 2) and the number of fallen mites on the control paper after administration of acaricide BeeVital (feature no. 3). The invasion impact of the *Varroa jacobsoni* mite was determined by the comparative assessment, of honey production extracted from the nest (feature no. 4), depending on the infestation degree of the bee colony.

Research results have shown that, invasion of *Varroa jacobsoni* parasitic mite species is expanded everywhere in Republic of Moldova, one hundred percent at each apiary and each bee colony. The invasion intensity (the infestation degree) of this mites species at *Apis mellifera* bee colonies, achieves a middle level and constitutes, on average at examined apiaries, $25,6 \pm 0,8\%$ (calculated according to the number of mites at 100 cells with drone brood), varying from $20,7 \pm 2,1\%$ in the apiaries, that pay an increased attention to prevention and control measures of this disease, and up to $28,0 \pm 1,5\%$, in the apiaries where is not paid due attention to these measures..

The infestation degree calculated on the mites number located on the bee body, at 100 working bees, is also, at the middle level, and constitutes, on average, at examined apiaries, $12,3 \pm 0,3\%$, varying up to $8,9 \pm 0,9\%$ at apiaries, where is paid an increased attention to prevention and control of this disease, and up to $14,8 \pm 0,4\%$, at apiaries where is not paid the due attention to measures of prevention and control of disease.

Between the infestation degree of the bee colonies with the *Varroa jacobsoni* mite and the quantity of honey extracted from their nest, there is a negative correlation, partial and strong. The correlation coefficient (r_{xy}) of these features falls in values $-0,87 + 0,048$ and $-0,92 \pm 0,038 \%$, having a meaning and certainty big enough (td = 18,1-24,2; P < 0,001).

Intensive infestation with *Varroa* mite has an adverse impact on the vital activity and productivity of the bee colony. Increase of the infestation degree of the bee colony with 1% (calculated according to the mites number located on

the bodies of 100 bees) causes the decrease of the quantity of honey extracted from the colony with 1,74 kg. The regression coefficient (R_{xy}) in the amount of extracted honey from the nest, depending on the infestation degree with *Varroa jacobsoni* parasite of the bee colony, calculated by reference to the three examined features, would be: $R_{4/1} = 0,60 \pm 0,028$ ($t_r = 20,9$; $P < 0,001$); $R_{4/2} = 1,60 \pm 0,066$ ($t_r = 24,2$; $P < 0,001$) and $R_{4/3} = 1,27 \pm 0,071$ ($t_r = 18,1$; $P < 0,001$).

THE AGE INFLUENCE OF WORKING BEES FROM MATING NUCLEI, ON THE QUEENS ACCEPTANCE AND MATING EFFICIENCY

Cebotari Valentina, Buzu Ion, Toderici Valeriu

Institute of Zoology, Academy of Sciences of Moldova, Chisinau
e-mail: valentinaceb@yahoo.com

The research purpose was to identify the age impact of working bees, populated in the mating nuclei, on the efficiency of queens mating.

The experiment was done on three batches of nuclei for queens mating. Each mating nucleus was completed with three frames with combs sized 1/3 of standard frame from multistoried hive, with a feeder in each. The mating nuclei were made in a beehive of small size, divided into 4 equal parts, each having a separate bee entrance, oriented in opposite directions. They were populated with 200 g of working bees, which differed, between batches, by age. Thus, the I batch was populated with working bees of all ages, the II batch was populated with young working bees, aged up to 10 days, and the III batch was populated with adult working bees (more than 10 days). Queens batch in total of 90, destined for insertion into the mating nuclei, came from a single mother-queen. All the queens have been hatched on May 10, 2013, with the difference of 3-4 hours. The queens have been inserted into the mating nuclei, being closed in metal cages „Titov” type, where closing cap was replaced with a drilled wax flimsy. The bees fraying the wax, released the queen, consequently accepting or rejecting it.

After the queens inserted into the formed mating nuclei, were kept in the dark, for 2,5 days, in a cold cellar, at a temperature of 12°C, the mating nuclei were placed on pedestals (30 cm from the ground) in three rows at a distance of 2,5 m as much between rows as between nuclei.

Mating nuclei of the queens were located in a forest glade, in the central area of the country. During the experience, weather conditions in the area were quite variable, often manifesting precipitations and thunderstorms. Air temperature in day was 24-26C. Examination of the mating nucleus lasted 20 days, starting on the third day of their establishment, were investigated following specifications:

- acceptance or non-acceptance (rejecting) of the queen at the 3th-5th day after its introduction in the nucleus, following the presence or absence of the queen;

- return (or disappearance) of the queen after the mating flight, checking its presence (or absence) from 6th-7th day since the nucleus creation and insertion of the queen;
- checking of queen's eggs laying, since 10th day of the nucleus creation, control being done twice a day.

The data obtained, as a result of research, were statistically processed using computer software «STATISTICS-6» and valued their certainty, according to variational biometric statistics, after the methods of Плохинский Н.А., 1969.

As a result, in mating nuclei from II batch, which were populated with young bee, aged up to 10 days, was registered the highest rate of acceptance of queens at ($93,3 \pm 4,6$ %), the highest rate of successful return of the queens after the mating flight ($96,4 \pm 3,6$ %), and the oldest age of the queens at the beginning of eggs laying ($13,5 \pm 0,12$ days). In the nuclei populated with adult working bees was recorded the lowest rate ($73,3 \pm 8,1$ %) of queens acceptance, and the lowest rate of successful return of queens after the mating flight at ($72,7 \pm 9,5$ %) and the lowest age of queens at the beginning of eggs laying ($11,5 \pm 0,13$ days). Have been drawn the conclusions that: populating the mating nuclei with young bees (up to 10 days) increases, compared to nuclei populated with adult bees (more than 10 days), so the queens acceptance rate with 27,3 %, as the rate of successful return of the queens after the mating flight, with 32,6%; the queens from mating nuclei populated with young working bees, begin eggs laying 2 days later, compared to queens from nuclei populated with adult bees; in a bee keeping season, of 100 nuclei populated with young bees may be obtained with 59,9 paired queen more, compared to nuclei populated with adult bees.

THE IMMUNE POSTVACCINAL INTENSITY IN THE PREGNANT CATTLE, POLYPARASITATED AND TREATED AGAINST PARASITES

Chihai Oleg¹, Erhan Dumitru¹, Talambuța Nina², Rusu Ștefan¹,
Melnic Galina¹, Zamornea Maria¹

¹*Institute of Zoology, Academy of Sciences of Moldova, Chisinau*

²*Free International University of Moldova,
Chisinau Moldova olegchihai@yahoo.com*

The immunologic reactivity of the organism against different antigenic stimuli is influenced by many factors, among which are the parasitic invasions. These have a opportunistic character, in which the parasitic agent multiplication is based on primary or secondary immunologic deficiency. In these cases the parasitic antigens cause an unspecific stimulation of B lymphocytes, whose overreaction disturbs the humoural response against the antigens of infectious origin.

This study aims at elucidating the consequences of poliparasitosis and of complex antiparasitic therapy on the postvaccinal immunity in Holstein cattle.

The structure of the parasitic fauna in the investigated specimens consists of *Strongyloides papillosus*, *Fasciola hepatica*, *Dicrocoelium lanceatum*, *Echinococcus granulosus larvae*, *Eimeria bovis*, *E. zuernii*, *E. smithi* and *E. ellipsoidalis*. The antiparasitic treatment with *Brovitacoccid*, *Moldbendazol 2,5%* and *Baitril 5%* was followed by immunisation with *anticolibacillar vaccine*.

According to the result of the laboratory analyses the specimens were divided in 6 experimental groups.

Group I- uninfected and immunised.

Group II- infested, untreated and vaccinated.

Group III- infested, treated and immunised 3 days post-therapy.

Group IV- infested, treated and immunised 7 days post-therapy.

Group V- infested, treated and immunised 14 days post-therapy.

Group IV- infested, treated and immunised 32 days post-therapy.

Group I served as negative control, Group II served as positive control.

According to the results the highest level of antibodies was identified 14 days postvaccinal in all the groups investigated. Comparing the groups the highest antibody level was identified in Group I - with a mean of $835 \pm 137,3$; followed by Group VI with $666,4 \pm 145,1$; Group V with $527,9 \pm 111,6$; Group IV with $372,7 \pm 106,3$; Group III with $179,9 \pm 27,9$. The lowest level was registered in Group II with the mean $173,7 \pm 31,8$.

These results show that treating the infested cattle leads to the aggravation of the pathologic process, causing complications conditioned by the diminution of the immunologic reactivity and of the therapeutic effect of the treatment, to aggravation of the clinical evolution of the invasion, and as a result the immune postvaccinal tension against the infectious agents diminishes clearly.

The decline of the immune postvaccinal tension in poliparasitated untreated and immunised cattle are probably the cause of antigenic concurrence of the parasitic antigen and the infectious antigen, which constrains to the eradication of parasites in cattle before vaccination.

The period of 14 days after the vaccine would be the most favourable for calving because this ensures the highest level of specific antibodies in the colostrum.

Thus, the antiepzoonotic measures for immunising against infectious diseases in poliparasitated cattle should be effectuated post-therapy, not earlier than 1 month after, in order to avoid the immunodepressing effect of complex antiparasitic therapy.

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BIOLOGICAL, SEROLOGICAL AND EPIDEMIOLOGICAL SURVEY FOR *TOXOCARA CANIS* INFECTION IN THE SOUTHERN PART OF MOLDOVA

Cojan Constantin^{1,2}, Cojan Mariana²

¹Institute of Zoology, Academy of Sciences of Moldova, Chisinau,

²Cahul District Hospital, Clinical Diagnostic Laboratory

e-mail: drd.mary_cojan@yahoo.com

SUMMARY. In this study an ELISA with *Toxocara canis* antigen was used for determination of sero-biological and epidemiology survey of *Toxocara canis* infestation in urban and rural areas of Southern part of Moldova. *Toxocara* seroprevalence was detected among randomly selected 630 persons.

Introduction. Human Toxocariasis is an important emerging zoonotic disease that has a high prevalence of infection predominantly caused by migration of the roundworm *Toxocara canis* larvae to organs and tissue of human beings. The major clinical consequences of prolonged migration of *Toxocara canis* larvae in humans are visceral larva migrants and ocular toxocariasis. There is a strong correlation between frequency of *Toxocara* infection, life style and infection risk. Toxocariasis is present worldwide but people living in areas with sanitary deficiencies are considered at the highest risk of infection. Young children up to 12 years of age represent the group which is more susceptible to *Toxocara canis* infection due to dirt pica, poor hygiene, or frequent contact with dogs. Most infected patients are asymptomatic and most of the clinical symptoms are not specific. The routine diagnosis of toxocariasis has been relied therefore upon immunological tests. Detection of an antibody response to *Toxocara canis* antigen in serum samples is sensitive and specific for the diagnosis and serological surveys. *Toxocara canis* larval excretory-secretory (TcES) antigen-based enzyme-linked immunosorbent assay (ELISA), which reportedly shows 78% sensitivity and 92% specificity.

Materials and methods. In Southern part of Moldova a total of 630 people, among which 315 people from rural areas and 315 people from urban areas were randomly selected for study. Informed consent forms were obtained from the parents of children included in the study. Detailed physical examinations were recorded from pediatrics. Demographic data were also collected for the study. A short, self-administered questionnaire was then used to collect relevant information from each subject, including data about keeping of dogs. Blood samples were tested using an enzyme linked immunosorbent assay (ELISA) technique for the detection of IgG-specific antibodies to *Toxocara canis*.

Results and discussion For the survey a total of 630 persons were screened for *Toxocara canis*. 315 persons were randomly selected in rural areas and the same number of 315 persons was selected in urban areas. Total seroprevalence rate for *Toxocara* infections was 39,3% in all study groups. Significant levels of anti-*Toxocara* antibodies were detected in 248 samples out of 630 persons

that participated in survey both from rural and urban areas in Southern part of Moldova. In rural area, anti-*Toxocara* antibodies were significantly higher in children who have a dog in their house than children who have no dogs. Seropositivity rate of *Toxocara* antibodies were similar between age groups as well as gender categories. Demographic and socioeconomical factors may lead to an increase in *Toxocara* seroprevalance as well as in wider recognized zoonotic infections throughout the world. *Toxocara* seroprevalance may be much more common than *Toxocara* infections that are generally asymptomatic and the seroprevalance varies from 3% to 86% in different study groups. From our studies it resulted that 32,3% out of 186 school-children were seropositive for *Toxocara* infection. While significant levels of anti-*Toxocara* antibodies were detected in children from rural area - 73 samples out of 315, only 14 children have been detected with positive levels of anti- *Toxocara* antibodies from urban area.

The results of the survey have also conveyed that 26,4% out of 82 soil samples were contaminated with *Toxocara* spp. eggs in Cahul district which highlighted high toxocariasis risk. Children who admitted living in a household where dogs were kept or confirmed playing in soil are at increased risk of seropositivity for *Toxocara* infection. Deplazes P. et al. (2) reported that dog ownership, especially puppies, and geophagia-pica, were significant risk factors. Şuteu E. et al. (5, 6) conducted a seroepidemiological survey for toxocariasis and concluded that infection risk was higher among children living in the city outskirts, where the socioeconomic conditions were worse, than in the central part of the city.

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Cojan Mariana

Institute of Zoology, Academy of Sciences of Moldova, Chisinau
e-mail: drd.mary_cojan@yahoo.com

SUMMARY. *Toxocara canis* and *Toxocara cati* are roundworms of dogs and cats and represent the most common gastrointestinal helminthes of domestic Canidae family and felids world-wide. The reported infection rates in Western Europe vary from 3.5% to 17% for *Toxocara canis* in dogs and from 8% to 76% for *Toxocara cati* in cats. The prevalence of *Toxocara* infections is highest in young dogs and cats and less common in adult animals. *Toxocara* infection is the (covert) infection following ingestion of *Toxocara* eggs, or ingestion of larvae that can lead to (overt) clinical disease, which is presently called toxocarosis.

Introduction. The life cycles of *Toxocara canis* and *Toxocara cati* are complex. Adult worms in the intestinal tract of infected dogs and cats shed large numbers of eggs via the faeces into the environment where they are ingested by natural hosts as well as paratenic hosts. In the intestine the larvae hatch and migrate via blood vessels all over the body. This is called visceral larva migrants (VLM). In young animals a tracheal migration occurs via the lungs and trachea and after swallowing, the larvae mature in the intestinal tract. In paratenic hosts and in most adult dogs and cats that have some degree of acquired immunity, the larvae undergo somatic migration to remain somatic larvae in the tissues. After predation of *Toxocara* infected paratenic hosts by dogs or cats, larvae will be released and develop in most cases directly to adult worms in the intestinal tract. In the pregnant bitch and queen, 'dormant' tissue larvae are reactivated and migrate in the bitch across the placenta to infect the foetuses. New-born puppies and kittens also acquire infection through ingestion of larvae in the milk.

Materials and methods. *Toxocara* eggs are unembryonated and are not infectious when passed in the faeces of dogs and cats into the environment. Within a period of between 3 – 6 weeks to several months, depending on soil type and climatic conditions such as temperature and humidity, eggs will develop to an infectious stage that can survive under optimal circumstances for at least one year. No larval development occurs at temperatures below 10° C and larvae die below temperatures of –15° C. The 2 larval stage or somatic larvae in the tissues has always been considered to be the infective stage; it has become clear that the infective stage is in fact the 3 stage, reached after two moulting in the eggshell.

Results and discussion. The source of the investigated soil, however, will certainly influence these findings. In a survey in the Cahul, the presence of *Toxocara canis* eggs in public parks was comparable with reports from other studies in other countries, but most of the investigated sand-boxes were polluted with *Toxocara cati* eggs. This was explained by the fact that cats prefer a quiet place with sandy material to defecate, while dogs only defecate in such places if own-

ers force or educate them to do this. The same conclusion was drawn in a study where the defecation habits of cats were observed. Only 22 (2%) of the total 378 defecating animals in 3 sandpits during a 3,5 months observation period were dogs, the remainder were cats. Almost all the cats were stray cats and between 25% and 67% of the cats that defecated in the different sandpits were infected with *Toxocara cati*. Eighty per cent of the defecations occurred at night.

Age resistance. By the time a puppy has reached the age of one to two months, the probability that newly hatched *Toxocara canis* larvae will develop into adult ascarids falls to a very low level, while the probability of somatic migration progressively increases. The failure to produce patent infections in older dogs is termed age resistance and is not 'all or nothing' in nature, but rather a gradual decrease in the recovery rate of adult ascarids as the age of the dog advances. A significant contribution of acquired immunity to this phenomenon has been exclusively demonstrated in several studies. The mechanism of resistance in mature dogs may operate partly within the lungs, perhaps as a delayed-type hypersensitivity response. The difficulty in development experienced by the infective stage larvae to the next stage suggests that the resistance is directed against the infective stage of the parasite.

FIRST RECORD OF AROCATUS LONGICEPS STÅL (HETROPTERA, LYGAEIDAE) FOR THE REPUBLIC OF MOLDOVA

Derjanschi Valeriu

Institute of Zoology, Academy of Sciences of Moldova, Chisinau
e-mail: valder2002@yahoo.com

The genus *Arocatus* Spinola, 1837 (Heteroptera, Lygaeidae) in Europe is represented by 3 species: *A. roeselii* (Schilling, 1829), *A. longiceps* Stål, 1872 and *A. melanocephalus* (Fabricius, 1798). Six other species in Palaearctic region occur on Eastern-palaearctic countries, especially in China, Mongolia, Far East of Russia as well as in Near East and Northern Africa. According to our data up to now in the Republic of Moldova has been known only one representative of this genus – *A. melanocephalus* F.

In July of 2013 the species *Arocatus longiceps* Stål in a significant number (18 males and 29 females) were recorded on *Platanus acerifolia* in Chisinau.

This species is very easy to observe, because it hibernates under the bark of *Platanus* trees and can easily be found during the winter and early spring. The adult bugs are able to fly well, which is helpful for dispersal, and also if they are blown out of the very tall trees in which they live.

The *Arocatus longiceps* is a Mediterranean species originally distributed just in southern parts of Europe and Asia. From the former USSR, this species is indicated by I.M.Kerzhner (1964) only from the Caucasus and Crimea. Recent there is a significant spreading out of this species towards the North, into Central Europe – Spain, France, the Netherlands, British Isles, Austria (Adelbauer and

Fries, 1996), Hungary (Kondorosy, 1997), Germany (Rieger, 1997), Czech Republic (Stehlik and Hradil, 2000) and Slovakia (Kment and Bryja, 2001).

Many of the countries recently invaded by this bug are outside the natural distribution of its host tree (the plane tree) and it can only live there because people have introduced these trees.

In Republic of Moldova the bug feeds on all species of the genus *Platanus* (*P. occidentalis* and *P. orientalis*) including their hybrid – *P. acerifolia*.

As in other European countries, the main pathways of introduction and dispersal of alien true bugs in Republic of Moldova are human activities: ornamental trade and movement as «stowaways» in transport vehicles and intentional introduction as biocontrol agent, followed by unintentional introduction through natural dispersal across political borders (Rabitsch, 2008, 2010).

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PREDATORY SHIELD BUG *PERILLUS BIOCULATUS* F. (HEMIPTERA, PENTATOMIDAE) IN THE REPUBLIC OF MOLDOVA: ACCLIMATIZATION OR NATURAL COLONIZATION?

Derjanschi Valeriu, Elisovetskaya Dina

*Institute of Zoology, Academy of Sciences of Moldova, Chisinau
valder2002@yahoo.com, dina.elis.s@gmail.com*

The North American predatory shield bug *Perillus bioculatus* F. (Hemiptera, Pentatomidae, Asopinae), as a natural entomophage of Colorado potato beetle *Leptinotarsa decemlineata* Say (Coleoptera, Chrysomelidae) for many decades was the object of attention of European scientists. The first attempts to acclimatization were taken in France in 1930 (Le Berre, Portier 1963, De Clercq 2000, Rabitsch 2010). In the late 50's and 60's of the twentieth century, the research resumed in Belgium, Germany, Czechoslovakia, Hungary, Bulgaria, Poland and the USSR. However, his acclimation and seasonal colonization did not give positive results. Research in this area has been discontinued, and information about it in the last 25-30 years in the literature almost never occur.

A «new history» of acclimatization of *Perillus bioculatus* in Europe begins in Greece and European Turkey, where was successfully observed the establishment in the field (Kivan, 2004; Fent, Aktaç, 2007; Rabitsch 2008, 2010). In 2002-2003 this species is recorded in natural habitats in Bulgaria (Simov, Langourov, Grozeva, Gradinarov, 2012). The locality Prokletije is so far the single site in Serbia where this species was recorded (Protic, Zivic, 2012).

In May 2008, during the examination thickets ragweed in the North Caucasus (Исмаилов, Агасьева, 2010) were found numerous larvae of *P. bioculatus* (10 to 20 spec./m), actively feeding on leaf beetles *Zygogramma suturalis* F., work on the introduction of which were discontinued more than twenty years ago. Russian scientists have concluded that the acclimatization and resettlement of ambrosia beetle made possible after these introductions of predatory shield bug

P. bioculatus (Матишов, Тютюнов, Титова, Ковалёв, Ильина, Бердников, 2012).

In July 2013 in the suburbs of Chisinau in the experimental field of potatoes was found a large population consisting of larvae and adults of the *Perillus bioculatus*, who actively fed larvae of Colorado potato beetle *Leptinotarsa decemlineata*. At the outbreak bugs density reached 3-5 spec./m.

Is this population remains from experienced attempts to acclimatization of shield bug *Perillus bioculatus* in Moldova in 1980 or is it the result of natural colonization? The answer to this and other questions to find out in future studies.

The study was performed within the project 11.817.08.16A financed by ASM.

ENTOMOLOGICAL ASSESSMENT OF THE EFFECT OF PLANT EXTRACTS ON BENEFICIAL ORGANISMS IN POTATO AGROECOSYSTEM

Elisovetskaya Dina¹, Nastas Tudor¹, Eliseev Serghei²

¹*Institute of Plant Protection and Ecological Agriculture, ASM, Chisinau, Moldova e-mail: dina.elis.s@gmail.com, tudor_nastas@mail.ru*

²*Institute of Ecology and Geography, ASM, Chisinau, Moldova, e-mail: serghei_eliseev@yahoo.com*

The damage inflicted by pesticides to the wildlife defies precise measurement, but it is obvious that it is huge. The development of third-generation insecticides containing more toxic compounds enables the reduction of preparation consumption rates. However, this circumstance does not prevent the apparition of resistant populations of pests. Potato beetle (*Leptinotarsa decemlineata* Say, Coleoptera: *Chrysomelidae*) represents a prominent example, which has developed a resistance to a broad range of applied insecticides in whole area of distribution.

To reduce pesticide load on the agroecosystem and prevent fast development of the resistance among pests, plant extracts with insecticide, deterrent, antifeedant, and repellent activity may be used as harvest protection means. In most cases substances synthesized by plants have a selective effect on different species of insects. In addition, the toxicity of chemical compounds is always relative and depends on a dose received in a certain period of time and the age and the condition of individuals, as well as on the mechanism of absorption and the method of toxin extraction out of the organism. Therefore, there is a high possibility that plant extracts being effective against potato beetle can provide gentle effect on entomophages.

The objective of our study was to determine the effect of plant extracts used to reduce the number of *L. decemlineata* on useful species of insects in the agroecosystem of a potato field.

The experiments were carried out during vegetation periods of 2008 – 2012. As a source for obtaining plant extracts, we used the following plant species: *Veratrum lobelianum*, *Ailanthus altissima*, *Vitis vinifera*, *Heracleum* sp. and *Juniperus sabina*.

It is known that 300 to 640 species of entomophages [1, 2] influence on the number of *L. decemlineata*. But most of them are polyphagous predators or distributed only in the home country of the pest. At the same time, during the period of the expansion of potato beetle many species adapt to eating its eggs and larvae.

As a result of our observations, it has been revealed that on plots treated with plant extracts several species of Coccinellidae were observed, among which the following species prevailed: *Coccinella septempunctata* L. (Coleoptera: Coccinellidae); *Chrysopa carnea* Steph. (Neuroptera: Chrysopidae), as well as *Forficula auricularia* L. (Dermaptera: Forficulidae) and a predatory bugs – *Zicrona caerulea* L. (Heteroptera: Pentatomidae).

It should be noted that a special place among entomophages observed by us on potatoes processed with extracts belongs to spiders. Spiders represent an important component of the agro-ecosystem, efficiently regulating the number of harmful invertebrate pests along with other entomophages. In addition, it has been registered [3, 4] the presence of three species of spiders preying on *Macrosiphum euphorbiae* Thom. and *Myzus persicae* Sulz. (Homoptera: Aphidiidae) on potatoes. On potato plots treated with plant extracts, we have also observed several species of spiders. Two of them – *Pisaura mirabilis* Clerck (Pisauridae) and *Synema globosum* Fabr. (Thomisidae) represent a particular interest.

During the accounting period (28 days after the treatment), it has been observed that on plots treated with extracts of plants of *V. lobelianum*, *V. vinifera* and *J. sabina* the number of entomophages was at the control level and significantly exceeded the number in the chemical standard. On plots treated with extracts of plants of *A. altissima* and *Heracleum* sp., the number of entomophages did not significantly exceed the number in the chemical standard.

Thus, we have determined that the treatment of potato plants with plant extracts can substantially reduce the density of potato beetle population while maintaining the number of many species of entomophages without affecting natural balance of the ecosystem.

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DATA ON INFESTATION OF BISON (*BISON BONASUS*, LINNAEUS, 1758) AND DOMESTIC ANIMALS FROM THE NEIGHBOR AREA OF THE RESERVED FOREST “PĂDUREA DOMNEASCĂ”

Erhan Dumitru, Rusu Stefan, Zamornea Maria, Chihai Oleg, Buza Vasile,
Dumbraveanu Dorin, Cilipic Grigore

Institute of Zoology, Academy of Sciences of Moldova, Chisinau
e-mail: dumitruerhan@yahoo.com

The bison (*Bison bonasus*, Linnaeus, 1758) belongs to genus *Bison* (H. Smith, 1827), comprising also american bison *B. bonasus* (Linnaeus, 1758) as well as other fossil species.

On August 19, 2005 three bisons have been transported from Poland to Republic of Moldova – one male - Podeawacz and two female - Kagura and Podwagra. The bisons are pasturing on limited space, the young animals being isolated from adults ones. The pasturing space is 2 ha for young animals, and 32 ha for adult ones.

In order to establish the level of infestation of bisons and domestic animals from the neighboring to the reserved forest “Pădurea Domnească”, the coprologic investigations have been performed. Thus, in June 2013 the biological probes have been collected from 3 adult and 2 young bisons kept in captivity. The young bisons (males) were born in Moldova on May 1 and June 1, 2011. On September 20, 2011 the adult bison killed the young bison aged 1,5 y.o. (this was the first bison born in Moldova).

The total number of 9 biological probes have been collected from adult bisons, 8 probes from young animals, 22 probes from cattle, 36 from sheep and 7 from horses inhabiting the neighboring to forest territory.

The following 6 species have been identified in adult bisons (trematodes – 1, nematodes – 2, protists - 3): *Fasciola hepatica*, *Strongyloides papillosus*, *Trichocephalus globulosa*, *Eimeria bovis*, *Eimeria auburnensis*, *Eimeria ellipsoidalis*, and 3 species in young bisons (trematodes – 1, nematodes – 1, protists - 1): *Fasciola hepatica*, *Strongyloides papillosus*, *Eimeria bovis* (tab. 1).

It was established that adult bisons had a high level of infestation with *Strongyloides papillosus*, and those young had the high level of infestation with *S. papillosus* and *Fasciola hepatica*. The adult bisons have been infested with multiparasites such as *Fasciola hepatica*, *S. papillosus*, *Trichocephalus globulosa*, *Eimeria bovis*, *E. auburnensis*, *E. ellipsoidalis*, and those young animals - with *F. hepatica*, *S. papillosus* and *E. bovis*.

The cattle were infested with 5 species of parasites (trematodes – 1, nematodes – 1, protists - 3): *F. hepatica*, *S. papillosus*, *Eimeria bovis*, *E. zuernii*, *E. ellipsoidalis*, sheep – with 5 (cestodes – 1, trematodes – 1, nematodes – 1, protists - 2): *Moniezia expansa*, *F. hepatica*, *S. papillosus*, *Eimeria parva*, *E. faurei*; and horses were infested with 2 species of nematodes - *Strongyloides westeri* and *Oxyuris equi*.

The infestation of bisons from reserved forest “Pădurea Domnească” and domestic animals from neighboring area

Invasion	Studied animal species				
	Bison		Domestic animals		
	Adults	Young	Cattle	Sheep	Horse
<i>Moniezia expansa</i>	-	-	-	+	-
<i>Fasciola hepatica</i>	+	+	+	+	-
<i>Strongyloides papillosus</i>	+	+	+	+	-
<i>Strongyloides westeri</i>	-	-	-	-	+
<i>Trichocephalus globulosa</i>	+	-	-	-	-
<i>Oxyuris equi</i>	-	-	-	-	+
<i>Eimeria zuernii</i>	-	-	+	-	-
<i>Eimeria bovis</i>	+	+	+	-	-
<i>Eimeria auburnensis</i>	+	+	-	-	-
<i>E. ellipsoidalis</i>	+	-	+	-	-
<i>Eimeria parva</i>	-	-	-	+	-
<i>Eimeria faurei</i>	-	-	-	+	-
Total species -12	6	3	5	5	2



Bisons from forest reserve „Pădurea Domnească”

Thus, the obtained results demonstrate that identified in bisons parasite fauna generally correspond to such fauna of domestic mammals (cattle, sheep) that have been pasturing in the neighboring to forest area.

The analysis of the obtained results of parasitological fauna reveals that identified parasitologic agents could be divided into 2 groups: *obligate* for wild mammals and *common* for wild and domestic animals. There have been identified 6 species of parasites among them one species is obligate and 5 species are common also for domestic ruminants (cattle, sheep). The work was performed within the projects 11.817.08.14 F, 11.817.08.40F, 11.817.08.15A

MOLECULAR PHYLOGENY AND PROBLEM OF CRYPTIC SPECIES IN *PARNASSIUS* (LEPIDOPTERA: PAPILIONIDAE) BUTTERFLIES: A CLUSTER NETWORK APPROACH

Frolov Artyom A. & Bolotov Ivan N.

*Institute of Ecological Problems of the North, Arkhangelsk, Russia,
af.atgc@gmail.com*

Parnassius (Lepidoptera; Papilionidae) butterflies are known for high individual and geographical variety. Increasing interest makes evolutionary history and systematics of these butterflies became the subject of many discussions for a long time. *Parnassius* genera consists of several clades, which are well supported by both traditional (based on morphology) systematics and recent molecular studies (Omoto et al. 2004, Katoh et al. 2005, Michel et al. 2008). One of the most diversified and widely distributed group is *Driopa* (Korshunov 1988). The famous Russian entomologist Yu P. Korshunov firstly distinguished it basing on genitalia and mouthpart structures. The wide distribution of this group extends up to the Pyrenees on the West, California/USA on the East (Schoville & Roderick 2009), Himalayas in the South and the Winter Coast (of the White Sea) in the North (Bolotov et al. 2013). Eight species belongs to this clade: *P. mnemosyne* from Europe and Middle East, *P. ariadne* from Central Asia, *P. nordmanni* from Caucasus, *P. orleans* from China, *P. stubbendorfi* & *P. glacialis* from Far East and *P. evermanni* from Far East of Russia and North America. In recent studies of *P. mnemosyne* some authors emphasizes on highly divergent populations of this species in the West-European region according to assumptions derived from analysis of COI gene (Gratton et al., 2006, 2008).

The goal of the study was to analyze phylogeny of *Driopa* clade in *Parnassius* genera using combination of all accumulated molecular data from previous studies (which one can obtain in free access) and the newly obtained material from the North European and Far East parts of Russia.

For the processing of raw sequence data (downloading, labeling, etc.) were used programs written in scripting languages Perl, Python & R. The following markers were chosen as the most presented in studies of *Parnassius* butterflies: 16s rRNA, COI, ND1, ND5.

All sequences were aligned using ClustalW (Larkin et al. 2007) and corrected by eye when needed. The appropriate substitution scheme and starting parameters were chosen for each dataset separately by Akaike criterion implemented in jModelTest 2.1.3 (Darriba et al., 2012). A hierarchical likelihood-ratio test for phylogenetic congruence in concatenated set was performed by CONCAT-ERPILLAR 1.7.2 (Leigh et al., 2008) and it shown low topological congruence between the genes in sets of the most combinations (16s+COI, COI+ND1+ND5, etc..). Despite the concatenated approach we inferred phylogenies of each gene separately. Maximum likelihood (Felstein 1981) analysis was performed in RAxML 7.4.4 and Bayesian analysis was made in MrBayes 3.2.1. To visualize

mismatched patterns in evolution of used markers, we joined all of obtained trees to the cluster network using Dendroscope 3.2.8 (Huson & Scornavacca 2012).

The figures, schemes and all of obtained graphs will be shown in the presentation.

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**TRICHOGRAMMA EMBRYOPHAGUM Htg. APPLICATION IN
DENSITY CONTROL OF THE PLUMS' WORM PEST (*GRAPHOLITHA
FUNEBRANA* TR.) AT PLUM TREES**

Gavrilița Lidia

*Institute for Plant Protection and Ecological Agriculture, ASM
Chișinău, Str. Pădurii 26/1, Republic of Moldova
E-mail: lidia_gavrilita@yahoo.com*

During the period 2011-2012, research studies with *Trichogramma embryophagum* Htg. were conducted in laboratory conditions and in the field. Field experiments were performed in the plum orchard Stenlei on a surface of 5,4 hectares in the household "Agro Brio", Bacioi, Republic of Moldova.

1. Determining the spatial distribution of the pest *Grapholitha funebrana* Tr. density in the field, to optimize terms and rules of *Trichogramma embryophagum* Htg. launch in pest control during the development of the plum crop.

During the pest (*G. funebrana*) development period, worm eggs laying dynamics was determined to optimize the launch terms and conditions. Density determination of the pest eggs (*G. funebrana*), was done by the traditional method. In Bacioi farm plum orchard 6 launches and 12 records were performed to determine egg density (*G. funebrana*) in plum, before and after the launch with *Trichogramma*. In each variant, records of the number of pest eggs were taken, with 100 fruits per tree, where pheromone traps were installed. The first variant includes rows 1, 4, 7 recording a total of 27 trees and 2700 fruits. The second variant includes row number 12, for a total of 15 trees and 1500 fruits. Third variant (row 18) comprises a total of 14 trees and 1400 fruits. Fourth variant (Witness - Control) contains row 24 in total 4 trees recorded for 500 fruits. Records were conducted at 60 plum trees uniformly distributed in the field.

During the first generation of the pest, the average density of plum worm eggs ranged from 1 to 8 eggs per 100 fruits per variants. Pest eggs density was lower than the economic damage threshold (2-5 eggs/100 fruits, or 2-3% damage). During the development of the second generation of the pest, average density of plum worm eggs ranged from 1 up to 16 eggs per 100 fruits per variants. With the "Bio Class" program – multi-classification system criteria of information optimization regarding the initial density in the field of *G. funebrana* there were built digital maps of the spatial distribution of eggs of *G. funebrana* during the development of two generations of this pest and where the uneven distribution was determined and outbreaks detected locations.

2. Determination of the release norms of *T. embryophagum* in combating plums worm (*G. funebrana* Tr.) at plums.

For the determination of the optimal norms of the launch of the *Trichogramma* against plum moth *G. funebrana* at plums, several variants were analyzed as it follows: 450 thousand eggs per hectare in the first variant, 350 thousand/ha in the second variant and 250 thousand individuals per hectare in the third variant.

In the fourth variant (witness) there were no launches performed. The number of parasitized eggs was determined on variants and witness.

3. Determination of the parasitic capacity of the plum moth eggs (*G. funebrana* Tr.) by the *T. embryophagum* H. at plum crops.

The launch of the *T. embryophagum* was conducted after the accumulation, determination of the biological indices and monitoring with pheromone traps of the plum moth butterfly in the field. In the plum orchard from Bacioi farm 6 launches were conducted for (*G. funebrana*) egg density determination. Evidences were performed before and after each the launch with *Trichogramma*. The density of the pest eggs was initially small and this is the reason why two launches were prophylactic. In the first generation – eggs parasitized by *T. embryophagum* H. varied on variants from 16.6% to 25.0 %, after the first two launches. During the second generation 4 launches were conducted up to the date of 15 august 2012 in dependence on the pest presence in the field. Later on the number of eggs parasitized by *T. embryophagum* was determined on variants and it oscillated between 25.0% and 70%. During the two generation development of the pest *G. funebrana*, biological efficacy of *T. embryophagum* in the field varied from 25% to 70% in first variant and from 20% to 69.2% in the second variant. In the third variant efficacy in the field varied from 16.6% to 66.6%. In case of the control plot the parasitized eggs during the entire period varied from 3.8% to 6%.

During the two generation development period of the pest *G. funebrana* in the plum orchard the pest attack was determined as it follows: in the first generation on variants it varied from 1.8 to 2.2% during the second generation on variants it varied from 1.3% up to 2.2%. In case of the witness plot, the pest attack on fruits varied from 3.0% to 4.4%. On variants, fruit attack ranged from 0.6 to 2.0% in the first variant; in the second variant ranged from 0.9 to 2.3%, in the third attack it ranged from 1.0 to 2.5%. In witness, fruit attack ranged from 1.8 to 4.4%. Fig. 7 summarizes *G. funebrana*'s eggs on fruits parasitized by *T. embryophagum* in the plum orchard. When comparing the results of the first with the third variant and third with the witness - the difference in biological effectiveness of the mean values (DEM) is essential.

SOME ASPECTS OF PROPOLIS CONTAMINATION

Gliga Olese

Institute of Ecology and Geography, Academy of Sciences, Chisinau
e-mail: camiprim@inbox.ru

Honey bees (*Apis mellifera* L) and their products have the image of being natural, healthy and clean. Nowadays bee products produced in the environment is exposed to pollution by multitude of sources of contamination (environmental pollution, chemical used in agriculture, beekeeping practice etc.). Many studies demonstrated that apicultural products directly depend on environmental ecol-

ogy and can be used as a bioindicator of ecosystem quality (Balestra, Porrini, Giorgio 1992, Омаров 2008, Porrin 2003).

Contamination of propolis and other bee products is an important issue discussed by many researchers from around the world in last time (Conty and Botre 2001, Еськов 2001, Bancova 2000, Chmielewski 2005, Roman and Popiela-Pleban 2012).

A numerous researches demonstrated that propolis is much more contaminated with heavy metals (Pb, Cu, Cd, Zn etc.) than any other bee products. Because during the processing of raw materials to propolis by worker bees its purification does not take place (Conty and Botre 2001, Еськов 2001, Roman and Popiela-Pleban 2012).

The pollutants occurring in harvesting area can be accumulated in the raw material collected by bees, and also in bees itself (Bogdanov 2006, Roman 2009, Roman 2010). There is a close correlation between the level of heavy metals accumulation in soil and plants and their content in bee products (Еськов 2001, Roman 2009, 2010). Also many researchers conclude that the level of toxic trace elements concentration in propolis depends on the state of environmental pollution.

In 2005, Chmielewski of the Department of Bee Products from Pulawy, Poland studied the contamination and infestation of propolis with arthropods (*Arthropoda*). His investigation demonstrated that 40% of samples of collected material were infested and contaminated with arthropods, mainly with insects and mites (living and dead specimens and their body fragments, excrements etc.). The results confirm earlier introductory observations (Chmielewski 2002, 2004) that arthropods are significant elements of biological contaminations of propolis collected from beehives [9].

Propolis has been used in folk medicine since ancient times and is now known to be a natural medicine with antibacterial, antiviral, antifungal, antitumoral and other beneficial activities. Bioflavonoids and vitamins are the more important components of propolis, because assist in strengthening and maintaining the immune system [10].

In recent years the interest in this ecological product has growing tendency, because of its curative features and application in medicine and cosmetics and lately in food industry. But for utilization propolis should be of a best quality and free of pests and the products of bees metabolism (body secretions, excrements, fragment etc.) and other contaminants [3, 4].

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**FAUNA DIVERSITY OF THE DIURNAL BUTTERFLIES
(LEPIDOPTERA, RHOPALOCERA) FROM THE NATURAL FOREST
RESERVE «COBILENI»**

Hacina Cristina, Derjanschi Valeriu

*Institute of Zoology, Academy of Sciences of Moldova, Chisinau
hacinacristy@yahoo.com, valder2002@yahoo.com*

The order Lepidoptera is the most representative in the class Insecta, both by number of species and their diversity, as well as by their importance as critical components of all terrestrial ecosystems. The diurnal butterflies are one of the best objects for monitoring biodiversity change. These biomarkers respond quickly to changes in the environment and are useful for tracking changes in European biodiversity – a real tool for warning on problems that would affect ecosystems.

Detection of a number of rare butterfly species in an area means that the natural characteristics of the area are preserved. Therefore, the monitoring of this group of insects allows keeping the situation under control, which is especially important in terms of human intervention. In specialized contemporary literature there are few works on the fauna of Lepidoptera from different regions of the Republic Moldova. The purpose of this paper is to highlight the current status and importance of diurnal butterflies (Rhopalocera) in ecosystems from the natural reserve "Cobileni".

The «Cobileni» natural forest reserve is an area with a surface of 33.5 ha. It belongs to the district forest Susleni, the State forestry Orhei, plot 1, subplot 2,

plot 2 subplots 1, 3. It is located in the Orhei administrative district in the center of Moldova, on the right bank of the Dniester River. The reserve, according to geomorphological regionalization of Moldova is located in the west Dniester's hills and its terraces. It is characterized by an altitude of 250-300 m and vertical fragmentation. The western slopes are slowly and the eastern ones descend sharply to the Dniester River.

Materials for this paper were obtained as a result of research conducted during the warm period of 2012 on faunal diversity, ecological and biological aspects of diurnal Lepidoptera from the reserve. Butterflies were collected with a silk entomological net having a circle diameter of 30 cm with relatively large mesh, allowing easy air flow. To identify the entomological material the contemporary lepidopterologic works were used.

Faunal diversity of diurnal butterflies in the natural reserve «Cobileni» consists of 62 species belonging to 39 genera and taxonomic 6 families: Hesperidae (6 species), Pieridae (10 species), Papilionidae (2 species), Nymphalidae (19 species), Riodinidae (1 species) and Lycaenidae (24 species). Below is a systematic list of Rhopalocera butterfly signaled in reserve:

Fam. Hesperidae: *Ochlodes sylvanus* Esp., *Thymelicus sylvestris* Poda, *Carterocephalus palaemon* Pall., *Erynnis tages* L., *Muschampia tessellum* Hbn., *Pyrgus armoricanus* Oberth.

Fam. Papilionidae: *Iphiclides podalirius* L., *Zerinthia polyxena* Den. et Schiff.

Fam. Pieridae: *Leptidea morsei* Fent., *L. sinapis* L., *Anthocharis cardamines* L., *Colias*

alfacariensis Ribbe (= *C. sareptensis* Staud.), *C. croceus* Fourc., *C. erate* Esp., *Pieris brassicae* L., *P. napi* L., *P. rapae* L., *Pontia edusa* F. (= *daplidice* L.).

Fam. Nymphalidae: *Argynnis paphia* L., *Boloria dia* L., *Issoria lathonia* L., *Neptis sappho* Pall., *Mellicta athalia* Rott., *M. aurelia* Nick., *Melitaea didyma* Esp., *M. phoebe* Den. et Schiff., *Aglais urticae* L., *Polygonia c-album* L., *Vanessa atalanta* L., *V. cardui* L., *Coenonympha arcania* L., *C. glycerion* Borkh., *C. pamphilus* L., *Aphantopus hyperantus* L., *Maniola jurtina* L., *Melanargia galathea* L., *Minois dryas* Scop.

Fam. Riodinidae: *Hamearis lucina* L.

Fam. Lycaenidae: *Thecla betulae* L., *Favonius quercus* L., *Satyrium acaeciae* F., *S. pruni* L., *S. spini* F., *S. w-album* Knoch, *Lycaena dispar* Haw., *L. thersamon* Esp., *Aricia agestis* Den. et Schiff., *Celastrina argiolus* L., *Cupido minimus* Fuess., *C. osiris* Meig., *Cyaniris semiargus* Rott., *Everes argiades* L., *Everes decoloratus* Staud., *Glaucopsyche alexis* Poda, *Plebejus argus* L., *P. idas* L., *Polyommatus bellargus* Rott., *P. coridon* Poda, *P. daphnis* Den. et Schiff., *P. amandus* Schn., *P. icarus* Rott., *P. thersites* Cant.

The most numerous species prefers open places, especially forest edge, where a large number of species (38) were collected and sunny glades of the forest, flowering vegetation where 28 species were collected. Few species, including

Thecla betulae, *Favonius quercus*, *Thymelicus sylvestris* prefer forests and forest roads with thickets of bushes (9 species). The first two species inhabit only in rare sectors of oak forests.

Most species inhabit many biotopes, preferring derelict areas (30 species), the right bank of the Dniester River (23 species), and various agrocoenoses (8 species): gardens, orchards ripe fruit (*Vanessa atalanta* and *V. cardui*) forest strips from agricultural fields etc.

Zoogeographical analysis of diurnal Lepidoptera of the nature reserve «Cobîleni» shows that in the studied area Eurasian species complex type (27 species or 44%) and westpalearctic (12 species, or 19%) dominated. European elements include 8 species with a value of 13%. Lepidoptera with palearctic distribution include 6 species, or 10%, and group items Holarctic species include 4 species (6%).

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**NEW INVASIVE SPECIES IN THE REPUBLIC OF MOLDOVA:
MULTICOLORED ASIAN LADYBIRD *HARMONIA AXYRIDS* PALLAS
(COLEOPTERA: COCCINELLIDAE)**

Iazlovețchii Igor, Sumencova Victoria

*Institute of Plant Protection and Ecological Agriculture, Academy of Sciences
of Moldova, Kishinev, Republic of Moldova,
e-mail: yazlovetsky@mail.ru*

Harmonia axyridis Pallas is a predatory ladybird, native to large areas of Central and South-East Asia. Numerous morphotypes of *H. axyridis* with different color (from yellow to orange, red to black) and with different number of spots on the elytra (0 to 21) are known. The species is bivoltine, but under favorable conditions can produce up to five generations per year.

In the last 2-3 decades, this ladybird migrated and settled in North and South America, Europe, Middle East and Africa. It was used as an agent for biological control of insect pests in the second half of the 20th century. At the beginning of the 21st century due to the identified threat to the diversity of native species of coccinellids the spreading of *H. axyridis* in Europe has received the status of invasion. It is arguably the most harmful invasive species of insects in the XXI century.

The aim of our work is to prove the fact of penetration of multi-colored Asian ladybird *H. axyridis* to the territory of the Republic of Moldova and forecast the possible negative consequences of this invasion.

Specimens were sampled in July - October 2011-2012 in the colonies of aphids in agrocoenoses of peach orchard and sorghum fields in the outskirts of the city of Kishinev. At the end of October 2012 adult coccinellids aggregating before hibernation were collected in the crevices of the window frames in residential buildings in Kishinev. Specimens were sorted by elytra pattern, the presence

elytra comb and stored in 70% ethanol. Morphotypes and species identification was carried out by known methods.

In the summer of 2011 multicolored Asian ladybird represented 42% from the total number of adult coccinellids collected by us on peach trees. In the field season of 2012, this type was dominated among coccinellids to an even greater extent (86%). In the season 2012, in sorghum field agroecose, the rate of *H. axyridis* has reached 90%. Among coccinellids collected within the buildings this species was represented at a similarly high rate (93%). In our samples *H. axyridis* is dominated by individuals of morphotype *succinea* (93% - 96,%). Three other adult morphotypes: *spectabilis*, *conspicua* and *axyridis* also occur.

It should be stressed that in 2011 the rate of native coccinellids *Coccinella septempunctata* L. and *Adalia bipunctata* L. in the peach garden was 27% and 13%, however in 2012, it decreased to 7% and 2% respectively. This means that the invasive species *H. axyridis*, having competitive advantages in comparison with the native European coccinellid species, quickly displaces them from their ecological niches and becomes the dominant species of predatory ladybugs. Similar invasion by multi-colored Asian ladybird has been observed in several European countries. Our results allow us to assert that the Republic of Moldova was on the path of the spread of *H. axyridis* all over Europe. We believe that the invasion of the invader-insect to our country happened in 2009 - 2010, from the neighboring Romania and (or) Ukraine.

The experience of many countries that suffered from invasion of *H. axyridis* in the last 20 - 25 years, predicts the following possible negative consequences for the Republic of Moldova:

1. Reduction of biodiversity of native species of terrestrial arthropods, including predatory coccinellids, with unpredictable disturbances in existing ecosystems.
2. The threat to human health because of the clustering of adults in residential homes for winter. Beetles can bite people and cause allergic reactions, manifested as rinoconjunctivitis, hives or asthma attacks.
3. Disadvantage for apiculture because of the damages caused by larvae and imago *H. axyridis* penetrating into the hives.
4. Damage to fruit growing, viticulture and winemaking. *H. axyridis* has the unique ability to change their eating behavior from herbivorous to carnivore if necessary, giving a viable offspring. In the U.S. and Canada *H. axyridis* is treated as a pest of ripening fruit and wine grapes. A lot of adult Asian ladybirds migrate to the crop plantations causing considerable damage just before the harvest. It was found that the presence of only 1-2 adult *H. axyridis* pro 1 kg harvested grapes leads to the formation of undesirable odors and flavors in the wine prepared. This is due to the excess of the threshold concentrations of N-heterocyclic compounds in wines, such as methoxypyrazin contained in the hemolymph of *H. axyridis*.

ENTOMOFAGOUS AND ACARIFAGOUS PREDATORS MITE PESTS IN PLANTATION OF PEACHES IN REPUBLICA OF MOLDOVA

Iordosopol Elena

*Institute of Plant Protection and Ecological Agriculture,
2002, z. Kichinev, st. Padurii, 26/1, Republica of Moldova*

According to the literature of mites populations predators are controlled by an estimated 150 species of insects entomophagous, acarifage and predatory mites. The peach crop known species of mites in different climatic conditions which bring considerable damage.

In practice known works depicting some complex of mites and insects which uses food as pest mites, as follows: order ACARINA - family STIGMAIDAE 13 species and one type of family fam. ANYSTIDAE, CHEYLETIDAE, ERYTHRAEIDAE, BDELLIDAE, TARSONEMIDAE, TYDEIDAE, PHYTOSEIDAE, ERENETIDAE; order ARANEA – fam. THERIDIIDAE and LYCOSIIDAE – 1 species; order DIPTERA – fam. CECYDOMYIIDAE - 8, SYRPHIDAE - 2, DOLOCHOPODIDAE-1, EMPIDIDAE - 1; order NEUROPTERA – fam. CHRYSOPIDAE - 7, CONIOPTERYGIDAE, HEMEROBIIDAE - 1 each specie; order DERMAPTERA – fam. LABIDURIDAE - 1; order COLEOPTERA – fam. COCCINELLIDAE - 40 species, STAPHYLINIDAE - 10, ENDOMYCHIDAE - 1; order THYSANOPTERA – fam. PHLAEOTHRIPIDAE – 4 species, AEOLOTHRIPIDAE - 5, THRIPIDAE - 7; order HETEROPTERA - fam. ANTHOCORIDAE – 11 species, MIRIDAE - 19, NABIDAE - 2, PYRRHOCORIDAE and PENTATOMIDAE - 1 each specie, LYGAEIDAE v RHOPIIDAE - 2 each specie.

Aim of this work was to reveal the complex entomophagous insects, mites predatory and predators that regulate pest populations.

On the basis of these investigations were the threading done during the growing season peach, collecting biological material consisted of leaves inhabited by colonies of pest mites.

The biomaterial was assembled by cutting 50 net sweeps, 5 counts. During the field data collection was moved from the skimmer in the flasks. After killed with ether and the material was transferred to the classified level units in petri dishes with special bottom. Further assays were performed to form classic method.

Rezultat and discussion. As a result, the attached list of species highlighted: the order ACARINA - family PHYTOSEIIDAE (*Metaseiulus occidentalis*, *Typhlodromus pyri*, *Amblyseius andersoni*), STIGMAEIDAE (*Zetzelia mali*), ANYSTIDAE (*Anystis bacarum*), TROMBYDIIDAE (*Allothrombium sp.*), ERENETIDAE (*Ereynetes boharti*), ERYTHREIDAE (*Balastium sp.*)

The order ARANEA - family LYNIPHIIDAE (*Erygone atra*), THERIDIIDAE (*Enoplognatha latimana*), LYCOSIIDAE (*Pardosa crassipalpus*).

The order DIPTERA - family CECIDOMIYDAE (*Therodiplosis persicae*, *Lestodiplosis sp.* *Arthoconodax occidentalis*, *Acaroletes tetranychii*, *Aphidoletes cardi-*

na, *Feltiella* sp.), SYRPHIDAE (*Toxomerus germinatus*, *Sphaerophora scripta*, *Syrphus ribesii*), DOLICHOPODIDAE (*Medetera* sp.), EMPIDIIDAE (*Drapetis myesopyga*).

The order NEUROPTERA - family CHRYSOPIDAE (*Chrisopa carnea*, *Ch. lateralis* *Ch. vittata*, *Ch. perla*, *Ch. septempunctata*, *Ch. formosa*), CONIOPTERYGIDAE (*Conwentzia pineticola*), HEMEROBIIDAE (*Hemerobius humulinus*).

The order RAPHIIDOPTERA - family RAPHIIDAE (*Raphidia* sp.).

The order DERMAPTERA - family LABIDURIDAE (*Labidura riparia*).

The order COLEOPTERA - family COCCINELIDAE (*Hypodammia variegata*, *Adalia bipunctata*, *Chilocorus bipustulatus*, *Ch. renipustulatus*, *Coccinella conglobata*, *C. septempunctata*, *Exochomus flavipes*, *E. melanocephalus*, *E. quadripustulatus*, *Propylaea quatuordecimpunctata*, *Scimnus frontalis*, *Semiadalia undecimnotata*, *Stethorus sulvulosus*, *S. punctillum*), STAPHILINIDAE (*Oligota flavicornis*) and fam. ENDOMYCHIDAE (*Saula japonica*).

The order THYSANOPTERA - AEOLOTHRIPIDAE (*Aeolothrips fasciatus* *A. melaleucus* *Parascolothrips presneri*, *Perisothrips brevicornis*), PHLAEOTHRIPIDAE (*Haplothrips faurei*, *H. subtilissimus*, *Leptothrips mali*), THIRIPIDAE (*S. longicornis*, *S. pallidus*, *S. sexmaculatus*).

The order HETEROPTERA – family ANTHOCORIDAE (*Anthocoris nemorum*, *A. nemoralis*, *Orius albipennis*, *O. insidiosus*, *O. niger*, *O. laevigatus*, *O. majusculus*, *O. minutus*, *O. tristicolor*, *O. vicinus*, *Wollastoniella gatti*), MIRIDAE (*Antractotomus mali*, *Blephadopterus angulatus*, *Campylomma verbasci*, *C. unicolor*, *C. diversicornis*, *Deracocoris nebulosus*, *D. punctulatus*, *D. lutescens*, *D. ruber*, *Diaphnocoris pellucida*, *Hyaliodes harti*, *Heterotoma meriopterum* *Malococoris chlorizans*, *Orthotylus marginalis*, *Pilophorus perplexus*, *Phytocoris reuteri*, *Ph. tiliae*, *Psallus ambiguus*, *Lygus genullatus*, *L. rugulipennis*, *L. punctulatus*), NABIDAE (*Nabis fesus*), RHOPALIDAE (*Rhopalus parumpunctatum*, *Rh. subrufus*, *Myrmus miriformis*), PENTATHOMIDAE (*Carpocoris pudicus*), LYGAEIDAE (*Geocoris pubescens*, *Camptocera glaberrima*) and fam. PYRRHOCORIDAE (*Pyrrocoris apterus*).

Conclusion. Rarely had meetings in the peach garden species *Blepharidopterus angulatus*, *Campylomma verbasci*, *Orius vicinus* *Deraecoris nebulosus* and *Stethorus punctillum*.

Therefore, the predators in the peach garden in the Republic of Moldova had 97 species.

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INSECTS - THE BEST OF SOILS MELIORATORS

Kuharuk Ecaterina, Burghelea A., Cojocaru Olesea,
Rusnac V., Panus A., Veliscu A.

Institute of Pedology, Agrochemistry and Soil Protection
«N. Dimo», Chisinau, Moldova
E-mail: ecostrategii@yahoo.com

Effect on soil small invertebrate animals, including insects, is very large. This was first noticed by Darwin. In Moldova, a great contribution in the development of science pedozoology introduced Nicholas Dimo, who studied in detail the life and work of ants, their impact on the soil. N. Dimo in 1955 published a book, «Observations and studies on soil fauna», which summed up his long-term supervision. In the soil of a large number of live insects (beetles, ants, etc.), which have a great influence on the process of soil formation. By doing numerous passages in the soil, they loosen the soil and improve its physical properties and water. Insects, actively participating in the recycling of crop residues, enrich the soil with humus and minerals.

Ant mounds are often found in a small area. Moving into the space, there are ant hills for centuries. For many decades we have seen nests in the forest park zone Valea - Morilor. Scientists have proved that the allocation of ants, affects the pH of the soil. They themselves have a slightly alkaline. Acidic and neutral soils alkalize ants, and strongly alkaline, the pH decrease. This has implications for the soil and for plants that prefer a response that is close to neutral. Nests do not occur in contaminated soils, so we can assume that this is one of the indicators of eco-friendly environment. Ant life flows on its established laws, it is interesting and complex. But, of course, the ants are of great use and need to be nurtured and protected.

On sandy soils, where strolling livestock (Grounds Motocross - the closest point of our observations) occurs beetle - beetle (*Ceratophius polyceros*). This beetle is found only on sandy soils, digging deep wells in them (mines), reaching up to 160 - 170 cm in depth. On the surface of the soil, these wells are summarized under the pile of manure of animals. Then the well perpendicularly to the depth omitted and only its center portion has 1 - 3 short horizontal branch. They probably intended to protect the well from crumble and sand filling. At a depth of 150 - 160 cm, the central well is branched into the barrel 3 - 4 blunt horizontal process, filled with manure, mixed with sand. They humus reaches from 9 to 17%, whereas in the uppermost soil layer itself does not exceed 1%. Activity of dung in the soil causes the formation of lenses, highly enriched in organic matter. In themselves these lenses and they are always observed near plant roots concentration is significantly greater than in the surrounding soil mass. The lenses kind of «suppliers» of nutrients for plants. Beetles - dung beetles are found on the banks of the rivers of Moldova, sea coasts and oceans. A wide variety of insects we find in the forest parks in Chisinau. In agrocenoses generated beetles an ex-

tensive void contributes to increased permeability of the soil, thereby improving the physical structure and improves agronomic properties.

Soil is housing and shelter for many organisms, it prevents from overheating, and from exposure to cold, protects from predators, living on earth's surface. The soil can serve as a shelter, due to the fact that temperature and humidity in it are much less susceptible to sharp fluctuations than on earth's surface. This soil feature is especially useful during abrupt weather changes' periods that mark Moldova's spring and autumn.

Actively use the land as a dwelling, many insects. Many invertebrates are widely used as dwelling burrows of certain rodents. So, in burrows of ground squirrels, except the owners, live spiders, woodlice, flies, beetles. In the cold season here is their winter refuge, and in the summer – a place of salvation from the heat. Fleas, flies and some beetles there and reproduce by laying eggs in the dung gophers. Many insects are held in the soil only a certain phase of development. For example, cicadas lay their eggs under the bark of thin twigs or leaf cuttings. The larva of the same after their exit from the egg falls to the ground and burrow into the soil often to a depth of 1 m, where is their further development.

The cases considered the use of soil as a “dwelling” suggests that the fourth (by V. V. Dokuchaev) kingdom of nature can be compared to the densely populated underground city where they live and its permanent residents, and those who work in the suburban area (for food on the ground), and those who are in the soil, only a limited time, as its guest.

The soil is capable of self-purification of her unusual microorganisms – that it's sanitary function. Therefore, violation of environmental protection under the influence of various toxicants represents a threat to all of the soil fauna, violates the biodiversity in ecosystems.

Thus, not only insects pests not only pollinators, not only the creators of these unique products like honey bees wax, propolis, etc., and endowed with builders and irrigators. In the description of the soil profile, soil scientist writes necessarily the presence of wildlife which may suggest a number of important points in the study.

We believe that it is necessary to enter the soil zoology in a compulsory subject, students of specialty «soil science», «ecology». No need to beliefs about the importance of the educational upbringing of the younger generation to protect insects. Thousands of farmers in our republic of Moldova are required to get the basics of zoology; environmental ethics should be incorporated in the heart of every citizen of our country.

MITES OF TREES FROM NATURE RESERVES OF THE REPUBLIC OF MOLDOVA

Kulikova Ludmila

Institute of Zoology, Academy of Sciences of Moldova, Chisinau
E-mail: zoologie@mail.ru

The purpose of this research was the study of mite's diversity from natural areas of the Republic of Moldova.

Samples were collected from plants (leaf) at 25 and 100 meters from the forest edge, on a sector of 100 meters in length. 15 species of plants were examined. The collected data were analyzed by the program Andreev A. The following indexes were characterized: abundance (A): rare (R), very rare (D), common (C); Simpson dominance index (Js). The surveys were carried out in the nature reserve: forest stands «Condrita», «Skoreni», «Flamin-da», «Dubasari», «Kalfa».

Mite fauna of trees in nature reserves is represented by 38 species, of which 13 rare, 6 rare, and 1 new species (*Anystis sp. n. 5*) for the fauna of the Republic of Moldova. Table 1 provides a list of mite species, diversity, dominance in habitats and the new species for the fauna of Moldova.

Table 1.

Species diversity and distribution of mites from various habitats (trees and bushes) in different protected nature areas of the Republic of Moldova

№	Species of mites	«Condrita»		«Skoreni»		«Kalfa»		«Flamin-da»		«Dubasari»	
		A	Js	A	Js	A	Js	A	Js	A	Js
1.	<i>Tarsonemus virgineus</i>	D	0,056								
2.	<i>T. lobus</i>									D	0,022
3.	<i>Tydeus californicus</i>	D	0,028			C	0,435	D	0,025	C	0,202
4.	<i>T. heterosetus</i>			C	0,305			R	0,101		
5.	<i>T. elinguis</i>	D	0,028								
6.	<i>T. wainsteini</i>			D	0,068			C	0,430		
7.	<i>T. praefatus</i>							C	0,127		
8.	<i>T. caudatus</i>							C	0,127	R	0,090
9.	<i>Paralorryia ferula</i>									D	0,022
10.	<i>P. mali</i>									D	0,067
11.	<i>Triophtydeus immanis</i>							R	0,101	C	0,382
12.	<i>T. ineditus</i>							D	0,051		
13.	<i>T. flatus</i>							C	0,304		
14.	<i>Zetzellia mali</i>	D	0,028					D	0,025	D	0,022
15.	<i>Bryobia redicorzevi</i>							D	0,025		
16.	<i>Panonychus ulmi</i>									C	0,202
17.	<i>Amphitetranychus viennensis</i>							D	0,051	C	0,180

№	Species of mites	«Condrita»		«Skoreni»		«Kalfa»		«Flaminda»		«Dubasari»	
		A	Js	A	Js	A	Js	A	Js	A	Js
18.	<i>Schizotetranychus fraxini</i>	D	0,056			C	0,522				
19.	<i>S. orientalis</i>			R	0,102						
20.	<i>Cenopalpus pulcher</i>	D	0,028	R	0,068			D	0,025		
21.	<i>C. piger</i>	D	0,028	D	0,305						
22.	<i>C. pennatisetis</i>	R	0,139								
23.	<i>Cheyletus aversor</i>									D	0,022
24.	Anystis sp.n. 5							D	0,051		
25.	<i>Amblyseius finlandicus</i>	A	0,611	R	0,068	C	0,435	R	0,051	C	0,562
26.	<i>A. andersoni</i>							C	0,329	D	0,022
27.	<i>Typhloctonus formosus</i>	C	0,194			D	0,174			D	0,022
28.	<i>T. sguamiger</i>	R	0,111	R	0,102	D	0,087				
29.	<i>Typhlodromus cotoneastri</i>	C	0,333	D	0,305			D	0,025		
30.	<i>T. pyri</i>	D	0,056					R	0,076		
31.	<i>T. rodovae</i>	D	0,028	D	0,068						
32.	<i>Anthoseius caudiglans</i>	C	0,194								
33.	<i>A. inopinatus</i>	D	0,028								
34.	<i>A. pirianykae</i>			D	0,102						
35.	<i>Phytoseius echinus</i>			C	0,305					R	0,090
36.	<i>P. juvenis</i>			C	0,203			R	0,076	D	0,045
37.	<i>Kampimodromus aberrans</i>	D	0,028	R	0,068	R	0,348			D	0,022
38.	<i>Paraseiulus soleiger</i>	D	0,028							D	0,022
		18		13		6		18		17	

In «Condrita» forest stand 12 rare and 2 endangered species of mites were found. There were identified the dominant predators *Amblyseius finlandicus*, *Typhlodromus cotoneastri* and phytophagous species *Cenopalpus pennatisetis*. In «Skoreni» forest stand 5 very rare and 5 endangered species of mites were found. The dominant predators *Phytoseius echinus*, *Typhlodromus cotoneastri* and phytophagous *Cenopalpus piger* were identified. In «Kalfa» reserve 2 very rare and one rare species of mite were found. The dominant predators *Amblyseius finlandicus*, *Kampimodromus aberrans* and phytophagous species *Tydeus californicus*, *Schizotetranychus fraxini* were registered. In «Flaminda» forest stand 8 very rare, 5 rare species of mites and 1 new - *Anystis sp. n. 5* species were recorded. There were identified the dominant predators *Amblyseius andersoni*, *Kampimodromus aberrans* and phytophagous *Triophtydeus flatus*, *Tydeus wainsteini*. In «Dubasari» forest stand 10 rare and 2 endangered species of mites were found. The dominant predator *Amblyseius finlandicus* and phytophagous *Panonychus ulmi* were identified.

The diversity of mites is similar in all the reserves, is characterized by stable relationship between trophic groups of phytophagous and predators, which is a

determinant factor of the acarian fauna distribution on the territory of the Republic of Moldova. The reserves are different after the fauna of rare and endangered species. The highest number of rare species was recorded in the «Condrita» forest stand.

Fauna of tree mites in nature reserves is represented by 38 species, of which 13 are rare, 6 - very rare and 1 - new species (*Anystis sp. n. 5*) for the fauna of the Republic of Moldova.

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MITE FAUNA OF CUCURBITA PEPO VAR. GIROMONTINA

Kulikova Ludmila

Institute of Zoology, Academy of Sciences of Moldova, Chisinau
e-mail: zoologie@mail.ru

Cucurbita pepo var. giromontina is a herbaceous annual plant from the family Cucurbitaceae. Courgettes are cross-monoecious plants, cold-resistant and drought-resistant. The study of diversity and trophic relations of phytophagous mites allows foreseeing the development of their population density. The examination of *Cucurbita pepo var. giromontina* allowed to fill up the data on the species diversity of the vegetable's mites.



Figure 1. *Schizotetranychus prunicola*



Figure 2. *Pronematus anconai*

The investigations in a field of *Cucurbita pepo* var. *giromontina* were conducted near Susleni village, Orhei district of the Republic of Moldova at a distance of 25, 100 meters from the edge of the field in 2010.

Vegetables samples were leaves picked from each 10 plant on a sector with the length of 100 meters. Mites were counted under the microscope MBS-10. The species composition of mites was determined under a microscope Leica CME.

For the first time on *Cucurbita pepo* var. *giromontina* phytophagous mites *Pronematus anconai* and *Schizotetranychus prunicola* of families Tydeidae Kramer, 1877 and Tetranychidae Donnadieu, 1975 were found (figure 1, 2).

Phytophagous mite *Schizotetranychus prunicola* was found in quantity of 23 individuals per leaf and is an economically significant pest. By gnawing the cell walls, mites suck the cell contents, which lead to the appearance of pale yellow spots on the leaves and general weakening of the plant. The changes in the quality of food resources (thickening of the cell wall) stimulate the movement of mites on the plant. It was recorded that the treatment field by selective preparations were not conducted by the vegetable crops owner.

For the first time in the *Cucurbita pepo* var. *giromontina* the phytophagous mites *Pronematus anconai* and *Schizotetranychus prunicola* were found.

The study was performed within the project 11.817.08.16A financed by ASM.

THE STUDY OF EVALUATION OF THE INFORMATIONAL LEVEL OF POPULATION ABOUT THE INVASION WITH *E. GRANULOSUS*

Lungu Vera

The National Centre of Public Health, Chisinau, the Republic of Moldova
e-mail: vlungu@cnspl.md

Although during the years has been performed many advances in the field of Echinococcosis, this pathology remains a current global problem of public health, being one of the worst parasitic diseases with a high incidence. This zoonosis affects and the Republic of Moldova, our country being adjacent one with an extensive region, where echinococcosis is endemic, to that of the basin of Mediterranean Sea. According to recent research in the last decade, Republic of Moldova shows medium morbidity through human echinococcosis of 4,3 per 100 000 population, in accordance with the level of spread of the invasion, it is on the first place in Europe. In the top of helminthiasis the cystic echinococcosis is placed on fourth place, but through the severe impact on the health of the population of the republic this invasion represents a major problem. The disease often affects young people, able for work, very high being the rate of infected children. The high quota of children and young people in morbidity structure confirms the presence of active transmission of the etiologic agent.

Because in prevention and control of echinococcosis an important role has the sanitary culture of the population, the goal of this study was to estimate the level of information of the population about the invasion of *E. granulosus*. Dur-

ing the research the method of medico- sociological survey was used. For this purpose we prepared a survey with 22 questions, the selection of which was intended to highlight which occupations and habits of the population favors and contribute to the spread and maintenance of the etiologic agent in nature. The survey was distributed to the population in 22 districts of the country, inclusively in two municipalities. Were investigated both, adults ($86,5 \pm 1,4\%$) and as well as children ($13,5\% \pm 3,7\%$). It was took into account the fact that to be interviewed people who practice different types of activity, including and health workers. Thus, depending on the occupation, the sample was presented by $32,6 \pm 3,1\%$ laborers and officers, $26,4 \pm 3,2\%$ farmers, $26,0 \pm 3,2\%$ intellectuals, half of which - medical workers, $14,9 \pm 3,5\%$ students and pupils. From rural areas were interviewed 639 ($89,9 \pm 1,2\%$) persons, from the city 72 ($10,1 \pm 3,6\%$). The women and men respectively constituted $50,6 \pm 2,6$ and $49,4 \pm 2,7\%$ from interviewed group. In total we studied data from 711 surveys.

Evaluation of survey data establish that in the republic there are all conditions that contribute to the implementation mechanism of transmission and persistence of the etiologic agent in the environment. Thus, in the households of $69,1 \pm 2,1\%$ interviewed persons the slaughter of farming domestically animals is practiced more frequently, $71,5 \pm 2,0\%$ of cases, in the absence of the veterinary service staff supervision. On the question how to proceed if at slaughter they detect diseased organs, $25,5 \pm 3,2\%$ of them stated that throws them and $26,7 \pm 3,2\%$ - they feed the dog with them. It is interesting the fact that in the country is a tradition of feeding dogs with raw food scraps, which is confirmed by $74,8 \pm 1,9\%$ of respondents, more than half of them non - practiced, never, their deworming from various reasons, and in other cases, $62,6 \pm 2,7\%$, because of the lack of information. On this background population basically is not informed about the actuality and consequences of these parasites. In the sample of interviewees $38,6 \pm 2,9\%$, regardless of age and type of activity, do not know anything about echinococcosis, and those who think that they know something, very often have wrong knowledge. Thus, $45,5 \pm 3,5\%$ of them think that the disease is transmitted from the sick man and $60,3 \pm 3,0\%$ - that the disease is transmitted from eating of sheep meat.

In conclusion it is emphasized that in the system of monitoring and control of echinococcosis an important role should be assigned to the educational department for health. The preventive measures need to be undertaken by all means, including informational and sanitary education companies concerning the method of contamination and severe consequences of these parasites.

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NEMATOPHAGOUS BACTERIA OF GEN. *RHIZOBIUM*

Melnic Maria¹, Rusu Ștefan¹, Onofraș Leonid², Todiraș Vasile², Lungu Angela²

¹*Institute of Zoology, Academy of Sciences of Moldova, Chisinau*

²*Institute of Microbiology and Biotechnology, Academy of Sciences of Moldova, Chisinau*

Among the natural enemies of agricultural crop parasitic nematodes stand out the nematophagous bacteria (*Pseudomonas*, *Bacillus*, *Pasteuria*, etc.), which are the most numerous organisms in the soil. The nematophagous activity of bacteria and fungi on nematode species that form cyst (*Heterodera*, *Globodera*) or galls (*Meloidogyne*) on roots was demonstrated (Stirling, 1991). The biological control is considered as new effective method in regulating parasitic nematode species, because it causes the reduction of toxic effect of their excessive number on plants. Among the abundant microorganisms in the soil, about 2-5% are the PGPR rhizobacteria (plant growth promoting rhizobacteria), which have increasing activation effect upon the plants. Interaction PGPR-nematodes has been extensively studied and recommended for use in density regulation of phytoparasite nematodes in plants (Kloepper et al., 1989).

In the studies conducted in laboratory conditions (2011-2012) was tested the lethal efficacy of cultural liquids from bacteria from gen. *Rhizobium* (*Rh. japonicum* RD₂, *Rh. japonicum* 646a, *Rh. phaseoli* F₁ and *Rh. meliloti* 19k) in contact with parasitic nematodes *Ditylenchus destructor*, *D. dipsaci* at different time intervals - 24 ... 48 ... 50 ... 72 hours. In experiments culture liquids obtained as result of *Rhizobium* bacteria growing under stirring for 3 days were used. The nematodes *Ditylenchus destructor* were extracted from potato tubers infected with ditylenchosis on third stage of disease, when the affected tissue contained only individuals of this species and *Ditylenchus dipsaci* - from affected garlic cloves. Test results showed that *Rh. japonicum* RD₂ and *Rh. japonicum* 646a exercise lethal action on nematodes in proportions of 95-100% during 48-72 hours. The species *Rhizobium japonicum* after 7-10 days contact carries destructive influence upon internal organs of parasitic nematodes - intestine, ovary, oviduct and so on, which lose their shape and became completely deformed. *Rh. phaseoli* F₁ activity is lower-82%, during 72 hours, and of *Rh. meliloti* 19k hasn't shown nematicide activity.

Testing of *Rhizobium* bacteria influence upon plant development, which was conducted in parallel, showed that the studied species, besides the well-known property to fix the molecular nitrogen from the atmosphere in symbiosis with leguminous plants, show additional stimulation of plant growth and development, stimulation of seed germination and increase plant productivity (Onofraș et al., 2013). According to some authors (Sikora, 2003, Mishra et al., 2006) the types of gen. *Rhizobium* are effective not only in reducing parasitic nematodes,

but also in other dangerous pathogens for plants such as fungi, bacteria, viruses that cause them serious diseases.

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PGPR BACTERIA IN THE PERSPECTIVE OF THE BIOLOGICAL CONTROL USE

Melnic Maria¹, Erhan Dumitru¹, Rusu Ștefan¹,
Onofraș Leonid², Todiraș Vasile²

¹*Institute of Zoology, Academy of Sciences of Moldova, Chisinau*

²*Institute of Microbiology and Biotechnology,
Academy of Sciences of Moldova, Chisinau*

It is known that along with the phytopathogenic organisms in the soil of crop plants rhizosphere, dominant populations (2-5%) form the majority of saprophytic rhizobacteria species, that stimulate the protective/resistance mechanisms of PGPR plants (plant growth promoting rhizobacteria) are *Pseudomonas*, *Bacillus*, *Paecylomices*, *Rhizobium* etc., which are antagonistic to both the harmful microflora, as well as to phytoparasitic nematodes.

In the researches conducted *in vitro*, it was tested the nematicidal efficacy of 9 stems of *Pseudomonas* bacteria – *P. fluorescens*, *Pseud. sp. 3RPG*, *Pseud. sp. 4RPG*, *Pseud. sp. 1RRă*, *Pseud. sp. 4RRă*, *Pseud. sp. 4RBN*, *Pseud. sp. 5RBN*, *Pseud. sp. 2RȘB*, *Pseud. sp. 3RȘB*; and 2 stems of *Azotobacter* - *RRA₇*, *RRA₈*, in contact with the *Ditylenchus destructor* nematode, which is a parasite of potato tubers. Liquids with bacteria cultures were used isolated from the rhizosphere and rizoplan areas of soybean plants from different regions of the Republic of Moldova. The experiments took place in the laboratory, under sterile conditions, at 25-27C, at different time intervals: 1, 2, 4, 6, 8, 21, 24, 48, 72 hours and 7 to 14 days. The study has revealed 4 stems of bacteria (4 *RBN*, 2 *RȘB*, 3 *RȘB*, *P. fluorescens*) of the *Pseudomonas* genus, which caused mortality of *D. destructor*

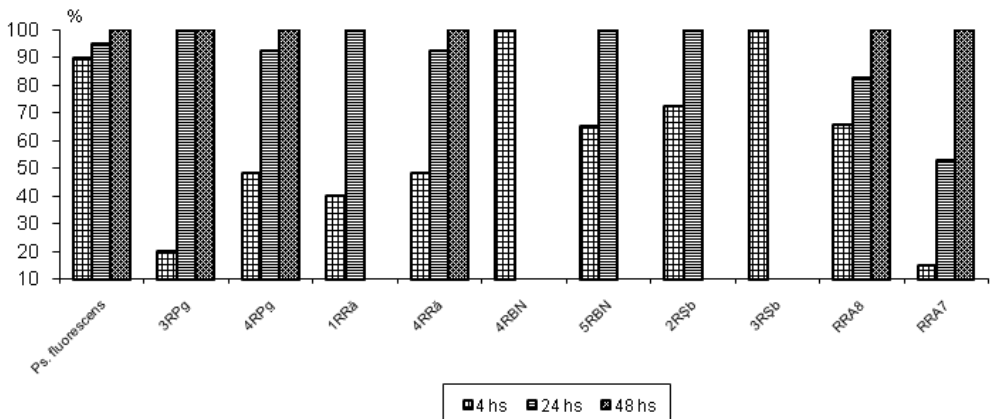


Figure 1. Mortality (%) of *D. destructor* in contact with the *Pseudomonas* and *Azotobacter* bacteria at different times of exposure

from 72.5 to 98.0%, in a period of only 4 hours (fig. 1). The other 5 species (3 *RPg*, 4 *RPg*, 1 *RRă*, 4 *RRă* and 5 *RBN*) also proved to be quite active, the lethal effectiveness on parasites being 92.0 to 98.0% for a period of 24 hours. *Azotobacter* Bacteria- *RRA*₇ and *RRA*₈ exerted nematocidal action by 98.0% for 48 hours.

A special interest is presented by the species *P. fluorescens*, which was evidenced by increased nematocidal efficacy. Already after 20-30 min the nematodes gain spiral forms, which demonstrates the action of liquid with cultures. After one hour of contact the percentage of nematodes that are not moving increases to 20-30%; after 2 hours – 55-60%; a mortality of 95-100% is observed after a contact of 24-48 hours. At intervals of 7-8 days, in the experimental variants, some nematodes start to deform (fig. 2). Under the microscope, there is a total destruction of the internal organs – the intestine, ovary, oviduct etc., located in the general body cavity and in particular, in the vulva-anus region, which lose their contours, turning into a homogenous mass. In previous researches (Melnic et al., 2009; 2011) it was observed that some stems of *Pseudomonas* exert toxic action on another harmful parasite – onion mite *Rhizoglyphus*, a secondary parasite, very common in potato tuber tissue infected with *D. destructor*. Laboratory tests showed that the *Pseudomonas* and *Azotobacter* bacteria also have the ability to stimulate seed germination, plant growth and development of soybean, and some stems are antagonistic to *Verticillium dahliae* pathogenic micromycetes. A high efficacy of *P. fluorescens*, *P. aeruginosa* was evaluated on galic nematode larvae *Meloidogyne incognita*, *M. Javanica*, which are root pests of tomato plants

(Ashoub, Amara, 2010; Hanna et al., 1999; Siddiqui, Shaukat, 2002). The priorities for use of PGPR bacteria, including stems of *Pseudomonas* and *Azotobacter* investigated by us, consist in the fact that they can be obtained *in vitro*, used to treat seed material, stimulates the protective/resistance mechanisms and do not cause phytotoxicity on plant development.

The study was performed within the project 11.817.08.13F financed by ASM.

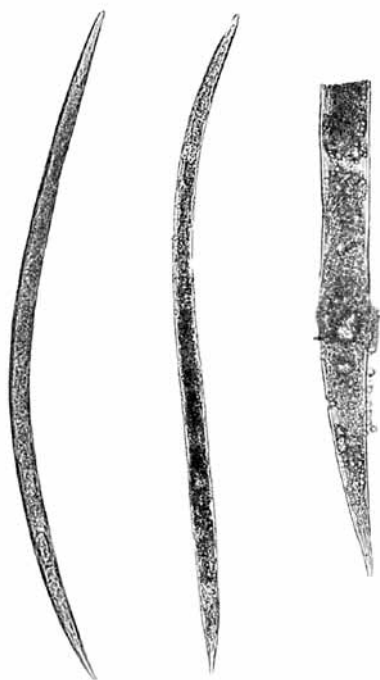


Figure 2. *D. destructor* in contact with the *P. fluorescens*: 1 – before contact; 2 – after 7-8 days; 3 – posterior end of the body

**THE STUDY OF COMMUNITIES OF COPROBIONTE ROVE
BEETLES (COLEOPTERA, STAPHYLINIDAE) IN NATURAL
GRASSLANDS IN REPUBLIC OF MOLDOVA**

Mihailov Irina

*Institute of Zoology, Academy of Sciences of Moldova, Chisinau
e-mail: irinus1982@yahoo.com*

Due to extensive areas with rich herbaceous vegetation (spontaneous plants - grasses, leguminous perennials) and animal waste, natural grasslands are «biocenotic basis» for staphylinid [1].

According to research by Babenko [3], manure is considered an «absorbing sponge» and staphylinids accumulation, a phenomenon explained by existence of: nutrient sources, positive conditions for breeding and growth, housing during the dry summer and winter time (for hibernation) and ability to participate in the process of decomposition of organic matter [5].

In summer and fall, the manure of cattle and horses, due to the rich nutrient content of undigested plant (maize and wheat), microspores of mushrooms, eggs, larvae, pupae of flies and other insects, earthworms, etc. the number of staphylinid is growing.

In the natural grassland from Dubăsari district, Cocieri town, the maximum number of collected rove (5133 individuals, 76 species belonging to eight sub-families: *Omalinae*, *Proteininae*, *Paederinae*, *Tachyporinae*, *Steninae*, *Oxytelinae*, *Aleocharinae* and *Staphylininae*) was obtained from livestock manure: of the cattle and horses.

Staphylinids of *Philonthus* genus are permanent «residents» of livestock manure. They feed and develop in piles of dung from the area of farms. *Philonthus* species specialize in exploiting of «cakes» of dung are *Philonthus quisquiliarius*, *Ph. debilis*, *Ph. ebeninus*, *Ph. politus*, *Ph. punctus*, *Ph. spinipes*, *Ph. varius*, *Ph. albipes*, *Ph. nitidulus*, *Ph. sordidus*, *Ph. concinnus*, *Ph. cruentatus*, *Ph. agilis*, *Ph. decorus*, *Ph. dimidiatus*, *Ph. micans*, *Ph. umbratilis*, *Ph. rectangulus*, *Ph. longicornis*, *Ph. fulvipes*, etc. [2, 4]. Some representatives of the genus *Platystethus*, *Anotylus*, *Gyrohypnus* and *Creophilus*. Most of them only accumulate in fresh manure (*Platystethus* and *Oxytelus*) and others (*Tachinus*, *Staphylinus* and *Platydracus*) are less demanding for organic layer moisture.

The investigations had shown that domestic cattle manure are the most populated by rove and fauna diversity of horse manure differs by a smaller number. Staphylinid common for manure of cattle and horses include a number of 39 species. *Cilea silphoides*, *Tachinus lignorum*, *Tachyporus nitidulus*, *T. hypnorum*, *Aleochara bipustulata*, *A. curtula*, *A. intricata*, *Atheta oblita*, *A. hypnorum*, *Lio-gluta granigera*, *Leptusa fumida*, *Oxyopoda acuminata*, *O. elongatula*, *Anotylus insecatus*, *A. nitidulus*, *A. rugosus*, *A. sculpturatus*, *A. tetracarinatus*, *Oxytelus laqueatus*, *O. sculptus*, *Platystethus nitens*, *P. arenarius*, *Gabrieus piliger*, *Gabronthus limbatus*, *Philonthus albipes*, *Ph. carbonarius*, *Ph. coprophilus*, *Ph.*

cruentatus, *Ph. discoideus*, *Ph. debilis*, *Ph. parvicornis*, *Ph. rectangulus*, *Ph. rufipes*, *Ph. sanguinolentus*, *Ph. spinipes*, *Ph. varians*, *Ontholestes tessellatus*, *Gyrohyphus fracticornis* and *Leptacinus batychrus* [1].

Staphylinid fauna of this habitat type can be divided into classes by dominance index: D_1 - 59 species subrecedente, D_2 - 8 species recedente, D_3 - 2 subdominant species, D_4 - 5 dominant species, D_5 - 2 species eudominant (*Oxytelus sculptus* - 16,93%, *Anotylus rugosus* - 14,92%). Staphylinid could be differentiated by constant index: C_1 - 47 accidental species, C_2 - 13 accessories species, C_3 - 7 constant species and C_4 - 9 euconstant species. Staphylinid number by ecological significance index is ranked W_1 - 41 species, W_2 , W_3 - 28, W_4 , W_5 - 7 species. Natural grassland environment indicator value is (Is) - 0,079, (Ish) - 1,320, (ϵ) -0,130.

Staphylinid fauna livestock manure (cattle, horses) of natural grasslands, according to the number of species and specimens, represents a quite pronounced value. The richest coprobionte staphylinid is subfamily *Staphylinidae* and according to ecological features such as these, they are included in the polybionte group of species.

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SPATIAL DISTRIBUTION OF *DERMACENTOR RETICULATUS* IN THE REPUBLIC OF MOLDOVA

Morozov Alexandr, Uspenskaya Inga, Sitnicova Natalia,
Movila Alexandr, Toderas Ion

Institute of Zoology, Academy of Sciences of Moldova, Chisinau

Dermacentor spp. ticks are well known vectors of various tick-borne pathogens, e.g. various species of Rickettsia Spotted Fever group, piroplasmoses and arboviruses, representatives of which have been identified on the territory of the Republic of Moldova.

On the territory of the Republic of Moldova ticks from genus *Dermacentor* are presented by 2 species *Dermacentor marginatus* Sulzer 1776 and *D. reticulatus* Fabricius 1794. The whole area between rivers Dniester and Prut is in the domain of sympatry of this 2 species. The area of *D. marginatus* lies to the south of that of *D. reticulatus*. Southern boundary of *D. reticulatus* and the northern boundary of *D. marginatus* overlap almost everywhere and in large parts of both species live all over the place. Data from 1980s suggests that the *D. reticulatus* species is dominant in urbanocenoses and *D. marginatus* - in agroocenoses.

The aim of our study was to investigate the current number and distribution of ticks from g. *Dermacentor* in Moldova and to compare these data with the results of a previous researches. Collecting of ticks was conducted during the period 2010-2013. The classical parasitological methods were applied for tick collection. Ticks were collected in 8 from 9 counties, missing only Soroca county. Ticks were collected in agroocenoses, urbanocenoses and from nature reserves if there was a possibility.

In the survey conducted in the 1960-80s, *D. reticulatus* was only the forth common species, yielding to the number of *Ixodes ricinus*, *Haemaphysalis punctata* and *D. marginatus*. In the present survey, *D. reticulatus* became the second most common species occurring almost in all counties involved in the monitoring and showed high prevalence, while *D. marginatus* is third and *H. punctata* became the number four. Also worth noting is that *D. reticulatus* became common for agroocenoses. The average number of *D. reticulatus* for all the studied areas of Moldova in 1989 was 0.8-1 tick for 200 meters, now given indicator makes 2-2.5 tick per 200m route with the flag.

D. reticulatus ticks are mostly knows as the vectors of *Babesia canis*, pathogen which causes canine babesiosis. With the increasing number of this tick species it can lead to intensification of the transmission rate of *B. canis* and probably other *D. reticulatus*-borne diseases (e.g. tularemia and tick-borne lymphadenopathy) in the region.

**CARABID BEETLES(COLEOPTERA: CARABIDAE) DIVERSITY
AND SEASONAL ABUNDANCE IN TWO NATURAL HABITATS OF
JAMAICA BAY WILDLIFE REFUGE**

Neculiseanu Zaharia

USA, New York, e-mail: zneculiseanu@yahoo.com

The research was conducted in wet meadow (site 1) and shrub thickets (site 2) habitats, both located in the Jamaica Bay Wildlife Refuge (Gateway National Recreation Area, New York). Ground beetles (Carabidae) were pitfall-trapped from May to October 2008. Totals of 210 beetles representing 27 species and 20 beetles representing 11 species were trapped from site 1 and site 2, respectively. Harpalinae was the most abundant subfamily, with a total of 20 species. This subfamily contributed to 77.39 % of all caught individuals. *Chlaenius sericeus* (Forster) was the most abundantly collected species from the site 1, and it was mostly trapped in spring and summer. *Calathus opaculus* LeConte was the most frequent species trapped from the site 2. The majority of carabid beetles trapped from the site 1 belonged to overwinter species as adults, but from the site 2 were species overwintering as larvae. Beetles activity was greatest in the site 1 in the spring-summer period, with activity declining in autumn; in the site 2 greatest activity was in spring and autumn.

In site 1 it was collected an average of 4.8 ± 1.23 in the spring time, in summer 5.3 ± 1.62 and in autumn 2.1 ± 0.45 carabids per trap per wk, whereas in the site 2 in spring were collected 1.5 ± 0.37 , in summer 1.3 ± 0.28 and in autumn 3.0 ± 1.94 carabids per trap per wk. In both sites also varied the average catches of specimens per 10 traps per day: in site 1 the average catches constituted 14.3 specimens per 10 trap per day in spring time, in summer – 13.0, in autumn – 2.7, whereas the average catches in the second site was lower than in the first site, and constituted 1.3 specimens per 10 trap per d. in the spring time, in the summer 0.4, and in the autumn 1.7. The ratio of female to male in all carabids caught in the traps in both sites was 1.34:1.

We found a great diversity of the carabids species in the sampled sites, although the number of species differed between both sites. In the wet meadow the Simpson's index had the highest value in the summer (0.441), and the lower value in the spring (0.332), and autumn (0.328), but in the shrub thickets this index had the highest value in the autumn (1.457) and in the summer (0.664), comparing to the spring (0.368). On the contrary, Shannon's index, had the highest value in both sites in the spring (3.655 and 2.416) and value of this index decreased throughout summer (3.246 and 1.520) and autumn (2.944 and 1.417), respectively.

**INVASIVE CARABIDS AND STAPHYLINIDS
(COLEOPTERA: CARABIDAE, STAPHYLINIDAE) OCCURRING IN
JAMAICA BAY WILDLIFE REFUGE**

Neculiseanu Zaharia

USA, New York, e-mail: zneculiseanu@yahoo.com

During field research effectuated between 2008-2009 in the Jamaica Bay Wildlife Refuge (Gateway National Recreation Area, New York) were found 98 carabids and 30 staphylinids species, 10 of which are non-native (introduced) species. Many of these species were introduced from other parts of the world as Europe, Asia, Central America, Palearctic region.

FAMILY CARABIDAE (GROUND BEETLES)

Carabus nemoralis O. F. Müller This Eurosiberian species was first reported in Canada in 1870. In North America this species is widely distributed (in 13 states of US and in 33 geographical entities of America North of Mexico) and has been found in the city gardens and open woods. Monovoltine, a spring-summer breeding species, overwintering as larva and adult, sometimes occur in the urban habitats with abundant vegetation . Some adults were captured in the pitfall traps installed near water in the summer and autumn.

Pterostichus melanarius Illiger The species was firstly recorded it in Nova Scotia in 1926.

This Eurosiberian species is widely distributed in North America, but it is more frequently throughout the northern states and Canada. Few specimens were collected in pitfall traps in the site 2 in the autumn. This eurytopic species is overwintering as larva, seldom as adult. Some authors demonstrated that it mainly prefers open habitat and is well adopted to agricultural field conditions and is abundant in many agricultural fields. It was also confirmed by other authors that this species occur in the forests and in the gardens too.

Amara bifrons (Gyllenhal) This introduced Palearctic species in the North America is found in dry, open habitats , in sandy places with thin vegetation. Adults were collected by pitfall traps in early October.

Amara aenea (DeGeer) This introduced Euroasian species in the North America is distributed in different areas along the North Atlantic Coast. Adults inhabits usually open, sun-exposed grossland on sandy soil. In JBWR species was found in early August under leaves and on sidewalks

Harpalus rubripes (Duftschmid). First time was recorded in North America. This Palearctic species was described in New Hampshire by Bell and Davidson (1987), and in Connecticut collected by Krinsky & Oliver (1988). Bousquet & Laroche (1993) showed that this species in America north of Mexico is known from Connecticut, New Hampshire and Rhode Island. Our data demonstrated the existence of this species also in New York. This summer-autumn breeding species, is mixophagous and is overwintering either as larva or adult.

FAMILY STAPHYLINIDAE (ROVE BEETLES)

Sepedophilus littoreus (Linnaeus) is native from Europe, introduced in North America before 1866. First was recorded in Pennsylvania. This species is known more commonly as rove beetles, which have most of their abdominal segments exposed. In JBWR we found the adults under loose and decayed bark.

Bolitobius cingulatus Mannerheim This Palearctic species of the genus *Bolitobius* was found in wood under leaf litter of East Pond of JBWR.

Xantholinus linearis Olivier Two of introduced Palearctic species of *Xantholinus* genus are known in North America. *X. linearis* occurred in grass litter of open habitats. In North America species is widespread and very common in moss of open habitats. The adult of this species is black, shiny, elytra often brownish, the dorsal row of pronotum has 12-15 punctures, lateral it has 9-12 each.

Creophilus maxillosus villosus Gravenhorst . This is a common species, very widely distributed in the Palearctic region, also in Central America, Mexico and in West Indies. In the JBWR were collected few specimens in the spring and fall, in the dung and on the raccoon carrion (*Procyon lotor*). The species is characterized by shiny black color, large eyes, mandibles close across each other in the front , golden setae on posterior angles of the head and slightly on the anterior angle of pronotum, , elytra and abdomen with densely white setae, finely punctate.

Philonthus politus (Linnaeus) This species was introduced into North America, mostly from Europe. This species belong to the group of species of the genus *Philonthus* who have 4 punctures in dorsal rows of pronotum and dilated front tarsi. Most specimens (adults and larvae) were collected during spring-summer on the carrion raccoon (*Procyon lotor*). This is spring-summer breeders, overwintering as adult. Adults emerge from hibernation in April. Some mating pairs was observed on July-August between 6 and 7 PM and also between 10 and 11 PM. The ovipositional period was 45-50 ds. The total fecundity ranged between 95 and 110. Eggs were laid in the soil, usually separately.

RECEPTIVITY OF SOME APPROVED SOYBEAN CULTURES TO THE TREATMENT WITH NODOSITY BACTERIA

Onofraș L.¹, Iacobuta M.², Vozian V.², Todiraș V.¹,
Prisacari S.¹, Mohova T.¹, Lungu A.¹

¹*Institute of Microbiology and Biotechnology of ASM*

²*Research Institute for field crops „Selectia”*

At present in the Republic of Moldova the soybean is cultivated on a surface of 40-50 thousand hectares, being considered as source of biologic nitrogen in phytotechny, of vegetal proteins for nutrition and increasing of nutrient quality.

Taking into account that for solving the problem of protein deficit an essential role is played by soybean plants, its productivity increasing and quality improvement of obtained crop became one of the important tasks of republic agriculture.

In order to obtain increased harvest of high quality during soybean cultivation it is necessary to use microbial preparations produced on the basis of nodosity bacteria. But, because the receptivity is different depending on the variety the aim of the study was to establish the reaction of approved varieties (Aura, Indra, Enigma) to the treatment with mentioned bacteria.

The investigation were conducted on the experimental plot of Research Institute for field crops „Selectia” from Balti city in collaboration with the Institute of Microbiology and Biotechnology of A.S.M.

As result of accomplished researches the role of studied soybean varieties peculiarities was emphasized. Thus, the best reaction was registered in Indra variety, where a higher growth (by 20.7%) and accumulation of dry mass (by 22%) comparing with control group was recorded. The nitrogen fixing activity increased by 1.8 times and the bean harvest increased with 210 kg/ha. The content of brut protein and of fats in beans increased with 0,6% and 0,9% respectively.

The result of inoculation with bacteria was less effective in Enigma variety, where at the end of experiment the harvest increasing was only with 20 kg/ha with very low content of brut proteins in beans.

The Aura variety had an average receptivity at treatment with nodosity bacteria and occupied an intermediary place between Indra and Enigma varieties.

As result of obtained data it was concluded that the tested varieties react differently to the process of inoculation with *Rhizobium japonicum*, the possible causes being various: the compatibility degree between the inoculant and inoculated specimen, amount of inoculant optimal for given variety, number of spontaneous bacteria in soil, humidity, temperature etc.

CONTRIBUTIONS TO THE STUDY OF DIVERSITY OF THE BEETLES (INSECTA, COLEOPTERA) IN THE LOWER BASIN OF THE ICHEL RIVER

Pelin Ana, Coadă Viorica, Nedbaliuc Boris

State University of Tiraspol, Chişinău, Moldova

e-mail anapelin@yandex.ru

This work represents the specific diversity of beetles in the lower basin of the Ichel River. The problem of studying and protecting biodiversity is currently one of the main and current directions of research. The area of the lower basin course of the river is surrounding the localities close to Ichel and is under the action of anthropogenic factor, such as: overgrazing, extracting limestone, main station, etc.

The natural area investigated represents a whole sector of the lower course of the Ichel River, located on the stretch between cities Cricova - Vadu-lui-Voda, both part of Chişinău. The area represents a sector of the Ichel River valley, located on the Central Moldavian Plateau, in the region of Eastern Codrii. Its surface has a hilly relief, heavily stripped by ravines and deep valleys, often in

the form of canyons. At the basis of basin there are tertiary rocks, covered with a coating of clay loess and clays. Entomological material was collected using specific methods of the given group in the vegetation period of 2011-2013. Research related to the entomofauna of the lower basin of the Ichel River focuses on three areas: 1) studying wildlife in forested areas, 2) studying entomofauna in open areas, 3) aquatic entomofauna study. For the determination of species we used the sources prescribed for this purpose (Panin S. 1957 Крыжановский О.Л., 1965). After processing in terms of systematic, evidence collected from the lower course of the Ichel River on the route Ciorescu - Hruşeva were identified 91 species of beetles belonging to 18 families. The share of species, Scarabaeidae family is played by 23%, Chrysomelidae 13.18%, Carabidae 12.08%, Curculionidae and Cerambycidae by 7.7%, Coccinellidae, Staphylinidae and Cantharididae by 5.5%, Elateridae and Tenebrionidae by 4.4 % Silphidae and Meloidae by 2.2%, Histeridae, Cucujidae, Oedemeridae, Anthribidae, Gyrinidae and Hydrophilidae by 1.1%. After the number of species best represented is the family Scarabaeidae (21 species), followed by families Chrysomelidae (12 species), Carabidae (11 species), Cerambycidae (7 species), Coccinellidae, and Staphylinidae Cantharididae by (5 species), Tenebrionidae, Elateridae by (4 species) and Meloidae Silphidae by (2 species), Histeridae, Cucujidae, Oedemeridae, Anthribidae, Gyrinidae and Hydrophilidae one species. Systematic list of species of beetles: the class Insecta, order Coleoptera, family Carabidae: *Carabus convexus* F., *Platysma vulgare* L., *Broscus cephalotes* L., *Zabrus tenebrioides* Gz., *Platysma nigrum* Schall, *Agonum muelleri* Hbst., *Platysma cupreum* L., *Harpalus aeneus* F., *Harpalus rufipes* Deg., *Harpalus hirtipes* Panz., *Amara plebeja* Gyll.; family Staphylinidae: *Ocypus olens* Müller, *Paederus riparius* L., *Staphylinus pubescens* Deg., *Staphylinus caesareus* Ced., *Philonthus aeneus* Rossi, family Silphidae: *Silpha atrata* L., *Silpha carinata* Hbst; family Histeridae: *Hololepta plana* Sulz.; family Cantharididae: *Lampyrus noctiluca* L., *Cantharis rustica* Fall., *Cantharis fusca* L., *Cantharis pellucida* F., *Rhagonycha fulva* Scop.; family Elateridae: *Agriotes gurgistanus* Fald., *Agriotes obscurus* L., *Agriotes lineatus* L., *Athous nige* L., family Cucujidae: *Cucujus cinnaberinus* Scop.; family Coccinellidae: *Adalia bipunctata* L., *Psyllobora vigintiduopunctata* L., *Propylaea 14 punctata* L., *Coccinella septempunctata* L., *Harmonia quadrifasciata* Sch.; family Oedemeridae: *Oedemera nobilis* Scop.; family Meloidae: *Meloë proscarabaeus* L., *Meloë rugosus* Marsh.; family Tenebrionidae: *Blaps halophila* Fisch., *Opatrum sabulosum* L., *Blaps mucronata* Latr., *Pedinus femoralis* L.; family Cerambycidae: *Agapanthia villosoviridescens* Deg., *Dorcadion fulvum* Scop., *Dorcadion holosericeum* Kryn., *Leptura rubra* L., *Leptura dubia* Scop., *Leptura virens* L., *Plagionotus arcuatus* L.; family Chrysomelidae: *Chrysomella fastuosa* Scop., *Cryptocephalus violaceus* Laich., *Cryptocephalus sericeus* L., *Cryptocephalus octacosmus* Bed., *Cryptocephalus bipunctatus* L., *Phytodecta rufipes* Deg., *Cassida nebulosa* L., *Clytra quadripunctata* L., *Galeruca tanac-*

eti L., *Entomoscelis adonidis* L., *Leptinotarsa decemlineata* Say., *Phyllotreta nemorum* L.; family Anthribidae: *Anthribus albinus* L.; family Curculionidae: *Cleonus piger* Scop., *Sitona lineatus* L., *Chlorophanus varius* Hbst., *Curculio glandium* Marsh., *Otiorrhynchus ligustici* L., *Lixus iridis* Oliv., *Lixus cardui* Oliv.; family Scarabaeidae: *Melolontha melolontha* L., *Amphimallon solstitialis* L., *Potosia metallica* Herbst., *Gnorimus nobilis* L., *Miltotragus aequinoctialis* L., *Lethrus apterus* Laxmann., *Valgus hemipterus* L., *Onthophagus ovatus* L., *Aphodius bimaculatus* Laxm., *Aphodius rufipes* L., *Onthophagus vacca* L., *Onthophagus amyntas* Oliv., *Aphodius luridus* F., *Epicometis hirta* Poda., *Cetonia aurata* L., *Rhizotrogus aequinoctialis* Hbst., *Copris lunaris* L., *Aphodius fmetarius* L., *Oryctes nasicornis* L., *Trichius flavus* L., *Oniticellus fulvus* Goeze.; family Gyrinidae: *Gyrinus natator* L., family Hydrophilidae *Hydrous piceus* L.

The order Coleoptera in Moldova includes 2000 species but in the area of research at this stage were reported 91 species belonging to 18 families. The study was conducted under institutional project «Study of natural area in the lower course of the Ichel River in order to preserve biodiversity and protect the hydrological and geological objects».

**BIOEFFICACY OF EXOMETABLITES OF STREPTOMYCETES
AND ABAMECTIN SOLUTIONS ON THE ROOT-KNOT NEMATODE
MELOIDOGYNE INCOGNITA IN VITRO**

Poiras Larisa¹, Iurcu-Straistaru Elena^{1,6}, Burteva Svetlana²,
Poiras Nadejda^{3,4}, Laquale S.⁵, Toderas Ion¹, Sasanelli N.⁵

¹*Institute of Zoology, ASM, Chisinau, R. Moldova, poiras@gmail.com;*

²*Institute of Microbiology and Biotechnology, ASM, Chisinau, R. Moldova;*

³*Institute for Agricultural and Fisheries Research ILVO, Belgium;*

⁴*Ghent University, Belgium;* ⁵*Institute for Sustainable Plant Protection, C.N.R., Bari (Italy);* ⁶*State University of Tiraspol, Chisinau, R. Moldova*

Growing of qualitative-quantitative healthy production of vegetables in greenhouses and reduction of negative impacts of phytopathogenic organisms remains the major strategic focus to study the environmentally friendly plant protection measures including biotechnological approaches. Streptomycetes is one of the most attractive sources of biological active substances such as vitamins, alkaloids, enzyme and enzyme inhibitors, antibiotics *etc.* with phytostimulating, antifungal, antibacterial and nematicidal activities (Dicklow *et al.*, 1993; Jaykumar, 2009).

Intensive crop cycles in greenhouses create favourable conditions to spread and develop many soilborne plant parasitic nematodes and plant diseases. Among plant parasitic nematodes particularly important are root-knot nematodes of the genus *Meloidogyne* because of their polyphagous with a wide host range (especially tomato, cucumber and pepper) that cause in greenhouses condition serious yield losses with pathologic changes especially at root level caus-

ing difficulties for plants in nutrients and water uptake. The affected plants are stunted with small and chlorotic leaves; wither shoots, later flowering and small amount of fruits and destruction of root systems with root gall indices ranging between 2 and 4 points according to a 0 - 5 scale. Normally, in greenhouses of the R.Moldova the root-knot nematode attacks vary from 10 - 20 to 40 - 50% and the trophic activity of the second stage juveniles through the mechanical action of the stylets favours penetration and infection of other pathogenic organisms (bacteria and fungi) increasing damages and severity of symptoms.

From the collection of *Streptomyces* (National Collection of Non-pathogenic Microorganisms, ASM) isolated from soils of R.Moldova 4 strains were selected (*S.sp.11*, *S.sp. 22*, *S.sp. 76*, *S.sp.154*) to verify *in vitro* their nematicidal activity. For the nematicidal test invasive juveniles (2nd stage) of *Meloidogyne incognita* (Kofoid & White) Chitwood were extracted from infested tomato roots and soils using the modified Baermann's method (BEZOOIJEN, 2006). Suspensions of invasive juveniles (about 100 specimens) were placed in 3.5 cm diameter Petri dishes and then exometabolites of the selected *Streptomyces* were added with an exposure time of 24 hours (or more). Fresh distilled water was used as control. Each treatment was replicated three times. Petri dishes were kept in a growth cabinet at 25°C. Exometabolites based on abemectin of *S. sp. 11*, *S. sp. 22*, *S. sp. 47*, *S. sp. 76* and *S. sp. 154* were diluted with distilled water for stock solutions (1:200). About 20 - 40% of second stage juveniles lost their vitality and activity by influence of EM *Streptomyces* sp.11, 22, 76 and 154 at high concentration 1:2 during exposure times 0.5 - 2 hours.

In addition a second experiment was carried out considering that abamectin is a mixture containing the disaccharides abamectin B1a and B1b which are differentiated by the presence of an ethyl group. These macrocycles lactones have similar biological and toxicological activities and they are exometabolites produced by the soil bacterium *Streptomyces avermitilis*. A commercial formulation, based on abamectin, Vertimec (18 g/L), normally utilized in agriculture against insects was used in an *in vitro* test to verify its nematicidal activity against an Italian population of *M. incognita*, at different concentrations (0, 0.125, 0.25, 0.5, 0.75 and 1 mL/L) and exposure times (24, 48, 96, 168 and 336 hrs). Batches of 20 *M. incognita* egg masses on 2 cm diameter of sieves (215 µm apertures) put in a 3.5 cm diam Petri dish were prepared from infested tomato roots and subjected to the different treatments. Four replications per each combination concentration x exposure time were considered. After treatments batches were transferred and incubated in a growth cabinet at 25 °C for the hatching test. Emerged juveniles were removed and counted at weekly intervals, renewing the hatching agent (distilled water) at the same time, over a twelve weeks period. At the end of the *in vitro* experiment egg masses were immersed in a 1% sodium hypochlorite aqueous solution and the unhatched eggs were counted. Numbers of second stage juveniles emerging

weekly were expressed as cumulative percentages of the total egg content of the egg masses. Data were subjected to 2 x 2 factorial analysis of variance and means compared by Least Significance Difference's Test after transformation in arcsen root square percentage values.

All concentrations from 0.125 to 1 mL/L significantly reduced the percentage hatch of *M. incognita* eggs in comparison to the untreated control (0 mL/L) (88.7% egg hatch). In all other treatments the percentage hatch ranged between 9% and 0.7% with an average of 2.5%. No statistical differences were found among the treatments with Vertimec.

The effect of the same product was also evaluated on tomato seeds germination using the same concentrations and exposure times above indicated. For each exposure time no significant differences were found in the percentage of germinated seeds among the different treatments including the untreated tomato seeds.

BUMBLEBEE COMMUNITIES IN ANTHROPOGENIC BIOTOPES OF THE TAIGA ZONE

Potapov Grigory, Bolotov Ivan

Institute of Ecological Problems of the North, Arkhangelsk, Russia
e-mail: grigorij-potapov@yandex.ru

Bumblebees (Hymenoptera: Apidae, *Bombus* Latr.) are the most important pollinators of entomophilous plants in natural and agricultural landscapes. If published materials for the European Union show rapid degradation of bumblebees' communities owing to intensive agriculture, the research in European North of Russia will allow to track a completely different situation. In this region a sharp decline of agriculture since the 1990s and development of natural successional processes on agricultural territories have began. Agro-ecosystems, previously occupied large areas, are being overgrown by shrubs and deciduous trees. We can identify patterns of changes in species composition of bumblebees during the succession from agricultural biotopes to native ecosystems of the taiga zone. The aim of this work was the study of bumblebees' assemblages along a gradient of anthropogenic changes of habitats within the taiga zone of the European North of Russia (by way of example the Arkhangelsk Region).

Our research shows that anthropogenic habitats within taiga zone are enriched by bumblebees species of southern origin, which are absent in native habitats of taiga. Species richness in anthropogenic meadows has a maximum level for the European North. However, bumblebee communities under intense anthropogenic impact are characterized by low species richness and predominance of 1–2 species. This is corresponding to the model of extreme environments.

In contrast to anthropogenic meadows, in the majority of cases the native habitats of taiga have only a few individuals of bumblebees. These species are typical for the taiga zone: *B. pascuorum*, *B. hypnorum*, *B. pratorum*, *B. jonellus*, *B. cingulatus* and *B. lucorum*. Low species abundance is due to poor forage base

of entomophilous plants during the summer season in native habitats of taiga. There are usually present only members of the Ericaceae.

In the process of succession from agro-ecosystems to native communities of the taiga zone is being increased the level of species richness within bumblebees' assemblages. In the zonal climax communities the species number and abundance of bumblebees is being negligible.

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THE ROLE OF EARTHWORMS IN SOIL FORMATION PROCESSES

Rusnac Veaceslav, Cojocaru Olesia, Kuharuk Ecaterina

Institute of Pedology, Agrochemistry and Soil Protection

«N. Dimo», Chisinau, Moldova

E-mail: veacekrus@gmail.com

Today, soil science is impossible to imagine without the close contact of the organisms living in the soil, the laws of their existence and processes of interaction between living matter and all other soil constituents. Soil fauna is very diverse and plentiful, and it takes an active part in the life of the soil. The great merit in increasing the fertility of the soil and soil-forming processes owned by the activities of earthworms.

Earthworms (earthworms) in Moldova are mostly species from lumbricids (Lumbricidae). This is mostly large species belonging to the macro fauna. All earthworms are geobionty true.

The activities of earthworms on soil are very diverse. Creating deep and numerous passages, sometimes reaching up to a depth of two meters or more, increase the porosity of the soil, facilitates the penetration of moisture, air, and the plant roots. On one square meter of soil, the total length of the worm moves more than 1 km, and sometimes up to 8 km. Spread of earthworms linked to climatic factors and soil types. An important condition is the humidity, during drought is usually worms are killed in large numbers. An earthworm not only improves the physical properties and structure of the soil, but also alters its chemical composition. In soils rich in waste products of earthworms - coprolites, significantly increases the amount of humus, increases the amount of exchangeable bases, acidity is reduced, as well as increased physical properties, increases its porosity, aeration and water-holding capacity and water permeability. If there are moves worms plant roots penetrate much deeper than in their absence. Worms move the soil, bringing it to the surface part of the subsurface and deep covered by plant

material from the litter. Produced by special glands calcium carbonate neutralizes the acid, so coprolites always have a higher pH, than the soil.

His famous book on the role of earthworms in the formation of the fertile soil layer Darwin concluded with the words: «The plow is one of the oldest and most relevant inventions of man, but long before his invention properly treated soil worms and always will be handled by them. It is doubtful that there were still other animals that in the history of the Earth's crust would have occupied so prominent „place”.

THE DIVERSITY OF PARASITIC FAUNA AND THE IMPACT OF CATTLE PARASITOSE ON THE ECONOMY

Rusu Ștefan, Erhan Dumitru, Zamornea Maria, Chihai Oleg,
Rusu V., Pruteanu M., Cilipic G.

Institute of Zoology, Academy of Sciences of Moldova, Chisinau; e-mail: rusus1974@yahoo.com

The parasitosis in animals are largely spread (reaching sometime the level of 100%) and cause considerable economical prejudices in zoo-technical sector. The presence of parasite disease pathogen agents in animals provokes essential changes in metabolism, digestive system, negatively influences the capacity of food assimilation that provoke organism attenuation, decrease of milk production and body weight gain, perforating the skin (Hipodermosis) and, in some cases, even the animal's death. An important factor is that parasitic diseases are dangerous not only for animals but also for humans, some of these diseases could not be treated. The presence and circulation of pathogen agents in the organism of humans and animals considerably reduces the immunologic resistance of their organisms, that provokes, during vaccination process, the crisis in immune response, while becoming sensibilized for pathogenic agents of infections that lead further to various important consequences for public health but also for national economy (Bondari, 1995; Safiulin, 1997; Zgardan et al, 1999; Erhan et al., 2007 etc.).

In order to evaluate the diversity of parasitizes, samples from cattle of different ages and from households placed in the central and northern part of Republic as well those purchased by the Meat-packing Plant from Chișinău city were studied.

The results of the conducted parasitological study on cca 800 cattle revealed that young cattle (23-25 months) purchased from households were more frequently infested with sarcocysts (76,2%), dicrocelium (54,5%) and strongiloidosis (50,0%), and adult cattle – with sarcocysts (97,3%), echinococcus (68,0%), dicrocelium (57,6%) and fasciola (48,8%), while the extensity of mixt invasion was nearly 100%. Calves aged up to one month have been infested with eimeria in 29,2% cases, aged 2-4 months - 67,6%, 6-8 months - 71,9%, 12-14 months - 79,0%, 23-25 months - 55,7%, and adult cattle have been infested in 40,3% of cases. Up to now, 4

species of eimeria have been established: *Eimeria bovis*, *E. zuernii*, *E. smithi* and *E. ellipsoidalis*. *E. bovis* seems to be dominating in fauna of eimeria species.

Comparing the literature data on conducted in 1960-1970 parasitological research in Moldova with results of proper recent research data, there was established that no essential modifications of the level of infestation in cattle, yet the extensity of some parasitizes (mostly biohelminthosis), have been increased.

Unfortunately, in veterinary practice the parasitosis are considered as mono-invasion, and the parasitic associations remain unexamined properly. The results of the own investigations show that phenomena of poliparasitism formed by 6 species, in which the following associations are dominating: fascioles, dicrocelium, echinococcus, strongiloides, eimeria and sarcocistes, in 6,8% cases, of 5 species of parasits (fascioles, dicrocelium, strongiloides, eimeria, sarcocistes) - in 10,6% of cases, from 4 species (dicrocelium, strongiloides, eimeria, sarcocistes) - in 18,5%, from three species (most frequently the following association have been formed: strongiloides, eimeria and sarcocistes; dicrocelium, eimeria and sarcocistes; fasciole, dicrocelium and sarcocistes etc.) – in 34,1% of cases and from two species of parasits (dicrocelium and strongiloides, fascioles and echinococcus, strongiloides and eimeria etc.) - in 23,6% of cases.

As the parasitological research show, helminth-protozoic parasitocenosis are quite commonly spread in cattle and these could be used in realization of treatment and profilactics measures in households of the Republic of Moldova. The preliminary calculations of the annual economical losses on the republican caused by the parasitic diseases of cattle, according to scientific estimations and data related only to descrics in milk production in cattle and loss of daily weight in young cattle reveals about 1,6 milliards of Moldovan lei. These losses may be prevented only through implementation of a complex program of prophylactic and combating measures applied to parasite diseases. Certainly that economical losses caused by parasitic diseases in domestic are not significant. Being this said, the generalization of experimental data related to the losses caused to zootechnical sector requires continuous monitoring necessary for the decision making on the prophylactic and treatment measures. The losses provoked by parasitic diseases in animals with those related to public health are hardly to compare. Many of such invasions are hardly diagnosticated in humans, are not identified during long period of time and practically not treated successfully, that finally cause invalidity and even death of humans.

In this way, the changes that appeared in the zootechnic sector, the dislocation of the cattle from the complexes and farms to the private sector, along with their pasturing on the limited spaces common for diverse species and diverse ages animals have essentially contributed to an increase of extensity of invasions with various parasitic agents. The conducted investigations allow to conclude that cattle are exposed to high level of infestation by various species of endoparasites in the form of mono- and polyinvasions, and in some cases it reaches

100%. The effective methods of prophylactics and treatment may be elaborated only after a profound research of the sistematic, biology and ecology of parasite fauna, the types of interconnections between the parasitocenosis components as well as their influence on the hosting organism.

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DOMESTIC ANIMALS – THE SOURCE FOR POLIPARASITIC POISONING OF PASTURES

Rusu Ștefan¹, Erhan Dumitru¹, Chihai Oleg¹, Pavaliuc Petru², Anghel Tudor¹,
Zamornea Maria¹, Silitrari Elena³

¹*Institute of Zoology, Academy of Sciences of Moldova, Chisinau*

²*Institute of Fisiology and Sanocreatology, Academy of Sciences of Moldova,
Chisinau* ³*State University of Moldova*

e-mail: rusus1974@yahoo.com

The infestation of domestic animals influences negatively the situation with grazing lands that are infested with parazitologic elements. This phenomenon is also considerably influenced by meteorological factors. The grazing lands represents a reservation that conservate fro the long period of time the infesting forms of parasites. The process of spreading out of the parasitic elements is one of the factors for biological spoiling, contaminating the gygienical status of the environment, with severe consequences for the health of humans and animals. Some of the stages of the biological circles of parasites – exogen parasitic forms (eggs, larvaes) evolutionate on the surfaces of grazing lands and in intermedia-tory hosts till the infesting stage (Olteanu Gh. and others, 2001; Erhan D. and others, 2007-2012).

The parasitological examination of the grazing spaces for pasturing of sheep situated in the surroundings of Călărași city during period March-October reveals the existance of infesting larvae of strongiloid type observed on the third stage of development (*L3*), that are characteristic for *gastro-intestinal nematodes* (genus *Trichostrongylus*, *Nematodirus*, *Cooperia*), as well as larvae of *pulmonary nemahtodes* (genus *Dictyocaulus* – third stage). The number of parasitic elements collected from the grazing lands (medium per month) and variations of environmental factors (temperature, precipitations, humidity) are presented in Table 1.

Table 1.

*The quantitative characteristics
of the presence of the gastro-intestinal and pulmonary nematodes
in sheeps on the grazing lands during pasturing season in 2009*

Specification	Number of larvae /100g of grass							
	March	April	May	June	July	August	Sept.	Oct.
Grazing land 1	40	55	65	25	5	4	52	45
Grazing land 2	45	65	70	38	8	6	60	55
Medium/month	42,5	60,0	67,5	31,5	6,5	5,0	56,0	50,0
Temperature(°C)	9,9	9,9	19,2	23,3	25,1	23,5	18,2	9,9
Precipitations (l/m2)	1,0	27,0	10,6	11,6	0	9,6	32,2	54,2
Humidity (%)	60,6	58,2	60,7	57,2	45,2	66,35	72,2	75,6

While analysing the data presented in Table 1 one can observe that in March the number of larvae per 100g of grass obtained from those 2 grazing lands have been in increase since in winter months the central zone of republic have registered the medium positive temperatures that allowed survival of the larvae on the ground. The infestation indices on these lands represent the highest values in May (67,5 larvae/100g of grass) and September (56 larvae/100g of grass), while the medium temperatures were **19,2 °C in May and 18,2 °C in September**, but the precipitations and humidity registered the favorable indices. The minimum number of larvae/100g of grass obtained from both researched grazing lands have been identified for July and August, when the average monthly temperature reached the maximum level of 23,5-25,1 °C, but the level of precipitations and humidity reached the minimum level.

In this way, the variation in number of larvae was directly depending on the environmental factors (temperature, precipitations, humidity) that are fluctuating each month. The maximum level of parasitic spoiling of grazing lands for sheep and goats, during the pasturing season can be characterized by a bifazic aspect, the curve of infestation representing two maximum values (peaks) in May and September.

There were calculated the correlation between the parasitic elements observed on the grazing lands as well as the values of the meteorologic factors (temperature, precipitations and humidity).

There were established that the indices of correlation (r) calculated in relation to the number of larvae and depending on the temperature was 0,67 (\pm), of precipitations - 0,44 (\pm) and that depending on the humidity - 0,03 (\pm).

Therefore, the positive correlation exists between the quantity of parasitic elements on the grazing lands and meteorologic parameters' values, that demonstrates their direct influence on the development of the biologic cycle of parasites and the dynamics of parasites population in general.

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SUSTAINABLE CONTROL METHODS AGAINST ROOT-KNOT NEMATODES IN GREENHOUSES OF ITALY AND R. MOLDOVA

Sasanelli N.¹, Iurcu-Straistaru Elena^{2,5}, Bivol Alexei², Poiras Nadejda^{3,4}, Laquale S.¹, Toderas Ion², Poiras Larisa²

¹*Institute for Sustainable Plant Protection, C.N.R.,
Bari, Italy, n.sasanelli@ba.ipp.cnr.it*

¹*Institute of Zoology, ASM, Chisinau, R. Moldova, poiras@gmail.com*

¹*Institute for Agricultural and Fisheries Research (ILVO), Belgium;
Ghent University, Belgium*

State University of Tiraspol, Chisinau, R. Moldova

Root-knot nematodes (*Meloidogyne* spp.) can cause relevant crop yield losses, especially when associated with soil borne plant pathogens in greenhouse conditions. An effective control of these nematodes has been achieved in the past using chemicals. According to the recent revision of the European legislation (Reg. CE 396/2005; 1095/2007; 33/2008, 299/2008 and 1107/2009) on the use of pesticide in agriculture, that has focused the attention on environmental safety, human and animal health, research on alternatives to chemicals has received a strong impulse. Among nematicides that in liquid formulation can be applied in fertirrigation only ethoprophos, fenamiphos, oxamyl and more recently fos-thiazate survived to the EU revision.

Plant protection from plant parasitic nematodes and soil-borne plant pathogens should rely on the alternative control strategies that are both environmentally sound and economically sustainable at the same time. A wide range of options was considered, including agronomic strategies (green manures, amendments, crop rotations, biofumigations, mycorrhization, grafting, resistant cultivars), physical methods (soil solarization, steam, ozone treatments), biopesticides (mainly fungi and bacteria) (Sasanelli, Ciccamesse, Papajova, 2008) and biocidal plants belonging to the different botanical families, including also the French marigold *Tagetes patula* (*Asteraceae*) (Bivol, Iurcu-Straistaru, Poiras, Bădăraș, 2011), and their derived products (Maistrello, Vaccari, Sasanelli, 2010).

Among the different control strategies the use of amendments is particularly interesting because of their large availability and the low production cost. Fresh or dry olive pomace amendments showed a suppressive effect on root-knot nematode populations in different experimental trials (D'Addabbo, Sasanelli, Lamberti, Greco, Carella, 2003). The additional nitrogen sources to fresh olive pomace may increase the nematicidal effect, enabling it to be used at lower dosages for the reducing phytotoxicity (Rodriguez-Kabana, Estaun, Pinochet, Marfà, 1995). Moreover, incorporation of olive mill wastes into the soil may improve the chemical soil properties (Sasanelli, D'Addabbo, Convertini, Ferri, 2002).

Also, soil amendments with agricultural and urban wastes may reduce the incidence of many plant pests and pathogens including plant parasitic nematodes (Akhtar, Malik, 2000; Gamliel, Austerweil, Kritzman, 2000).

Soil amendments with urban sewage sludge and green residues were demonstrated to be suppressive on root-knot nematodes (Nico, Jiménez-Díaz, Castillo, 2004; Sasanelli, D'Addabbo, Mancini, Ciccicarese, 2010; Oka, Yermiyahu, 2002). Mechanisms of nematode suppression seem to be different and can be attributed to the ammoniacal nitrogen liberation or to the development of nematode predators and parasites on the organic matter substrate (Stirling, 1991).

A greenhouse experiment was undertaken to verify the suppressive potential of three composts on the root-knot nematode *Meloidogyne incognita* on tomato, as related to the soil content of organic matter and ammoniacal nitrogen. Three different composts (C1 = 72% fresh olive pomace + 17% straw and sawdust + 11% wool; C2 = 60% grass + 30% pruning residues + 10% soil; C3 = 30% sewage sludge + 70% city green residues) were added at the rates of 1.0, 2.5, 5.0 and 10.0 % w/w to a sandy soil infested by *M. incognita* (15 eggs and juveniles/ml soil). After two months nematode infestation on roots was estimated according to a 0 – 5 scale (Taylor, Sasser 1978). Final population density of *M. incognita* was calculated both on tomato roots (Hussey, Barker, 1973) and in the soil (Coolen, 1979). Organic matter and ammoniacal nitrogen content of soil from each plot was determined according to standard methods (Anonymous, 1966). Effects of composts and their application rates were analysed by 3 x 5 factorial design analysis of variance. Differences among rates of each compost and among the composts at each rate were evaluated by LSD (P= 0.05). Root knot nematode populations and tomato root infestation were significantly suppressed by the addition of all composts, compared to the untreated control. No significant difference resulted among the different doses, although the nematicidal effect was stronger at the highest rate.

Influence of different starting doses of mineral fertilizers (N 28 P 16, K 23 kg/ha and N 55, P35, K 55 kg/ha S.A.) on the base urea (46% N), ammophos (12% N and 52% P₂O₅) and potassium salt (61% K₂O) showed in different degrees the abilities for phytostimulation of tomato plants and the control of densities of the root knot nematode *M. incognita*, showing a positive influence on the increase of free-living nematode populations especially the saprophytic species (Bivol A., Iurcu-Străistaru E., Poiras L., Bădărau S., 2011).

ENTOMOLOGICAL CHARACTERISTICS OF NATURAL FOREST AREA GÂRBOAVELE (GALAȚI COUNTY- ROMANIA)

Șerban Cecilia

Complex Muzeal de Științele Naturii Galați, România

ABSTRACT: The purpose of this paper is to make a characterization of the insects fauna from Gârboavele Forest Reserve Forest. The investigated area is located near the city of Galați (about 14 km), with an area of 230 ha. Taking into account that entomofauna is strictly dependent on the vegetation, the protection of the latter is a prerequisite for any conservation initiatives entomofauna. An

important group of insects found in this area represents those whose existence is linked to the presence of nature steppe vegetation habitats, most of which are included in various lists and annexes of laws that protect them.

It should be noted that 19.16% of the species identified in these studies, are protected at national level and are included in the IUCN and Red List of diurnal butterflies of Romania (Rakosy, L. 2003). Among the endangered species, with a high risk of becoming extinct, we mention: *Hyponephele lycaon* (Kuhn, 1774), *Pyrrhia purpurina* (Esper, 1804), *Mazaria incarnate* (Freyer, 1838), *Conistra ragusae macedonica* Pinker, 1956, *Cleoceris scoriacea* (Esper, 1789), *Hadula stigmosa* (Cristoph, 1887) *Agria tau* Linnaeus, 1761, *Apatura ilia* (Dennis et Schiffermuller, 1775), *Eudia pavonia* (Linnaeus, 1758), *Papilio machaon* (Linnaeus, 1758), *Saturnia pyri* (Dennis et Schiffermuller, 1775) and the critically endangered species, with extremely high risk of extinction include: *Tomares nogelii dobrogensis* Caradja, 1895 and *Polyphaenis viridis* (Villers, 1789).

Between the Coleoptera (beetles), the observations made in the Forest Gârboavele, identify species *Cerambyx cerdo* Linnaeus 1758, *Lucanus cervus* Linnaeus 1758 *Morimus funereus* Mulsant, 1863 și *Osmoderma eremita* (Scopoli, 1763) as being vulnerable species, they being encountered in EU Habitats Directive (EU Directive 92/43/EEC), and were included in the species of Community interest requiring strict protection and that need the establishment of special protection areas. Red List of species of flora and fauna of the border Romania-Republic of Moldova, mentions for the Forest Gârboavele, from studies conducted in this area, *Aromia moscata* (Linnaeus, 1758), *Calambus bipustulatus* (Linnaeus, 1767), *Calosoma sycophanta* (Linnaeus, 1758), *Carabus (Hydrocarabus) variolosus* Fabricius, 1787 și *Oryctes nasicornis* Linnaeus, 1758 as endangered species, with a very high risk of becoming extinct, and include this species together with beetles included in the Habitats Directive, *Bolbelasmus unicornis* Schrank 1798 as being vulnerable. The same list includes giant fly (*Satanas gigas* Eversmann, 1855) valga bee (*Xylocopa valga* Gerstaecker, 1872), purple bee (*Xylocopa violacea* (Linnaeus, 1758)), clay bumblebee (*Bombus argillaceus* (Scopoli, 1763)) and the bumblebee step (*Bombus fragrans* (Pallas, 1771)) as endangered species and steppe wasp (*Scolia hirta* Schrenck, 1781) and the giant hornet (*Scolia maculata* (Drury 1773)) are included in the list of vulnerable species for Gârboavele Forest entomofauna.

Heteroptera fauna (bugs) in Forest Gârboavele brings together 39 species (Marcu A. 1982; Serban C. 2009, 2010), the majority are widespread in all regions of Romania, except species: *Carpocoris mediteraneus* (Tamanini, 1958) of family Pentatomidae has been found localized in Constanta, Tulcea and Caras-Severin, point locations, *Rhopalus rufus* Shilling 1821 known by two female specimens collected in 1964 Kis. B Dubova Craiova Dolj and confirmed as new species for the Romanian fauna from studies carried out in 2004-2009 (Serban C. 2009a, 2009b, 2010), *Stictopleurus pictus* (Fieber 1861) known only from

Dolj, Bihor Tulcea and *Maccevethus errans caucasicus* (Kolen 1845) a rare species, found in lowland regions.

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**BIOCONTROL STRATEGY OF SMALLER MULBERRY PYRALID
GLYPHODES PYLOALIS Wlk. IN IPM SYSTEM**

Shukhrat Madyarov

*Institute of Gene Pool of Plants and Animals.
Uzbek Academy of Sciences 32, Bogi-shamol str., Tashkent , 100125,
Uzbekistan. E-mail: shuhm@yandex.ru*

Smaller mulberry pyralid *Glyphodes pyloalis* Wlk. is serious mulberry pest progressing all over the world, affecting mulberry plantings. It reduces photosynthesis processes, weakens a plant and finally leads to its death. It, first of all, negatively affects nutritive base of sericulture.

Smaller mulberry pyralid larvae affected by entomophages and pathogens getting together with feed in silkworm larvae rearing rooms are secondary factors of pest invasion damage. They can cause the additional losses in sericulture branch. For example bracon (*Bracon hebetor* Say) is a host both for smaller mulberry pyralid and mulberry silkworm. Precisely also endogenic virus of smaller mulberry pyralid is identical to a virus of denonucleosis and to mulberry silkworm infectious flasheria virus.

On the other hand massed pest control by chemical insecticides in the bigger degree affects entomophages rather than target insect, causing stronger propagation of smaller mulberry pyralid and as a whole does harm both mulberry plantings and cotton growing.

So, goal-directed and safe control of smaller mulberry pyralid is complicated problem, important both theoretically and also especially practically. This is very important for biosafety of densely populated agrocomplexes of Uzbekistan

In connection with the problems set forth above the purposeful and safe control of smaller mulberry pyralid represents an uneasy problem important not only theoretically but also especially practically.

The solution of problems in the created situation is restoration of former level of useful insects at a roadside of cotton fields with the infected linear mulberry plantings. Practical measures in mulberry pyralid control should become: decrease in use of chemical insecticides affecting useful entomofauna, use of biological agents of the control produced at biofactories - bracon and lacewings as well as creation of conditions for attraction and propagation of other active mulberry pyralid entomophages: ladybirds, spiders, ants, hornets, wasps and other hymenopterans and some dipterans.

Powerful alternative to chemical insecticides could be baculovirus preparations – wild and recombinant with group specificity, for example *Autographa californica* and also some bacterial, fungal and nematode preparations used after feeding season in sericulture on condition when virulence of used strain affected by biotic and abiotic factors will completely disappear till a following season of silkworm feeding. Their use together with preparations of botanical and also sparing chemical insecticides which mechanism of action is safe animals is pos-

sible. Thus questions of economical, fine dispersed and pervasive applying of preparations into the infected zones of plants are very important. For full liquidation of the pest it is necessary to use total destructive actions especially after cold winters significantly decreased pest population.

**DATA REGARDING THE TROPHIC SPECTRUM OF THE
POPULATIONS OF *ADALIA BIPUNCTATA* AND *COCCINELLA
SEPTEMPUNCTATA* IN THE REPUBLIC OF MOLDOVA**

Stahi Nadejda M., Timuș Asea M.

*Institute of Zoology, Academy of Sciences of Moldova, Chisinau
n_stahi@yahoo.com; asea_timus@yahoo.com*

Adalia bipunctata and *Coccinella septempunctata* are predatory beetles which are best known for feeding on aphids. They are specialist at exploiting the rapid growth of aphid colonies, arriving when the colony is large and plenty of food is available and moving on to the next colony as the food supply diminishes. The adults and larvae of these species are predatory and eat many types of small insects, not only aphids. If food is not available, they are strongly cannibalistic: adult beetles will eat eggs, and larvae will eat eggs and other larvae. So, for biological protection these species present a huge importance, therefore we had studied their trophic spectre in the Republic of Moldova.

Eight cultures from different localities of country were studied (7 – from North and by 5 from Centre and South) in the second decade of June and in the first decade of July. In these points 198 specimens of ladybirds were collected by hand, of which 65 belong to *Adalia bipunctata* and 133 specimens to *Coccinella septempunctata* species. In the North of our country were collected 43 specimens (33 of *A. bipunctata* and 10 of *C. septempunctata*), in the centre – 50 specimens (by 25 of each species) and finally, in the south of the Republic of Moldova were collected 105 specimens (98 of *C. septempunctata* and just 7 of *A. bipunctata*). Most specimens – 48 were collected in plums orchards (*Prunus domestica*) where they devour *Hyalopterus pruni* aphids and most interesting fact is that the *Coccinella septempunctata* were prevalent (47 specimens). Also, 47 specimens were collected in feeding aphids of sunflower crop, and all specimens belong to the seven-spotted lady beetle. The fewest ladybugs were collected on cherry trees where they devour aphids of *Brachycaudus helichrzi* species.

The general conclusion is that the dominant species is *C. septempunctata* which consume *Aphis malus* aphids from *Malus domestica*; *Hyalopterus pruni* and *Myzus cersai* aphids from *Prunus domestica* and *P. cerasifera*, also, aphids from sunflower and oak trees (*Quercus pubescens*). The *A. bipunctata* prevailed on colonies of aphids of *Chromaphis juglandicola* species from *Juglans regia*; *Brachycaudus helichrzi* from the *Cerasus avium* and aphids from *Zea mays* and wild plants.

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Primary research of species *Adalia bipunctata* and *Coccinella septempunctata* in different cultures of the Republic of Moldova, 2013

Locality	Date	Walnut tree		Apple tree		Plum tree		Corn		Cherry tree		Oak tree		Sun-flower		Wild plant	
		Ab	Cs	Ab	Cs	Ab	Cs	Ab	Cs	Ab	Cs	Ab	Cs	Ab	Cs	Ab	Cs
North																	
Edineț (Brânzeni)	16.06	–	–	5	–	–	–	–	–	–	–	–	–	–	–	–	–
Naslavcea (Oc-nita)	16.06	–	–	–	–	–	–	–	–	–	–	–	–	–	5	15	–
Parcova	16.06	1	3	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Viișoara	16.06	2	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Râșcani (Mihailovsco)	16.06	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Bălți (Izvorăș)	16.06	7	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Fălești (Glinjeni)	16.06	2	2	–	–	–	–	–	–	–	–	–	–	–	–	–	–
TOTAL		13	5	5	0	0	0	0	0	0	0	0	0	0	5	15	0
Centre																	
Chișinău	03.07	8	1	–	–	1	2	–	–	–	–	–	–	–	17	–	–
Criuleni (Onițcani)	04.06	4	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Telenești (Bogzești)	19.06	3	–	–	1	–	–	7	–	–	–	–	–	–	–	–	1
Telenești (Cu-coaia)	19.06	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–
Călărăși (Meleşeni)	19.06	–	–	1	2	–	–	–	–	1	–	–	–	–	–	–	–
TOTAL		15	1	1	4	1	2	7	0	1	0	0	0	0	17	0	1
South																	
Bugeac	22.06	–	–	–	–	–	–	–	3	–	–	–	–	–	20	4	–
Cimișlia	22.06	2	1	–	–	–	31	–	–	–	–	–	–	–	–	–	–
Cucoara, Cahul	23.06	–	1	–	–	–	–	–	–	–	–	–	–	–	5	–	–
Pelinei, Cahul	23.06	–	–	–	–	–	12	–	–	1	–	–	7	–	–	–	7
Vinogradovca, Taraclia	23.06	–	–	–	3	–	2	–	–	–	–	–	–	–	–	–	6
TOTAL		2	2	0	3	–	45	0	3	1	0	0	7	0	25	4	13
TOTAL		30	8	6	7	1	47	7	3	2	0	0	7	0	47	19	14

Legend: *Ab* – *Adalia bipunctata*; *Cs* – *Coccinella septempunctata*

**BACULOVIRUS – BASED PRODUCT FOR BIOLOGIC CONTROL
OF THE SPECIES *HYPHANTRIA CUNEA* IN THE AGRICULTURAL,
ORNAMENTAL AND FOREST PLANTATIONS**

Stîngaci Aurelia

*Institute for Plant Protection and Ecological
Agriculture, ASM, Chisinau, Republic of Moldova,
e-mail: aurelia.stingaci@gmail.com*

The microbial biopesticide market still only represents about 1% of the sales of chemical pesticides (CPL Consultants, 2010; Marrone, 2007). Factors impeding the establishment of strong MPCA markets are complex (Chandler et al., 2011; Marrone, 2007; Ravensberg, 2011) but include the burdensome costs associated with the registration of commercial products that are aimed at relatively small niche markets (Chandler et al., 2011; Ehlers, 2011). The main priority of regulatory agencies is to protect human health and safety and the environment from potential risks associated with the use of pest control products. Even though public attitudes to the use of biological control agents has been favorable (63%) a large proportion of the public (46%) has expressed concerns about the consumption of food treated with microbial pesticides (Cuddleford, 2006).

Baculoviruses only infect insects, are ubiquitous in the environment and are known to be important in the regulation of many insect populations. Baculoviruses are host specific, infecting only one or a few closely-related species, helping to make them good candidates for management of crop and forest insect pests with minimal off-target impacts (Hewson et al., 2011). In fact, baculoviruses have been recognized as being amongst the safest pesticides (Black et al., 1997).

Efficiency of baculoviral insecticides is ensured by an active ingredient and by a number of advantages in comparison with chemical methods, among which the most important is their specificity. Wide application of baculoviral preparations has become reality only after organization of their production thanks to deep biotechnological researches. Thus has become possible the production of efficient and cheap viral preparations necessary for control of pests of crops (Chukhrii, 2008; Mattias & Wratten 2008; Voloshchyuk 2010). Technologies of baculoviral preparation production may be realized on the grounds of mass growth of plant feeder insects (Chukhrii et al., 1990; Voloshchyuk, 2009).

In this review of baculoviruses, we discuss how baculovirus evolution, host range determination and pathogenesis have contributed to their inherent safety for non-target organisms including humans. The article represents a generalization aimed to the obtaining of viable preparations and improving of active strains.

At present, it is recommended to use against the *H. cunea*, the ecologic clean virus preparation Virin –ABB-3, which is not connected with the laboratory rising of insects. For achieving these aims natural populations of insects shall be used. It is profitable from economic point of view, because the natural food is used. The obtaining of the virus preparation directly on the insects hosts creates

the conditions for the obtaining of the native virus. On the basis of our experiments and those of the other specialists, we ascertained that raising insects' hosts creates the conditions for obtaining of native virus.

In this respect, put into practice of an integrated control system would allow the inclusion of a production process that could be used simultaneously or succeeding, on the background and for the purpose of maximization of the efficiency of restricting action of entomophagy, pathogens for ensurance of big and high quality production, diminishing the registered loss (Franc et al, 2007; Joop Van Lenteren, 2011)

Given that all published reviews unequivocally state that baculoviruses are safe and support their use as low-risk biological control agents for the control of insect pests, we propose that human and environmental toxicity tests and studies related to the residual fate of baculoviruses not be required for the registration of baculoviruses.

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THE SUPERFAMILY APOIDEA (HYMENOPTERA, APOIDEA) POLLINATORS OF ETHER PLANTS SPECIES CULTIVATED IN MOLDOVA

Stratan Veniamin

Institute of Zoology, Academy of Sciences of Moldova, Chisinau

The etheric plants have been used from the ancient times. During 4 millennia until our era the Egyptians used these plants as spices to make tea, flavored drinks, to perform massages.

In India, Egypt, Ceylon and other ancient centers of civilization developed the industry of obtaining ether oils, which gradually spread throughout the world.

Nowadays ether oils have a wide use in food, medicine, cosmetics, in engineering and in high precision measuring instruments lubrication.

The raw material for obtaining these oils are species of ether plants which can be grown. The number of plants that contain oils and aromatic ethers, include about 3000 thousand of species. But among this diversity of species only 10 of them are used in production of essential oils and are cultivated on large surfaces.

In the recent past, the plantations of these ether plants, in Moldova covered about 16 500 ha, representing 7.4% of the area occupied by all the agricultural crops in the country.

Oil production from some species of ether plants was concentrated in sovkhoses-specialized factories.

In Moldova such plants as *Salvia scalpreia*, *Lavandula angustifolia*, *Mentha piperata*, *Foeniculum vulgare*, *Anethum graveolens*, *Coriandrum sativum*, *Dra-cocephalum moldavica* and *Rosa crimeia*, are cultivated on large areas. But the below listed plants are usually cultivated on smaller areas. They are Chamomila recutata, *Sedum acra*, *Achilea coartata*, *Hyssopus officinalis*, *Symphitum officinale*, *Melissa officinalis* and *Hypericum perforatum*.

Lately the areas occupied by these plants have decreased considerably due to land privatization. Once the transition period ended, the need of ether plants cultivation, returned to normal as soil composition and climatic conditions in Moldova are very favorable for their cultivation, and revenues from oil production are considerable.

In present days the pace of development of using the essential oils in different spheres has considerable increased. That is why it is necessary to increase the production of high quality raw material, that can be obtained from the cultivation of the ether plants .

Biological and physico-chemical peculiarities of cultures containing oils and aromatic ethers differ substantially from the grain and the technical ones. Growing plants that contain essential oils , needs deep research in biology and ecology, aplication of perfomant technologies.

Most species of pollinating insects (about 90%) which pollinate such plants are the wild bees and honey bees, which belong to the superfamily Apoidea.

The recording of spieces spectrum and the composition of pollinating Apoidea complexes, studying the role and their efficiency, will help in optimizing and directing them in the pollination of ether plants. The results of the research will be applied in practice to prepare recommendations for increasing amount of the harvests and quantitative and qualitative raw material with high content of active ingredients and aromatic plant cultivated.

Materials included in this work were obtained in the process of the research of Apoidea fauna during the 1987-1994 mainly on the territory where such plants are cultivated and partly on beds in the Botanical Garden of A. S. M. in Moldova.

Apoidea were collected during the growing seasons using entomological manual method from the flowers of those species. Collecting samples took 2 hours in the middle of each plantation area. Each sample was collected from the surface of 10 m² during 10 minutes. Herbs samples from the flower beds of Botanical Garden were collected for 30 min. Specific apartness of Apoidea was based upon the works of Ocinciuk A. Z, Panfilov D. V., and Ponomariov A.A.

The territory of ether plant cultivation , were scientific research of Apoidea took place is located in the south-east of Chisinau, on the periphery. In the south-eastern part ,this territory is the limit of a forest and in the south-west it borders the road route, linking the city with the airport and in the east with the road Chisinau-Tighina.

The relief of the territory represents inhomogeneous ground, crossed by many ditches, hollows and hills. Both of these slopes, the edge, the intermittent land of the forest and small oases have a definite condition of their exhibition – southern, southwest. They are warmed by the sun, becoming favorite places for nesting and colony forming of Apoidea, contributing beneficially in shelters building, ensuring sustainable colonies' lifehood.

These colonies have a specific biocenosis, that is characterized by a relatively stable order through combining abiotic and biotic environmental factors. They were mutually adjusted over several years of the Station Territory of cultivating ether plants existing. This agrosistem's base is formed on the natural stations and the flavoured cultures cultivation. Natural colonies of apoidea represents a necessary component of nature, because it is the source of providing the effective spieces of Apoidea with individuals, that are the main pollinators of all the entomophilous plants of biota.

The diversity of Entomophilous plant species: annual and perennial trees and shrubs that grow on the Station's territory and bloom every year, creates a permanent basis of food during the vegetal season for Apoidea and keeping them in these places.

In early spring in the fields and forests appear the flowers of ephemeral plant species: violets, coridalis, pulmonaria officinalis, dogwood and on fallow colonies- primula obconica, crocus benffelianus, also appear in April on the slopes rapture - some species of willow. In May, some species of flowering trees: apricot, cherry, sweet-cherry, apple and some shrub species. Apoidea species that have wintered, collect pollen and nectar from the flowers of these plants, depositing it in the galleries of nests located in the soil and in the cavities of dried stems of herbaceous plants from the previous year and lay eggs which will develop and increase brood up adults of the first generation of wild bees. The result of this process, the number density of effective Apoidea species in colonies increases. In summer, basic forage for wild bee colonies in the Station territory is the pollen and nectar of the ether plants .

Several species of flavoured plants (sown at different times of the vegetal season) in early June start to bloom at a time until the end of the season. As a result these plants create a specific conveyor for producing pollen and nectar , fully supplying food for Apoidea that simultaneously participates in flavoured plants pollination. Note that all species of wild bees that inhabit the station in the summer develop second generation, and will spend the winter in the larval stage.

Investigation of pollinating Apoidea took place during several years in the flowering period of cultivated species of plants ,by taking samples during the vegetal season from flowers of each species separately. Investigations were subjected to 15 ether plant species : anethum graveolens, sedum acre, achilles coar-tata, matricaria chamomilla, coreandrum sativum, mentha piperata, dracocephalum moldavica, hissopus officinalis, lavandula angustifolia, ruta graveolens, salvia natans (Table 1).

According to the obtained data, scientists had identified the spectrum of pollinator Apoidea species (84 spieces) , that several years visited flavoured plants, cultivated on the Station territory.

Analizing the complexes of Apoidea in acordance with their forming at studied spieces of plants , they can be devided into 4 groups.

First group has a big number of Apoidea species in one complex : *Anethum graveolens*- 29 species; *Coreandrum sativum*- 19 species; *Salvia scalreia*- 18; *Foeniculum vulgare*-18.

The second has an average number of spieces: *Dracocephalum moldavica*- 13 species; *Camomilla recutata*-12; *Achilea coretata*-11; *Hyssopus officinalis*-9.

The third group- a small number of spieces: *Agastache foeniculum*, *Lavandula angustifolia* and *Monarda* have in their complexes 7 spieces of wild bees.

The fourth group of flavoured plants had formed even no one complex of Apoidea species: *Mentha piperata*, *Sedum acra*, *Anemone sylvestris* and *Ruta graveolens* (3-4 species).

The variety of viziting grades depends on their adaptation in coevolution process and on the amount and the concentration of ethers in flavoured plants.

In general to 10 spieces of ether plants are assigned 84 spieces of Apoidea.

Dominant and subdominant species of Apoide, that populate different places, are the following: *Megachile eritrocerum*, *Halictus quadricinctus*, *H. Morbilosus*, *Lasioglossum politum*, *L. Malachurum*, *Andrena flavipes*, *A. nitiduscula*, *A. dorsata*, *A. nitiduscula*, *A. chrisosceles*, *A. hedikae*, *Bombus lucorum*, *B. Lapidarius*, *B. Terrestris*, *B. Silvarum*, *B. Lucorum*. Among these the superdominant species are: *Bombus lapidarius*, *B. lucorum*, *A. flavipes* and *A. nitiduscula*.

For keeping the relative stability of the species spectrum of wild bees that pollinate all the entomophilous plants and for optimizing their division process , we suggest the following measures for protection of natural resources and complexes:

- 1.To improve the forest density by planting trees, bushes and nectar giving plants that are missing. These will contribute in increasing insects diversity.

2. Keeping steppe fallow areas close to the ditches, hollows. They will help in avoiding erosions and will serve as places for forming wild bee colonies.

- 3.Integrately implementate the protection of plants , minimalize or exclude toxic substances.

4. Locating the sown fields near the natural and artificial stations with slopes that are tipped to the south and southwest, where during several years exist colonies of wild bees.

The information prezented in this work represents a scientific novelty in studying the Apoidea fauna- pollinators of ether plants which were cultivated in Moldova.

The spieces spectrum of Apoidea, determined by us is located in Zoology Institute's Museum of Scientific Academy of Moldova.

SPECIES COMPOSITION AND PREVALENCE OF MOSQUITOES (DIPTERA: CULICIDAE) IN THE SCIENTIFIC RESERVE “PĂDUREA DOMNEASCĂ”, MOLDOVA

Sulesco Tatiana, Toderas Ion, Toderas Lidia, Bujor Aliona, Railean Nadejda

Institute of Zoology, Academy of Sciences of Moldova, Chisinau
e-mail: tatiana_sulesco@yahoo.com

Mosquitoes are the most important group of arthropods of medical and veterinary importance, as vectors of dangerous diseases like malaria and arboviruses. Pădurea Domnească is a 6032 hectares natural reserve of national and international importance as habitat for large number and variety of mammals and birds. This in combination with the presence of favorable ecological conditions makes Pădurea Domnească reserve an area of high mosquito species richness and a potentially high-risk area for arbovirus circulation in the Republic Moldova.

Our surveys were conducted in summer 2012 and 2013, near the villages Moară Domnească, Cuhnești and Balatina, in Pădurea Domnească reserve. Adult mosquitoes were collected using CDC Miniature Light Trap model 512 (John W. Hock Company), and on human baits. Larval sampling was conducted with standard dipping techniques.

Altogether 15 species have been recorded in Pădurea Domnească by three different methods for mosquito monitoring. The light traps captured eight species: *Anopheles maculipennis s.l.* (34.2%), *Aedes cinereus/geminus* (1.3%), *Aedimorphus vexans* (32.9%), *Ochlerotatus annulipes* (6.6%), *Oc. cantans* (3.9%), *Oc. caspius* (1.3%), *Culex pipiens s.l.* (9.2%) and *Uranotaenia unguiculata* (10.5%). Human landing catches provided an information about eight anthropophilic mosquitoes: *Ae. cinereus/geminus* (2.3%), *Am. vexans* (10.5%), *Dahlia geniculata* (5.8%), *Oc. annulipes* (33.7%), *Oc. behningi* (1.2%), *Oc. cantans* (27.9%), *Oc. riparius* (4.6%) and *Oc. sticticus* (14.0%).

There were detected four species in the permanent water bodies near Moară Domnească and Cuhnești: *An. maculipennis s.l.* (84.4%), *Cx. modestus* (14.0%), *Cx. pipiens s.l.* (0.9%), *Cx. torrentium* (0.6%). Larvae of very rare species *Anopheles claviger* were collected from the lake „La Fontal”, Balatina with mineral water and the water temperature about 16C.

As a result, the most abundant species, captured by the light traps and dipping techniques was zoophilic species *An. maculipennis s.l.*, which was not present in human landing collections during the day. Species *Am. vexans* was the second most abundant species from the light traps. The preferred hosts are mammal, but females readily bite human hosts when available. The most abundant species, captured on human bait, were *Oc. annulipes*, *Oc. cantans* and *Oc. sticticus*. First two species were captured in low numbers by the light traps, and the last one wasn't present in light trap collections at all. *Ochlerotatus annulipes* and *Oc. cantans* are monocyclic species and breed in semipermanent

or permanent water pools in spring. The larvae of polycyclic species *Oc. sticticus* occur in temporary water bodies after floods. In our surveys larvae of these species were not collected.

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THE ACCLIMATIZATION AND TROPHIC SPECTRUM OF *HARMONIA AXYRIDIS* IN THE REPUBLIC OF MOLDOVA

Timuş Asea, Stahi Nadejda

Institute of Zoology, Academy of Sciences of Moldova, Chisinau
asea_timus@yahoo.com; n_stahi@yahoo.com

In the context of current research study of invasive insects in the Republic of Moldova on framework Project funded by NEF: 2/3056-4373 from 05.02.2013 «Identification of invasive animal species in Moldova and assess their impact on ecosystems», the ladybird species *Harmonia axyridis*, commonly known as the Asian lady beetle (because it occurs in numerous colour forms) has become an important goal.

Early information about the species *H. axyridis* in the Republic of Moldova have exposed colleagues from the Institute of Zoology (I. Chiriac and A. Andreev), who observed it in the 70's of last century. Information can be considered credible because in Soviet times (the 60's) this species was launched for the acclimatization near the Carpathian Mountains of Ukraine. Semyonov (1974) mentions that the results of introduction are not known, probably, acclimatization was slowly and unnoticed. However, after about 50 years, this species has completely acclimated to conditions (in special climatic) of various countries from Europe, including in the Republic of Moldova.

The first generation of ladybird beetle in 2013 developed large populations in crops (walnut, apple, plum, cherry, sunflower, corn, mulberry), forest (oak, elm) and in those spontaneous were had attacked different aphids species. On the leaves of walnut and apple were recorded all stages of development of ladybug: egg, larva, pupa and imago, but on the other cultures – just some. The plant lice species from referred plants are trophic basis of the *H. axyridis* (tab. 1). From the results presented in the table it follows that *H. axyridis* in 2013 has a spread to all areas of country and more intense in the Center (69,2%). Most preferred are: walnut aphids – in Center 68,2% and in North 98,5%; apple aphids – Center – 15,5% and in South 3,2%). From the respectively results which currently are incomplete because this year is the first of the studying and has been analysed just the 1st generation we conclude that:

1. Species *H. axyridis* has been acclimatized definitively on the territory of our country;

2. From the expanding of Asian ladybug on a wide range of harmful aphids of plants, it can be predicted that this species will develop further successfully – the second generation in 2013 in and of course in subsequent years;

3. The effective of Asian ladybug will contribute significantly at reducing sucking pest of fruit trees including insects with small tales such as aphids, spider mites and scale insects (adults, larvae, eggs, etc.).

Table 1.

Distribution and trophic spectrum of Harmonia axyridis in the Republic of Moldova (first generation of 2013)

Locality	№ of specimens	Researched <i>aphids</i> species and their host plants								
		I	II	III	IV	V	VI	VII	VIII	IX
North										
Naslavcea (Ocnița)	2	2	0	0	0	0	0	0	0	0
Brânzeni (Edineț)	3	3	0	0	0	0	0	0	0	0
Parcova (Edineț)	18	18	0	0	0	0	0	0	0	0
Viișoara (Edineț)	2	2	0	0	0	0	0	0	0	0
Lopatnic (Edineț)	1	0	0	0	0	1	0	0	0	0
Mihailovscoe (Râșcani)	2	2	0	0	0	0	0	0	0	0
Bălți (Izvorăș)	18	18	0	0	0	0	0	0	0	0
Glinjeni (Fălești)	21	21	0	0	0	0	0	0	0	0
Total	67	66	0	0	0	1	0	0	0	0
%	12,9	98,5	0	0	0	1,5	0	0	0	0
Center										
Chișinău (Park UASM)	114	64	50	0	0	0	0	0	0	0
Chișinău (Primăria)	141	141	0	0	0	0	0	0	0	0
Chișinău (Ciocana)	19	19	0	0	0	0	0	0	0	0
Chișinău (Telecentru)	3	0	0	0	0	0	3	0	0	0
Chișinău (IPPAE)	7	0	0	7	0	0	0	0	0	0
Criuleni (Onițcani)	20	20	0	0	0	0	0	0	0	0
Țigănești (Strășeni)	2	0	0	0	0	0	2	0	0	0
Bravicea (Călărași)	24	20	0	0	0	0	0	0	0	4
Meleșeni (Călărași)	19	4	4	2	7	0	0	0	0	2
Bogzești (Telenești)	8	8	0	0	0	0	0	0	0	0
Cucoaia (Telenești)	3	0	2	0	0	0	1	0	0	0
Total	360	276	56	9	7	0	6	0	0	6
%	69,2	76,6	15,5	2,5	1,9	0	1,6	0	0	1,6
South										
Cimișlia	7	7	0	0	0	0	0	0	0	0
Bugeac (Comrat)	28	0	0	8	0	16	3	1	0	0
Viișinăuca (Cantemir)	1	1	0	0	0	0	0	0	0	0
Pelinei (Cahul)	39	0	0	5	17	0	7	0	10	0
Ciumai (Taraclia)	2	2	0	0	0	0	0	0	0	0
Cucoara (Cahul)	2	1	0	0	0	1	0	0	0	0

Locality	№ of specimens	Researched <i>aphids</i> species and their host plants								
		I	II	III	IV	V	VI	VII	VIII	IX
Vinogradovca (Taraclia)	14	2	3	5	0	0	4	0	0	0
Total	93	13	3	18	17	17	14	1	10	0
Total in the country	520	355	59	27	24	18	20	1	10	6
%		68,2	11,3	5,2	4,6	3,4	3,8	0,2	1,9	1,1

Legend: **I** – *Chromaphis juglandicola*; **II** – *Aphis pomi*; **III** – *Hyalopterus pruni*; **IV** – *Myzus cerasi*; **V** – *Brachycaudus helichrysi*; **VI** – *Aphids* on wild plants; **VII** – *Aphids* on *Zea mays*; **VIII** – *Aphids* on *Quercus pubescens*; **IX** – Fruits of *Morus alba*, *M. nigra*.

STUDY CONTRIBUTIONS REGARDING FORMS OF *HARMONIA* *AXYRIDIS* IN THE REPUBLIC OF MOLDOVA

Timuș Asea, Stahi Nadejda

Institute of Zoology, Academy of Sciences of Moldova, Chisinau
asea_timus@yahoo.com; n_stahi@yahoo.com

The species *Harmonia axyridis* is an outstanding ladybug thanks to variations of body colours, spots size, and spots count of the elytra which divided this species in many forms. Therefore, in Russia and Ukraine this coccinellid beetle is called harlequin ladybird, changeable or with 19 points, etc. On the strength of the increased population density of the first generation in 2013, we decided to study the relation of these forms according host plant of the aphid which are trophic base of multicoloured Asian lady beetle.

From the results shown in Tab. 1 can be see that the species had developed enough (520 specimens) for to undertake research regarding forms and life stages: larvae – 77 specimens or 14,8%; pupa – 22 (4,2%); pupal exuvia – 133 (25,5%); imago – 288 (55,3%). These specimens were collected in different stages from different plants attacked by aphids or not (agricultural: 7 – walnut, apple, plum, cherry, sunflower, mulberry – fruit; forest: oak and *Ulmus* spp; on spontaneous grasses (*Onopordum acanthium*, *Artemisia absinthium*, *Cirsium serrulatum*, *Rosa canina*, *Verbascum thapsus*, *Achillea millefolium*, *Humulus lupulus*).

The most representative conclusions about forms of harlequin ladybird are based on nut and apple aphid where *H. axyridis* had developed: 216 specimens or 60,8 % on the walnut tree and 38 (64,4%) on the apple tree. Within multicolored Asian lady beetle collected on the nut tree prevailed the next forms: *H. axyridis* var. *novemdecimsignata* – 88 specimens (40,7%); *H. a.* var. *siccoma* – 55 (25,4%); *H. a.* var. *succinea* – 54 (25%); *H. a.* var. *spectabilis* – 14 (6,4%) and *H. a.* var. *conspicua* – 5 (2,3%). On the apple tree were recorded *H. a.* var. *siccoma* and *H. a.* var. *novemdecimsignata* by 13 specimens (34,2% for each),

H. a. var. succinea – 8 (21,0%), *H. a. var. spectabilis* – 3 (7,8%) and *H. a. var. conspicua* just one specimens (2,6%).

From general analysis of *H. axyridis* from researched plants prevailing next forms on the decrease: *H. a. var. novemdecemsignata* with 120 specimens respectively 41,6%; the next one is *H. a. var. succinea* – 79 (27,4%), *H. a. var. siccoma* – 75 (26%), *H. a. var. spectabilis* – 18 (6,2%) and *H. a. var. conspicua* – 6 (2,0%). Specimens of *H. a. var. novemdecemsignata* have two obvious colors: yellow and red (most spectacular) and size of spots (especially from the center of elytra) frequently presents like points, so it becomes more difficult to discern and to distinguish by the *H. a. var. succinea*.

The general conclusion is that one the dominant forms are *H. a. var. novemdecemsignata* and *H. a. var. succinea*, indifferent of host plants of aphid.

Tabelul 1.

The forms of Harmonia axyridis according to the trophic spectrum (Generation 1, 2013)

Aphid species and fruits / host plant	Specimens collected on the host plants	Recorded exemplars / %				<i>Harmonia axyridis</i> var. / %				
		Larvae	Pupae		imago	<i>siccoma</i>	<i>succinea</i>	<i>novem-decem-signata</i>	<i>spectabilis</i>	<i>conspicua</i>
			live	Exuvia						
<i>Chromaphis juglandicola</i> / <i>Juglans regia</i>	355	57	16	66	216	55	54	88	14	5
	%	16,0	4,5	18,5	60,8	25,4	25,0	40,7	6,4	2,3
<i>Aphis malus</i> / <i>Malus domestica</i>	59	14	0	7	38	13	8	13	3	1
	%	23,7	0	11,8	64,4	34,2	21,0	34,2	7,8	2,6
<i>Hyalopterus pruni</i> / <i>Prunus domestica</i> , <i>P. cerasifera</i>	27	0	0	19	8	2	2	3	1	0
	%	0	0	70,3	29,6	25,0	25,0	37,5	12,5	0
<i>Myzus cersai</i> / <i>Cerasus avium</i>	24	0	0	24	0	0	0	0	0	0
	%	0	0	100	0	0	0	0	0	0
Brachycaudus helichrzi / <i>Helianthus annuus</i>	18	5	4	5	4	0	0	4	0	0
	%	27,7	22,2	27,7	22,2	0	0	100	0	0
Aphids / <i>Zea mays</i>	1	0	0	0	1	0	0	1	0	0
	%	0	0	0	100	0	0	100	0	0
Aphids / <i>Quercus pubescens</i>	10	0	0	1	9	3	2	4	0	0
	%	0	0	10,0	90,0	33,3	22,2	44,4	0	0
Aphids / Wild plants	20	1	2	11	6	0	2	4	0	0
	%	5,0	10,0	55,0	30,0	0	33,3	66,6	0	0
Fruits / <i>Morus nigra</i> , <i>M. alba</i>	6	0	0	0	6	2	1	3	0	0
	%	0	0	0	100	33,3	16,6	50,0	0	0
Total specimens / %	520	77	22	133	288	75	79	120	18	6
	%	14,8	4,2	25,5	55,3	26,0	27,4	41,6	6,2	2,0

The invasive species *Harmonia axyridis* is investigated according to framework Project funded by NEF: 2/3056-4373 from 05.02.2013 «Identification of invasive animal species in Moldova and assess their impact on ecosystems».

ANTHELMINTIC TREATMENT STRATEGY AND PREVENTION OF CONTAMINATION WITH *TOXOCARA SSP* IN MOLDOVA

Toderaş Ion, Cojan Mariana

Institute of Zoology, Academy of Sciences of Moldova, Chisinau
e-mail: drd.mary_cojan@yahoo.com

Summary. There are two reasons for *Toxocara* control: one is to prevent human infection and another is to reduce the risk of infection to pets. *Toxocara* eggs are very resistant to adverse environmental conditions and remain infective for years. Since no practical methods exist for reducing environmental egg burdens, prevention of initial contamination of the environment is the most important tool. This can be achieved by taking measures such as eliminating patent infections in dogs and cats, preventing defecation by pets in public areas, hygiene, and education of the public.

Materials and methods. High degrees of environmental contamination can be expected in places where dogs and cats are concentrated, such as training schools, animal shelters and breeding kennels. No correlation could be established between pet ownership and the presence of *Toxocara* spp. eggs in suburban gardens. Household garden soil was found to be a potentially greater source of *Toxocara* infection than soil in public green areas.

A decrease in contamination can be achieved by methods including: restriction of uncontrolled dogs and cats, cleaning up faeces from soil and on pavements by dog owners, preventing access of dogs and cats to public places (especially children's playgrounds) and by use of strategic anthelmintic treatment of dogs and cats with emphasis on puppies, kittens, nursing bitches and queens. *Toxocara* eggs are not destroyed by composting and can survive sewage treatment.

A complicating factor in the prevention of environmental contamination is the presence of infected wild and stray canines and felines. In Europe the wild fox is nowadays more common in urban areas and stray cats are familiar in every neighborhood. In surveys in the Cahul, foxes and stray cats were found to be heavily infected with *Toxocara*

Results and discussion. The most serious and concentrated source of infection are dogs that eat litter, bitches that nurse and puppies aged between 3 weeks and 6 months. A major aim of long-term prophylactic treatment programmes is to suppress *Toxocara canis* egg-output throughout the whole of puppyhood using a multidose schedule. Anthelmintic treatment should be started before the age of 3 weeks. Because milk transmission occurs continuously for at least 5 weeks post partum, repeated treatments are necessary. Larvae that reach the intestine need

at least 2 weeks to mature and start passing eggs, therefore the treatment should be repeated every 14 days.

Re-infection can occur throughout the suckling period and treatment should be continued at least until the time when the last larvae arrive through the milk in the puppies' intestine at 7 weeks of age. Bitches should always be included in the treatment at the same time as the puppies.

Advice regarding the initial anthelmintic dose for kittens can cause confusion, because prenatal infection does not occur in kittens and egg excretion begins later than in puppies. Therefore, preventive treatment in kittens can usually be instituted effectively at 6 weeks of age.

Control in older dogs and cats can be achieved by periodic treatments with anthelmintics whose efficacy can be limited to the intestinal stages, or by treatments prescribed based on the results of periodic diagnostic faecal examinations.

In Moldova, the following schedule to prevent egg output is advised: puppies should be dewormed every two weeks starting from 2 to 8 weeks of age and kittens from 4 to 8 weeks of age, followed by treatments every 2 months until 6 months of age. Nursing bitches and queens should be treated concurrently with their puppies and kittens respectively and every other dog and cat twice a year.

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COMPARATIVE STUDY OF THE MORPH-PRODUCTIVE AND BEHAVIORAL CHARACTERISTICS OF *APIS MELLIFERA* QUEEN BEE DAUGHTERS DESCENDED FROM QUEENS ARTIFICIALLY INSEMINATED AND NATURALLY MATED

Toderici Valeriu

Institute of Zoology, Academy of Sciences of Moldova, Chisinau
e-mail: valeriu.toderici@gmail.com

The goal of the work was to identify how reliable are the advantages of queen-daughters obtained from mothers instrumentally inseminated compared to their contemporaries obtained from queen-mothers, naturally paired in the «mating flight». To achieve this goal, was organized a scientific experiment on two batches of bee colonies with queens of same age, of same breed - Carpathian,

maintained at same apiary, in same feeding and maintenance conditions. Apiary was located permanently (stationary) at the edge of the broad-leaved forest. The main nectar and pollen sources of the apiary were: acacia, linden and polyfloral vegetation. The queens from the first batch in number of 24 species were for control and were daughters of queen-mothers, naturally paired in «mating flight», in the bare area near the apiary. Queens from the second batch in number of 17 species, served as the experimental batch and were daughters of queen-mothers instrumentally inseminated with sperm of best pattern colony from whole apiary. Queen-mothers' insemination was done in the laboratory using a special device *Latshaw Insemination Instrument* (made in United States), with fresh sperm, once in dose of 8 mm. The queen-daughters from II batch were naturally paired in «mating flight» in a bare area near the apiary.

During the whole bee season, at colonies from both batches have been investigated biological morph-productive and external characters: the proboscis length, cubital index and discoid dislocation of the bifurcation point of the anterior wing of the bees, brood resistance, hygienic behavior, queens prolificacy, colonies strength and honey production.

The results of the study have shown that, the families of queen-daughters obtained from queen-mothers, instrumentally inseminated, differ significantly better than their contemporaries from queens naturally inseminated in the «mating flight», by the main biological features of morph-productive characters. So, the colonies from second batch, whose queens were obtained from mothers instrumentally inseminated, significantly exceeded his contemporaries received from queens naturally inseminated in the «mating flight», on following characters: proboscis length by 0,04mm, or 0,6% ($P < 0,05$), winter resistance by 4,0 units, or 5,0% ($P < 0,05$), colony strength – by 0,12 kg or 4,2% ($P < 0,05$), brood viability by 1,9 absolute units, or 2,1% ($p < 0,01$), hygienic behavior by 1,8 absolute units, or 2,0% ($P < 0,05$) and honey production - by 5,3 kg, or 12,6% ($P < 0,01$). In addition to it, queens from second batch colonies, had a tendency to a bigger prolificacy, to an increased cubital index and a bigger share of colonies with positive discoid dislocation, compared to queen-contemporaries from the first batch, but the difference in these characters meaning was not reliable ($P > 0,1$).

FAUNISTIC REVIEW OF THE BUTTERFLIES (LEPIDOPTERA, DIURNA) OF KUNASHIR AND SAKHALIN

Vlasova Alisa

Institute of Ecological Problems of the North, the Ural Branch of Russian Academy of Sciences, Arkhangelsk, Russia, e-mail: vlasowaalisa@yandex.ru

In recent decades, the ecology and biogeography has been an increased interest on species biodiversity of regions, countries, and natural zones around the world. Particular interest has hard to reach areas with significant variations

of climate. Therefore the research of Sakhalin and Kunashir is topical. Data on these islands are few and some are quite old or it is comprehensive assessment of fauna butterflies on the Kuril Islands (Matsumura, 1911 Gritskevich, 1994; Konovalov, 1996). This work will be part of a comprehensive review of butterflies' fauna of Sakhalin and Kunashir.

The aim of this work is a review of butterflies' fauna in anthropogenic habitats of Kunashir and some valleys of the rivers on Sakhalin.

The observations were made on Sakhalin and Kunashir in July 2011 and in June 2012. Total were collected nearly 300 specimens of butterflies.

The studied communities of butterflies on Sakhalin and Kunashir are very poor and there were only 37 species. We noted 30 species on Kunashir and 20 species on Sakhalin. Diurna fauna of Sakhalin is rich and has 43 species (Gritskevich, 1994), on Kunashir noted 42 species (Konovalov, 1996). Poor species composition of the insect fauna was collected during the expedition to the Kuril Islands and Sakhalin, due to different regional conditions.

Most of the species on Sakhalin lives in the valley of the rivers in the flood plain of grass-forb meadows with wild rose and honeysuckle and the meadows along the roadsides with red clover (*Trifolium pratense*). On Kunashir is in the southern part of 1.5-2 km from the coast, as well as along roads, rivers and Stolbovskie hot springs on wet grass, forb meadows and coniferous forests with Kuril bamboo (*Arundinaria kurilensis*). *Neope goschkevitschii* mainly found in shrubby thickets of bamboo in the forest, where it forms massive clusters on the trunks of willow trees, feeding on tree sap. Bamboo communities characterized *Lethe diana* and *Thoressa varia*, which are associated with trophic relationships. Single specimens caught in the middle of the island, on the coast of the Okhotskoe Sea near Stolbovskie and Neskuchenskie springs and along roads, grass-forb meadows and coniferous-deciduous forests. In moving to the north there is a gradual disappearance of deciduous and coniferous forests and dramatic depletion of the insect fauna (Krivolutskaya, 1973). Due to the impact of cold climate butterflies live mostly near hot springs. In open spaces is a large abundance *Celastrina argiolus*, *Papilio machaon*, *Papilio bianor*.

On Kunashir are few species living in mixed grass meadows: *Solias erate polyographus*, *Everes argiades*, *Lycaena phlaeas*, *Apatura metis*, *Pieris brassicae*, *Nymphalis antiopa*. On Sakhalin floodplain grass-forb meadows marked only single specimens *Ahlbergia ferrea*, *Clossiana euphrosyne*, *Clossiana oscarus*, *Inachis io*.

Kunashir has massive cluster *Thoressa varia*, *Brenthis daphne* and *Ochlodes sylvanus* on meadow areas, vacant lots and valleys with Kuril bamboo, grasses, etc., which are host plants for their caterpillars on about. Sakhalin has *Parnassius stubbendorfi* and *Carterocephalus silvicolus* on wet meadows, forest edges with grasses. These species are caught on habitats during their intensive summer (June-July) (Korshunov, 1995).

On Kunashir were found species which not previously registered - *Pieris brassicae*, *Cyaniris semiargus*, *Maculinea telejus*, *Neptis rivularis*. On Sakhalin were found *Papilio maackii*, *Leptidea amurensis*, *Ahlbergia ferrea*, *Apatura metis* (Matsumura, 1911 Kurentsov, 1970; Gritskevich, 1994; Konovalov, 1996). *Pieris brassicae* is an active migrant and successfully expanding its range to the East. Other species are widespread in Eurasia, Japan, China, the Kuril Islands and Sakhalin (Korshunov, 1995).

Fauna of Kunashir and Sakhalin is very diverse and heterogeneous. It changes not only when driving from the north to the south, but also when moving from west to east, due to the regional paleogeographic conditions and the influence of ocean currents surrounding the islands.

PATHOGENIC ACTION OF THE PARASITES ON THE BIRD'S BODY

Zamornea Maria¹, Erhan Dumitru¹, Rusu Ștefan¹,
Chihai Oleg¹, Bondari Lidia², Coadă Viorica³

¹*Institute of Zoology, Academy of Sciences of Moldova, Chisinau*

²*Republican Center for Veterinary Diagnostics*

³*State University of Tiraspol*

e-mail: mariazamornea@gmail.com

Birds are seen in PSSA program (Programme special pour la securite alimentaire) within FAO as a crucial element in the fight for growth in food production and poverty reduction. Efficient usage and continuity of populations of species of hunting interest, implies knowledge of the manner of life of species of hunter and the relationships between populations of these species and other components of the ecosystem to which they belong.

It is proved that at the current stage of the livestock (at the population level) and the host animals (individually) are infested not only with one species of parasites. For many livestock, especially cattle, sheep, pigs and poultry is characteristic the phenomenon of poliparasitism.

Parasites directly influence metabolic and host immune responses, which presents practical and theoretical interest because it determines the consequences of the host parasite interaction.

Proteins have leading role in the animal organism, fulfilling the functions of biocatalyser, protecting the body, and, if necessary, the energy. Monitoring the correlation between changes in proteinic indices and low indices of infestation with ectoparasites (biting, fleas, and parasitic forms of mites) allow following the evolution of parasite and disease severity factor.

The dynamic of morphophysiological changes in the poliparasitated body of the host is different compared to that found under monoparasitism.

In the results of the investigations were established variations of the protein indices for wild poliparasitated birds with biting, flea and parasitic forms of mites.

Research results reveal deviations of total protein content in blood serum from infected group representing averages of 40.9% and 34.6% of birds from the healthy group. In all pathological conditions which identify an increase in the metabolism, the need of the proteins is higher, including in the states of mixed invasion with ectoparasites. The body of wild birds, free of ectoparasitic fauna probably ceases protein consumption compared to bird's infestation (Figure 1). It is important to notice the deflections of protein fractions. Established dysproteinemia is characterized by decrease in total albumin content (29.8%) for infected birds followed by an increase (32.5%) in the free group.

An alpha globulin level in poultry is free of ectoparasites, increased by 17.4% compared to the infected group. There was an increase of gamma globulin in infected group (41.7 ± 0.32). This increase probably show nonspecific humoral activity, accompanied by the body's immune response and immunological activity of the body reveals the dependence of the intensity of invasion.

The dynamics of electrolytes in the blood of wild birds infested with ectoparasites is expressed as the decrease in Ca^{2+} ion content (1.19 ± 0.09) reflected by an increase in this index (2.96 ± 0.11) at the birds free of ectoparasites. This can be explained probably by the fact that the hematophagous insects in their saliva which neutralize the properties of the thrombin components, fibrinogen, salts of Ca^{2+} , such that, no blood clots are formed in the plagues. The phosphorus content in infected birds was reduced by 27.6% compared to the uninfested

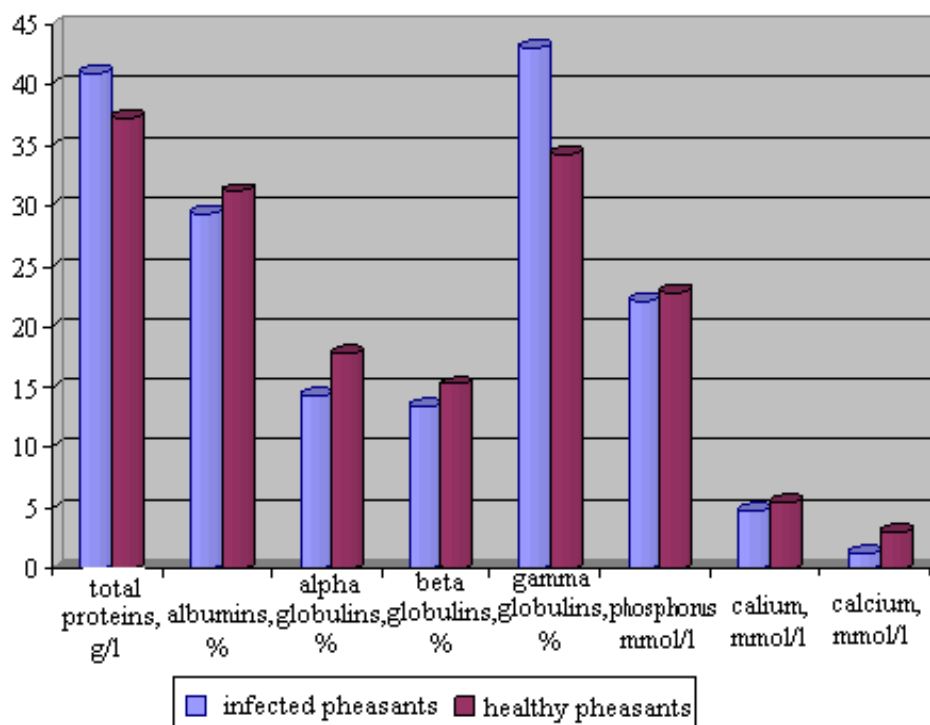


Figure 1. Indices of protein and ionograms among wild birds

group. Also in the group of infected birds has been established an imbalance of the Ca²⁺: P (2: 1) ratio.

Therefore, researches that were made provided an opportunity to argue and interpret the features of manifestation of the societies of ectoparasites with biting, fleas and parasitic forms of mites on indices of protein and ionograms.

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SECTION 3

WATER ECOSYSTEMS: METHODOLOGY OF INVESTIGATION, MONITORING, EVALUATION OF THREATS, AND ASSESSMENT OF RISKS

DYNAMICS OF MINERALIZATION AND MAIN IONS IN WATERS OF THE LOWER PRUT

Bagrin Nina, Borodin Natalia

*Institute of Zoology, ASM, Chisinau, Moldova,
e-mail: boichenco_nina@mail.ru*

Field collection of samples and their chemical analysis in laboratory conditions have been performed according to established methods in hydrochemistry (Semenov, 1977) and EU standards (ISO 5667-6:2005; ISO 5667-6:2009) during 2012-2013. Content of hydrogen carbonate and carbonate ions ($HCO_3^- + CO_3^{2-}$) was determined by titration classical method (ISO 9963-1:1994; ISO 9963-2:1994), of chlorides – by silvermetric method (ISO 9297:1989). Determination of both water hardness and content of calcium ions was carried out by complexometric EDTA-titrimetric method (ISO 6059:1989; ISO 6058:1984). In the case of sodium and potassium ions the method of Alekin (1973) was used. Sulphate ion concentration (SO_4^{2-}) was determined by gravimetric method (ISO 9280:1990).

Mineralization, as well as the content of main ions, are conservative indices and depend mostly by natural factors. It is known the water mineralization decreases in the period of floods and increases in the period of low flows, but during the last years this ratio has deregulated in the waters of the Prut River. In 2012 (year with drought) the values of mineralization varied between 291-436 mg/l, in 2013 – between 338-777 mg/l. In 2013 it was observed an evident increase of concentration of sulphates (up to 239 mg/l), sodium and potassium ions (up to 105 mg/l) at Cahul station in February and on the sector Leuseni - Cahul in March.

As result, in February of 2013 the waters of the Prut River referred to the hydrogen carbonate-sulphate class, group of sodium-calcium, type II (Cahul) and to the sulphate class, group of sodium in March of 2013 (on the Leuseni - Cahul sector). In most cases, the water of the Prut River referred to the hydrogen carbonate class, group of calcium, type II, accordingly to classification of Alekin.

The correlation between cations and anions is a basic indicator in the determining of surface water stability, thus the modification of water class reveals the existence of pollution or the water metamorphosis under the influence of some major factors. The Prut waters, taking in account the composition of main ions, correspond to the requirements on quality, which must be met by drinking water, and waters used in pisciculture and aquaculture.

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NUTRIENTS IN WATERS OF THE PRUT RIVER, LOWER SECTOR

Borodin Natalia, Bagrin Nina, Bogonin Zinaida

*Institute of Zoology, ASM, Chisinau, Moldova,
e-mail: natciobanu@rambler.ru*

The content of nutrients is one of the most important indicators of water quality, which determines both the development of several aquatic organisms, as well as trophicity level, intensity of production-destruction processes of aquatic ecosystems.

Nutrients (N-NH₄, N-NO₂, N-NO₃, mineral P) were investigated by using classical spectrometric methods, which complies to a range of standards: ISO 7150-1:1984, ISO 6777:1984, ISO 7890-3:1988, ISO 6878:2004.

The concentration of ammonium ions ranged between 0.02-0.758 mgN/l, of nitrite ions – 0.005-0.067 mgN/l, and of nitrate ions – 0.338-2.430 mgN/l. The share of nitrates in the sum of forms of mineral nitrogen was 54-90%, of ammonium nitrogen – 8.5 – 43%, and of nitrites – 1.1-6.0%

As rule, in aquatic ecosystems the content of mineral nitrogen exceeds those of organic nitrogen. In 2012 in 25% of samples the share of mineral nitrogen in total nitrogen was equal to 25-44%, but in 2013 already in 30% of samples it varied between 6-38%. To this extent, it was evident the tendency of increase of the organic nitrogen concentration. The ratio between mineral and organic nitrogen is an integrated index that reflects not only nitrogen flow processes, but also the intensity of self-cleaning processes, secondary pollution and trophicity level of aquatic ecosystems.

The content of mineral phosphorus varied between 0.013-0.078 mgP/l, and of organic phosphorus – between 0.17-0.187 mgP/l. It is worth to mention that in summer of 2012 the concentrations of mineral phosphorus, in most of cases, were higher than those of organic phosphorus, and in autumn of 2012- opposite. In 2013 the concentration of organic phosphorus in most samples exceeded those of mineral phosphorus.

In comparison with the 80-90 years of the past century the values of mineral nitrogen and phosphorus are much lower. The current contents of nutrients in the waters of the Prut River are favourable for development of hydrobionts.

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ACTUAL PISCICOLOUS ZONING OF THE PRUT RIVER AND ITS DETERMINANT FACTORS

Bulat Dumitru¹, Bulat Denis¹, Toderas Ion¹, Zubcov Elena¹, Rusu Vadim^{1,2}

¹*Institute of Zoology, ASM, Chisinau, Moldova,*

²*State University of Moldova*

e-mail: bulatdm@yahoo.com

The ichthyological investigations, which have been done in the Prut River basin during 2010-2013 years, have found out an ichthyofaunistic complex of 50 fish species assigned to 11 families and 8 orders: Ord. *Acipenseriformes*, fam. *Acipenseridae* (1 sp.); Ord. *Clupeiformes*, fam. *Clupeidae* (1 sp.); Ord. *Esociformes*, fam. *Esocidae* (1 sp.); Ord. *Cypriniformes*, fam. *Cyprinidae* (26 sp.), fam. *Balitoridae* (1 sp.), fam. *Cobitidae* (4 sp.); Ord. *Siluriformes*, fam. *Siluridae* (1 sp.); Ord. *Gadiformes*, fam. *Lotidae* (1 sp.); Ord. *Gasterosteiformes*, fam. *Gasterosteidae* (2 sp.); Ord. *Sygnathiformes*, fam. *Sygnathidae* (1 sp.); Ord. *Perciformes*, fam. *Percidae* (5 sp.), fam. *Gobiidae* (4 sp.), fam. *Centrarchidae* (1 sp.), fam. *Odontobutidae* (1 sp.). As result of fragmentation of the Prut River by building of the dam of Costesti-Stinca reservoir in 1976, piscicolous zoning of riverine ecosystem had suffered essential modifications. Currently, the Prut River macroecosystem may be divided into a few piscicolous zones represented by characteristic species and distinct hydrobiotopes:

1. Zone of thresholds and fords with fast flow - typical representatives being: *Alburnoides bipunctatus*, *Alburnus alburnus*, *Chondrostoma nasus*, *Squalius cephalus*, *Barbus barbus*, and *Romanogobio kesslerii*.

2. Zone of bed with slow flow - *Barbus barbus*, *Pelecus cultratus*, *Vimba vimba*, *Silurus glanis*, *Ballerus sapa*, *Blicca bjoerkna*, *Abramis brama*, *Aspius aspius*, *Sander lucioperca*, *Leuciscus idus*, *Alburnus alburnus*, and *Perca fluviatilis*.

3. Zone of Costesti-Stinca reservoir - *Rutilus rutilus*, *Abramis brama*, *Perca fluviatilis*, *Aspius aspius*, *Sander lucioperca*, *Alburnus alburnus*, and *Cyprinus carpio carpio*.

4. Zone of Belevu natural lake and Manta swamp - *Carassius gibelio*, *Rutilus rutilus*, *Blicca bjoerkna*, *Gymnocephalus cernuus*, *Alburnus alburnus*, *Cyprinus carpio*, *Hypophthalmichthys molitrix*, *Hypophthalmichthys nobilis*, *Ctenopharyngodon idella* (in high flood period of time, ichthyofaunistic component is strongly influenced by ichthyocenosis of the Danube and Prut River).

5. Zone of water-meadow, branches, channels etc. - *Lepomis gibbosus*, *Rhodeus amarus*, *Pseudorasbora parva*, *Perca fluviatilis*, *Carassius gibelio*, *Alburnus alburnus*, *Rutilus rutilus*, *Esox lucius fry*.

Ichthyofaunistic diversity in these piscicolous zones depends on hydrobiotic particularities and abiotic factors, season, nyctemeral period, ecoton, anadromous and potamodromus migration, etc. As usually, in the river bed ichthyocenosis the share of rheophyle fish species is higher, while in stagnant water ichthyocenosis, opposite, the share of limnophilous fish species is higher.

Nowadays, due to the active process of fragmentation, eutrophication, silting of lotic ecosystems, and hydrobiotopic homogenizing, the trend of progress of some eurytopous, generalist and high competitive representatives, which successfully habit and increase their abundance in different ecological conditions, is observed.

Among eurybionte, generalist, with high ecological valence and high density species, in the Prut River macroecosystem should be mentioned: *Alburnus alburnus* – abundant in both of the Prut River sectors (middle and lower) and in all piscicolous zones (I, II, III, IV, V); *Perca fluviatilis* – has become especially numerous in the middle sector (II, III), in the flooded depressions and braches on entire river length (V); *Rutilus rutilus* – eudominant and euconstant species almost in all piscicolous zones of the Prut River (II, III, IV, V), *Carassius gibelio* – non-native invasive species, extremely numerous in stagnant, not deep water with slow flow (IV, V), *Blicca bjoerkna* and *Gymnocephalus cernuus* – suddenly had increased the density in hydrobiotops of the river bed and in Beleu natural lake and Manta swamp (II, IV). A range of species with short life cycle as *Neogobius fluviatilis*, *Babka gymnotrachelus*, *Rhodeus amarus*, *Pseudorasbora parva* etc., have demonstrated high abundance in littoral habits, but with variable frequency even in the same piscicolous zone.

It is rejoicing that some of rare representatives of ichthyofauna of the Republic of Moldova, such as *Squalius cephalus*, *Leuciscus idus*, *Chondrostoma nasus*, *Ballerus sapa*, *Barbus barbus*, *Vimba vimba*, *Pelecus cultratus*, *Alosa tanaica*, *Gymnocephalus baloni*, *Gymnocephalus schraetser*, *Alburnoides bipunctatus*, *Sabanejewia balcanica* are quite frequently registered in some hydrobiotops of the Prut River, demonstrating spatial accidental distribution, determined by hydrobiotop preservation level and accessibility of migration ways. In such way, *Squalius cephalus*, *Chondrostoma nasus*, *Alburnoides bipunctatus* and *Sabanejewia balcanica* are frequently met in bed zone and in tributaries of the Prut River middle sector, while *Leuciscus idus*, *Pelecus cultratus*, *Alosa tanaica* and *Gymnocephalus baloni* are characteristic for piscicolous zone of lower sector. *Barbus barbus* and *Vimba vimba*, considered as rheophyle species, have become common in Costesti-Stinca reservoir as result of 2008 and 2010 flooding. Heavy natural calamities, possibly, had caused not only interpenetration on large surfaces of adjacent piscicolous zones, but, also, provoked the cleaning of previos silted spawning places, improving in such way the reproduction conditions of lithophilous fish species. Comparative analysis of preservation state of the Prut River hydrobiotop sectors has emphasized a different level of ecological bonitation. In the middle sector of river bed the ecological state is more favorable, the hydrobiotop being plentiful of fords, thresholds, holes, meanders, islands, and the substrate varying from stone one to sandy, clayey or earthy one. Unfortunately, the ecological state is changed over in the lower sector of the Prut River: sand

and gravel are actively extracted from the river bed, everywhere the poaching is practiced, the banks are exposed to the tree cutting, resulting in erosion, ecosystem silting and eutrophication.

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INVASIVE POTENTIAL OF FISH SPECIES FROM AQUATIC ECOSYSTEMS OF THE REPUBLIC OF MOLDOVA

Bulat Denis¹, Bulat Dumitru¹, Toderas Ion¹, Usatai Marin¹,
Fulga Nina¹, Rusu Vadim^{1,2}

¹*Institute of Zoology, ASM, Chisinau, Moldova,*

²*State University of Moldova*

e-mail: bulat.denis@gmail.com

The paper is devoted to the assessment of invasive potential of 22 non-native and intervenient fish species from aquatic ecosystems of the Republic of Moldova by using Fish Invasiveness Screening Kit (FISK) protocol.

In the case of 14 species, which form 63,6% from the total of 22 species, the invasive potential is high (total FISK score > 19 points), other 36,3% (8 species) are considered to possess medium invasive potential (total FISK score between 1 and 18,9 points). In decrease order of invasive potential value, the first four positions are occupied by allogene fish species, which successfully have naturalized in the Republic of Moldova, producing major ecological and economical danger. On the top is *Carassius gibelio* (Bloch, 1782) with 41 points. In small rivers and in Beleu natural lake and Manta swamp, the species has become a multidominant one, which, because of specific abiotic conditions, formed ecotypes with slow growing rate and exceptional competitive capacity. Also, in other palustrines and lake environment ecosystems of the country, the species has become very numerous, having a direct contribution to the total disappearance of *Carassius carassius* (Linnaeus, 1758) and *Tinca tinca* (Linnaeus, 1758) from country area. In last decade, a significant increase of the *Carassius gibelio* share is observed in ecosystems of the Dniester and Prut rivers, which currently are under an active process of limnification, eutrophication and silting. On the second place, according to the potential invasive value, is placed *Perccottus glennii* (Dybowski, 1877) - 38 points, considered as a relatively new species for the Republic of Moldova – for the first time was recorded in 2005 in the Draghiste River, the Prut River hydrological basin. On the third place, according to invasive potential in the Republic of Moldova, is *Pseudorasbora parva* (Temminck & Schlegel, 1846) - 34 points. It shows high quantitative values only in degraded anthropic ecosystems (as small rivers, some lakes in the river bed, etc.); in other

ecosystems it occupies a secondary position. The same high value of invasive potential is characteristic for *Lepomis gibbosus* (Linnaeus, 1758) - 34 points.

According to naturalized non-native species, depending on the dangerous and invasive potential, is follow a fairly large ecologic group of intervenient species by ponto-aralo-caspian and mediterranean origin, which, in evolution, had been stationed in biotopes of littoral marine and estuary one.

Currently, one of most dangerous intervenient fish species, which has increased rapidly the density and expansion area in the Republic of Moldova, is *Syngnathus abaster* Risso, 1827 (30 points). It is an euryhaline species by mediterranean origin, forming numerous freshwater populations in barred lakes (Cuciurgan, Dubasari, Ghidighici etc.). Between gobies, the most dangerous from the point of view of invasive potential are considered *Neogobius fluviatilis* (Pallas, 1814) (28 points), the most abundant and frequent gobie species in the Republic of Moldova, which is present in all types of aquatic ecosystems (small, middle and big rivers, reservoirs, etc.); *Neogobius melanostomus* (Pallas, 1814) (26 points); *Babka gymnotrachelus* (Kessler, 1857) (23 points) and *Neogobius kessleri* (Guenther, 1861) (22 points).

Last time a rapid advancement of some species is observed in freshwater ecosystems of the country (especially in the Dniester basin), which are considered to be exclusive marine, as *Atherina boyeri* Risso, 1810 (27 points) and *Clupeonella cultriventris* (Nordmann, 1840) (27 points). In the Republic of Moldova, the mentioned species, so far, are reported in the Lower Dniester, Cuciurgan reservoir and Cahul Lake, where they succeeded to form very numerous populations. Also, it has been revealed a sudden increase of abundance of other two intervenient fish species from *Gasterosteidae* family as *Gasterosteus aculeatus* Linnaeus, 1758 (27 points) and *Pungitius platygaster* (Kessler, 1859) (25 points), which had invaded littoral zone of the Dniester and its tributaries.

The danger of these species for functionality of autochthonous ichthyocenosis is determined by their timely idioadaptation at different levels of systemic organization, most of species being characterized as eurytopus, eurythermic, euryoxybionts, mixohalinous, with high prolificacy, substratum polyphylous, with precocious and portion reproduction, fast embryonic development and exceptional voracity, caring for survivors, *r* type reproductive strategies, pronounced flexibility between polyphagous and monophagous, inaccessibility to predators, etc.

Cyprinus carpio carpio Linnaeus, 1758 (25 points) was included in potential invasive species group because of its large ecological valence, in spite of that, in our country, it has an undeniably importance in amateur and sportive fishing, as also in pisciculture where it is holding the first place by production quantity on national market. The large introducente fish species as: *Hypophthalmichthys molitrix* (Valenciennes, 1844) (10 points), *Hypophthalmichthys nobilis* (Richardson, 1845) (9 points), *Ctenopharyngodon idella* (Valenciennes, 1844) (9,5

points) and less *Mylopharyngodon piceus* (Richardson, 1846) (7,5 points), in spite of systematic population and accidental ingress in huge quantities in hydrographic network of the country, has never produced an invasive effect. On the contrary, they are desired in the fish captures and appreciated in acvaculture for their ameliorative effects against „blooming of water” phenomenon (*Hypophthalmichthys molitrix*, Valenciennes, 1844) and excessive macrophytes stud (*Ctenopharyngodon idella*, Valenciennes, 1844).

In conclusion we can mention that it is easier to prevent the negative effects caused by non-native and intervenient fish species, than to eliminate the negative consequences, which, in most of cases, it is possible only by destroying the whole ecosystem.

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RED MICROALGAE *PORPHYRIDIUM CRUENTUM* – MARKER OF NANOPARTICLE TOXICITY

Cepoi Liliana¹, Rudi Ludmila¹, Chiriac Tatiana¹, Miscu Vera¹, Ghelbet Viorica¹, Guțu Tatiana², Sadovnic Daniela¹, Rudic Valeriu¹

¹*Institute of Microbiology and Biotechnology, Academy of Sciences of Moldova*

²*Institute of Electronic Engineering and Nanotechnologies, Academy of Sciences of Moldova*

The development of nanotechnologies that is recorded in the last decades has seen a great success, in particularly in nano-materials, which is characterized by the eminence from the point of view of the basic knowledge and from the point of view of practical applications.

Along with the development of this branch of science, increases the risk of human exposure and nanomaterial environmental action. Since the aquatic environment is very vulnerable to direct or indirect contamination with nanoparticles, reaction study of aquatic organisms to the action of these materials is very opportune.

Nanomaterials hybrid systems – microorganisms offer the opportunity to make a perfect study of nanoparticle toxicity on organisms, but also of their potential beneficial effects. Microalgae present very convenient and representative objects, which offer enormous facilities in modeling various effects and determination of action mechanisms of diverse compounds on vital cell's processes, that is what these aquatic objects are very convenient models to determine potential toxic effects.

Currently several species of microalgae (*Chlamydomonas reinhardtii*, *Euglena gracilis*, *Chlorella vulgaris*, *Scenedesmus sp.* etc.) are used as models for establishing different types of nanomaterials toxicity. The method of determining

the toxicity of nanoparticles with the use of microalgae, requires the exposure of the crop's which is exposed to the exponential growth phase, the action of nano-materials in various concentrations and calculation of growth inhibition rate or accumulation of the free radicals.

To reduce the duration of the existing tests, was proposed setting procedure of the nanoparticles toxicity using red microalgae *Porphyridium cruentum* CNMN-AR-01.

The process consists of algal crop incubation with nanoparticles for 6 hours with determining the nanoparticles' toxicity by the negative correlation between the malonic diadehyde quantity in the biomass at the early stages of action and biomass quantity at the end of the microalgae growth cycle.

One of the principles behind the selection of the *Porphyridium cruentum* crop as a marker of the nanoparticles' toxicity, is the increased content of polyunsaturated fatty acids, which are exposed to peroxidation in the case of toxic action of xenobiotics. The reaction to foreign substances is a prompt action, which occurs in the first hours of interaction. The level of MDA (malonic dialdehyde) registered in the first hours of microalgae's *Porphyridium cruentum* interaction with xenobiotics, correlates with the biomass quantity at the end of the life cycle of the crop. Thus decreases the necessity to reproduce the whole life cycle to observe the inhabitation effect of the productivity, toxicity being expressed through the increase of the malonic diadehyde level. In the experiments for determination of the ZnSe and ZnS nanoparticles toxicity was demonstrated that the correlation between the increase of the MDA content in the biomass with the reduction of biomass accumulation (table 1)

Table 1

The level of MDA and biomass quantity of Porphyridium cruentum to the action of different concentration of ZnSe and ZnS nanoparticles

Monitoring indicator	Concentration of ZnSe nanoparticles, mg/l				
	0,1	0,5	1,0	1,5	2,0
Biomass, %M	102,2±3,1	78,7±3,0*	54,6±2,4*	51,6±3,2*	47,6±3,0*
MDA, %M	100,9±2,6	124±2,6*	132,2±1,8*	135,3±3,0*	135,9±2,6*
Concentration of ZnS nanoparticles, mg/l					
Biomass, %M	82,3±2,6	60,7±1,7*	53,6±2,4*	50,9±3,3*	45,1±3,0*
MDA, %M	114,5±2,6	126,7±3,0*	134,2±2,7*	135,6±2,5*	145,0±2,1*

* - $p < 0,01$

The data in Table 1 demonstrates that the increase of MDA content in porfidrium biomass after 6 hours of contact with ZnSe and ZnS nanoparticles in concentration of 0,5 mg/l and above, associates with a decrease of biomass quantity which accumulates at the end of the growth cycle of the crop. The presented results confirm the possibility of early assessment of the toxicity level of nanoparticles in the test of determining the different products of lipid peroxidation.

THE MAIN DISEASES OF THE SPECIES *ANCISTRUS BREVIPINNIS* (REGAN, 1904) AND *CORYDORAS AENEUS* (GILL, 1858), FORM LORICARIIDAE AND CALLICHTHYIDAE FAMILIES IN CAPTIVITY, THEIR PREVENTION AND TREATMENT

Chiorean Adriana, Papadopol Nicolae C., Dumitrescu Elena

Muzeum Complex of Natural Sciences Constanța, Romania,
e-mail: adrianahacvariu@yahoo.com

In this study, the authors present the main diseases encountered in the species selected for this study : *Ancistrus brevipinnis* (Regan, 1904) and *Corydoras aeneus* (Gill, 1858), bred in captivity. While living in natural conditions, the occurrence and spread of the diseases are less frequent and harmful, except for the cases of pollution, compared to living in clustered breeding conditions, where these are more dangerous, the artificial life conditions encouraging the action of a larger variety of abiotic and biotic pathogenic agents. Depending on the nature of pathogenic agents, we encounter, as well as in fish and in other animal organisms, specific diseases that are caused by: animated pathogenic agents (viruses, bacteria, parasites) and non-specific diseases caused by physical-chemical, nutritional and constitutional agents.

The environmental conditions act both on fish and on pathogenic agents, either encouraging or inhibiting their action on the host. The statuses of the disease are the result of the close interaction between pathogens, host and ambient environment.

In order to establish the diagnostic of fish, a macroscopic examination was carried out, accompanied by the microscopic examination.

On the basis of the results of research and experiments carried out for the identification of diseases, their prophylaxis and therapy, for the two species of aquarium fish, as well as the accumulated knowledge in this field in the literature, a number of measures result, necessary to be taken for preventing and combating the morbidity of these species of fish (www.doctorfuncus.org, Radulescu, I., Lustun, L., Viocan, V., 1983).

Aquatic environment acts on fish by its physical-chemical abilities and pathogenic agents which it contains. For the diseases to be prosecuted it is necessary that the body of the fish to be sensitive, sensitivity generated by the living conditions or transmitted hereditary lines.

The prophylactic measures serve at increasing the resistance of fish to disease, as well as at limiting the action of pathogenic agents in the aquatic environment of life.

**PRELIMINARY CONSIDERATIONS REGARDING BIOGEOGRAPHY
AND PHYLOGENY OF *ACROCEPHALUS* GENERA INFERRED BY
mtDNA ANALYSIS**

Ciorpac Mitică, Ion Constantin, Gorgan Dragoş Lucian

Faculty of Biology, "Alexandru Ioan Cuza" University of Iasi, Romania
e-mail: lucian.gorgan@uaic.ro

The reed warbler's genera, *Acrocephalus* (Acrocephalidae Family) numbers 37 species. The members of this family breed widely across the Old World and Australasia: in Eurasia - 17 spp., mainly Palearctic; Africa / Madagascar / Seychelles / Mascarene islands - 7 spp. and Australia/Polynesia - 13 spp. Previous studies of molecular phylogeny were focused on taxonomy of this genera and phylogenetic relationships with other genera. The divergence dating time of the reed warblers was not previously robust estimated. Fossil records and molecular data provide strong indications of higher taxa ages. In the present study, we used mitochondrial DNA sequence, data to infer the divergence dating time of all species of reed-warblers.

Blood samples were collected and preserved in Queen's Lysis Buffer. The total DNA was isolated and purified using DNA IQ System protocol (Promega). Genetic analysis was performed in a volume of 25 µl using the GoTaq Flexi DNA Polymerase Kit (Promega) on the gene that encodes the cytochrome b gene using two pair of primers: L-14841 and mt E-syl; mt D-syl and mt FNP. The PCR products were separated by agarose gel electrophoresis purified using Wizard SV Gel and PCR Clean-up System (Promega) and direct sequenced using CEQ 8000 Genetic Analysis System (Beckman-Coulter). The sequence analysis was performed using the CEQ8000 instrument software. A number of 40 samples were combined with another sequence from GeneBank to generate a dataset comprising 180 individuals belonging to a total of 35 *Acrocephalus* species and *Emberiza schoeniclus* as out-group. The full cytb sequences were cut to 879bp fragments and aligned using MEGA 5 software.

Our phylogeny, which includes 35 taxa, permits us to infer the colonization patterns of all species of reed-warblers. We believe that the *Acrocephalus* genera ancestor was originated in Greater India subcontinent, and appeared in Late Cretaceous. While India is drifting north, *Acrocephalus* ancestor split in two forms, one with large body size and another with small body size; the ancestors of two primary lineages of reed warblers in terms of size. After that, those two forms had different courses across the world, the small size form remains in Greater India subcontinent and the large size form migrated in Africa through Madagascar.

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PRELIMINARY SURVEY OF THE MOLLUSCS (MOLLUSCA, GASTROPODA, BIVALVIA) FROM THE LOWER BASIN COURSE OF THE ICHEL RIVER

Coadă Viorica, Pelin Ana

State University of Tiraspol, Chisinau, Moldova;
e-mail: vioricacoada@gmail.com

Identifying faunistic elements and environmental variability reflects the state of the habitat. Related to their environment, molluscs are very important in their value as bioindicators. Malacofauna's functional status may serve as an indicator of environmental quality and highlights the search for new solutions to protect, use and exploitation of biological resources.

This paper has as main goal the presentation of the situation of molluscs and aquatic fauna of the lower basin of the Ikel River. The collection and the conservation were performed according to specific methods. The species determination was made after the literature: (Лихарев, 1960; Шилейко, 1978, 1984; Лихарев, Виктор, 1980; Kerney and co., 1984; Grossu, 1983, 1995).

This area is a whole sector of the stretch of Ikel River located at Cricova - Vadu lui Voda town, a specific region of rocks with intercalation of the steppe, meadow and woodland areas. It is a unique space of the landscape structure for flora as well as for faunal diversity.

Research conducted in research stations revealed the presence of about 30 species, which systematically speaking belong to two classes: Gastropoda and Bivalvia, 3 orders and 13 families. These species constitute 20% of the total number of molluscs identified in the malacofauna of Moldova. Shellfish species collected in this area are: Phylum Mollusca, Class Bivalvia *Pisidium casertanum* (Poli, 1791) - is one of the most widely distributed species of freshwater molluscs in the world, cosmopolitan in distribution. Found in unpolluted waters thus habitat disturbance and human activities causing water pollution are possible threats to this species.

Class Gastropoda, Subclass Pulmonata, Order Basommatophora, *Stagnicola palustris* (OF Müller, 1774) - collected in permanent waters and rich vegetation, particularly in the lowlands, *Galba truncatula* (OF Müller, 1774) - typical habitats are wet meadows. *Lymnea stagnalis* (Linnaeus, 1758) - species widely distributed in lakes rich in vegetation, *Radix auricularia* (Linnaeus, 1758) - prefer slow water sludge as substrate, can tolerate polysaprobe water with high concentrations of organic matter, sulphides (Matuskova, 1985), *Radix peregra* (Linnaeus, 1758) - inhabits stagnant waters, prefers calcareous waters (Welter-Schultes, 2005), *Anisus vortex* - species that have preference for temporary waters in the plains, during the drought needs a moist substrate.

Listed species were collected from water basins in the study area, streams that drain into the Ikel River. In the Ikel River we did not collect any species of mol-

lucos, what means that the water quality of the river is characterized by a high degree of pollution.

Among terrestrial gastropods have been determined following species: Order Stylommatophora, *Vallonia costata* (O. F. Müller, 1774), *Vallonia pulchella* (O. F. Müller, 1774), *Vallonia excentrica* (Sterki, 1893), *Oxyloma elegans* (Risso, 1826), *Succinea putris* (Linnaeus, 1758), *Succinella oblonga* (Draparnaud, 1801), *Cochlicopa lubrica* (O. F. Müller, 1774), *Pupilla muscorum* (Linnaeus, 1758), *Truncatellina cylindrica* (Férussac, 1807), *Chondrula tridens* (O. F. Müller, 1774), *Zonitoides nitidus* (O. F. Müller, 1774), *Aegopinella minor* (Stabile, 1864), *Tandonia kusceri* (Wagner, 1931), *Vittrina pellucida* (O. F. Müller, 1774), *Deroceras reticulatum* (O. F. Müller, 1774), *Helix pomatia* (Linnaeus, 1758), *Helix lutescens* (Rossmässler, 1837), *Cepaea vindobonensis* (Férussac, 1807), *Xerolenta obvia* (Menke, 1828), *Helicopsis striata* (O. F. Müller, 1774), *Lindholmiola griva* (Frivaldsyky, 1835), *Euomphalia strigella* (Draparnaud, 1801), *Monacha cartusiana* (O. F. Müller, 1774).

Those 30 species identified in the lower basin of the Ikel River belong to the 4 zoogeographical categories. European elements are predominant, which are 50% of the identified species. Next in percentage (36.6%) are the Holarctic species, 10% and 3.3% are the Palearctic and the Carpathian elements. This relative homogeneity in terms of zoo-geographic, in the structure of the malacofauna of the area under investigation can be explained by the relatively small surface and the relative homogeneity of habitats in this area.

As a result of collection, our observations and research carried out in the lower basin of the Ikel River was first reported in the fauna of Republic of Moldova the species *Tandonia kusceri* (Wagner, 1931).

Through shellfish species identified in the lower basin of the Ikel River, we can highlight some peculiarities of the area. The complete absence of species of molluscs in the main bed of the Ikel River, means that man, through his work came to a sharp disturbance of the water body.

HYDROBIOLOGICAL RESEARCH ON HABITATS FROM THE UPPER HYDROGRAPHIC BASIN OF THE RIVER DAMBOVITA

Craciun Nicolae¹, Davideanu Grigore²

¹University of Bucharest, Faculty of Biology, „Aquaterra” Ecological Society.

²University „Alexandru Ioan-Cuza”, Iasi, Natural Sciences Museum.

Keywords: Natura 2000 Network, hydrobiology, river habitats, Dambovita.

Introduction: Research and sampling of biological material have been made from aquatic habitats of Dâmbovița river upstream of the lake Pecineagu and downstream of Pecineagu dam. Natura 2000 Network habitats inventory was conducted, until Dambovita's confluence with Tamas tributary. Specialty literature doesn't mention aquatic habitats researches upstream of Pecineagu dam. An assessment of the unique habitats of Natura 2000 network is presented, more or less similar to standard habitats of the Dâmbovița river basin and tributaries in

the upper course. A great emphasis was put on characterization of microhabitats present on tributaries, dead branches and toplices of the main course of the river.

An original map of the inventory and geographical location of the aquatic habitats from Dâmbovița basin and an original ecological restoration plan were made, proposed on the basis of our experience in assessing biodiversity of aquatic habitats that represent ecological rehabilitation needs in Dâmbovița valley.

Aims: Aquatic biodiversity and Natura 2000 Network habitats assessment, concerning their conservation status.

Materials and methods: Habitats study was realized using determinators for the inventory of flora and fauna species. Aquatic habitats were highlighted, but also ecotone habitats of shores, oligotrophic ponds, toplices and closed arms of the river. Besides inventory of flora and fauna species, data regarding pollution sources and threats for species were collected. Using classic (rheophile nets) and modern methods (electrofishing) we realized fisheries and collected samples for measuring and weighing them. With the data obtained we could calculate the abundance for fish species from the study area. Zoobenthic species were also determined and a distribution map was realized. A statistical analysis was made for the data sets obtained on the field.

Microbiological, physical and chemical determination of water properties were made in different laboratories, according to ISO standards.

Results: Cluster analysis was made for fish, amphibians and invertebrate species. We elaborated a monitoring plan for different groups of fauna for observing the changes made in the field once the management plan is elaborated. Aquatic biodiversity analysis for all hydrobiont species was realised, but also of microhabitats from the shores (toplices, dead branches of the river). Microhabitats from Natura 2000 Network were characterised, considered vulnerable at European level. Threats and vulnerabilities of fish species were inventoried and solutions were proposed.

Conclusion: From the field data we found that drastic measures are needed in the area, measures included in a management plan for combating threats present in every mountain and submountain aquatic habitat. The upper hydrographic basin of Dambovita was little studied, previous researches being conducted by this article authors in 1997-2000. Comparing data from the past with the data obtained in the present we can conclude that fish populations were drastically reduced, reproductive individuals disappearing almost completely for every fish species.

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VARIATIONS IN THE FISH POPULATION DENSITY IN THE PROCESS OF ECOLOGICAL SUCCESSION OF THE KUCHURGAN RESERVOIR

Crepis Oleg, Usatii Marin, Strugulia Oleg, Usatii Adrian,
Cebanu Aurel, Bodean Anatol

*Institute of Zoology of the Academy of Sciences of Moldova,
Chisinau, Moldova e-mail: ihio.moldova@mail.ru*

The Kuchurgan estuary, before the control of its flow, was a surviving remnant of the ancient estuary of the Dniester and provided spawning and feeding pond for the River phytophilous fish (common bream, taran, carp, zander, pike, etc.). In addition, it was a place for feeding migrations of such rheophils as beluga sturgeon, starry sturgeon, starlet, shad, Black Sea roach, ide, asp, barbel, vimba, and nose carp. After the construction of the dam, its ecological succession occurred and the natural estuary converted into an artificial inlet water pond for TPP recycle water supply. The Power plant affected the environmental conditions in Kuchurgan water storage and contributed to its further ecological succession that was accompanied by changes in populations of different ecological groups of fish. At the beginning of TPP exploitation (years 1964-1965), there disappeared the sturgeon fish from the ichthyofauna and there was a sharp reduction in the density of fish populations of rheophilous fish species – ide (0.2%), shad (0.1%), nose carp (0.1%), gudgeon (0.1%), European chub (0.1%), and others. The populations of himnophilous species maintained or increased their numbers – roach (24.6%), silver bream (16.4%), gibel carp (13.4%) and perch (13.2%). At a weak heating of the reservoir (years 1969 -1970) it was observed an increasing of the feed reserves for the fish, which contributed to an increase in the population density of common bream (21.5%), roach (43.7%), silver bream (17.4 %) and perch (15.6%). However, the number of other species declined – gibel carp (0.2%), pike (0.6%), Black Sea sprat (0.3%), belica (0.2%), carp (0.1%), and zander (0.4%). Reducing the number of predators, in spite of the large stocks of small fish, was due in the case of zander to the location of its main spawning grounds in front of water intakes, and for pike – to violation of the quality of sexual products under the influence of high temperature. Changing the environmental conditions at an intensive heating of the water reservoir (years 1981-1985) led to a reduction of the primary bio products and had an adverse impact on the populations of some native fish species. The number of common bream fell to 2.2%, roach - to 8%, and perch - up to 2.2%. However, in general, changes in environmental conditions in the reservoir Kuchurgan in the period of intense work of the station had a positive impact on its fish fauna. The accelerated water exchange and increase of the average temperature of the water contributed to the prolongation of the period of intensive growth of fish for 2 months, and the introduction in the pond of new fish species (silver and bighead carp, grass and black carp) allowed to form a new, highly productive

fish complex. The silver carp (29.0%) and the bighead carp (10.0%) took a dominant position in the fish fauna and accounted for over 90% of the commercial stock of the reservoir. Until the mid-90's there have not been noted significant changes in its fish fauna. As before, there dominated silver and bighead carp (33.0%), and the number of perch (11.3%) and gobies (13.0%) increased. Other species (roach, common bream, silver bream, zander, pike, and carp) showed a tendency to decrease in numbers. In the period of years 1991-95 a new invasive non-commercial species - the Big-scale sand smelt - appeared in the reservoir, the population of which, thanks to eurybionte and high rates of reproduction has taken a leading position in the fish fauna (25.5%).

Since the mid-1990s, as a result of reducing the intensity of the power plant, a disturbance of the system of regulation of abiotic and biotic environmental conditions occurred in the Kuchurgan reservoir. This led to a further reduction in the number of commercial fish populations. Pike, zander, asp, and tench met in catches in single units, and the density of populations of other species dropped significantly: roach (1.0%), common bream (0.1%), bighead carp (0.3%) and silver carp (0.8%). The most adapted to changing environmental conditions were big-scale sand smelt (26.0%), bleak (23.4%), perch (15.0%), and gobies (17.5%). Further changes of the thermal and hydrological regimes of the water reservoir led in years 2004-2006 to its massive overgrowing with macrophytes. As a result, there occurred another ecological succession and the reservoir became an overgrown lake with a poor water exchange. During this period, a successful reproduction of populations of pike (2.1%), perch (16.9%), gibel carp (13.2%), rudd (13.8 %), and tench (2.9%) was noted. In 2007-2009, under the influence of changing environmental conditions the fish fauna of the reservoir continued to change. There significantly increased the number of Black Sea sprat population (16.5%), belica (10.3%), rudd (23.1%), perch (25.2%), pumpkinseed sunfish (3.4%), and ruffe (3.9%).

At present, the highest population density in the fish fauna was observed in bleak (16.3%), big-scale sand smelt (9.0%), belica (9.0%), rudd (8.3%), perch (8.1%), and silver bream (7.0%). Over the past three years, it has significantly increased the number of pumpkinseed sunfish (6.7%) and it is now a serious competitor to native species. However, there was observed a trend towards restoration of the populations numbers of roach (1.8%), zander (0.1%), European catfish (0.1%), and other valuable species, indicating the beginning of the normalization of the environmental conditions in the reservoir.

DATA REGARDING PARASITE INFESTATION OF OCEANIC FISH SPECIES USED IN MARINE MAMMAL DIET IN CONSTANTA DOLPHINARIUM

Curlișcă Angelica¹, Papadopol Nicolae C.¹, Dumitrescu Elena², Bîlbă Adrian¹

¹*Complex Museum of Natural Sciences of Constanta, Romania,
curlisca.angelica@gmail.com*

²*INCDM “Grigore Antipa” Constanța, Romania, eledumi@yahoo.com*

The present paper is investigating the prevalence of the endoparasites, potentially zoonotic, in oceanic fish species *Scomber scombrus* and *Clupea harengus*), *Mallotus villosus*, (Northwest Atlantic) and *Scomber japonicus* (Eastern Central Atlantic) given as food intake to the marine mammals located in the CMSN Constanta Dolphinarium pools (dolphins (*Tursiops truncatus*) and South American sea lion (*Otaria byronia*)).

To the mentioned species it was identified endoparasites pertaining to the nematodes group, genera *Anisakis* and *Contracaecum* (Fam. Anisakidae) and *Porrocaecum* (Fam. Ascarididae).

Investigations performed during the period 01.03-30.06.2013, have had the character of a survey performed on species control overseas, frozen, coming from industrial fisheries done in the Atlantic and entering the diet of marine mammals from Constanta Dolphinarium, part of the Complex Museum of Natural Sciences from this municipality.

Were collected for parasitological studies, parties of frozen ocean fish, procured for food marine mammals, a total of 30 specimens of *Clupea harengus*, 30 specimens of *Scomber scombrus*, 140 specimens of *Mallotus villosus* and 30 specimens of *Scomber japonicas*.

The fish were necropsied and nematodes were collected from the body cavities.

For determination of the four species of fish analyzed and Nematodes species that parasitizing this species were used the following authors: Papadopol (1995), Kulharenikov and Kukaev (2010), Munteanu Bogatu (2008), Gaevskaia and Kovaleva (1991).

The 210 fish specimens analyzed were selected random from defrosted biological material, prepared for feeding the marine mammals. We took into consideration also the gravimetric and dimensional characteristics of the fish species analyzed, to see if is any association between fish length and nematode infection intensity (tab. 1).

Results. Of the total specimens examined for each species, the proportion of the parasitized specimens varied as follows: 45% for *Mallotus villosus*, 80% for *Scomber scombrus* and *Clupea harengus*, and for *Scomber japonicus* proportion was 100%.

Characteristics of dimensional and gravimetric analysis of fish species

Species	No. specimens	Length (L-cm)		Weight (W-gr)		Sex	
		Average	Limits	Average	Limits	♂	♀
<i>Mallotus villosus</i>	140	16.9	14.8-19.0	22	12-32	48	92
<i>Scomber scombrus</i>	30	35.5	33.0-38.0	34.7	298-396	12	18
<i>Scomber japonicus</i>	10	39.6	38.5-41.0	492	438-522	3	7
<i>Clupea harengus</i>	30	28.1	25.5-30.5	203	182-244	7	23

Endoparasites identified belong to the group Nematoda, Anisakidae family (genus *Contracaecum* and *Anisakis*) and Ascarididae family (genus *Porrocaecum*). Individuals parasitic larvae are present as in all three genera, and as adults only to the *Contracaecum* sp. The most common parasite to *Mallotus villosus* is *Contracaecum* sp. (75%), followed by *Anisakis* sp. (20%), *Porrocaecum* sp. and *Porrocaecum reticulatum* (5%). For the species of the genus *Scomber* prevailing *Porrocaecum* sp. (70%), secondary *Anisakis* sp. (27%) and sporadically *Contracaecum* sp. (3%). For the genus *Clupea harengus* and *Mallotus villosus* *Contracaecum* provided most of the parasitic cases.

We can consider the results preliminary, given the limited amount of investigation. Even in this situation taking into account what was followed, the result points to the need for close monitoring of fish used as trophic base. A warning signal is the presence of *Anisakis* genus which includes in development cycle marine mammals as final host.

Of those observed, we can mention that the freezing state is a good and sufficient sterilization method, given that samples from the male Pei Pei, and dolphin feces has not identified any parasite from those mentioned in the paper.

Knowing the possible intake of parasites coming from the natural parasite species equipment, part of food of these mammals is useful in promoting effective prophylactic measures in their pathology, and knowing the sources of infestation.

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GRASS CARP AND OTHER PHYTOPHAGOUS SPECIES OF FISH IN FISHING RESERVOIRS

Dadu Ana

Institute of Zoology of ASM Chisinau Republic of Moldova
anita_dadu@mail.ru

Aquaculture has been the fastest growing source of global food production since 1985, and fishery production in Moldova is able to significantly improve food resources.

The climatic conditions in the country proved to be favorable for the growth and development of grass carp (*Ctenopharyngodon idella*). Phytophagus fish farming allows the use of these species directly using a significant portion of the primary products formed in the water and creating a profitable ecosystem.

Grass carp was introduced for the first time into ponds and lakes in Dubasari and Cuciurgan in 1961. In the first two years this species was farmed under special conditions, then this species was farmed in polyculture with other species.

Terms of a biotic factors, Moldova has a favorable factor for the growth of phytophagusfish. Optimum temperature is over 20°C season, which also can provide enhanced growth of this species in polyculture. The mower starts to feed spring at 10-12°C and basically doesn't feed below 10°C temperatures. The optimal temperature of this species is higher than that of the carp between 20-30°C. In the winter hardiness grass carp does not give free cloth and wintering easy in the basins of our country. The grass carp as well as the carp, is less demanding on hydro-chemical regime. In particular, it is resistant to oxygen deficiency dissolved in water - 0.5 mg / l which is considered the minimum. The farming depends largely on the water temperature and feeding the fish. Grass carp has a high growth potential and can reach over 32 kg mass under natural conditions.

Lack of reproduction material prevents the widespread deployment of advanced technologies of phytophagus fish growth in water basins of Moldova. The satiety of the lakes with enough fish depends much on the phytophagus fish breeding lots.

The amount of this valuable economic species declined significantly for the last few years due to natural disasters, overfishing and poaching.

Populating lakes with macro phytophagusfish species aims further increase of fish biomass without worsen interspecific trophic competition and excess aquatic vegetation control.

Sampling of ichthyological material was carried out in the aquatic ecosystems of the Dniester River basin between 2011-2013. Collection, definition and processing of the ichthyological material was made by using classical methods.

Highlighting the ichthyofauna in heritage and identifying the main factors that influenced it became possible after multiannual investigations (2010-2013) of the fish fauna of the natural and anthropogenic ecosystems in our country.

This is largely caused by human factors and their improvement depends also largely on human actions.

More and more ameliorative fishery action has been taken for the last years in order to minimize the influence of negative factors over the reproduction, conservation and rational use of aquatic biological resources. Dubosari, Cucurrgan, Costesti-Stincalakes and the Dniester River are populated each year with young economically valuable fish species such as: grass carp (*Ctenopharyngodon idella*), bighead carp (*Hypophthalmichthys nobilis*), silver carp (*Hypophthalmichthys molitrix*) and common carp (*Cyprinus carpio*) in order to maintain the diversity of ichthyofauna.

Improvement works were carried out during the years 2011-2013. The Dubosari lake was populated in 2011 with grass carp - 4000 kg, bighead carp and silver carp - 4000 kg and common carp - 4000 kg, it was repopulated in 2012 with young silver carp and bighead carp - 12000 kg and common carp - 8000 kg. And with grass carp - 2500 kg, silver carp and bighead carp - 8400 kg and common carp - 5000 kg in the first decade of 2013.

Populating ecosystems with economically valuable fish species contributes to the increase of fish population, decrease of the surface occupied by saprophytes and increasing fish population.

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ASSESSMENT OF WATER QUALITY IN LOWER DANUBE REGION

Ene Antoaneta, Munteanu Viorel

*Dunarea de Jos University of Galati, Romania,
47 Domneasca Street, 800008 Galati, Romania,
e-mail: aene@ugal.ro; munteanu_viorel48@yahoo.com*

Water is one of the most important major natural resources and is a basic need for human development, health and well-being and for other living bodies. The water demand is continuously increasing mainly due to population and economic growth and rising needs in domestic services, public and private supply, agriculture, industry, manufacturing and other sectors. Pollution of soil and air,

industrial and domestic waste disposal, application of fertilizers and pesticides in agriculture influence the quality of surface waters and groundwater receivers. Together with accelerated extraction of groundwater, the significance of groundwater chemical quality also increases relative to its economic value and usefulness. Because of the grave consequences the pollution of surface waters could have upon the ecosystems and population health, the problem of attentive monitoring is imposed, especially in urban communities and industrial zones, by the implementation of high precision and sensibility modern techniques. In Romania the concentration of many polluting objectives in certain geographical regions leads to the accumulation of polluting agents which can produce a real ecological stress.

The monitoring and assessment of water quality is based upon the fundamental physical and chemical properties of water. In this paper we present the results of the analysis of some water samples from the Danube-Prut rivers basin (Galati and Braila counties, Eastern part of Romania, Lower Danube region), using various analytical methods. The water samples have been collected in different months/seasons: a) from Danube river – inlet site and Prut river - Giurgiulesti, Galati county, b) Prut river and Danube river near Galati and Braila towns, from different locations (zones with harbor activity – shipbuilding yard, mineral port; zone with touristic interest; from the vicinity of an affluent discharging mouth; inlet, etc.); c) surface and underground water from natural protected areas of Lower Prut basin, Galati-Oancea/Cahul region. The spectrometric, electrochemical and optical determinations were carried out at “Dunarea de Jos” University of Galati for: turbidity, nutrients, oxygen regime (dissolved oxygen, CCO-Mn, CCO-Cr, CBO₅), mineralization grade (pH, conductivity), volumetric determinations (alkalinity, chlorides) and toxicological analyses (phenols, Fe, Zn, Cu, Cr, beta radioactivity). The obtained results for the concentrations of heavy metals and physical-chemical parameters in water samples were generally found within the Romanian admissible values for surface and drinking water.

CHARACTERISTICS OF GONADS IN MATURE FEMALES OF *SANDER LUCIOPERCA (L.)* FROM COSTESTI-STANCA RESERVOIR IN THE PERIOD OF REPRODUCTIVE CYCLE

Fulga Nina, Bulat Dumitru, Bulat Denis, Railea Nadejda, Dumbraveanu Dorin

Institute of Zoology of ASM, Chisinau

In Costesti-Stanca water reservoir *Sander lucioperca* is one time spawning fish, as evidenced by histological images of female ovaries after they have completed their spawning. Females, in which ovaries traces of spawning were found, fall in catches in the first decade of April. Among spawned fish individuals with gonads at the IV-A and V stages of maturity were also present, which allow to speak about asynchronous maturation of individuals and extended spawning, which lasts until the second decade of May.

After spawning the female gonads pass in VI-II maturing stages and contain only oocytes of protoplasmic growth and follicular membranes in resorption, which characterizes the one time spawning fishes. It is known that after the resorption of follicular membranes ovary passes in the II stage of maturity. According to studies M.P.Statova (1959) and L.V.Chepurnova (1975) in pike perch from Dubossari reservoir this process takes about a month. According to our data, the transition of the gonads «selected» females from Costesti-Stanca to the II stage of maturity occurs within a month. The duration of protoplasmic growth of oocytes in repeatedly maturing fish is about three months (tab. 1).

Table 1.

State of reproductive system in sexually mature females of pike perch in spring-autumn period in Costesti-Stanca reservoir

Period	Stages of gonad maturity	Phases of oocyte development
Ist decade of April	IV-A V VI	Ending of protoplasmic growth Maturation Ovulation
IInd decade of May	VI- II	Resorption of empty follicular membranes and of unspawned yolk oocytes
June	II	Protoplasmic growth
July	II	Protoplasmic growth
IInd decade of August	II-III	Vacuolization of cytoplasm
September	II-III	Vacuolization of cytoplasm
October	III III-A	Primary accumulation of yolk Primary accumulation of fat

The transition of ovaries from II to III stage of maturity in females of Costesti-Stanca occurs in the second half of August to October and lasts about two months. In pike perch from Dubasari reservoir the transition duration of the gonads in the III stage of maturity is two months (Statova 1962), and in the Dniester estuary – four months: from June until late September (Chepurnova 1991). In the process of vacuolization, the development of oocytes is asynchronous. The gonads contain oocytes with varying degrees of vacuolation, in phase D₁ as well as in phase D₃. Asynchrony in oocyte growth continues during vacuoles filling with yolk. In pike perch from Dubasari reservoir was noted the uneven development of sexual cells in the initial phases of vacuolization and accumulation of yolk (Statova 1962). In pike perch from the northern boundary of the area in Pyarnu Bay and Lake Ladoga, uneven growth of oocytes is observed up to their transition to ovulation (Koshelev, 1984).

Phase of primary accumulation of yolk is characterized by the appearance of vacuoles in the cytoplasm of oocytes filled with yolk. The presence of a significant number of these cells indicates the transition of the gonads in the III stage of maturity. The nucleus is with scalloped edges, in the protrusions of which the nucleoli are located. The oocyte membrane is represented by radial zone

with minor thickness. Pike perch females, of which ovaries were in stage III of maturity, were caught in early October. In some individuals there are 60% of the oocytes filled with yolk affected the process of resorption. In the seventies of the last century, cases of mass resorption of oocytes in pike perch from Dubasari reservoir were observed (Chepurnova 1975). But in the subsequent years of studies in this reservoir there were identified females with destructive changes in the development of sexual cells that have completed vitellogenesis (Fulga and oth. 2008). Abnormalities in the structure of the yolk oocytes, in the absence of conditions for spawning have also been reported in the pike perch from Danube (Kukuradze 1968) and from Volga delta (Koshelev 1984).

Initial phase of fat accumulation is characterized by the presence in the cytoplasm of the oocyte of yolk clumps and dispersed of fat droplets in between. Oocyte membranes advanced in their development. In the radial membrane the striation is clearly visible. Between the cells of the follicular epithelium the borders are visible. In the transition of the gonads to the III-A stage of maturity, and of the oocytes to the primary accumulation of fat droplets (end of October), the asynchrony in their development become smoothed and a single generation of oocytes is prepared for spawning.

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PHYSICO-CHEMICAL PARAMETERS AND BIOCHEMICAL CONSUMPTION OF OXYGEN IN WATERS OF THE PRUT RIVER

Jurminskaia Olga, Bagrin Nina, Borodin Natalia,
Bogonin Zinaida, Niculita Svetlana

Institute of Zoology, ASM, Chisinau, Moldova, ojur_aia@mail.ru

Investigations have shown that in summer of 2012 the dissolved oxygen content was relatively satisfactory for hydrobiont development, its concentration ranging within 7.86 and 8.86 mg/l, or from 90.4 to 101% of saturation at a water temperature of 21.2- 25.8°C; in autumn of 2012 - winter of 2013, at water temperatures of 5-16.4C, the water saturation with oxygen varied between 77-98.5%, in spring of 2013 - between 90.7- 113.9%, these values being favourable for hydrobiont development.

Suspensions have an important role in the functioning of aquatic ecosystems, especially in their self-cleaning processes. Namely to suspensions belongs the role to adsorb a range of dissolved substances, including pollutant ones, and to store them in bottom sediments. The high contents of suspensions diminish the intensity of photosynthesis process, influence the processes of production and destruction of organic matter and have a negative impact on planktonic organisms (Zubcov et al., 2009). The quantity of suspensions in the Prut River varied in a quite large diapason- from 2 mg/l to 190 mg/l. The dynamics of suspensions in the Prut River is highly dependent on its right tributary – the Bahlui River,

which provokes the increase of their content by ten times in the Prut River on the Leuseni- Cislita-Prut sector. At Giurgiulesti station, in the zone of small water speed, most of suspensions are stored in silts.

It was evident the increase of organic substances content, both easily degradable (CCO_{Mn} oscillated from 3.53 to 16.73 mgO/l) and poorly degradable (CCO_{Cr} oscillated from 18.53 to 84.46 mgO/l), along the Prut River with few exceptions, when the highest values were registered at Leuseni and Cahul, being provoked by discharge of insufficient treated wastewaters.

On the base of determination of chemical (CCO_{Cr}) and biochemical (CBO_5) consumption of oxygen, it was calculated the self-cleaning capacity of the Prut River: in 2012 its value not exceeded 0.162 (Braniste, August of 2012), and in 2013 it not exceeded 0.1. It is worth to be mention that no obvious correlation was observed between the values of CBO_5 and CCO_{Cr} .

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THE WAYS OF RESTORATION OF QUANTITY OF RARE AND DISAPPEARING STURGEON OF THE DNIEPER - BUG ESTUARY ECOSYSTEM.

Kornienko V.O.¹, Pilipenko Yu.V.¹, Plugatariov V.A.², Moshniagul K.I.²

¹*Kherson State agrarian university*

²*VEDORZ, Ukraine, Kherson, pilipenko_eco@mail.ru*

The most valuable species of fish fauna in the Dnieper-Bug estuary ecosystems are sturgeons that native species are among the most anadromous objects and only one species - sterlet is typically freshwater species, which in large estuary river systems formed a semi-anadromous form. This species under the influence of increasing anthropogenic pressure on the natural hydroecosystems demonstrated the high vulnerability, leading to reduction of its total population, supplies and gradual disappearance of fisheries in some regions that fomed natural habitat in general and in particular the lower Dnieper. One way to overcome this situation is to arrange artificial reproduction in specialized enterprises and large-scale re-acclimatizatiional works that need planned growth of fish-stocking material for introduction into natural waters. Against this background, climatic and production conditions of Ukraine set the stage for significant expansion re-acclimatizatiional works with sterlet.

The works with sturgeon re-acclimatizatio were stated on VEDORZ in 2003, researches carried out by maintenance staff of Kherson State Agrarian University. The main direction of scientific activity has been focused on the adaptation of technology of sterlet artificial reproduction to the terms of VEDORZ, forming their own brood stock and production of young sterlet in natural waters. In the first years after the starting works with sterlet in the Dnieper-Bug estuarine eco-

system were issued more than 50,000 young sterlet, which after two years later began to be recorded in the catches. Further, due to the economical problems the stock of sterlet spawners at the fishfarm was almost lost. Only in 2008-2009, as a result of work of specialists of VEDORZ in close contact with scientists from KSAU, the sterlet re-acclimatizational works were restored and eventually formed a powerful sterlet brood stock, which at present consists of 875 copies of mature spawners and more than 1,000 copies of young spawners of various age groups. This powerful brood stock allowed to increase production volumes fry sterlet in the Lower Dnieper with 0.426 million copies in 2010 to 0.925 million copies sterlet fry in 2012.

DIVERSITY OF PLANKTONIC INVERTEBRATES IN THE ECOSYSTEMS OF THE PRUT RIVER

Lebedenco Liubovi, Subernetkii Igor, Jurminskaia Olga

Institute of Zoology, ASM, Chisinau, Moldova, lebedenco.asm@mail.ru

As result of carried out investigations on zooplankton in 2012-2013 there were identified 74 species and varieties from 3 taxonomic groups (*Rotatoria*, *Copepoda*, *Cladocera*), of which most species (59,5% % of total zooplankton) belongs to *Rotatoria* (*Brachionus calyciflorus*, *Brachionus angularis*, *Brachionus leydijii* *Filinia longiseta*, *Keratella quadrata*, *Notholca squamula*, *Lecane luna*, *Notholca squamula*, *Ascomorpha* sp., *Polyathra euryptera* etc.); 29.7% refer to *Copepoda* (*Eudiaptomus gracilis*, *Mesocyclops leuckarti*, *Mesocyclops crassus*, *Macrocyclus albidus*, *Eucyclops* sp., *Paracamptus* sp., etc.) and 10.8% - to *Cladocera* (*Bosmina longirostris*, *Daphnia longispina*, *Scaridium* sp., *Moina* sp., *Alona affinis*, etc.). Despite of taxonomic domination of *Rotatoria*, only 2 species (*Keratella quadrata*, *Brachionus angularis*) were registered in each investigated sample.

From quantitative point of view, zooplankton of the Prut River has been scarce during investigation period: the biomass of total zooplankton oscillated between 0.180 and 221.44 mg/m, and its density – between 50 and 15100 ind./m, the highest values being registered at Braniste and Cislita-Prut - Giurgiulesti stations. It is important to mention that the highest values were recorded at Giurgiulesti in spring of 2013, in the period of an increasing water flow under the influence of Danube. In Costesti-Stinca reservoir (next to the dam) in winter period the density and biomass of zooplankton were almost equal to zero. The taxonomic composition of zooplankton differed from those of vegetation period. For instance, *Asplanchna* sp. and *Filinia longiseta* were dominant among *Rotatoria*, *Nauplii Calanoida*, *Copepodit Calanoida*, *Metadiaptomus asiaticus*, and *Acanthocyclops gigas* - among *Copepoda*, *Bosmina longirostris* and *Daphnia cucullata* - among *Cladocera*.

The indicative species of saprobity zone make up to 95% of total number of species identified in the Prut River. Their majority (38%) belongs to the group of species characteristic for β -saprobic zone. As average for investigated stations, the saprobity index varied in a narrow diapason -1.50 – 2.50, which corresponds to the β -mesosaprobic zone.

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***PERCCOTTUS GLENII* - A POSSIBLE THREAT FOR THE FRESH WATER ECOSYSTEMS**

Luca Monica, Rau Marius-Andrei, Gorgan Dragoş Lucian

Faculty of Biology, "Alexandru Ioan Cuza" University of Iasi, Str. Carol I 20 A, 700505 Iasi, Romania, e-mail: lucian.gorgan@uaic.ro

In the last decade a particular interest has developed in the scientific area of biological invasions, which have become one of the main factors affecting the species diversity and the structure of the global fauna. In the case of fresh water ecosystems, both the human activity and natural hazards transformed the ichthyofauna and caused the emergence of many invasive fish species, with a spread speed higher than investigators possibilities of quantifying their positive and negative impact on the environment.

There are few main aspects which make the invasive species *Perccottus glenii* a possible threat for many fresh water ecosystems.

The first one is its spread speed. On Romanian territory for example, in only four years the Amur sleeper enlarged its areal from the eastern part of Romania to the south (in the Danube river). By the time it was recorded for the first time in Romania, in 2001, in the waters of the Siret basin, its status of invasive species had been already claimed in other countries from the East and South-East Europe, where it had spread very fast, in a short period of time (ten years).

After the 2005, when was also recorded in the Romanian waters of the Danube, its spread continues exponentially, not only in Romania, (where after another four years it can be found all the way to the central part of the country, in the basin of the Mures river) but also in Europe, where it appears in more and more countries from the East to the West.

A second argument for the possible threat status of *Perccottus glenii* is the morphology and physiological traits which make this species easily adaptable and resistant to very extreme environment conditions, being capable to survive in a wide temperature range, even in frozen (0C or below) or dried waters (in summer, at high temperatures). The environmental limits forced this species to develop a special behaviour that can be associated with a hibernation stage both in winter (when modifies its shape in order to fit in small ice hemispheres) or

summer (when, in case of drought, can survive up to a few days in the mud from the bottom of the water basin).

Third, *Perccottus glenii* can be a damaging species due to the negative aspects of its feeding ecology. On one hand the small size of their body doesn't stop them from being very skilful predators and their trophic spectrum includes not only invertebrates, but also amphibian larvae and small fish (even their own juveniles), and from this point of view can cause great economical loss. On the other hand, the economical loss can be caused also indirectly, by the simple overlapping of the diet for both *Perccottus glenii* and other valuable fish species.

Thus, the study of all these morphological traits is very important, representing an issue which will also require a deeper research for the future, with a special attention given to the differences appeared in the invasive species compared to the native ones. Further, all the registered variation will be correlated to the genetic analysis, in order to better evaluate the potential risk represented by this species.

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THE BIOMANIPULATION OF AN ANTHROPIC LACUSTRIN ECOSYSTEM CASE STUDY : BICAZ RESERVOIR

Ionel Miron¹, Manuela Miron¹, Liviu Miron²

¹UAIC-Iasi, România

²USAMV Iasi, România

The Bicz Lake, like other reservoirs, hydropower has a natural low biological productivity, thanks to the mitigating level with an amplitude of tens of meters annually. This process inhibits the development of coastal macrophytic algae, as the basis of the trophic pyramid. In the natural food chain, initiated by the phytoplankton, the natural productivity of the lake is only about 2 kg of salmonid species/ha/an.

Through territorial, nutritional, reproductive and ihtiopatologic behaviour biomanipulation, in conjunction with abiotic factors, integrated in the limnic aquaculture system, the salmonid production reaches about 100 tonnes/ha/an.

The aquaculture system on the lakes is applied on 1% of the lacustrin area, thus ensuring the ability of self-purification of water required for other uses.

Under these conditions, the implementation of intensive aquaculture compatible on the reservoirs already built in Romania is about 160 hectares, with a potential of about 16,000 tons of salmonid species/year/1ha.

EXTERIOR OF THE ALTAY MIRROR CARP AND OTHER EXISTING BREEDS

Moruzi Irina Vladimirovna, Pishchenko Yelena Vitalyevna,
Petukhov Valeriy Vladimirovich, Nezavitin Anatoliy Grigoryevich,
Kropachev Dmitriy Valeryevich

*Novosibirsk State University of Agriculture, Novosibirsk, Russia,
e-mail: moryzi@ngs.ru*

The Altay mirror carp has ancestors Galitsiysky a carp gradually acclimatised in Siberia, and then run wild in the conditions of one lake. Authentic data on a pedigree accessory of initial herd are not present. According to Z.A. Ivanova «... the initial herd has been formed from distant offsprings of a mirror carp, strange to Altay territory in 1932 at carrying out of experiences on its cultivation in northern areas».

On an exterior these breeds differ from each other. Fish of these breeds are various by origin, defined scale an integument and some other features have the form.

The highest assessment (5 balls) females of the Altay mirror carp with an index of a girth of a body ($V \cdot 100/l$), equal 92-98, females Sarbojansky receive a carp – 83-85 (the Instruction on an appraisal of quality of carps, 1988); at males – accordingly 86-93 and 80-83. The girth of a body at the Altay mirror carp increases for the account big expressivenesses of a thickness of a body that specifies in the best development of a lateral musculation – deflexion to rather fast accumulation of a muscular tissue. As acknowledgement the comparative assessment 2 + years these breeds on a ratio of parts of a body serves.

At the fish close on mass, in herds commodity 2 +, an exit of meat at the Altay mirror carp on 7,5 % more than at Sarbojansky, basically at the expense of augmentation big-headed at the last. The analysis of the data on a constitution has established authentic ($P > 0,99$) the superiority of the Altay mirror carp on indexes l/H and a girth.

Exterior signs of a female of the Altay carp are intermediate between mirror Parsky a carp and an Ukrainian carp. At smaller fatness repair females of the Altay mirror carp, in comparison with other breeds have the greatest girth of a body. The mass of a body of a repair jounge growth of miscellaneous age groups corresponds to the standard for the breeding carps, established “the Instruction on an appraisal of quality of carps” (1988). The average mass of females of the four-yearlings translated in a breed herd, has compounded 3710 the Standard of mass for classes superstrain – record is equal 3500 g, superstrain – 3000 g. To the basic signs of a constitution of a female correspond to the indicators provided by the target standard for the Altay mirror carp.

Sexually mature fish of the Altay mirror carp have the original exterior distinguishing them from other breeds and herds of a mirror carp on a series of signs. At what, there are differences of an exterior between bunches of breeds hav-

ing a lobe of blood of the Amur carp (Sarbojansky, Parsky and Central Russian carps) and the bunch, having relationship with German carps – the Altay carp, the Ukrainian carps.

At mature females of the Altay mirror carp the index I/H differs from its magnitude at Parsky and layers of the STORAGE-NK of a Central Russian carp, it more low, than at the Ukrainian carp, and above, than at layers Z-NK Central Russian a little. At them it is appreciable above, than at a Central Russian carp, an index $V \cdot 100/I$. On a girth index only STORAGE-NK layer exceeds this indicator at females of the Altay mirror carp. At males of the Altay mirror carp the index I/H above, than at the Ukrainian carps, more low, than at Parsky and layers Z-NK Central Russian, also does not differ from STORAGE-NK layers. On a thickness of a body exceeds all other compared bunches, on a girth index yields only to fish layers of the STORAGE-NK of a Central Russian carp.

If to carry out the exterior analysis between the Altay and German carp taken as an initial strain at selection Selinsky carp, and comparison to conduct at on bunch of animals having about identical fatness it is possible the attention attracts a likeness on indexes of height and a body girth. However the index of a head at the Altay carp is less, than at German, but about same as at Selinsky and local not purebred carps of Stavropol Territory.

For the purpose of an assessment of parentage of the Altay mirror carp we had been carried out the likeness analysis between breed cultivated by us and German carps. The index of a genetic likeness calculated on It, on the polymorphic albuminous systems studied by us between populations of the Altay mirror carp and a German burl very high also fluctuates from 0,9392 to 0,995, and only on locus *Est-2* likeness degree low – 0,345. Summarised observed the index of a genetic likeness is equal 0,788.

Study of features of an exterior and albuminous polymorphism of the several breeds having miscellaneous parentage, says that undoubtedly offsprings Galitsijsky carp were ancestors of the Altay mirror carp). The Galitsijsky carp was a starting material for breeding of the big bunch of breeds of the European carps.

BENTHIC MACROINVERTEBRATES OF THE PRUT RIVER (2012-2013)

Munjiu Oxana, Toderas Ion, Zubcov Elena, Biletchi Lucia, Subernetkii Igor,
Railean Nadejda, Banu Vitalie

Institute of Zoology, ASM, Chisinau, Moldova, munjiu_oxana@mail.ru

Benthic invertebrates are a group of animals, which meets several requirements for the indicator organisms: wide distribution, enough high density, relatively large size of the body, combination of populating certain biotopes and a certain degree of mobility.

There have been collected more than 200 samples of the benthic macroinvertebrates from the Prut River during May 2012 - July 2013. The common sampling stations were Costesti-Stinca, Braniste, Sculeni, Leuseni, Leova, Cahul, Cislita-Prut, and Giurgiulesti, and only in July 2013 four more stations were investigated: Criva, Tetcani, Badragii Noi, and Duruitoarea Noua.

The quantitative samples were collected by the Petersen grab, with the area of capture of 1/40 m. A dredge for different substrates has been used for qualitative samples. The preservation of the samples was made by using 4% formaldehyde and 70% alcohol. All individuals were sorted as much as possible by groups or species afterwards in the laboratory and identified by using identification keys (Jadin, 1952; Mordukhai-Boltovsky, 1968, 1969, 1972; Kutikova, Starobogatov, 1977; Tsalolikhin, 1994, 1995, 1997, 2000, 2001, 2004).

The identification of species was carried out by the stereomicroscope МБС-9 and upright microscope *Jenaval* (Zeiss), but since April 2013 the laboratory investigations have been performed by the aid of the stereomicroscope *STEREO Discovery.V8* (Zeiss) and upright microscope *Axio Imager A.2* (Zeiss). The hydrobiont biomass has been determined via their weighting, being previously dried up on a paper filter till the disappearance of wet spots. The analytical balance ABS 80-4 Kern was used.

The total number of invertebrate taxa has reached 159. The most spread taxa were: **Tubificidae** (*Tubifex tubifex*, *Branchiura sowerbyi*, *Limnodrilus hoffmeisteri*), **Lumbriculidae** (*Lumbriculus variegatus*), **Naididae** (*Ophidonais serpentina*, *Stylaria lacustris*), **Chironomidae** (*Chironomus plumosus*, *Chironomus sp. div none*), **Tanypodinae** (*Tanypus punctipennis*, *Tanypus vilipennis*), *Orthocladus sp.*, *Diamesa insignipes*, **Ceratopogonidae** (*Bezzia hydrophila*), **Culicidae** (*Culicoides setosinervis*), **Tabaninae** Gen. sp., **Nematoda**, **Myzidae** (*Limnomysis benedeni*, *Paramysis lacustris*), **Gammaridae** (*Dikerogammarus haemobaphes*, *Pontogammarus crassus*, *Chaetogammarus warpachowskyi*, *Chaetogammarus ischnus*), **Corophiidae** (*Corophium robustum*, *Corophium curvispinum*, *Corophium nobile*, *Corophium chelicorne*), **Isopoda** (*Jaera sarsi*), **Ostracoda**, **Ephemeroptera** (*Baetidae*, *Baetis rhodani*, *Heptagenia flava*, *Heptagenia coerulans*, *Palingenia longicauda*, *Potamanthus luteus*), **Trichoptera** (*Hydropsychidae*, *Hydropsyche ornatula*, *Polycentropus sp.*, *Ecnomus tenellus*, *Triaenodes bicolor*, *Hydroptila tineoides*, *Limnephilidae*), **Gordiacea** (*Gordius aquaticus*), **Heteroptera** (*Plea minutissima*, *Mesovelgia sp.*, *Nepa cinerea*, *Aphelocheirus aestivalis*), **Coleoptera** (*Dytiscus sp.*, *Haliplus sp.*), **Odonata** (*Gomphus flavipes*, *Gomphus vulgatissimus*, *Platycnemis pennipes*, *Agrion splendens*, *Agrion virgo*), and **Lepidoptera**.

The taxa with the lowest occurrence were: *Hydra*, *Bryozoa*, *Collembola*, *Theodoxus transversalis*, *Pisidium moitessierianum*, *Conchostraca*, *Notostraca*, *Ephemera vulgata*, *Polymitarsis virgo*, *Phryganeidae*, *Anabolia furcata*, *Mystacides sp.*, *Simuliidae*, *Megaloptera* (*Sialidae*).

The highest number of rare species has been remarked at the Tetcani and Braniste stations. Along the river stream, the total number of species has differed significantly: Criva - 8, Tetcani - 29, Badragii Noi - 11, Duruitoarea Noua - 4, Costesti-Stinca - 6, Braniste-85, Sculeni-53, Leuseni - 39, Leova -43, Cahul - 50, Cislita-Prut - 50, and Giurgiulesti - 9. The differences may occur because of various ecological conditions: hydromorphological, hydrochemical, type of substrate, and level of anthropogenic load.

The Braniste station has distinguished by the highest values of density and species diversity – there have been registered up to 85 species. This phenomenon demonstrates the influence of hydrological conditions and flow from Costesti-Stinca reservoir on the diversity of benthic organisms at the given station. Also, there have been registered species, which are characteristic for clean zones of aquatic ecosystems – 7 species of *Ephemeroptera* and 9 species of *Trichoptera*.

The total biomass has varied from 0.006 g/m to 2971.764g/ m, the biomass without molluscs – from 0.006 g/m to 58.4 g/m, and the density of total zoobenthos – from 6 ind./m to 39000 ind./m. The density and biomass of benthic organisms have had the lowest values at Giurgiulesti station.

The state of benthic invertebrate communities and the density of invertebrate taxa are extremely important for the determination of water quality, and assessment of aquatic ecosystem state, in general. Thus, during the investigation period the saprobity zones calculated based on macrozoobenthos from the Prut River have varied within β -mesosaprobic and α -mesosaprobic and the water quality class - within the moderately polluted and critically polluted.

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BACTERIOPLANKTON FROM THE PRUT RIVER AND COSTESTI-STINCA RESERVOIR IN 2012 – 2013

Negru Maria, Shubernetski Igor

Institute of Zoology, ASM, Chisinau, Moldova, nadea_md@mail.ru

Microbiological investigation of water samples from the Prut River and Costesti-Stinca resevoir have been carried out during 2012 - 2013. There were determined the total number of heterotrophic bacteria (in nutrient agar media at 22° C), the number of physiological groups of microorganisms, which are involved in the circuit of main elements - N, P, C (in selective culture media), and also the density of bacteria, which are involved in the decomposition of toxic (phenols) and poorly degradable (petrol products) compounds. Results are listed in the Table 1.

The results indicated:

- An increased microbial density in the Prut River and Costesti –Stinca reservoir (Table 1).

- Heterotrophic bacteria dominate among eco-physiological groups, highlighting strong degradation processes due to both allochthonous and autochthonous affects.
- Limits of variation of heterotrophic microorganism density are extremely high: from 1 up to 4 orders of magnitude, in dependence of the season. Maximum value was 12.8 thousand cells/ ml at Costesti- Stinca and the 12.0 thousand cells/ ml at Braniste station. Usually the highest values have been recorded during the warm months.
- The potential for water self-purification in the Prut River is high, which is demonstrated by increased density of ammonifying - up to 8.0 thousand cells/ m, amylolytic -up to 6.4 thousand cells/ ml and denitrifying microorganisms - up to 3.0 thousands cells/ ml.
- High levels of phenolytic microorganisms, up to the 1.3 thousand cells/ ml and the petrolytic ones – up to 7.0 thousand cells / ml, which indirectly reveals that the aquatic ecosystems are affected by phenol and, in particular, by petroleum products.
- Nitrogen fixating, nitrifying and cellulolytic bacteria play an important role in aquatic ecosystems production, but the density of these eco-physiological groups is lower in both Costesti – Stinca reservoir and in the Prut River. Their density ranged from sub units up to units, and rarely- up to tens cells/ ml.
- The most polluted stations in summer period were Leova, Cahul and Cislita-Prut.

Table 1

Density of bacterioplankton in the Prut River and Costesti-Stinca reservoir in 2012 – 2013 (variation limits - thousand cells/ml)

Ecophysiological groups	Station							
	Costesti-Stinca	Braniste	Sculeni	Leuseni	Leova	Cahul	Cislita-Prut	Giurgiulesti
Heterotrophic	0,09-12,8	0,04-12,0	0,42-2,78	1,28-6,8	0,37-8,32	0,18-7,0	0,1-6,4	0,2-6,4
Ammonifying	0,015-3,2	0,08-6,0	0,2-1,2	0,7-4,0	0,39-8,0	0,4-3,0	0,2-2,2	0,3-1,1
Denitrifying	0,005-0,5	0,01-0,6	0,07-1,0	0,02-0,65	0,02-0,65	0,01-1,0	0,03-2,0	0,02-3,0
Amylolytic	0,01-1,2	0,02-6,4	0,05-2,4	0,24-2,6	0,6-2,88	0,24-5,0	0,1-4,0	0,08-3,5
Phosphate mineralizing	0,02-1,0	0,005-1,2	0,01-0,86	0,08-1,6	0,17-1,0	0,05-1,2	0,03-1,0	0,03-2,8
Phenolytic	0,0-0,79	0,003-1,2	0,004-0,9	0,04-0,80	0,05-0,60	0,03-1,3	0,02-1,1	0,02-1,0

Ecophysiological groups	Station							
	Costesti-Stinca	Braniste	Sculeni	Leuseni	Leova	Cahul	Cislita-Prut	Giurgiulesti
Petrolytic	0,003-7,0	0,0-6,5	0,015-1,0	0,35-3,0	0,08-3,80	0,001-3,50	0,002-4,2	0,005-5,00

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A BIODIVERSITY STUDY OF BENTHIC MACROINVERTEBRATES FROM COGEASCA (CUCUTENI) LAKE, IASI COUNTY, DURING 2012-2013

Nicoară Mircea, Constandache Ionela,
Strungaru Ștefan-Adrian, Plavan Gabriel

*“Alexandru Ioan Cuza” University of Iasi, Faculty of Biology,
Department of Biology, 700505, Iasi, Romania*

The aim of present study is to assess the benthic macroinvertebrates communities and emphasize their importance as water quality bioindicators.

Through this study was conducted and a short characterization in hydrogeochemistry terms of a reservoir, in the basin of Jijia River, located on its main tributary – Bahlui River with a large number of reservoirs located in its basin including the Cogeasca (Cucuteni) reservoir.

The Cogeasca (Cucuteni) reservoir was built on the Voinești River - one of the right hand tributaries of Bahlui River, about 14 km from the springs and approximately 3.3 km towards the confluence with River Bahlui, situated near Letcani village, in Iasi County.

The reservoir is used for recreation, irrigation, fisheries and flood control.

The macrozoobenthos was seasonally sampled, to perceive the influence of climatic factors, during July 2012 - May 2013, at 4 different sampling sites (springs, Cogeasca village, barrage, and lake tail) established according to the substratum.

The sampling sites were set to surprise as accurate as possible the hydrophysical and hydrobiological aspects, in order to obtain a correct assessment of abundance, diversity and equitability indices of benthic macroinvertebrates. The physical-chemical parameters were measured in the field.

For macrozoobenthos sampling, a Petterson modified benthic dredge and a benthic net were used. After sampling procedure, the samples were washed, sorted, deposited in bottles filled with 70% alcohol and labelled. The qualitative analysis of macroinvertebrates was done using stereomicroscope and different

benthic macroinvertebrate keys. The quantitative analysis was done using statistical programmes.

A GPRS was used for the sampling site positioning, and a HANNA Combo pH/EC/TDS/C tester was used for physical-chemical *in situ* analysis (pH, conductivity, temperature and TDS).

The data were analyzed and processed using OriginLab v8.00 and R programmes, through which we could observe the macroinvertebrates differentiation depending on the season and state.

The macroinvertebrates identified in Cogeasca (Cucuteni) reservoir belonged to a large number of taxa: 3 Phyla (Anellida, Mollusca and Arthropoda), 3 Classes (Oligochaeta, Gastropoda and Insecta) and 7 Orders (Plesiopora, Basommatophora, Hemiptera, Odonata, Coleoptera, Trichoptera and Diptera), 21 Families (Tubificidae, Lumbricidae, Glossiphoniidae, Physidae, Limnaeidae, Valvatidae, Planorbioidea, Naucoridae, Coenagrionidae, Libellulidae, Dytiscidae, Ecnomidae, Elmidae, Psychodidae, Limoniidae, Tipulidae, Ceratopogonidae, Simuliidae, Chironomidae, Empididae and Rhagionidae).

Among the identified taxa were: *Tubifex tubifex*, *Eiseniella tetraedra*, *Helobdella stagnalis*, *Physa acuta*, *Radix ovata*, *Valvata piscinalis*, *Gyraulus* spp., *Naucoris* spp., *Coenagrion puella*, *Orthetrum* spp., *Hydrovatus* spp., *Ecnomus* spp., *Psychoda* spp., *Chironomus* spp.

The number of individuals increased at all four sampling sites in the beginning of spring, to the maximum of abundance in autumn, followed by the minimum of individuals in winter.

During the autumn period, the chironomids increased in biomass, especially at the third sampling site (barrage), showing a significant increase of food available for these organisms, compared to other sampling sites, situation due to water current. In addition, the increase is due to the natural adaptation to cold season (winter).

The presence in the reservoir of *Tubifex tubifex* (Muller, 1774) and Chironomidae Family during every season made that Cogeasca (Cucuteni) reservoir to be placed in polysaprobe category, these taxa being characteristic for waters with high organic dissolved substances levels.

These categories of waters have a low level of dissolved oxygen and contain organisms that are adapted to this kind of environment or are facultative anaerobic, adapted to pH variations, being resistant to decomposition products like H₂S and NH₃.

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GROWTH, DEVELOPMENT AND REPRODUCTION OF THERMAL LYMNAEIDAE (GASTROPODA: LYMNAEOIDAE) IN AQUACULTURE

Paltser Inga S., Bolotov Ivan N., Bepalaya Yuliya V.

*Institute of Ecological Problems of the North, Arkhangelsk, Russia,
ingasevsk@yandex.ru*

Intensity of reproduction and lifespan of individuals in population defines the role of freshwater gastropods in transformations of organic matter. Pulmonary pond snails are often used as the objects in different biological studies, so the knowledge of their reproductive function is fundamental for developing of proper experimental methods (Beryozkina 1984).

The most important factor affecting growth is the temperature (Serbina 2010). Shell size of gastropods living in thermal springs are significantly reduced, which is may be the result of the species' adaptive strategy (Khmeleva et al. 1985, Berezkina & Starobogatov 1988, Tahteev 2009, Bolotov et al. 2012). It is still unclear, is there a profound differences between lifespans of the pond snails from thermal and from zonal populations. Reliable experimental data are not enough at now.

Analyses of growth in natural populations is complicated so we used laboratory aquaculture for reliability of the results (Kirik & Zotin 2011).

We set the following aims for our work:

- to study growth and development of thermal Lymnaeidae in artificial environmental conditions;
- to perform analyses of morphometric shell parameters and egg clusters of thermal Lymnaeidae while the study.

Subjects of our study are the species of freshwater gastropods from Lymnaeidae family living in Pymvashor thermal tract, southeastern part of the Bolshezemelskaya tundra, Nenetsky Autonomous Region, Russia.

Material was collected in the areas of hot springs influence. In the result of molecular analysis of ~ 700 bp COI fragment, we identified analyzed individuals as one group of haplotypes belongs to single species in *Radix* genus.

For our experiments, we developed and adapted several units based on classic aquariums.

An important indicator of growth is the character of changes in proportions and form of shell. We measured changes of the main linear parameters of shells and egg clusters of gastropods in different ages each 10 days (Kruglov 2005). There was three replications in our experiment (each represented by one aquarium) with more than 2000 individuals in a whole.

Life cycle of individuals, estimations of shells sizes, growth, fertility and reproduction characteristics of Lymnaeidae will be presented in report and shown in the presentation.

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MICROEVOLUTION OF THE ALTAY MIRROR CARP AT SELECTION

Pishchenko Yelena Vitalyevna, Moruzi Irina Vladimirovna

*Novosibirsk State University of Agriculture, Novosibirsk, Russia,
e-mail: moryzi@ngs.ru*

At acclimatisation of a carp in Altay territory and a 32-year-old natural selection, as well as in the nature at free mating there was a continuous intrapopulation hybridization with complex scission, originating of homozygotes and het-

erozygotes. Therefore at a mass selection in herds of the Altay mirror carp rigid rejection of animals not corresponding to desirable phylum was conducted.

Mass selection directed on raise of rate of increase in breed herds of the Altay mirror carp, begins in the end of the first season of cultivation (this year's brood) or in the beginning of the second season (yearlings) (Ivanova, Moruzi, Pishchenko, Degtjar, 1998, Pishchenko, 1998). At underyearling the coefficient of variation on body mass compounded the Altay carp F_3 41,2. To the seventh generation of selection level of variability at underyearling on an indicator body mass has decreased to 25,9 %.

Simultaneously to augmentation of mass of a body at underyearling the Altay mirror carp there was an augmentation of such indicators, as a length, height, a thickness and a body girth. Have most strongly increased body height - on 28,5, a girth - on 27,9 and a thickness - by 24,0 %. The body length has increased by 11,2 % less, than to other signs. There was simultaneously a decrease on 37 % of a coefficient of variation by sign a body girth. Also variability level on height and a body length - on 30,7 and 27,0 % accordingly was considerably dropped.

From indexes l/H , $B*100/l$ and $V*100/l$ the greatest changes are watched for a girth. There was an ascending of its value on 15,71 %. The index l/H on 14,3 % At the same time has decreased and $B*100/l$ the index has increased by 11,5 %. In aggregate these changes speak about considerable change of outward underyearling. They becomes less long and wider.

For an index of a girth of a body (with 12,0 the coefficient of variation has authentically decreased to 5,3 %), an index l/H (with 12,0 to 8,2) and a condition factor.

For five generations of selection the mass underyearling has considerably raised: if in F_3 a diversity of fish on body mass was from 9 to 42 in F_7 - from 20,5 till 56 In the right part of a curve in herds F_3 and F_7 high concentration a variant is marked. The variation curve has right-hand asymmetry at the expense of slenderness of the right branch of a curve. Thus fast-growing individuals in F_3 had mass 27,5-42 g and compounded 25 % of herd In the course of selection there was an augmentation of number of fast-growing individuals to 43 % in herd. Their mass also has increased and lies in limits from 37 till 56 it is necessary to mark high concentration of fish in modal and submodal classes to - 82,7 and 83,3 %.

This year's broods F_7 have the big average mass – 33,1 g (allocation standard, criterion $c=2$, at $c_{st}=3,8$). The polygon of their allocation on body mass is more stretched on an axis At , than at fish of the third generation of selection. Its curve has more connivent branches and is displaced in the right side on two classes. The coefficient of asymmetry of a curve is equal 0,785.

In the third generation of selection of a fish of classes modal and adjoining to it compounded 72,8 % from an aggregate number. On the establishment of it we can tell that in herd F_3 there was a small bunch (1,3 %) slowly growing fish. The fish entering into bunch of take-off F_3 , was about 3 % with mass 34,5-42 g,

in F_7 – 8 % with mass of a body of 50-59 Polygon of allocation of a length of a body in the third generations unimucronate.

Asymmetry coefficient is equal-0,68, i.e. the curve has link sided asymmetry and under the form differs from a normal distribution curve strongly enough. Fish modal and classes adjoining to it have compounded 83,3 % from an aggregate number. In herd there was a small bunch stunted fish that is acknowledged link sided asymmetrica.

At underyearling F_7 the allocation polygon on a body length also differs the raised concentration of individuals in modal and classes adjoining to it. Their number compounds 84,6 % from a herd aggregate number. Right-hand asymmetrica curve (the coefficient of asymmetry +1,1) specifies in occurrences of small bunch of fish with the raised rate of increase ($c=3$, $c_{st} = \{7,8-11,3-16,3\}$).

Variation curve masses and lengths of a body of the seventh generation of the Altay mirror carp differ connivent branches. They more symmetrically also have the big concentration a variant in modal and submodal classes. Such character of curves proves that selection take-off during a lineage has led big to a homogeneity and uniformity of herd.

Thus, considering dynamic rows of an exterior of females on indexes l/H , $B*100/l$, a body girth and as conformation profiles, we can draw the following breeding: from the third on the seventh generation, against appreciable raise of mass of a body, the body length was moderated, the girth, height and a thickness have increased. The body of the Altay mirror carp for five generations of selection became more compact, the exterior has improved.

**BIOACCUMULATION AND RECOVERING METAL
MICROCOMPONENTS FROM SLURRY RESULTING OF
SOLUBILIZE ALKALINE OF URANIUM ORE, WITH THE HELP
OF NOSTOC LINCKIA CYANOBACTERIA AND PORPHYRIDIUM
CRUENTUM MICRALGAE**

Rudic Valeriu, Cecal Alexandru, Cepoi Liliana, Rudi Ludmila, Chiriac Tatiana,
Miscu Vera, Ghelbet Viorica, Djur Svetlana, Iațco Iulia

*Institute of Microbiology and Biotechnology of the Academy
of Science of Moldova*

Microalgae and cyanobacteria have a strong interest in the field related to the search and development of new materials with the property of bio-sorbent. This is explained by their sorption capacity and by their great availability, being present in nature in virtually unlimited quantities in seas and oceans, and being obtained through advantageous economic technologies. Cyanobacteria and microalgae accumulate heavy metals from the environment via different mechanisms: through the passive absorption of metals on the cell surface (cell wall, membrane and capsular polysaccharides); either by their chelation by cytoplasmic ligands, phytochelatins, metallothioneine and intracellular molecules. The presence of

numerous functional groups that facilitate the bond formation between metal and cytoplasmic ligands, phytochelatins and metall-proteins and other intracellular molecules determine the interest toward these objects.

Metal ions can be bioaccumulative both by continuous culture and by the accumulation of cyanobacteria and microalgae. In this direction are feasible and research testing of metal microcomponents retention capacity contained in the sludge resulting from alkaline leaching of uranium from ore by various fractions of bioactive components of microalgae and cyanobacteria biomass – donors of active functional groups capable of producing these mechanisms.

It was studied the bioaccumulation capacity and recovery of metal slurry microcomponents obtained in alkaline leaching of uranium from ore, using *Nostoc linckia* cyanobacteria and *Porphyridium cruentum* microalgae in accumulation culture conditions, and the level of concentration of these metal micro-components by the microalgae biomass component fractions. Thus, obtained porphyridium biomass in culture storage conditions are present as an agent for the recovery of metal micro-components from slurry of the alkaline leaching uranium though the preventive oxidation application providing biomass accumulation of 95% of the present uranium ions in the solution and recovery of 44,82% iron solution (III), 35.08% of chromium (III) 57.7% of zinc (II) and 17.1% of copper (II). For Nostoc biomass, as well is characteristic a high level of bioaccumulation of the metals resulting to an alkaline leaching of uranium, ensuring biomass accumulation of 85% from present uranium ions in the solution, of 38.12% of iron (III), 36.37% of zinc (II), 28.9% of chromium (III) and 80.16% of copper (II). The obtained biomass in terms of storage, since the working phase involving the reactive species in much lower – up to 2 hours compared with the application of the continuous culture, in which the contact with water that contains radioactive elements of long duration, the desired effect is achieved in 10-20 days.

Given that cyanobacteria and microalgae, especially the two selected phyco-logical objects, offers through its biomass bioactive components, considered active functional groups donors through which are involved bioaccumulation processes was monitored the level of metallic of uranium slurry micro-component bioaccumulation in different bioactive principle fraction obtained in fractioned biomass accumulation under different times of contact with uranium slurry solution.

The exopolysaccharides from porphyridium and nostoc biomass present average levels of chrome and copper recovery from slurry solution (50-57%), high recovery of iron (71-86%) and the lowest levels characteristic for zinc bio-absorption by these bioactive fractions (12-30%). Both porphyridium and nostoc protein preparations obtained from biomass fractions can be characterized effective bio-accumulative (60-80% for porphyridium and 76-100% for nostoc) of metal micro-components from slurry resulting to alkaline leaching of uranium from ore. In particular, proteins soluble in alkaline solutions from porphyridium

and *Nostoc* provide 80-100% of the bioaccumulation of metal micro-components resulting from slurry solution prepared from the alkaline leaching of uranium from ore.

Therefore, cyanobacteria *Nostoc linckia* and red microalgae *Porphyridium cruentum* ensure a high level of solubilization of uranium ions and the recovery of metallic micro-components such as iron (III), zinc (II), chrome (III) and copper (II) of uranium ore, which is due to presence of micro- and macromolecular bio-components – functional donor groups capable of binding and store metals. Distinctive peculiarities of bio-accumulative and effectively recovered, characteristic for cyanobacteria and microalgae provide as the basis for new efficient procedures of bioaccumulation and recovery of metallic micro-components sludge from the alkaline leaching of uranium from ore. The results are applicable in green technologies (green technologies – involving the case of cyanobacteria and microalgae) for environmental protection in areas of uranium obtaining firms, technologies that can also be used to enrich poor ores and the metal micro-components concentration of different uranium mining.

ACTION OF SELENIUM COMPOUNDS ON GROWTH AND PRODUCTIVITY OF SPHRULINA PLATENSIS AND THE LEVEL OF ACCUMULATION OF THIS ELEMENT IN THE BIOMASS

Rudic Valeriu¹, Djur Svetlana¹, Cepoi Liliana¹, Chiriac Tatiana¹,
Rudi Ludmila¹, Miscu Vera¹, Iațco Iulia¹, Bogdevici Oleg², Izmailova Daria²

¹*Institute of Microbiology and Biotechnology of the
Academy of Science of Moldova, Chisinau, R. Moldova*

²*Institute of Chemistry of the Academy of Science of Moldova,
Chisinau, R. Moldova*

In recent years has increased considerable the interest toward the study of the microelement impact and especially of the selenium on phytoplankton. This is explained by the important role that the phytoplankton plays in the biotransformation of this element. The accumulation level of selenium in microalgae and cyanobacteria cells and its toxicity for these vary essentially depending on their morfo-functional particularities, concentration and oxidation degree of selenium, the presence in the sulphates and heavy metals environment, temperature, pH and other environment factors. A relatively high resistivity by selenium have cyanobacteria type of *Spirulina*. It was shown that *S. maxima*, *S. subsalsa* and *S. plantensis* species continue to grow well up to concentrations of Se (IV) of 20-40mg / l and the selenium lethal concentration for *S. maxima* is 400 mg/l. In the culture of accumulation conditions, maximum productivity and specific speed of growth for *S. platensis* is observed at Se (IV) of 5-10 mg/ L concentrations. One of the Cyanophyta resistance cause to lethal doses for an absolute majority of microalgae can be the capacity of cyanophytes to secrete extra-cell polysaccharide which absorb the selenite and selenate on the surface preventing partial

penetration of the toxic substances within the cells. This property of cyanobacteria is used for setting the biological purification systems of the residual waters based on artificial microbiocenosis. In most cases, the dominant component of such community is made up of representative cyanophytes.

In this paper, we proposed the study of some selenium compounds on the growth and cyanobacteria *S. platensis* productivity, as well as the level of accumulation of this element in biomass.

The object of study was *S. platensis* strain CNMN-CB- 02 deposited in the National Collection of Nonpathogenic Microorganisms, Cyanobacteria and Microalgae Section at the Institute of Microbiology and Biotechnology of the ASM. The strain was grown in modified mineral environment Zarrouk within 144 hours at 30C. In the cultivation of spirulina were introduced following compounds: Na_2SeO_3 , $(\text{NH}_4)_2\text{SeO}$, ZnSeO_3 , $\text{Fe}_3\text{Se}_3\text{O}_9 \cdot 6\text{H}_2\text{O}$, GeSe_2 and CoSeO_3 . The spirulina productivity was photometrical determined with the re-calculus of the cell mas in g/l absolutely dry biomass. Selenium was determined by atomic absorption method according to the described procedures described in GOST R 51309-99 „Drinking water. Determination of elements content bz atomic spectrometry methods”.

A positive effect was established of the selenium compounds Na_2SeO_3 and $(\text{NH}_4)_2\text{SeO}$ on the growth of spirulina biomass, in its cultivation in the presence of 110mg/l and 70mg/l concentrations. GeSe_2 compound stimulated the growth of spirulina culture only up to a concentration in the environment of 15mg/l, and ZnSeO_3 compound showed a similar effect in a wider concentration interval: up to 30mg/l, although the spirulina culture grown in the absence selenium compounds, did not exceed both experimental variants. The highest level of toxicity on growing spirulina culture has manifested the CoSeO_3 compound. During the spirulina cultivation in the presence of this compound, the culture productivity has significantly decreased from 10 mg/l, the compound concentration of 20mg/l, observing to be already lethal for growing spirulina culture. Of all the studied compounds, only $\text{Fe}_3\text{Se}_3\text{O}_9 \cdot 6\text{H}_2\text{O}$ has demonstrated the most pronounced stimulatory effect on the growing spirulina culture: the presence in the cultivation environment concentration of 45mg/l, spirulina productivity at the end of growth exceeded with 35% the productivity values of the spirulina grown in the absence of selenium compounds. Selenium accumulates in the spirulina biomass at its cultivation in the presence of all selenium used compounds: with the growth of the compound concentration, grows the level of selenium accumulation, but decreases the spirulina's productivity. The highest selenium accumulation level in the spirulina biomass was set for $\text{Fe}_3\text{Se}_3\text{O}_9 \cdot 6\text{H}_2\text{O}$ - 606,9mg% at the concentration of 50 m/l of this compound

Therefore, the results of the study and their analysis allows to infer a conclusion about the positive physiological response of the spirulina culture that normally grows and develops in the presence of the selenium compounds, except CoSeO_3 . Thus, the *Spirulina platensis* CNMN CB- 02 strain can be used for the

selenium accumulation and bio-generation of compounds containing selenium. Also, spirulina biomass with bio-transformed selenium content in organic selenium can be used in biotechnological purposes – for example to obtain premixes animal feed selenium consumption component to fill the deficit this vital life element.

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THE EXPERIENCE OF REESTABLISH OF ATLANTIC SALMON'S AND EUROPEAN PEARL MUSSEL'S POPULATIONS IN THE GLADYSHEVKA RIVER (LENINGRAD REGION, RUSSIA)

Titov Sergey, Mikhelson Sergey, Sendek Dmitry

FGBNU "GosNIORKh", St.Petersburg, Russia. sergtitov_54@mail.ru monitoryfish@gmail.com

A relatively small river Gladyshevka belongs to the lake and river system located on Karelian Isthmus in 70 km from St. Petersburg. It flows from Lake Gladyshevskoye, and merges with the Roshinka River thus forming the Chornaya River flowing into the Gulf of Finland (Baltic Sea). The system Gladyshevka-Chornaya is the only river system in the northern part of the Gulf of Finland in the Russian Federation, where – according to reliable data – there used to be a local population of Atlantic salmon.

There are scarce publications about the local salmon population, which was exterminated. There are only some notes on several cases of the catch of mature specimens in the Chornaja River in 1961 and 1962, and in the Roshinka River in 1949 (Kazakov, Petrenko, 1987). Local people reported that in 1972 a salmon of 20 kg was caught in the mouth of the Velikaya River, which flows into Lake Gladyshevskoye. There are no data on the sport of salmon spawning.

In the end of 1970s – beginning of 1980s, new attempts were made to reestablish the population of Atlantic salmon in the Gladyshevka River. For several years in rivers Chornaya and Roshinka young salmon of the Neva origin was released (Kazakov, Petrenko, 1987). There was some success in returning spawners to the Gladyshevka River, but unfortunately, there were no data obtained that would give the evidence of reestablishment of natural spawning in this watercourse.

In the end of 1990s, the Gladyshevka was added to list of potential salmon rivers within the ICES Action Plan on salmon. Reestablishment of natural salmon regeneration in the Gladyshevka River became possible due to the implementation of the Program of conservation and restoration of valuable salmonid species and European pearl mussel in the basin of this river. The Program was developed and is being implemented by GosNIORKH in cooperation with the reserve "Gladyshevskii".

As a result of the research of spawning and hatching areas of the Gladyshevka River it was established that along the whole river (17,8 km) about 8000 m are suitable for spawning and young salmon growth. At the same time, about 5800 m, i.e. almost two thirds of all spawning and hatching areas of the river, are located at two rapid sections situated in the upper and lower parts of the river.

The results of hydrobiological investigation showed that development of food stock is at a high level and can support maximal density of young salmon (up to 1 specimen/m). Therefore, potential environmental capacity of fattening and growth grounds of the Glagyshevka River makes:

$$ECP = 8000 / 1 = 8000 \text{ specimens (mixed-aged young salmon)}$$

During the last several years, thousands of mixed-aged salmon specimens grown at the Narva fish farm were released at the rapids of the river. Over 160 thousand fishes were released during those years in total. The results of test fishing demonstrated the young salmon released spreads both up and down the stream. Its highest density, 1 specimen/m, was recorded right at the spot of release and within 100 m up and down the stream. The density became lower in proportion to the distance from the release spots and made 0.1-0,2 specimens/m near the boundaries of the rapids.

Within framework of the International Program (2007-2013 South-East Finland-Russia ENPI CBC) Finnish – Russian project “Rivers and fish – our common interest” has been started. The objective of the project is to improve the ecological state of rivers in the Vyborg District of the Leningrad region, ensuring existence and viability of valuable species of salmon fishes and European pearl mussel. River Gladyshevka – one of the Target Rivers of the project. There are several directions of the project activities:

- Scientific research aiming at recovery of salmon and trout populations (annual monitoring of fish fauna, study of genetic structure of salmon populations);
- Ensuring free migration of fish in Target Rivers (removing obstacles, introducing technological changes to the dams);
- Restoring major rapids during ecological camps;
- Protection of forests in river’s basins areas;
- Development of sustainable eco-tourism and fishing in project area, ecological education for local people.

Natural salmon spawning is the evidence of the effectiveness of the activities: during the last several years, natural mixed-aged young salmon can be found at the rapids of the Gladyshevka River. Reestablishment of natural salmon population in the Gladyshevka River will make a positive impact on the condition of European pearl mussel dwelling in the water body. Local population of this hydrobiont – which has been included into the Red Data Book – life cycle of which is connected with young salmon is on the verge of extinction.

INFLUENCE OF ABIOTIC AND BIOTIC FACTORS UPON COMMUNITIES OF AQUATIC ORGANISMS

Toderas Ion, Zubcov Elena, Ungureanu Laurentia, Biletschi Lucia, Subernetkii Igor, Negru Maria, Zubcov Natalia, Borodin Natalia, Tumanova Daria

Institute of Zoology, ASM, Chisinau, Moldova, iontoderas@yahoo.com

The main role in the development of bacterioplankton, phytoplankton and zooplankton belongs to nutritive elements, especially nitrogen and phosphorus compounds. Dynamics and ratio between the ammonifying, nitrifying and denitrifying bacteria is directly dependent on the content of ammonium ions, nitrates and nitrites in the waters of aquatic ecosystems. The role of phosphorus in the development of planktonic bacteria and alga consists of its contribution to the accumulation and transformation of energy inside cells. Quantitative assessment of the intensity of planktonic bacteria and alga response to the modifications of phosphorus concentrations in water is one of relevant methods used for elaboration of prognostic on aquatic ecosystem trophicity (Zubcov et al., 2009; Zubcov, Ungureanu, Munjiu, 2005). The dynamics of organic substances dissolved in the waters of the Prut River reflected destruction processes, because organic matter is the main nutrition source for many groups of bacteria, especially amylolytic and cellulolytic ones. It was proved that when the temperature of the Prut River water is favourable for these groups of microorganisms, the relationship between the concentration of organic substances in the water and density of these bacteria is almost linear. From other hand, it was evident a positive correlation between the concentration of organic substances and density of planktonic bacteria. The synthesis of phytoplankton primary production depends on a range of factors, especially on solar radiation and water transparency. The carried out investigations revealed a negative correlation between the suspensions content in the waters of the Prut River and Costesti-Stinca reservoir and the values of primary production. One of indicators of the influence of environmental factors on aquatic organisms is the accumulation level of metals in aquatic organisms. The limits of variation of metal concentrations in aquatic plants, benthonic invertebrates and fish were quite large, being conditioned by the content of metals in living environment, taxonomic peculiarities, and chemical properties of metals. It is extremely important to establish the relationships between different environmental factors, but particularly, between different groups of aquatic organisms. For instance, it was obvious a classic correlation between the biomass of planktonic organisms (phytoplankton – zooplankton) in summer time.

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DIVERSITY AND PHYTOPLANKTON FUNCTIONING IN THE CUCIURGAN RESERVOIR

Ungureanu Laurenția, Tumanova Daria, Ungureanu Grigore,
Melnicu Cristina

*Institute of Zoology of Academy of Sciences of Moldova, MD 2028,
1 Academiei str., Chisinau, Republic of Moldova, ungur02laura@yahoo.com*

The phytoplankton diversity, the dynamics of quantitative parameters, the productivity capacity was evaluated, the trophicity and water quality of Cuciurgan reservoir was determined, based on algae species saprobity indicators. In 2009-2011 the phytoplankton of Cuciurgan reservoir was represented by a total of 103 species and interspecific taxa, with the dominance of species from the groups *Chlorophyta-43*, *Bacillariophyta-38* and *Cyanophyta-10*.

The phytoplankton number varied within the limits of 10,79-52,46 million cell/l with biomass 2,53-7,98 g/m in spring period, 11,66-40,19 million cell/l with biomass 5,60-14,50 g/m in summer period and 1,86-54,45 million cell/l with biomass 2,14-21,63 g/m in autumn period. The main share in forming the phytoplankton number belongs to Cyanophyta, while in algal biomass formation – to Bacillariophyta.

The maximum intensity of production process was recorded in summer period, primary production values being situated within 7,79-9,45 gO₂/m 24 h. In spring and autumn the phytoplankton primary production was lower in all the sectors of Cuciurgan reservoir and was situated within the limits of 0,65-1,73 gO₂/m 24 h. The seasonal and spatial fluctuations of primary production values in Cuciurgan reservoir are followed by fluctuations of phytoplankton biomass values, successions of plankton algae community structure, changes in nutrient concentrations and oscillations of water transparency values, caused by the contents of the substances in suspension.

The values of destruction of organic substances were higher than primary production values in spring and autumn periods. The A/R ratio was higher than 1 during the summer and lower than 1 in spring and autumn period, reflecting the negative balance of formation of organic substances in the Lake.

The saprobic index values ranged between 1,8-2,33, water quality being better in the lower sector of the Lake and more polluted in the medium and superior sectors, where the saprobic index values were higher than the limits of β-mezosaprobe zone.

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PRODUCTIVITY AND SUCCESSIONS OF PHYTOPLANKTON IN THE PRUT RIVER

Ungureanu Laurenția, Toderăș Ion, Ungureanu Grigore, Tumanova Daria, Melniciuc Cristina

Institute of Zoology of Academy of Sciences of Moldova, MD 2028, 1 Academiei str., Chisinau, Republic of Moldova, ungur02laura@yahoo.com

Seasonal successions of phytoplankton are one of the basic indicators characterizing the stability of algal communities and their degree of adaptation to living conditions. In 2012-2013 years, the Prut river phytoplankton was represented by a total of 89 species and intraspecific taxa distributed in the following taxonomic groups of algae Cyanophyta – 8, Chrysophyta -1, Dinophyta – 1, Bacillariophyta – 42, Euglenophyta – 6, Chlorophyta – 31. The basis of the floristic diversity of the Prut river consists of groups *Bacillariophyta*, *Chlorophyta* and *Cyanophyta*, which recorded the highest number of taxa of different ranks. The most commonly found species were *Merismopedia tenuissima*, *Synecocystis aquatilis*, *Monoraphidium contortum*, *Monoraphidium komarkovae*, *Scenedesmus quadricauda*, *Trachelomonas hispida*, *Chlamydomonas globosa*, *Navicula cryptocephala*, *Cocconeis placentula*, *Nitzschia acicularis*, *Cyclotella kuetzingiana*.

Phytoplankton are characterized by large amplitude of space-time oscillations of number and biomass values, that stands out when comparing their values over time (seasonal and multiannual dynamics) and space (distribution of algal communities in different sectors of Prut river). The numbers of phytoplankton changed within the limits 1,69 to 29,58 mln.cel/l with biomass from 1,02 to 17,19 g/m in the spring, from 0,89 to 29,36 mln.cel/l with biomass from 0,43 to 12,26 g/m in the summer, and from 2,16 to 24,96 mln.cel/l with biomass from 1,15 to 5,34 during autumn. In Prut River was attested the preponderance of Cyanophyta in the forming of the number and Bacillariophyta algae in the formation of phytoplankton biomass in both investigated stations, with higher values in the medial sector of the river. The seasonal succession of phytoplankton is determined by a complex of factors, of which the leading role belongs to temperature, light, water masses dynamics and nutrient elements concentration.

There were established considerable differences between the values of primary production of phytoplankton and organic matter destructions during the growing season and in different sectors of Prut river. During the vernal period the primary production values ranged from 0,33 to 4,85 g O₂/m² 24 hours, with significant differences recorded between values certified in different sectors of the river. Higher values of primary production were identified in Braniste (2,87 g O₂/m² 24 hours) and Cășlița-Prut (4,85 g O₂/m² 24 hours) stations. In the vernal period destructions values changing from 0,28 to 15,6 gO₂ /m²·24 h.

The limits of variation of primary production values during summer (0,42 to 4,99 g O₂/m²·24 h) were higher than during the vernal period. Along with in-

creasing the intensity of production processes during the summer, there greatly increased also the values of organic substances destructions. Higher values of primary production were identified in Leuseni (4,28 g O₂/m² 24 hours) and Leova (4,58 g O₂/m² 24 hours) stations.

At the same time the destruction processes intensity was quite high, destructions values changing from 0,36 to 74,79 gO₂/m²·24 h in the summer period. The ratio A/R less than 1 reflects a negative balance of oxygen content in the river during the summer period and shows a high content of allochthonous substances.

During the autumn the primary production values, with fluctuations within 0,55 to 21,82 g O₂/m²·24 h were significantly lower than in the summer and vernal periods. Higher values of primary production were identified in Braniste (21,82 g O₂/m² 24 hours), Sculeni (8,13 g O₂/m² 24 hours) and Leova (3,93 g O₂/m² 24 hours) stations.

Like the situations documented in other seasons, the destructions values of organic substances located within 1,00 to 13,83 g O₂/m²·24 h exceeded the primary production values, the ratio A/R being less than 1.

The dynamics of phytoplankton primary production in Prut river is determined by hydrological and hydrochemical conditions and seasonal and multianual successions of planktonic algae communities.

It was determined that the seasonal fluctuations of phytoplankton biomass do not make corresponding changes of intensity of algae primary production. The photosynthetic intensity of phytoplankton dominated by bacilariophyta algae is higher than that dominated by cyanophyta algae, conditioned by photosynthetic peculiarities of different species. Reduced phytoplankton development is compensated by the intensification of its photosynthetic activity.

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DYNAMICS OF BIODIVERSITY AND QUANTITATIVE INDICATORS OF ICHTHYOFAUNA IN THE PRUT RIVER ECOLOGICAL SUCCESSION

Usatîi Marin¹, Crepis Oleg¹, Şaptefraţi Nicolai¹, Usatîi Nadejda²

¹*Institute of Zoology of the Academy of Sciences of Moldova,
Chisinau, Moldova*

²*High School "Traian", Chisinau, Moldova
e-mail: ihio.moldova@mail.ru*

Analysis of data from the specialized literature shows that before the regularization of the Prut River courses there was recorded in their water reservoirs within Moldova the presence of 74 fish species and subspecies, belonging to 16 families. After the Costesti – Stanca dam construction and drainage of spawning

sites in the river meadow, there are in full progress negative changes in composition of fish fauna of the river, it is being continuing the substitution of valuable species by economically worthless species with a reduced growth rate, and there are being modified the conditions of reproduction of native species of fish. As a consequence, there disappeared or are endangered such species as sturgeon, starry sturgeon, eel, European mudminnow, etc. There have reduced their numbers the populations of semi migratory species (Black Sea roach, ide, ziece). Only two of introduced species were acclimatized – mottled topmouth gudgeon and Amur sleeper, which are currently being reproduced naturally. The numbers of other species (silver carp, bighead carp, and grass carp) are maintained only by artificial reproduction in specialized fish farms nurseries.

Numerous ecologically unjustified activities made so far in aquatic ecosystems have caused major disturbances in specific diversity of fish fauna and ecological changes in the status of most species of fish. It practically disappeared from the fish fauna composition the Black Sea roach, ide, burbot, Volgha zander, Mediterranean barbell, common minnow, etc. There are endangered the populations of crucian carp, European mudminnow and stone loach. There have taken the status of rare species sterlet, tench, streber and golden spined loach. There decreased significantly the population numbers of majority industrially valuable species that had previously an increased frequency in ihtiocenoze (zander, taran, barbel). On the other hand, some species have adapted to changing environmental conditions and extended their area and their number is growing numerically. First of all, the mentioned above refers to economically worthless species (topmouth gudgeon, gudgeon, bleak, gibel carp, perch and rudd). Thus, the current fish fauna of the aquatic ecosystems of the Prut River in Moldova practically includes in its composition 60 species and subspecies of fish.

Analysis of the fish resources of the Middle Prut performed in the period 2000 - 2013 revealed as predominant by frequency in the riverbed the worthless fish species (bleak - 13.6%, gudgeon - 8.4%, western tubenose goby- 7.3%, and monkey goby- 8.5%). There prevail two species of those with low economic value: the roach (6.3%) and gibe carp (6.0%). It was rarely met in fish catches such species as shad (4.5%), wels catfish (3.9%), zander (3%), ziece (2.4%), asp (1.8%), carp (2.1%), and hake (1.2%). The fish fauna in the Middle Prut confluents is represented by 7 species, of which the carp is met only episodically, and the less numerous ones (roach, perch, rudd, silver Bream, and gibel carp) are from 4.3 to 13.4%. In the Costesti-Stanca reservoir it has been reported in recent years a considerable reduction of fishery resources. There are predominant in the reservoir the valuable species of common bream (8.9%) and those with low economic value - roach (12.7%) and perch (12.4%). The asp (1.9%), gibel carp (2.9%), carp (1.1%) and silver carp are met less often. There are episodically met wels catfish (0.7%), pike (0.4%) and grass carp (0.4%). As regards worthless species, there predominate bleak (21.2%) and bitterling (6.5%).

In the Lower Prut, it is predominant by frequency the bleak (18.3%), but the gobies species are also numerous (western tubenose goby - 9.4% and monkey goby - 6.1%). Among the valuable fish species it was reported the prevalence of the the species of roach (6.1%) and gibel carp (6.1%). The populations of valuable species of fish in this area are quantitatively more numerous (common bream - 4.2%, wels catfish-3, 8%, zander -3, 1%, and vimba -1, 9%). In the Lower Prut confluents there were found six valuable species, represented by carp, phytophagus fish and zander that are rarely met. Perch, roach and gibel carp are from 3 to 7% of the fish fauna numbers. The Beleu and Manta reservoirs were previously dependent on Prut River and formed a common ecosystem, of which fish fauna was influenced by the seasonal migration of the main species of fish in the river. Currently this link is affected and this greatly reduced access of valuable species to the reservoirs.

Thus, analysis of changes in the structural and functional state of fish fauna of the Prut River in the process of ecological succession revealed a negative dynamics of these changes in most of the commercially valuable and rare species of fish and a positive trend in a number of non-commercial species with high reproductive and adaptive potential in changing ecological conditions of the habitat.

DYNAMICS OF BIODIVERSITY AND QUANTITATIVE INDICATORS OF ICHTHYOFAUNA IN THE ECOLOGICAL SUCCESSION OF THE RIVER DNIESTER

Usatîi Marin, Crepis Oleg, Usatîi Adrian, Şaptefraţi Nicolae,
Vatavu Dumitru, Bodean Anatol

*Institute of Zoology of the Academy of Sciences of Moldova, Chisinau,
Moldova e-mail: ihio.moldova@mail.ru*

Analysis of ichthyofauna data from the specialized literature shows that before the Dniester River regularization, there has been reported in their basins within the Republic of Moldova the presence of 83 species and subspecies, belonging to 18 families. After the construction of the Dubasari dam, negative changes are fully underway in the composition of ichthyofauna: it continues the substitution of valuable species by species with low rate of growth and economically worthless; the conditions of reproduction of native species of fish are modified. As a consequence, such species as beluga sturgeon, Russian sturgeon, starry sturgeon, eel, European mudminnow etc. disappeared or are endangered. The populations of semi-migration species (Black sea roach, ide, vimba, and ziece) have reduced their livestock numbers. Simultaneously, the acclimatization and introduction of new species of fauna complexes from the Far East and North America, conducted in the 70-80th years of the last century, made it possible to complete the ichthyofauna with 11 new species: silver carp, bighead carp, grass carp, black carp, paddlefish, bester, buffalo, American catfish, pilen-

gas, two alien invasive species – mottled topmouth gudgeon and amur sleeper, which were introduced accidentally together with Asian cyprinids. Only three of the introduced species were acclimated - American catfish, topmouth gudgeon striped and amur sleeper, which currently reproduce naturally in water bodies of the country. Other livestock species are maintained exclusively by artificial reproduction in specialized fish farms nurseries.

Numerous unjustified environmental activities made until now in aquatic ecosystems caused major disorders in specific diversity of fish fauna and changes in the ecological status of most species of fish. There were practically disappeared from ichthyofauna composition the large Black Sea roach, ide, burbot, Volgha zander, Danube bleak, common minnow etc. There are endangered the populations of vimba, ziega, crucian carp, European mudminnow and stone loac. Sterlet and tench have been passed to the status of rare species. It decreased significantly the number of populations of the majority of industrially valuable species, which had an increased frequency in ichtyocenoze (zander, carp, wels catfish, common bream, and taran). On the other hand, some species have adapted to changing environmental conditions and extended their area and their number is growing numerically. Firstly, the above-mentioned concerns to the economically worthless species (topmouth gudgeon, gudgeon, gibel carp, bleak, perch, and rudd). For example, in the middle section of the Dniester River, a marked increase is now standing out in the number of rare species, such as dace, stickleback, southern stickleback, bullhead. Thus, the current composition of the fish fauna of aquatic ecosystems of the Dniester River within Moldova basically includes 72 species and subspecies of fish.

Analysis of quantitative indicators of ichthyofauna in the Dniester River basin performed in 2000 -2013 showed that the fish fauna of no economic interest in the middle section of the river is dominated by stickleback (9.0%), southern stickleback (8.0%), perch (7.9%), dace (7.0%) and bleak (6.0%). More numerous of valuable species are roach (5.1%), pike (2.7%), carp (1.3%) and common bream (1.3%). The fish fauna in the middle Dniester affluents is rather poor. The valuable species (carp, asp) are met only episodically and the economically worthless species (gibel carp with low growth rate, and perch) are 4.2-7,3%. Among the valuable species of the fish fauna of the Dubasari lake there are prevailing the roach (11.1%), common bream (9.6%) and gibel carp (8.0%). Of the economic worthless species in ichtyofauna there are prevailing bleak (10.0%), perch (6.7%), bitterling (6.0%), stickleback (5.4%) and belica (5.2%).

In the lower course of the Dniester River, the most frequent of valuable species are gibel carp (6.5%), common bream(5.4%) and roach (5.0%). Species of no economic interest in dominant catches were bleak (14.0%), belica (8.6%), gudgeon (6.5%), perch (5.3%), Black Sea sprat (4.7%), Big-scale sand smelt (4.6%), silver bream (4.5%) and bitterling (4.1%). Compared with the middle Dniester affluents, the lower course affluents have a richer specific diversity of ichthyofauna. For ex-

ample, the upper and middle courses of the Bic River are populated by pike (0.4%), carp (2.8%), common bream (2.4%), gibel carp (7.0%), roach (4, 6%), etc.

Thus, the analysis of changes in the structural and functional state of the fish fauna of the Dniester in the process of ecological succession reveals its negative trend in the majority of the industrially valuable and rare species of fish and a positive trend in a number of non-industrial species with high reproductive and adaptive potential in changing environmental conditions of the habitat.

BIOTA OF HYPERHALINE LAKES OF THE SOUTH OF WESTERN SIBERIA

Vesnina Lyubov Viktorovna

Altai Branch of the Federal State Unitary Enterprise State Scientific and Production Center for Fisheries «GOSRYBCENTR» – «Altai scientific research institute of water bioresources and aquaculture» Barnaul, Russia, e-mail: vesninal.v@mail.ru; artemia@alt.ru

Studying of hyperhaline lakes causes a particular interest that is bound to feature of their biota. The natural stock of self-regulation and self-preservation of water ecosystems of hyperhaline lakes is limited owing to a combination of an unstable hydrology in a combination with high extent of natural accumulation of mineral and organic matters, and also a low species variety of hydrobionts. As a part of a phytoplankton are noted high rates of a biomass at the expense of development of 1-2 main species. The zooplankton in the majority of lakes is presented by a monoculture of a crustacean from the sort *Artemia* Leach, 1819, class *Branchiopoda*. The practical value of *Artemia* consists in use its diapausing eggs as a starter feed for a larvae of valuable species of fish and crustaceans. *Artemia*'s cysts is highly demanded, and possibilities of preparation of this valuable resource in hyperhaline lakes are very high. Their total stock in lakes of the Altai territory is estimated at the level of 6-7 thousand tons.

Hyperhaline lakes of Western Siberia are settle down in the extensive inland falls surrounded with heights and a massif. Classical example is the southern Areas of West Siberian Plain surrounded with a massif of Altai, Ural and Sayan Mountains, heights of the Average-Siberian plateau and the Kazakhstan folded country. Salt lakes occupy drainless hollows. Zones of arrangement of salt lakes usually coincide with internal artesian pools, and mineral underground waters play a part in a mode of land reservoirs.

Hyperhaline lakes are located rather compactly in the arid and semi-arid zones of the West Siberian lowland; they are subordinated to zonal regularities of climatic conditions of salt and organic accumulation and have a common tendency to the succession.

Natural complexes of hyperhaline lakes are in close connection with climatic conditions which form heat and water balance, conditions of activity of organ-

isms. Environment in the latitudinal zones influences on the formation of a biota of lakes, lacustrine accumulation and chemical composition of water.

The considerable proportion of hyperhaline reservoirs of Russia (1,2 – 1,3 thousand sq.km) is located in the Altai territory and dated for areas with poor moisture content and excess heat availability. There are three categories of lakes, based on the ecological and economic importance. The largest in the Russian Federation hyperhaline lake Kulundinskoe (the water area of 728 sq.km) gets into to reservoirs of the highest category, and the most deep-water salt lake having world value – the lake Bolshoye Yarovoye (the water area of 66,7 sq.km) also belongs to the highest category. Reservoirs of the first category include 13 lakes, the lakes Maloye Yarovoye (the water area of 35,2 sq.km) and Malinoye (the water area of 11,4 sq.km) are the most valuable of them. To the second category belong hyperhaline lakes with the water area more than 1,0 sq.km.

For hyperhaline lakes limiting natural factors are temperature and a common mineralization of water, also a derivative of hydrological conditions on the drainage basin and in the reservoirs – the mode of water level determines the sizes of the «inhabited» zone of crustaceans and their diapausing eggs.

In the territory of an arrangement of hyperhaline lakes the sum of the active air temperatures more than 10 °C fluctuates within 2000-2400 °C.

The mode of water level of the major part of hyperhaline lakes is changeable and exposed to the considerable fluctuations, up to the thorough drying of shallow reservoirs and noticeable reduction the areas and depths in larger ones (regression phase of water content). At the improvement of environment begins the flood of lakes, comes a transgression stage of the mode of water level. Therefore the number of lakes, their linear dimensions, coastline outlines, level of a mineralization of a brine are in integral dependence on water content conditions.

In the described territory for the last decade such periods are noted: 2001-2005 – a transgression phase of water content, 2006-2013 – a regression phase.

Mineralization of water of lakes varies in the wide range: from 30 to 320 g/l. On type of their hydro-chemical composition, majority of hyperhaline lakes fall into the chloride class (Bolshoye Yarovoye, Krivaya Puchina, Kurichye etc.). Some lakes fall into to the mixed chloride-sulfate class (Kulundinskoye, Belenkoye, Mormyshanskoye etc.). Also there is a small amount of carbonate lakes (Tanatar, Petukhovo). In most cases a group of water is the sodium.

The zooplankton, in the majority of lakes, is presented by a monoculture of halophilic crustacean from the genus *Artemia* Leach, 1819. One of the features of *Artemia* is ability to beget as cyst (with thin and thick-shell), and nauplii. *Artemia*'s thick-shell eggs (cysts) are valuable object of trade. In lakes of the highest category there are about three-four generations of the crustacean during the warm period.

LONG-TERM DYNAMIC OF POPULATION'S NUMBER OF *ARTEMIA* LEACH, 1819 IN HYPERSALINE LAKES OF THE ALTAI TERRITORY

Vesnina Lyubov Viktorovna, Ronzhina Tatyana Olegovna

Altai Branch of the Federal State Unitary Enterprise State Scientific and Production Center for Fisheries «GOSRYBCENTR» – «Altai scientific research institute of water bioresources and aquaculture» Barnaul, Russia
e-mail: vesninal.v@mail.ru; artemia@alt.ru

Biocenoses of hyperhaline reservoirs are very peculiar and differ a slight biodiversity. The phytoplankton and zooplankton are presented by gallophil species. The basis of a phytoplankton is made by filamentous green and blue-green algas, with dominance of 1 - 2 species. The zooplankton, in the majority of reservoirs, is presented by a monoculture of a crustacean *Artemia* Leach, 1819.

Artemia is the cosmopolitan species, and occupies reservoirs of a continental and sea origin with a range of mineralization of 40 - 320 g/l. *Artemia* belongs to species with short life cycle and during the vegetative period is capable to create several generation (from 1-2 in small reservoirs to 3, it is rare 4 – in large). One of the features of *Artemia* is ability to beget as cyst (with thin and thick-shell), and nauplii. *Artemia*'s thick-shell eggs (cysts) are valuable object of trade.

The sizes and number of lakes depend on the drainage basin, conditions of water content, duration of process of a salt accumulation and aridity of climate, and this is what defines the fund of *Artemia*'s reservoirs. For the territory of an arrangement of hyperhaline lakes characteristically alternation of transgression and regression phases of the water content, that determines conditions of development of a crustacean and quantity of trade reservoirs. For years of supervision was noted abounding in water period in the 2001-2005 years and shallow period of 2006-2013.

The first *Artemia*'s nauplii are fixed in the middle of April – at the beginning of May when water warming up to - 3°C. Puberal individuals are marked out from the middle of June. In hyperhaline lakes of the Altai territory development from 1 to 4 generations of a crustacean is observed. For larger lakes Kulundinskoye and Bolshoye Yarovoye development of 3-4 generations is characteristic. Duration of life of the first generation fluctuated from 55 to 69 days.

The second and the subsequent generations evolve with superposition of each other that complicates identification of their clear boundary. The second generation appears in the middle of June and exists to the middle of August. The beginning of the third generation coincides with the end of July, the elimination of individuals of this generation is observed from the second half of September. Development of the fourth generation a lot more depends on abiotic and biotic factors. Its beginning is dated for the middle of August, individuals reach a sexual maturity at the end of September beginning of October, at the favorable conditions.

Females of the first generation generally multiply from live birth. Female of the second and the subsequent generations in the lake Kulundinskoye usu-

ally reproduce only diapausing eggs, live birth practically is absent. In the lake Bolshoye Yarovoye live birth was observed up to the third generation that is due with stability of abiotic factors.

Data about *Artemia*'s number at different stages of development and in different phases of water content considerably differ. In the lake Kulundinskoye average annual value of number during the period of abounding in water exceeds the number of crustaceans during the shallow period, and is respectively: $36,0 \pm 24,5$ and $27,9 \pm 8,2$ thousand exemplar/m³. It can be explained with presence of males at population structure in a transgression phase of water content, and also more than the favorable conditions for live birth. In the regression phase, being accompanied increase in a mineralization of water, population was presented by only parthenogenetic females, thus the increase in number a cysts was observed. The fertility, that is quantity of embryos on one female, in the lake Kulundinskoye, despite a water content phase, was at the level of 30 exemplar/individual.

In the lake Bolshoye Yarovoye, thanks to its deep-water content, there are stabler conditions of dwelling of hydrobionts. In a transgression phase of water content mean values of *Artemia*'s quantity were $21,0 \pm 4,7$ thousand exemplar/m³. In a regression phase of water content the significant increase *Artemia*'s quantity in the all stages of development was observed, and reaches $175,3 \pm 53,8$ thousand exemplar/m³. Data of a fertility also considerably differed in transgression and regression phases of water content, and were respectively $47,8 \pm 18,8$ and $223,0 \pm 52,2$ exemplar/individual. At structure of population there were males..

Results of long-term researches behind a biota of lakes Kulundinskoye and Bolshoye Yarovoye testify to their uniqueness and different ecological tolerance of *Artemia*'s populations. Change of abiotic factors gets a different response in each concrete reservoir, being expressed in change of numerical and production characteristics of *Artemia*, and consequently and on a condition of stocks its cysts.

STRUCTURE OF OLIGOCHAETA FROM AQUATIC ECOSYSTEMS

Vition Pantelei

*Institute for Plant Protection and Ecological Agriculture
of ASM ippae@asm.md*

The aim of investigations is to bring into evidence ecologo-faunistic of the oligochytes aquatic in the hydrographic basins of the R. Moldova. Investigations were carried out in the hydrographic basins of the rivers Nistru, Prut, barrage lakes, rivers, fishponds, rivulets from the forest ecosystems. To bring into evidence the taxonomic groups of aquatic oligochets the common hydrobiological methods of Jadin, Cecanovschi etc. were used. Oligochaeta fauna of aquatic ecosystems has the following zoocoenosis: Coastal zoocoenosis of aquatic ecosystems is composed of the following taxa of Oligochaeta: *Nais behningi* *Limno-*

drilus hoffmeisteri, *Limnodrilus claparedeianus*, *Limnodrilus michaelsoni*, *Nais pardalis*, *Tubifex nevaensis*, *Propappus volri*, *Potamotheix isochaetus*, *Peloscoclex velutina*, *Psammoryctides albicola*, *Psammoryctides barbatus*.

Zoocoenosis psammophilous fauna is composed of the following Oligochaeta species: *Amphichaeta leydii*, *Propappus volri*, *Potamotheix stephensoni*, *Euiyodrilus moldaviensis*, *Nais bretscheri*, *Limnodrilus profundicola*, *Limnodrilus claparedeianus*, *Limnodrilus michaelsoni*, *T. ignotus*, *T. filum*, *Pristina rosea*, *P. bilobata*, *P. aeguiseta*, *P. longiseta*, *Rhyacodrilus falciformis*.

Oligochaets of peloreafilas zoocoenosis consists of the following species: *Tubifex tubifex*, *Tubifex nevaensis*, *Euiyodrilus moldaviensis*, *Euiyodrilus hammoniensis*, *Euiyodrilus bedoti*, *Psammoryctes barbatus*, *Nais behningi*, *Spercaria josinae*, *Chetogaster diastrophus*, *Dero digitata*, *Vejdovskyella comata*, *Vejdovskyella intermedi*, *Limnodrilus hoffmeisteri*, *Limnodrilus claparedianus*, *Limnodrilus udekemianus*, *Uncinaiis uncinata*, *Ophidonais serpaentina*, *Isochaetides michaelsoni*, *Pristina rosea*, *Pristina bilobata*

Zoocoenosis argiloreafilas Oligochaeta has the following forms: *Nais behningi*, *Limnodrilus hoffmeisteri*, *Limnodrilus udekemianus*, *Tubifex tubifex*, *Euiyodrilus hammoniensis*.

Fitore biocenosis has the following structure Oligochaeta: *Nais barbata*, *Nais communis*, *Nais simplex*, *Stylaria lacustris*, *Pristina rosea*, *Euiyodrilus hammoniensis*, *Dero digitata*, *Limnodrilus hoffmeisteri*, *Limnodrilus claparedianus*, *Limnodrilus udekemianus*, *Limnodrilus michaelsoni*.

Pond and swamp zoocoenosis has the following specific components: *Tubifex tubifex*, *Limnodrilus hoffmeisteri*, *Limnodrilus claparedianus*, *Limnodrilus udekemianus*, *Limnodrilus michaelsoni*.

INVESTIGATION OF METALS AND ELABORATION OF METHODOLOGY OF THEIR MONITORING IN AQUATIC ECOSYSTEMS ACCORDINGLY TO THE EUROPEAN DIRECTIVES

Zubcov Elena, Toderas Ion, Zubcov Natalia, Biletschi Lucia, Sova Sergiu

Institute of Zoology, ASM, Chisinau, Moldova, ecotox@yahoo.com

In compliance with European Directives, a range of FAO guidelines and main concerns of the international scientific societies of hydrobiology, limnology and ichthyology, trace metals are included in the list of most important environmental pollutants. Metals are natural toxicants, which are essential for plant and animal life; most of them are part of the natural enzymes, being catalysts of fundamental biochemical processes. At the same time, metals are enough strong toxicants, which are not destroyed in environment, but merely pass from one form of migration to another.

Over the years, we investigate the dynamics of migration and distribution of trace metals in surface waters of Moldova. Researches are carried out in an integrated manner. Thus, the trace element dissolved forms were investigated, after

filtration of natural water through the filter with pore size not more than 0.45 microns. There was determined the overall content of trace metals in suspended substances and also their share in surface-adsorbed complexes, organic-mineral complexes and metals in association with hydroxides of manganese and iron. After centrifugation of fresh samples of bottom sediments, the silt solution was studied, and also the metal overall content in silt, in different silt granulometric fractions and metal mobile forms. In order to assess the hydrobiont role in metal biological migration and influence on the functioning of water ecosystems, the accumulation level of metals in aquatic plants, zooplankton, zoobenthos was investigated in dependence of season, age and taxonomic peculiarities, including weight of aquatic organisms. Furthermore, the experimental researches in laboratory condition and also field works were undertaken on the influence of metals on one or another species and production-destruction processes (Zubcov E., 2000; Toderas et al., 1996). A special attention was paid to the investigation of regularities of metal accumulation in tissues and organs of fish at different stages of ontogenesis. Investigations were focused on the early stages – eggs, larvae, fry, immature fish, mature fish in different periods – pre-spawning, spawning and feeding one (Zubcov N., 2011; Zubcov E. et al, 2012). For the main rivers (Dniester, Prut) and their tributaries, as well as for Dubasari, Costesti-Stinca and Cuciurgan reservoirs there were established the main patterns of metal migration in dependence of natural and anthropogenic factors, estimated the share of anthropic component in the metal dynamics in aquatic ecosystems, determined the stimulating, inhibitory and toxic concentrations of separate metals and their complexes for aquatic organisms and production-destruction processes (Zubcov E., 2000; Zubcov, N. 2011) .

Modern equipment, lots guidelines and standards are available nowadays for determination of one or another metal in different materials, including water, but they in fact only give the information about the type of metal and its quantity in the given sample. The aquatic ecosystem is a huge mutually dependent complex of organisms, their communities and living environment, correspondingly, serious errors and controversial conclusions may arise from the absence of complex researches and estimation of ecosystem functioning trends. Especially, this is dangerous in the case of unreasonable establishment of criteria for water quality and aquatic ecosystem state, without taking into account regional, more exactly background components and physical-geographic features of the hydrologic basin of rivers or lakes/reservoirs. As example, some of metals are more toxic for cyprinids than for salmonides.

In conformity to one of the main concepts of geochemical ecology and biogeochemistry, organisms and biocenoses not only are able to adapt to the chemical factors of environment, but from their side, they modify the environment composition in correspondence with their needs to the development and reproduction. Trace metals are chemical elements, for which it is of utmost impor-

tance to identify the environmentally tolerable diapason of the natural variability of their content. The limits of diapason are due to the regional characteristics of ecosystems.

Based on multiannual investigations, we concluded that the fundamental stages of elaboration of methodology of metal monitoring in surface waters should consist of: 1) rules and methods of collection of water, suspended matter, bottom sediments and biological material (aquatic plants and animals) samples for investigation of metals; 2) methods of preparation of water, suspended matter, bottom sediments, invertebrates and fish samples for determination of metal accumulation; 3) methods of dissolved metal determination, of suspended forms of metal migration, methods of investigation of metal distribution in bottom sediments, metal accumulation in aquatic plants, invertebrate hydrobionts, fish organs and tissues; 4) methods of modelling and experimental investigations on evaluating the metal influence on aquatic flora and fauna; 5) methods of assessment of aquatic organism role in the metal biogenic migration, ecosystem self-cleaning processes and those of secondary pollution; 6) adaptation and modernization of investigation methods accordingly to the existing international and national standards.

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SECTION 4
PALAEOZOOLOGY

MAMMALS SCHELETON REMAINS FROM THE ENEOLITIC (TRIPOLIAN) SETTLEMENT IABLONA I

David Anatolie, Pascari Viorica, Rusu Viorelia

*Institute of Zoology of ASM, Chisinau, Republic of Moldova,
e-mail: davidanatolie@gmail.com, pascaruviorica@gmail.com*

More than 20 archeological temporal settlements have been identified nearby Iablona village situated in Glodeni rayon, belonging to Eneolithic epoch and characteristic for the Tripolian culture (first half of IVth – second half of III rd millennium B.C.) (Керпач, 1973; Попов, 1973). More or less comprehensive studies have been performed only at settlements Iablona I, Iablona XIII and Iablona XV that allowed discovering essential number of scheletal remains belonging to various wild and domestic mammals used mainly as food by inhabitants of above settlements. The remains became the subject of scientific research by the archeologists.

The most important and interesting from the faunistic point of view proved to be settlement Iablona I situated 0,4 km west of Iablona village in Pidmîta area. This excerpt has been attributed to the middle stage of Tripolian culture. The excavations and reconstruction works of this settlement arranged by archeologists involved those more than 4 thousands of mammal scheletal remains that have been studied by the authors of this paper, this number including about 665 remains identified as belonging to 11 species of wild mammals and the rest to domestic animals.

The scheleton remains have been attributed to the following wild mammal species: *Lepus europaeus* L., *Nannospalax leucodon* Nordm., *Vulpes vulpes* L., *Ursus arctos* L., *Martes cf. Martes* L., *Meles meles* L., *capreolus capreolus* L., *Cervus elaphus* L., *Sus scrofa ferus* L., *Bos primigenius* Bojan. / *Bison bonansus* L.

The identified mammals except mole rat were hunted animals captured by settlement inhabitants in its surroundings. Yet these generally do not reflect all hunted in this area species complex that evidently cover more animals.

The number of scheletal pieces (about 400 exemplars) and number of individs (minimum 15) of red deer (*Cervus elaphus*) demonstrates that it served (similarly as in other tripolian settlements from the north part of Moldova (Давид, 1982)) as a main hunting object for tripolian people and most probably spread in the area of above settlement as well as in the north part of country during Eneolithic time. The most significant scheletal remains of the red deer found in Iablona I site is a fragment of cranium with both horns clinging above ramifyings of upper orbital parts which apexes are also damaged that gives reason to believe that such object have been used to work the land. The red deer is represented by fragments of horns, maxillars and other various bones of extremities.

The roedeer (*Capreolus capreolus*) has been hunted especially due to its delicious meat yet its limited number (4) of captured animals is a reflection of

the fact that this appeared sporadically in the surroundings of the mentioned settlement.

The badger (*Meles meles*) is represented by the fragment of cranium, 14 parts of mandibulas and various bones of extremities belonging to 7 animals. The badger has been hunted for its fell, meat and fat. Usually, the studied tripolian settlements from Moldova lack remains of badger or these are rarely reported (except the settlement Ruseștii Noi I) (Давид, 1982).

More than 160 fragments of ribs, vertebres and bones of extremities of a quite large size but lacking distinguishing characters have been preliminarily attributed to the group *Bos taurus*/*Bos primigenius*/*Bison bonasus*. In fact, both bovides – taurus and bison have been inhabiting the north and central parts of Moldova during the tripolian epoch (Цалкин, 1962; Давид, 1982; David, Rusu, 2001).

The true hare (*Lepus europaeus*) valued also nowadays for its nice fell and delicious meat was hardly hunted by eneolithic tools being probably captured by applying crafts similarly to hunting of other small animals such as fox, marten etc.

The mammal complex hunted nearby Iablona I settlement includes also other species but these are registered in small quantity of skeleton remains and individuals: wild boar- 9/2, fox-6/2, marten-4/2, brown bear 1/1.

The major part (84%) of mammal skeleton remains from Iablona I belong to domestic animals: bovides (*Bos taurus*), ovicaprines (*Ovis aries* / *Capra hircus*), horse (*Equus caballus*) and dog (*Canis familiaris*). The most frequent are bovides (50% belonging to 34 individuals), follows by ovicaprines 20,9% and 23 individuals), suines 8,6%, 18 animals and horses (5,3%, 8 individuals).

The study of the mammal skeletal remains from Iablona I indicates that the main occupation of inhabitants of the respective tripolian settlement was raising animals, especially bovides, ovicaprines and pigs that assured the necessary food supply of animal origin, sometimes enriched supplementary by hunted animals mostly sporadically depending on the appearance of the wild animals in the respective zone. The hunting was practiced also due to the necessity to obtain fell of some species such as rabbit, marten, bear, wild boar and elk.

The humans from tripolian culture inhabiting Iablona were also engaged in raising horses proved by the large number of skeletal remains, about 180 exemplars belonging to 8 individuals.

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**THE FINDINGS OF FOSSIL MAMMALS IN THE CONTEXT OF
PALEONTOLOGICAL RESEARCH IN AZOV REGION**

Kalmykov N.P.

*Institute of Arid Zones SSC RAS, Rostov-on-Don, Russia,
e-mail: kalm@ssc-ras.ru*

The substantial contribution to many aspects of ecosystems evolution and fossil mammals in Black and Azov Seas Region was made recently by L.I. Alexeeva, A. David, E.L. Korotkevich, A. Lungu, T. Obade, V. Pascaru and others. Little attention is paid to data on paleontology, paleoecology and stratigraphy of Azov region with incorrect conclusions. For example, in the article “Visible fossil record of Razdorskaya settlement and its vicinity” (Titov, 2004, p. 37), it was noted that “on the described territory we see several levels of geological record... The most ancient sediments, observed on the daily surface, are Middle Sarmatian (Karanganian-Konkian, Melihovian) layers (15–14 Myr ago)... The so called “hipparion fauna” thrived at that time on the territory, including tridactylous horses – hipparions, rhinoceros, tapirs, paleotargus giraffes, antilopes, proboscides – zygodont mastodons and dinotheriums, as well as saber toothed cats – *Machairodus*”. In the vicinity of Razdorskaya there was no record of the fossils of the named mammals. These false data remind the known Piltdown Man incident (Johanson, Idi, 1984). The volume and the name of “Middle Sarmatian (Karanganian-Konkian, Melihovian) layer” do not also correspond to reality. The Sarmatian regiostage includes lower- middle- and upper-sarmatian substages, but not “Karanganian-Konkian” stages, especially not “Karanganian”, corresponding to the different system of Quaternary period. The Konkian and Karaganian (but definitely not “Karanganian”) layers are corresponding to the earlier period of Neogene system, then Sarmatian stage. It is written in the same work that: “The rabbit *Hypolagus igromovi* Gureev was described for the first time from Razdorskaya site... The palm-trees, ferns, Araliaceae, Lauraceae, acacias have been growing here at that time”. In the vicinity of Razdorskaya the fossils of late Miocene hare *Hypolagus* I. Gromovi (Gureev, 1964) (but certainly not *Oryctolagus* (rabbit)) were truly described without any in situ attribution. In the report “Information on Scientific Board on paleobiology and organic world evolution activities in 2005” (P. 12) it was stated that “the intrusion of the first camels to Western Europe took place in Late Miocene (in early Pontic stage), probably, through the Northern Parathetis (Eastern Europe), but not through Africa”. The intrusion of mammals “through the Northern Parathetis territory” is impossible, because this was the Paleogenic and Neogenic Sea, with Black and Caspian Seas as its remainders. The invasion of camels to Europe was described by L.I. Alexeeva (1985).

In the work “Continental late-pliocene theriocomplex of Azov region in geological history of North ecosystems of Arid Zone” (Baigusheva, 2006, P. 187) the interesting conclusion is made: “... The significant variability of features

could be explained by the significant ecological plasticity of horses, which made it possible, through selection, in relatively short period to derive the numerous breeds...". In the other work "Some characteristics of functioning and dental replacement of Caucasus elasmotherium *Elasmotherium caucasicum*" (Baigusheva et al., 2011, P. 305) it is stated that "on the enamel M2 the high number of scratches and relatively big amount of holes was registered... But, on the enamel of *E. caucasicum* the average amount of scratches is higher, then in other rhinoceros species". But the absence of teeth sheares, enamel microsections and the specialized equipment does not give any reasons to judge about the character of enamel abrasion and elasmotherium ecology. The difficulties of *Bos* and *Bison* determination in juvenile stages by the postcranial bones was noted a lot of times (Burchak-Abramovich, 1957; Gromova, 1960). Regardless of this information, the "hard-to-determine remnants" of Bovidae were attributed to European bison (Baigusheva, Titov, 2007; Timonina, 2004). No proof was given about the attribution to European bison and time of burial. The peculiarities of geological site, the presence of juveniles exclusively in the burial is an evidence that they are a part of burial grounds, where the dead juveniles of cattle were buried.

K. Popper (2008) stated firmly the difference between falsifiability and falsification. The given examples are related to the second case. The big lie is constructed out of "small things" given, which, by the misrepresented consideration of mammal fauna evolution, is put to the modern bio-ecological research in Black and Azov Seas region.

TOOTH-WEAR PATTERNS IN EXTANT POPULATIONS OF *MICROTUS ARVALIS OBSCURUS* (ARVICOLIONAE, RODENTIA) AND THEIR RELATION TO AGE AND DIET

Markova E.A., Sibiryakov P.A., Trofimova S.S.

*Institute of Plant and Animal Ecology, the Ural Branch of RAS, Ekaterinburg,
Russia e-mail: e.markova@ipae.uran.ru*

Tooth wear analysis in vertebrates is often used as a tool to reconstruct dietary adaptations in extinct species and populations, which in turn can be used for paleoenvironmental reconstructions. Numerous studies emphasize the need to reveal causative components producing different patterns of dental wear in extant species in order to improve the reliability of paleoecological inferences from the analysis of tooth wear in fossil forms. Here, we consider the three scales (macro-, meso- and micro-) of measuring dental wear in a hypselodont vole *Microtus arvalis obscurus* with particular emphasis on the mesowear patterns.

Mesowear analysis is based on a series of samples of common vole *Microtus arvalis obscurus* from natural populations in the Ural region (641 animals from northern, middle and southern taiga, forest-steppe and steppe). Relative age of animals was established based on the percentage of skull maturity. For 65 animals trapped in 2012-2013 in northern taiga and steppe both dental wear at dif-

ferent scales and stomach contents were analyzed. In washed and dried stomach content both food remains (vegetative and generative plant parts, fragments of insects and chitin) and extraneous materials (vole hair and grains of sand) were recognized and considered for potential abrasiveness.

Quantitative analysis was performed for the two patterns of tooth mesowear. First, an occlusal wear angle between the anterior (mesial) edge of the tooth crown and the occlusal plane was measured lingually on the first lower molars using an ocular micrometer. Second, the three patterns of occlusal relief were established based on the extent to which the enamel ridges and dentinal areas of the basic triangles T1-T3 on m1, m2, M1, M2 were worn: 1) flat occlusal surface of basic triangles (thin enamel ridges at the trailing edges of basic triangles, primary and secondary dentine in the center of the triangles are equally worn); 2) enamel ridges of the leading and trailing edges are rising above sunken dentinal areas in the center of a triangle with the most depressed area in the secondary dentine portion; 3) thick enamel ridge of the leading edge and adjacent dentinal area are rising above sunken dentinal area and thin enamel ridge of the trailing edge (the lowermost point is at the enamel of the trailing edge).

It is shown that both occlusal wear angle and occlusal relief strongly depend on age of an animal. In younger animals the occlusal wear angle is less acute and the frequency of teeth with flat occlusal surface is higher than in mature and senile ones. Regardless of age, the samples from different natural zones differ in occlusal wear angle: the highest average values are revealed in the samples from steppe and forest-steppe suggesting the higher rate of tooth wear in these zones as compared to taiga. Preliminary results reveal no statistically significant correlation between the occlusal wear angle and presence of different types of particles in the stomach content. However, the frequencies of the three types of occlusal relief on m1 were different between animals with and without non-plant material in the stomach (the occlusal relief type 2 predominated among the animals with both plant and insect/chitin remains whereas types 2 and 3 were equally represented in animals with plant material only). Thus, the results of the mesowear analysis suggest that patterns of dental wear in *Microtus arvalis obscurus* depend not only on diet but also vary with age and geography.

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MARMOT BONES BOBAC MULLER, 1776, IN THE NORTH OF THE REPUBLIC OF MOLDOVA

Pascari Viorica

Institute of Zoology of ASM, Chisinau, Republic of Moldova

Steppe marmot, which we see today speeded from Belarus and Ukraine to the center of Kazakhstan, lived not so long ago also in Republic of Moldova. **The name of bobak marmot or baibac is a Turkish-tartar loan word.** Steppe marmot is a relative of alpine marmot. Bones of bobak marmot on the territory

Figure 1. General view of the steppe marmot Bobak marmot Muller, 1776



on Republic of Moldova were collected in the following Paleolithic stations: Du-tuitoarea Veche cave (str. 3-4, așeulean culture, beginning of upper Pleistocene), 104 fossils from 16 individuals; Buzdujeni I – 79/6; Butești – 28/4; Brînzeni I (upper Pleistocene) – 1737/153; (Mesozoic, upper Holocene) – 230/49; Trinca III – 4/2 str.II, 5/1 str. III, 8/2 str. V; Corjeuți 1/1 str. II; 62/4 str. III; Cosăuți (upper Paleolithic, str. 4-5) – 5/2. The careful study of these fossils gave us the opportunity to observe the difference in the structure of the inferior maxillary of the marmot found in the deposits of middle Pleistocene, lower Pleistocene and Holocene, which can be distinguished by: **a.** the flat end above the symphysal edge of the jaw of the representatives of the end of middle Pleistocene is less developed than of those in lower Pleistocene; **b.** the linking ridge of the facial muscles of the maxillary on the back of the jaw is underdeveloped. In the opinion of I. Gromov (1961) the last distinguishing mark is related to the previous one and indicates the amplitude of the moving of the maxillary branches one in relation to other horizontally; **c.** the posterior edge of the jaw at the level of the former-inferior angle of the masseter surface is thicker and wider than those of the marmots from late Pleistocene and Holocene. The alveoli row of inferior maxillary is very large – 25,7 mm. Pm_4 is long, with several anterior intermediary buds, with anterior bulbs poorly developed and massive hipoconoid. Posterior width of the tooth at some individuals is larger than its length and for other individuals it's the other way. The anterior and posterior roots of the teeth are widely open from the exterior part of the teeth and at the internal part is a little nearer. The



Figure 2. Inferior maxillary with M1-M3 of the steppe marmot Bobac Marmot Muller, 1776
From Duruitoarea Veche cave

anterior part of the root Pm_4 is always more wide and flattened unlike the *M. Marmota* L. The elongated trail of the misgrowth of this root is present and at some individuals is very pronounced or not so much at another. The mastication surface has a rectangle form. Articular apophyses is wide at the base, the end is bent back and a little inclined to the exterior and narrows to the tip and takes all its superior surface. The length of the inferior maxillary from the deposits of the end of late Pleistocene from the anterior part of the symphysis to the posterior part of the angular symphysis is of 73,2 mm., the length from the anterior part of the symphysis to the end of the articular symphysis reaches 68,8 mm. The length of the dental alveoli row is of 24 mm, the height of the jaw at the middle of the diastema – 12,7 mm (the alveolar length- 52,8 mm), and the minimum distance between the chin orifice and the exterior end of the maxillary cut – 47 mm. These sizes correspond to the biggest specimens of marmots from the late Pleistocene.

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MAMMAL FAUNA OF PALAEOOLITHIC STATION FROM CIUNTU CAVE

Pascari Viorica, David Anatolie

*Institute of Zoology of ASM, Chisinau, Republic of Moldova,
e-mail: pascaruviorica@gmail.com davidanatolie@gmail.com*

Palaeolithic site of Ciuntu cave is located about 2.5 km north of the village Corjeuți, Briceni district in «Ciuntu valley» gorge formed over millennia by Lopatnic river course (left tributary of Prut river) in the chain of Tortonian limestone reefs.

This archaeological site investigated by digging on area of about 15 m under the guidance of notorious archaeologists from Moldova N. Chetaru and I. Borziac (Борзиак, Кетрару, 1978), is attributed to the early stage of Upper Paleolithic (Branzeni archaeological culture) and late Pleistocene (early phase of the last wurmian Pleniglacial, accurate dating according to C -18500±200 – 22100±220, after Borziac, 2005).

During the excavations there was discovered, mainly in the lower level of living, an interesting osteological material (over 1800 remains), representing skeletal remains of mammal hunted in the surroundings of this territory by the inhabitants of the site, which represented their main source of food. At the same time, through washing of sandy-clay soil from lower housing layer, skeletal remains of small mammals were collected and studied. This fauna is of great interest in the reconstruction of environmental conditions in studied area at that time.

The results of investigations of mammalian skeletal remnants from the Palaeolithic site of Ciuntu cave revealed the following species compositions: ***Insectivora***-*Crociodura leucodon* Herm., *Sorex* sp.; ***Lagomorpha***: *Lepus europaeus* L., *Lepus* sp., *Ochotona spelaea* Owen; ***Rodentia***: *Marmota bobac* Mull., *Sper-*

mophilus (Citellus) suslica Guld., *Cricetus cricetus* L., *Allocricetus* sp., *Nanospalax leucodon* Nordm., *Spalax* sp., *Dicrostonyx guilielmi* Sanf., *Lagurus lagurus* Pall., *Arvicola teresrtis* L., *Microtus socialis* Pall., *M. (Stenocranius) gregalis* Pall., *Apodemus sylvaticus* L.; **Carnivora:** *Vulpes* sp., *Ursus arctos* L.; **Perissodactyla:** *Equus* cf. *latipes* V.Gom., *Coilodonta antiquitatis* Blum.; **Artiodactyla:** *Cervus elaphus* L., *Megalocerus giganteus* Blum., *Rangifer tarandus* cf. *guettardi* Desmar., *Bison priscus* Boj.

The heterogeneous composition in ecological and palaeo-geographic aspects of this faunal associations (the presence of representatives of steppe fauna - ochotona, marmots, ground squirrel, steppe lemming, horse, bison, etc., of Tundra and subarctic zone – collared Lemming, narrow headed vole, reindeer, wood mouse, brown bear, red deer, reindeer; of open land fauna – rhinoceros, giant elk etc.) prove that the mammal fauna as the fauna of third levels of living from Branzeni I Paleolithic site, from the same area of north-western Moldova is particular for the initial period of the last wurmian Pleniglacial in Europe.

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THE ECOLOGY OF THE TERRESTRIAL GASTROPODS COMMUNITIES FROM THE PALEOLITHIC PERIOD IN THE NISTRU RIVER MIDDLE COURSE (MOLODOVA V)

Prepelita Afanasie

Tiraspol State University, Chişinău, e-mail: prepelitanas@gmail.com

A complex study on documentation and field multidisciplinary researches of the Paleolithic station Molodava V (Cernăuți, Ucraina) performed at the end of the '90 of the last century by a mixed team of experts from Belgium, France, Ukraine and Moldova involved also the collection of terrestrial gastropods remnants. These investigations represent a part of a larger research program on the study of the geochronology and paleoecology of the Paleolithic man from Eurasia (Borziac *et al.*, 2005).

There was obtained overall 26 samples of mollusks' shells from that archeological site rock layers, distinct from lithological point of view. The identified gastropods communities largely characterize all the lithostratigraphic units and living levels of the Paleolithic man that were distinguished in the 0,8 to 12,3 m depth interval (Haesaerts *et al.* 2004)

Upon the whole, the mollusks fauna is represented by 17 species that are met nowadays in different environment conditions (Table 1). Considering the classification of the Pleistocene continental mollusks by habitat proposed by V. Lozek (1964) and completed by J-J. Puissegur (1976) the identified species are referred to the following ecological groups (A-E letters from the table):

Group A – forest mollusks, that live or prefer forest biotopes with a high level of humidity: *Clausilia pumila* and with mesophilic character - *Vitrea crystallina*.

Group E – mollusks that prefer humid biotopes (hydrophilic species), still the *Succinea oblonga* and the *Columella edentula* are not strictly related to these habitats.

The Molodova V mollusks communities addressed as environment conditions indicators show their spread within the station during the whole evolution of the Paleolithic culture of some preponderant open landscapes. The climate is cooler – a fact shown by the presence of *Columella columella* and *Valonia tenuilabris* species - boreal-alpine forms that are met nowadays in Northern latitudes and at high altitudes in Eurasia mountains. The ecosystem had a specific feature from structural point of view that is a result of the joint presence in the samples of the boreal-alpine species and typical steppe representatives that at present don't have a distinct area of spread.

In the same time, the composition and the ecological structure of the gastropods associations, examined separately, show heterogeneous environment conditions that had existed during the accumulation of the rocks series that integrate the cultural levels. These situations are marked by an irregular sectional repartition of the environment indicator species such as typical steppe mollusks, forest biotopes representatives, boreal-alpine species. All these facts show a variable evolution character of the landscape-climate conditions from the period of existence of prehistoric man in the Nistru river middle course.

UPPER PLIOCENE AND LOWER PLEISTOCENE REPTILES' FAUNA OF THE REPUBLIC MOLDOVA

Redkozubov Oleg

*Institute of Zoology, Academy of Sciences of Moldova, Chishinau,
Republic of Moldova e-mails. Emys1952@mail.ru*

In the last years there were discovered several Pliocene-Pleistocene sites with reptile fauna. Also, a review of previously collected materials was performed. As result of the studies updated data on upper Pliocene – lower Pleistocene reptile fauna are presented

UPPER PLIOCENE. Moldavian faunistical complex, MNQ 14-15, (4.5-2.9 mln. years). Deposits: Musait, Dermengy, Lucesty, Tataresty, Gavanosa, Mihailovca, Vladimirovca, Etuliya, Alexanderfeld, Priozerne (PMR).

Fauna: Testudines - *Chelydropsis nopsai*, *Macrocephalochelys pontica*, *Melanochelys pidoplickoi*, *M. mossoczyi*, *M. sakyiformis*, *M. etulensis*, *Sakya riabinini*, *Testudo kuchurganica*, *T. cernovi*. Squamata - *Lacerta* sp., *Pseudopus cf. pannonicus*, *Eryx moldaviensis*, *Coluber robertmertensi*, *C. gemonensis*, *Elaphe aff. longissima*, *E. longissima*, *E. aff. quaturlineata*, *Coronella ausriaca*, *Natrix longivertebrata*, *Vipera cf. kuchurganica*, *V. cf. ammodytes*.

LOWER PLEISTOCENE. Odessan faunistical complex, MNQ 18(1.8-1.2 mln. years). Deposits: Tanatari, Bacioi, Salcia. Kobuska.

Fauna: Testudines - *Melanochelys mossoczyi*, *Mauremys salciensis*. Squamata - *Lacerta* sp., *Pseudopus* cf. *pannonicus*, *Coluber* sp., *C. gemonensis*, *Elaphe* aff. *longissima*, *Natrix natrix*, *N. longivertebrata*, *N. cf. sansaniensis*, *Vipera* cf. *ammodytes*.

Tamanian faunistical complex, MNQ, 19 (1.2-0.8 mln. years).⁷ Deposits: Chismikioi. Fauna: Testudines - *Emys antiqua*. Squamata - *Lacerta* sp., *L. cf. agilis*, *Pseudopus* cf. *pannonicus*, *Coluber* sp., *C. gemonensis*, *Elaphe longissima*, *Coronella austriaca*, *Natrix* cf. *sansaniensis*, *N. longivertebrata*, *N. natrix*, and *Vipera* cf. *ammodytes*.

For comparison - present fauna of reptiles of Republic Moldova is presented by following species Testudines - *Emys orbicularis*. Squamata - *Anquis fragilis*, *Eremias arguta*, *Lacerta agilis*, *L. viridis*, *L. taurica*, *Coluber jugularis*, *Natrix natrix*, *N. tessellata*, *Elaphe longissima*, *E. quatuorlineata*, *Vipera ursinii*, *V. berus*.

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