XIII
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Том I

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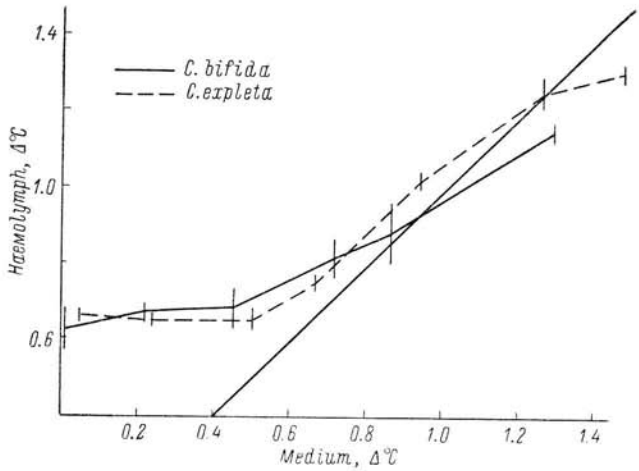
at these concentrations. These latter values schould not be compared with the other data, but are included to demonstrate that the survivors in the two species do attempt to hyporegulate in these media and they do so at different levels.

Experiments on survival indicate that at 5° C unfed *C. bifida* survive only 4.9±0.64 days at Δ_E° C = 0.95 (compared with 40.4±6.2 days at Δ_E° C = 0.92), while *C. expleta* survives for 94.6±9.2 days at Δ_E° C = 1.29, but lives only 5.1+0.58 days Δ_E° C = 1.45 (Scudder, 1968). These data show that at the point



Curves showing osmoregulation in two *Cenocorixa* species. Points on curve show mean plus 95%. Confidence interval.

at which the osmoregulation curve for both species crosses the isosmotic line, there is a marked reduction in survival.

The upper limit of distribution of these two *Cenocorixa* in the saline waters in central British Columbia is evidently set by the limit of hyperregulation in these species, and further the difference in distribution in the upper salinities is due to differences in this osmoregulatory capacity.

It is shown that adults of both species can regulate to the same extent in the fresh and low salinity waters, yet only *C. bifida* occurs naturally in these waters. The absence of *C. expleta* in these latter waters does not appear to be due to a lack of osmoregulatory ability in the adult.

SEASONAL MIGRATION OF COCCINELLIDS AS A MANIFESTATION OF HABITAT CHANGES PRINCIPLES

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Migration and accumulation of *Coccinellidae* during the wintering period are regarded as a most spectacular phenomenon in the biology of species. The entire variety of different types of accumulations may be subdivided into two large groups: accumulations in plain and mountain areas. In plains of the European part of the USSR aggregations are formed by such species as: *Coccinella septempunctata* L., *C. quinquepunctata* L., *Coccinula quatuordecimpustulata* L., *Hippodamia tredecimpunctata* L. and a series of others. *Ithone mirabilis* Motsch. and *Leis axyridis* Pall. spend their wintering period in the hills of the Far East; *Brumus octosignatus* Gebl. and *Semiadalia undecimnotata* Schneid. migrate for the winter season to the mountain area of Middle Asia; *Adalia bipunctata* L., *A. fasciatopunctata* Fald., *Coccinella septempunctata* L. and *Synharmonia conglobata* L. winter in the hills of south-east Kazakhstan; *Coccinella septempunctata* L. form aggregations in the hills of the Crimea; *Hippodamia convergens* Guerin, *Coccinella novemnotata* Herbst. and *Hyperaspis binotata* Say. are observed in California and Oregon of U. S. A.

In Middle Asia and south-east Kazakhstan, California and Oregon the wintering of *Coccinella* appears to be impossible as a result of frequently occuring warm periods which break into the winter period; the intervention of warm periods causes «reactivation» and destruction as a result of excessive consumption of fat reserves. In the Far East wintering proves to be impossible owing to other reasons. In this area winters are very severe (the diurnal temperatures are from —15 to —20° C and even lower) with scarce snow falls (the height of the snow-cover is 25—50 cm). Under these conditions involved with severe withering winds, the species wintering in plains would have probably been connected with considerable risks.

All *Coccinella* species encountered within the European area of the USSR, according to their type of wintering may be subdivided into two groups. The first group is composed of species, which have a cycle of development occuring within arboreal and shrub vegetation (deciduous, mixed and coniferous woods, parks, gardens and forest belts) fails to form aggregations and does not migrate to wintering sites for they can find favourable conditions for wintering in reproduction stations. The second group consists of species forming wintering aggregations; their entire cycle of development proceeds as a rule within the grass vegetation.

Many stations with grass vegetation are characterized in autumn, particularly in spring during the thawing period, at least in the non-chernozem zone, by extremely high humidity. Practically most of the meadow stations appear to be flooded with water in spring. This situation lasts for some time and it disables the wintering of these species in sites of development. Hence, *Coccinella* are forced to change their habitats for wintering. Optimal hydro-thermic conditions for the wintering of *Coccinella*, where they assemble by the end of summer, are observed in the southern and south-western edges of pine woods in elevated areas.

The recently established type of estivation characteristic of desert *Coccinella* species seems to be originated by the absence of physiological adaptations for the survival throughout the draught period. This situation, in accordance with the requirements of the species ecological standard, enforces it to change its habitat. And in this case the very essence of the phenomenon is very much alike the situation observed above, namely, the impossibility of the species survival throughout the unfavourable period of the year in sites of their development.

Thus, in all the reviewed cases there is a strikingly pronounced seasonal change of stations. The law of station shifts was formulated by G. J. Bey-Bienko back in 1930 and was subsequently developed into the principle of habitat shifts. This concept is of general biological significance. Seasonal shift of stations in *Coccinella* may be regarded as a particular manifestation of the principle of habitat shifts known as «the law of Bey-Bienko».

ECOLOGY OF THE DIASPINE SCALE *PHENACASPIS PINIFOLIAE* FITCH IN THE PROVINCE OF QUEBEC

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The indigenous diaspine scale of pines *Phenacaspis pinifoliae* Fitch, is widely distributed in most of the United States, the northern part of Mexico and in southern parts of Canada. Five coniferous hosts are most mentioned in literature. They are *Pinus strobus* L., *P. austriaca*, *P. sylvestris*, *P. mugho* and *P. resinosa*.

In the eastern townships of Quebec this scale greatly infests *P. sylvestris* and *P. mugho*. It has been observed from its simple State of contamination (with 1 scale per 0.85 mm). The greater infestation not only weakens the plants but gives an undesirable appearance to them.

In Quebec, as in other parts of Canada, there is only one generation per annum with five development stages — the crawlers, the 1st-stage larva, first stage female, 2d stage female, the 3d stage female and the eggs. This cycle begins near 12th June and is completed towards 22d August.

In most of the United States two generations per annum have been mentioned except for certain places where some authors mention only one generation. This difference in number of generations has been attributed by different authors, to the influence of climate, altitude and disposition of plants. Under laboratory conditions we have obtained a second generation, this perhaps due to the favourable conditions. The great number of crawlers and their establishment lead to serious infestations of pines. The scale's natural mortality encountered at different stages may average up to 33% (the crawlers 2.69%, first stage 7.41%, the second stage female 4.77 and empty scales 7.72).