

Morphology, systematics and host plants of Palaearctic Donaciinae larvae

Andrzej O. Bieńkowski and Marina J. Orlova-Bieńkowskaja
Zelenograd, Moscow, Russia

Abstract

This chapter includes the morphology, description, key to genera and species, and host plant data of the larvae of 27 palaearctic Donaciinae species from the genera *Macroplea*, *Neohaemonia*, *Donacia*, and *Plateumaris*. Larvae of *D. tomentosa*, *D. brevitaris*, *D. obscura*, *D. malinovskyi*, and *D. impressa* are described for the first time.

Introduction

Chrysomelid beetles of the Donaciinae are very common freshwater insects (Fig. 1). The adults feed and copulate on water plants, the females lay their eggs on the submerged parts of their host plants. The larvae develop on roots, rhizomes, or in leaf axils under water. They feed on plant sap. Five larval instars are found in certain species. Pupation takes place in the waterproof cocoons attached to roots or rhizomes. A two- or three-year lifecycle is typical of Donaciinae (Bieńkowski, 1996).

The morphology and host plants of immature stages of members of the subfamily Donaciinae have not yet been sufficiently studied. Larvae of only 23 palaearctic species, less than half the total number, have been described more or less satisfactorily (Bieńkowski, 1992; Böving, 1910; Medvedev & Zaitsev, 1980; Ogloblin & Medvedev, 1971; Zaitsev, 1982; Zaitsev & Pavlov, 1986). The most complete key to Donaciinae larvae (Ogloblin & Medvedev, 1971) includes sixteen species.

Methods

Larvae and cocoons (containing mature larvae, pupae, or adults) were collected from the submerged por-

tions of water plants, fixed, and preserved in 90% ethanol. Canada balsam slides were prepared from larval exuviae taken from cocoons containing adults. Therefore, determination of larvae was based on adult beetles. In addition, Canada balsam slides were made from mature larvae, because some details (setae, denticles, etc.) can be lost or destroyed in exuviae. Slides were examined under a microscope at a magnification of 52.5-600x, and figures were made using a drawing apparatus. Other material was compared with the slides under a binocular microscope at a magnification of 8-56x. A total of 3307 larvae and 1033 cocoons were studied.

Collecting locations

Larvae were collected by the authors in 1990-2002 (if not indicated otherwise) and deposited in the private collection of the senior author (in Moscow). Collecting data, with their numerical codes, are as follows:

Russia: 1. Moscow: Matveevskoe: Syetun River valley: pond; 2-15. Moscow Oblast: 2. Zelenograd: Pump-house pond and adjacent pool; 3. 10 km W Zelenograd: ditches; 4. 5 km N Zelenograd: Mendeleevo: Kliazma river; 5. Chashnikovo vill.: pond; 6. Kosino vill.: Chernoe Lake; 7. 23 km W Zvenigorod: Glubokoe Lake; 8. 23 km W Zvenigorod: deciduous-coniferous forest: *Carex* swamp; 9. 23 km W Zvenigorod: lowland: ditches; 10. 20 km W Zvenigorod: Terekhovo field: pond; 11. 23 km W Zvenigorod, Novo-Gorbovo vill.: ponds; 12. Zvenigorod: Moskva River; 13. Nikolina Gora vill.: Moskva River; 14. 12 km W Zvenigorod: Moskva River; 15. environs of Odintsovo: Dubki vill.: pond; 16. Ryazan Oblast: Dubrovka vill. (collected by G.V. Olsufjev).

Address for correspondence: Andrzej O. Bieńkowski, Zelenograd, 1121-107, 124460, Moscow, K-460, Russia. E-mail: E-mail: abk@mtu-net.ru

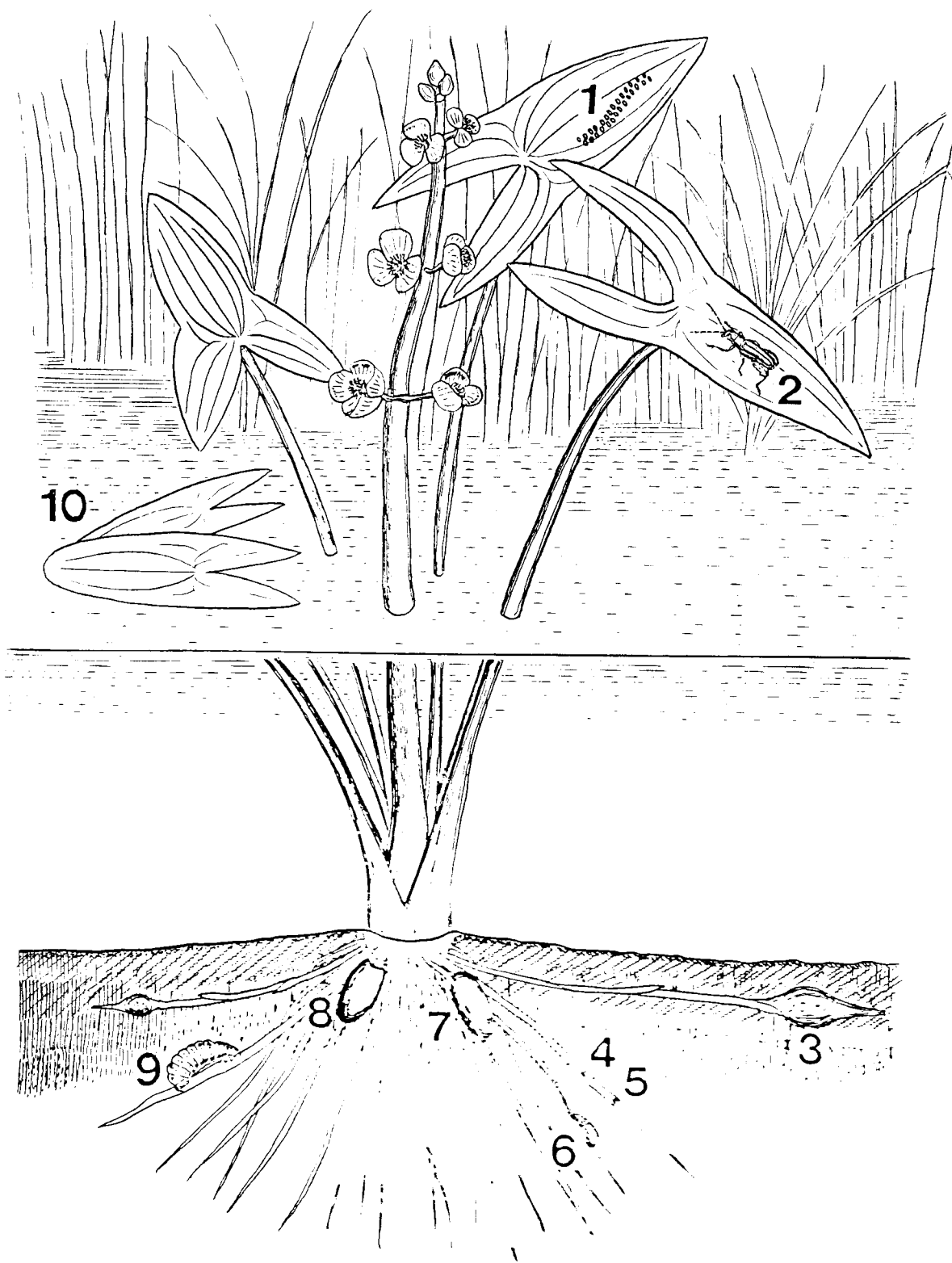


Fig. 1. *Donacia dentata* on its host plant (*Sagittaria sagittifolia*) in August. 1. gnawing place of beetle; 2. adult; 3. overwintering stolon of host plant; 4. gnawing place of larva; 5. larva from abdominal hooks of larva; 6. young instar larva; 7. cocoon with pupa; 8. cocoon from which beetle emerged; 9. mature beetle's eggs between two floating leaves.

17. Kaluga: Yachenka River: old riverbed; 18. Novgorod Oblast: Edrovo Lake; 19. Saratov: Volga River: Sazanka Station; 20. Penza Oblast: Sura River valley: Sosnovka vill.: old riverbed; 21. Leningrad Oblast: Ladozhskoe Ozero (collected by V.E. Panov);

22. Pskov Oblast: Chudskoe Ozero (collected by I.D. Kuznetsov); 23-26. Karelia: 23. Olonets District: Mikhailovskoe vill.: river; 24. Olonets District: Izhino vill.: lake; 25. Podporozhie District: Vazhiny vill.: ditches; 26. Olonets District: Tashkentsy vill.: lake;

27. Murmansk Oblast: Kandalaksha District: 12 km SE Poyakonda vill.: *Sphagnum-Carex* swamp; 28. Samara Oblast: Uglovoy vill.: old riverbed (collected by S.I. Pavlov); 29. Krasnodar Krai: environs of Sochi: Mamaika vill.: pond; 30. Siberia: Shchuchie vill. (collected by Y.M. Zaitsev); 31. Primorski Krai: Khasan District: Doritsine Lake (collected by S.Y. Kuptsov); 38. Moscow Oblast: 26 km NW Zvenigorod, Trostenskoe Lake; 39. Chelyabinsk Oblast: Ilmsky Reservation: Bolshoi Tatkul Lake; 40. Moscow Oblast: Zelenograd: pools near St. Petersburg Road.

Ukraine: 32. Chernigov Oblast: environs of Baturin: Seim River valley: old riverbed; 33. Chernigov Oblast: environs of Baturin: lake; 34. Crimea: Simferopol: Anatra River and upper pond on this river.

Poland: 35. Olsztyn Province: Pelnik vill.: Palsenka river.

Mongolia: 36. Ara-Khangaj Aimak: Ugijn-nuur Lake (collected by L.N. Medvedev and Y.M. Zaitsev); 37. Altan-Bulak: Gun-nuur Lake (collected by Y.M. Zaitsev).

Morphology of *Donaciinae* larvae

The body is subdivided into the head, three thoracic segments, and ten abdominal segments (the ninth and tenth are very small; Fig. 2). The first instar larva is about 1 mm long, the last 9-17 mm long in various species. Integument microsculpture (spinules) (Figs. 21 and 22) mostly presents on the ventral side of the body, and the membranous parts of the coxa and femur.

Head: Frontale pentagonal, has two angular, two or four discal, and four marginal setae, and two pores (Fig. 13a). Five ocelli (dark spots) present on each side of the parietale. Antennae of three antennomeres, the first has several pores laterally, the second two microsetae and one large two-segmented conoid sense-process, the third is cylindrical with one seta on the apex (Figs. 3 to 6 and 13e). Clypeus with four setae and two pores (Fig. 13i). Labrum (Fig. 14) with four pores and usually with sixteen setae (eighteen in one species); namely, two proximal, two lateral, two distal, two angular, two median, and six marginal ones. Mandibles (Fig. 13j) with two large teeth and two setae: one at the face, the other at the dorsum. Cutting edge of different shapes: straight, convex, undulate, or with small denticles. Mandibular teeth sometimes have denticles on inner edge. Maxillae (Fig. 9) are subdivided into cardo, stipes, lacinia, galea, palpifer, and maxillar palp. Cardo with one short seta. Stipes with two long setae. Palpifer with two long setae and one pore; first palpomere with two pores; second palpomere with two setae and one pore; third palpomere with several small setae at the apex. Lacinia with long or short processes (Figs. 9c, 19 and 20). Galea with elongated lobe (Fig. 9b). Labium (Fig. 9) consists of mentum, mental sclerite, and praementum bearing one-segmented labial

palps. Mentum with two long setae, four short ones, and twopores. Praementum with two long setae and several short setae and pores (Figs. 9g and 10 to 12). Labial palp with one pore laterally.

The body is covered with short setae arranged in patches.

Prothorax (Fig. 2: 1) dorsally with two feebly sclerotized shields surrounded by numerous setae and patches of setae as follows: epipleural, lateral intercalary, lateral pedal, inner pedal, and sternal.

The mesothorax (Fig. 2: 2) and metathorax have the following patches of setae: middle anterior tergal, lateral anterior tergal, middle posterior tergal, lateral posterior tergal, suprspiracular, infrspiracular, lateral intercalary, middle intercalary, lateral pedal, inner pedal, and sternal.

The legs consist of coxa, 'femur' (in reality, trochanter fused with femur), and tibiotarsus with one claw (Figs. 32 to 37).

The abdominal segments 1-6 (Fig. 2: 3) have the following patches of setae: middle anterior tergal, lateral anterior tergal, posterior tergal, suprspiracular, infrspiracular, pedal, and sternal.

The spiracles are normally developed on the mesothorax and abdominal segments 1-7, they have large hooks on segment 8 (Fig. 15), and rudimentary ones on the metathorax.

Key to Palaearctic *Donaciinae* larvae

The present keys to genera and species are only adequate for mature larvae (no less than 8 mm in length), because young larvae are morphologically very different from the older ones. The 'rows of setae' mentioned below are always transverse and irregular.

Key to genera

Palaearctic members of *Donaciinae* belong to five genera: *Macroplea*, *Neohaemonia*, *Donacia*, *Plattemaris*, and *Sominella* Jacobson, 1908. The larvae of the final genus are still unknown. The single palaearctic species, namely, *S. macrocnemia* (Fischer-Waldheim, 1824), is distributed in Transbaikalia, Yakutia, the Far East, E Mongolia, and NE China.

1(4) Frontale as long as wide, or slightly wider than long (Figs. 13 and 16), with eight long setae. Labrum with anterior angles more or less distinct in most species (Figs. 14 and 38 to 48). Lacinia with long, narrow process (Figs. 9a and 19). Middle intercalary patch on meso- and metathorax usually absent or consists of no more than four setae, only in *Donacia sparganii* and *D. crassipes* it consists of five to fourteen setae.

2(3) Dorsum covered with setae which are usually short and conical (Fig. 22), in several species

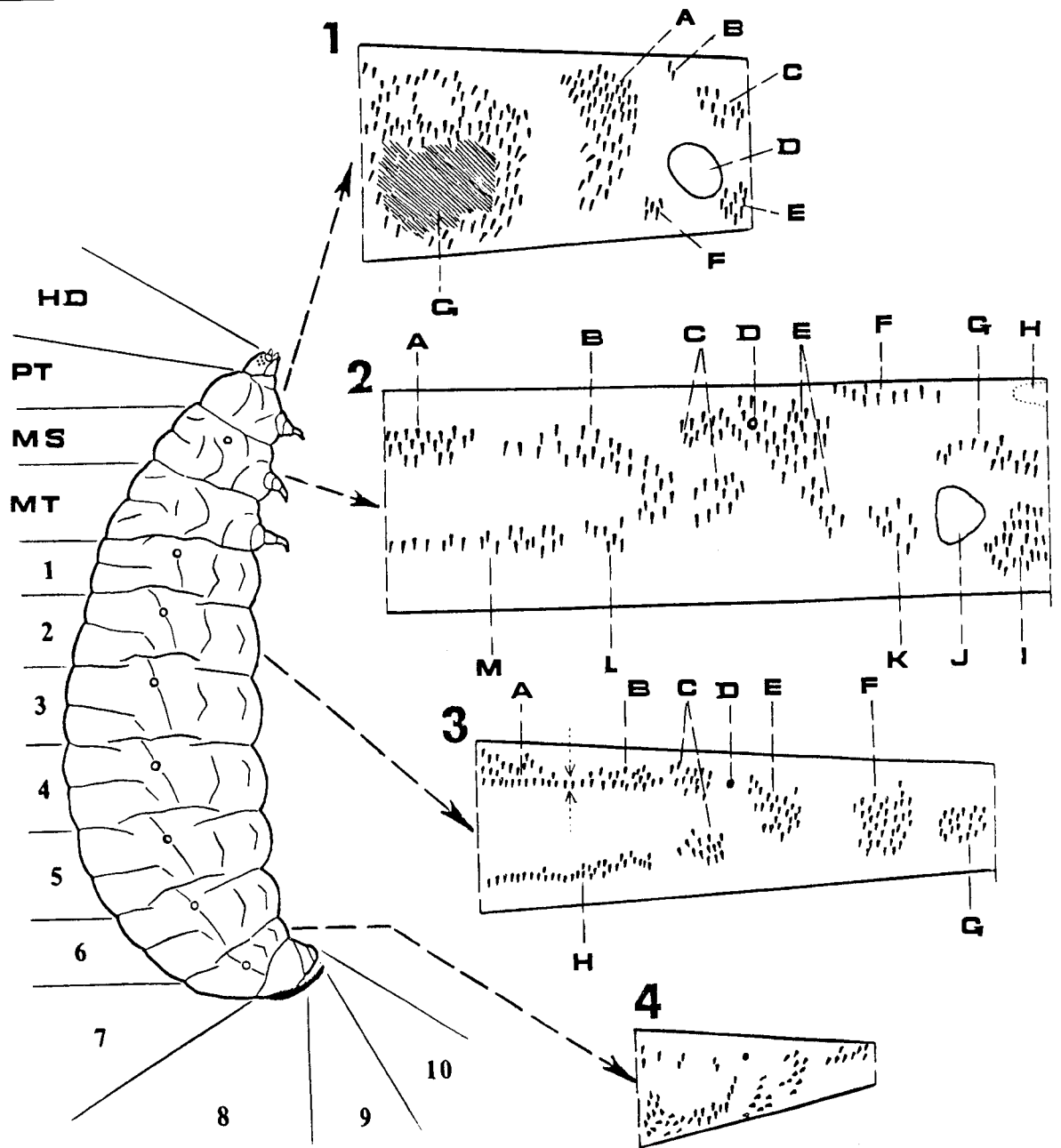


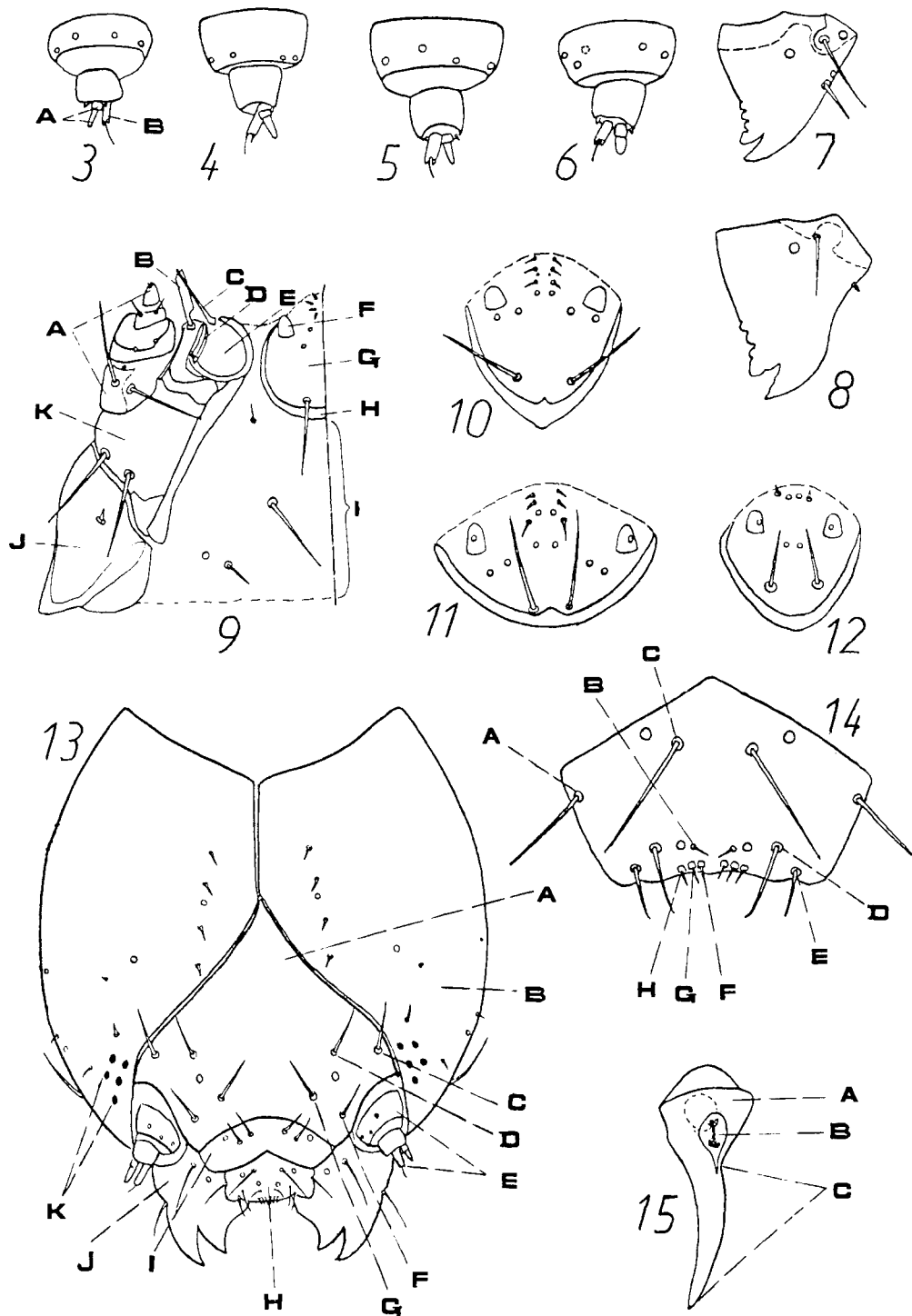
Fig. 2. General morphology of larva (*Donacia thalassina*): hd: head; pt: prothorax; ms: mesothorax; mt: metathorax. 1. Prothorax: a-c, e-f: patches of setae: a: epipleural; b: lateral intercalary; c: sternal; e: inner pedal; f: lateral pedal; d: location of coxa; g: sclerotized shield. 2. Mesothorax: a-c, e-i, k-m: patches of setae: a: middle anterior tergal; b: lateral anterior tergal; c: supraspiracular; e: infraspiracular; f: lateral intercalary; g: sternal; h: location of middle intercalary (this patch is absent in *D. thalassina*); i: inner pedal; k: lateral pedal; l: lateral posterior tergal; m: middle posterior tergal; d: spiracle; j: location of coxa. 3. Second abdominal segment: a-c, e-h: patches of setae: a: middle anterior tergal; b: lateral anterior tergal; c: supraspiracular; e: infraspiracular; f: pedal; g: sternal; h: posterior tergal; d: spiracle. 4. Seventh abdominal segment.

more or less numerous long narrow setae mixed with the short ones. On each side of the labrum, all three marginal setae are mostly close to each other or the distance between the bases of the outer marginal and central marginal seta is less than double the diameter of the base of the outer marginal seta (Figs. 14, 38, 39, 41, 42 and 44 to 48). If the outer marginal seta is placed 1.5x closer to the angular seta than to the central marginal one (Fig. 43) then the abdominal hooks are very

long, as long as 2.0-2.4 the width of the head. Middle intercalary patch on meso- and metathorax as in couplet 1(4).

Donacia Fabricius, 1775

- 3(2) Dorsum covered with long, narrow, filiform setae (Fig. 21). On each side of the labrum, outer marginal seta is distant from central marginal seta and 1.5-2x closer to angular seta than to the central marginal one (Fig. 40). Abdominal hooks are short, as long as 1.2-1.3 the width of the head. Middle intercalary,



Figs. 3 to 15. Donaciinae larvae, structural details. 3 to 6. Antenna: 3. *Donacia thalassina* (a: conoid sense-process; b: third antennal segment), 4. *D. sparganii*, 5. *D. cinerea*, 6. *Plateumaris discolor*. 7 and 8. Mandible: 7. *P. discolor*; 8. *D. sparganii*. 9. Maxilla and labium (*D. thalassina*): a: palpifer and maxillar palp; b: lobe of galea; c: process of lacinia; d: hairs; e: lacinia; f: labial palp; g: praementum; h: mental sclerite; i: mentum; j: cardo; k: stipes. 10 to 12. Praementum and mental sclerite: 10: *D. sparganii*; 11: *D. cinerea*; 12: *P. discolor*. 13. Head: a: frontale; b: parietale; c: angular seta; d: discal seta; e: antenna; f and g: marginal setae; h: labrum; i: clypeus; j: mandible; k: ocelli. 14. Labrum (*D. sparganii*): a to h: setae: a: lateral; b: distal; c: proximal; d: medial; e: angular; f: inner marginal; g: central marginal; h: lateral marginal. 15. Abdominal hook: a: basal frame; b: spiracular orifice; c: falciform part.

patch on meso- and metathorax is absent.

Macroplea Samouelle, 1819 and *Neohaemonia* Székessy, 1941

4(1) Frontale longer than it is wide (Figs. 17 and 18), with four long marginal setae and six

short angular and discal setae. Labrum is usually rounded anteriorly, with no anterior angles (Figs. 49 to 52). Lacinia has a short, wide process (Fig. 20). The middle intercalary patch on the meso- and metathorax consists of

Table 1. Setation of thoracic and abdominal segments in larvae of *Macrolea* and *Neohaemonia* (number with an asterisk, e.g. 2* means a presence of several additional setae not forming a separate row besides two rows).

Characters	<i>Macrolea appendiculata</i>	<i>Macrolea mutica</i>	<i>Neohaemonia voronovae</i>
Meso- and metathorax:			
Lateral anterior tergal patch (rows of setae)	2-3	2	2
Middle anterior tergal patch (setae)	12	13-15	16-18
Middle posterior tergal patch (rows of setae)	ms:2*; mt:3	3	2
Lateral intercalary patch (setae)	7-21	8-10	12-15
Middle intercalary patch (setae)	0	0	0
Sternal patch (rows of setae)	1*	1-2	1-2
Abdominal segments 1-4:			
Lateral anterior tergal patch (rows of setae)	2'-3	2'	2-3
Middle anterior tergal patch (rows of setae)	2'	2'	2'
Posterior tergal patch (rows of setae)	2'-3	1'-3 ?	2'-3

Legends: ms - mesothorax, mt - metathorax.

four to 26 setae arranged in one to two rows.
Plateumaris Thomson, 1859

Key to species of *Macrolea* Samouelle, 1819 and *Neohaemonia* Szekessy, 1941

The genus *Macrolea* includes three species. *M. pubipennis* (Reuter, 1875) has a disjunct distribution, occurring in Finland and W. China. Its larvae have not yet been discovered. The larva of the single palaeartic species of *Neohaemonia* is morphologically close to larvae of *Macrolea*.

1(4) Anterior tergal patches consist of 33-44 and eight to 42 setae on abdominal segments 6 and 7, respectively; very long setae occur among normal setae on abdominal segments 6 and 7 (Fig. 65).

2(3) Abdominal segments 1-4 with broad posterior tergal patches, consist of two rows with additional setae or three rows of setae (Fig. 59). Europe, Siberia, Kazakhstan, N. Africa. Various lentic and lotic fresh waterbodies. Larvae on roots of Ranunculaceae: *Ranunculus divaricatus*; Cyperaceae: *Carex rostrata*, *C. riparia*; Potamogetonaceae: *Potamogeton lucens* (Böving, 1919), *P. natans*, *P. pectinatus*, *P. perfoliatus*, *P. praelongus*; Haloragaceae: *Myriophyllum spicatum*; Sparganiaceae: *Sparganium angustifolium*.

Macrolea appendiculata (Panzer, 1794)

3(2) Abdominal segments 1-4 with posterior tergal patches narrow, consisting of one row with several additional setae. Transpalaeartic species. Lakes, estuaries. Larvae on roots of Cabombaceae: *Brasenia schreberi*; Potamogetonaceae: *Potamogeton filiformis* (Klefbeck, 1916); Zosteraceae: *Ruppia maritima*, *Zostera* sp. (Medvedev & Zaitsev, 1978).

Macrolea mutica (Fabricius, 1792)

4(1) Anterior tergal patches consist of fifteen and

thirteen setae on abdominal segments 6 and 7, respectively; very long setae occur among normal setae on abdominal segment 7 only (Fig. 66). Siberia (Chita Oblast), Mongolia (Ara-Khangaj aimak; Ugijn-nuur Lake). Larvae on roots of Potamogetonaceae: *Potamogeton* sp. (Medvedev & Zaitsev, 1980); Haloragaceae: *Myriophyllum* sp. (Medvedev & Zaitsev, 1980).

Neohaemonia voronovae L. Medvedev, 1977

Description of larvae

Setation of thoracic and abdominal segments are shown in Table 1.

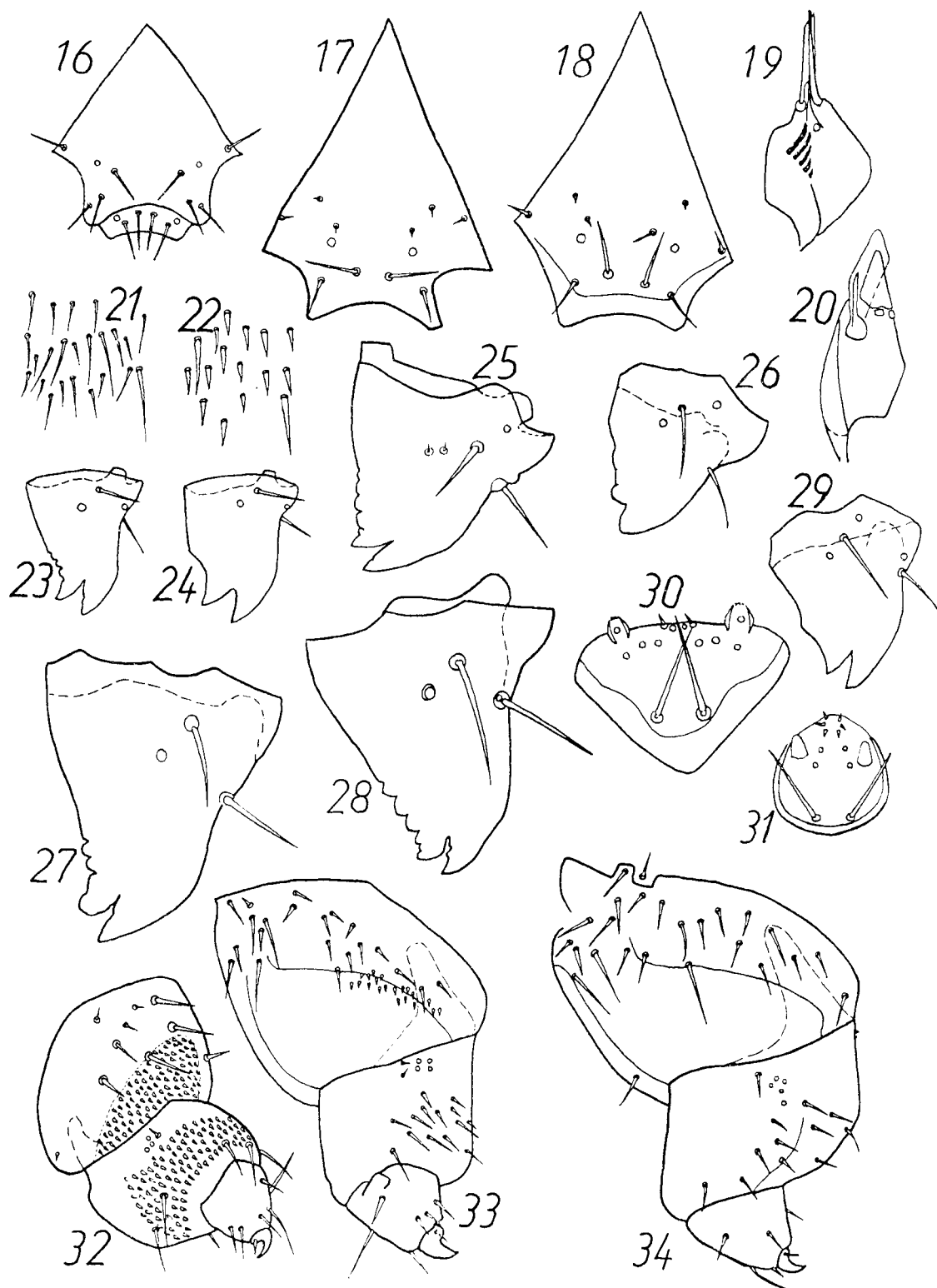
Macrolea appendiculata (Panzer, 1794). Figs. 21, 25, 40, 59 and 65

Body white, head, legs, and prothoracic shields pale yellow, spiracles, claws, abdominal hooks, setae, and ocelli brown. The labrum (Fig. 40) has sixteen setae, its anterior margin has shallow, narrow emargination between the central marginal setae or wide emargination between the outer marginal setae; median seta is very long, placed at an equal distance between proximal and angular setae, or slightly closer to the latter; outer marginal seta 1.5-2x closer to the angular seta than to the central marginal seta. Mandible: the cutting edge has two to three triangular denticles, the inner tooth has one denticle (Fig. 25). The mental sclerite is broad, not broadened medially, 15x narrower than the distance between its ends. Integument microsculpture present on the ventral side of the thoracic and abdominal segments and the membranous part of the femur; occasionally, several spinules also present on the outer side of the coxa.

Collecting locations: 7, 12, and 22.

Macrolea mutica (Fabricius, 1792)

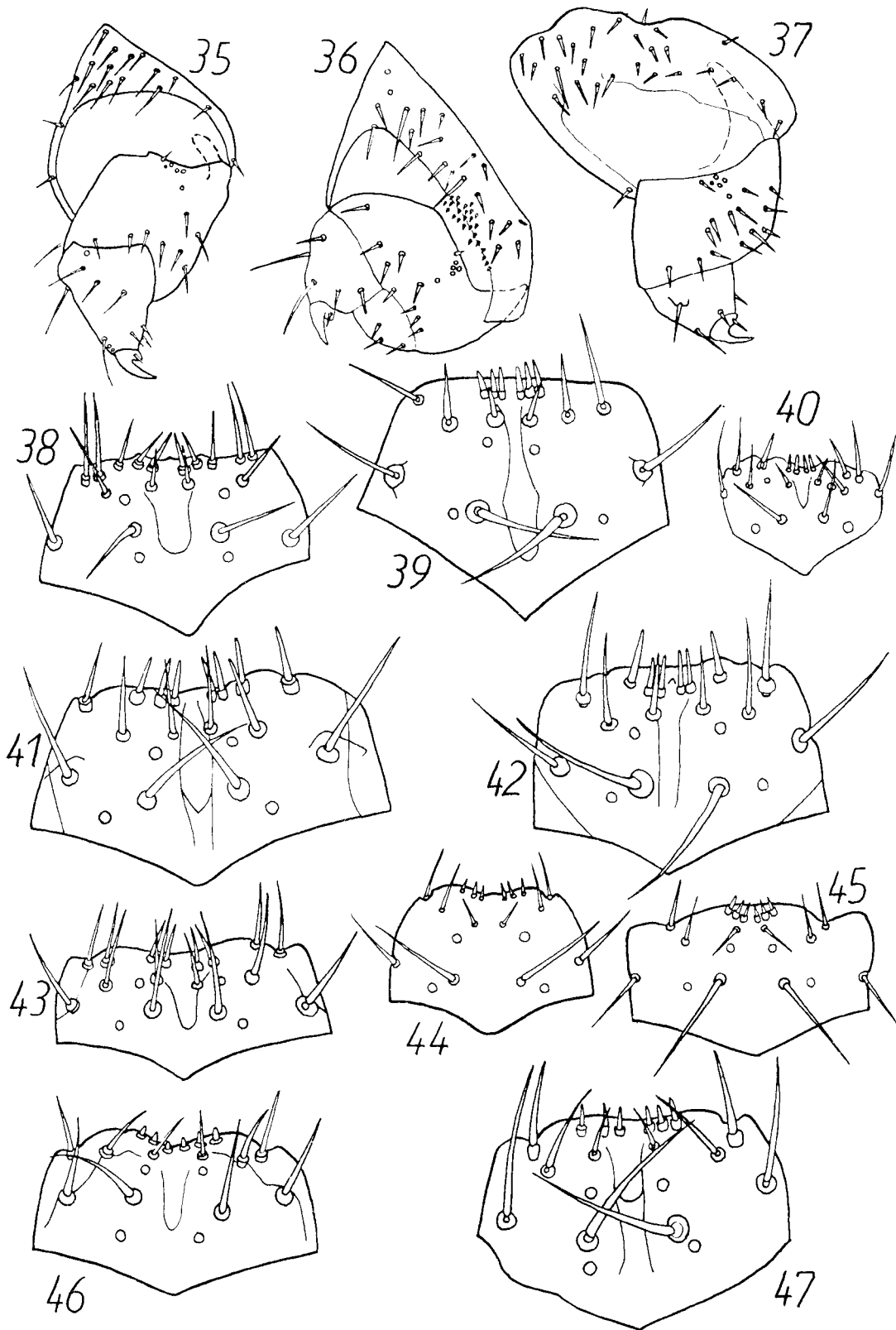
The description is based on the larval exuviae.



Figs. 16 to 34. Donaciinae larvae, structural details. 16 to 18. Frontale: 16. *Donacia sparganii*; 17. *Plateumaris discolor*; 18. *P. Weisei*. 19 and 20. Galea and lacinia: 19. *D. cinerea*; 20. *P. discolor*. 21 and 22. Setae covering body: 21. *Macrolea appendiculata*; 22. *D. cinerea*. 23 to 29. Mandible: 23 and 24. *D. thalassina*; 25. *M. appendiculata*; 26. *D. clavipes*; 27. *D. vulgaris*; 28. *D. bicolora*; 29. *D. cinerea*. 30 and 31. Mental sclerite and praementum: 30. *D. semicuprea*; 31. *D. thalassina*. 32 to 34. Leg: 32. *D. tomentosa*; 33. *D. impressa*; 34. *D. cinerea*.

therefore larval coloration is not included. Labrum has sixteen setae, its anterior margin has very shallow emargination between the central marginal setae; median seta is very long, placed slightly closer to the angular seta than to the proximal seta; the outer

marginal seta is 1.5x closer to the angular seta than to the central marginal seta. Mandible: cutting edge has two denticles, the inner tooth one denticle. The mental sclerite is broad, not broadened medially, 21x narrower than the distance between its ends. Integu-



Figs. 35 to 47. Donaciinae larvae, structural details. 35 to 37. Leg: 35: *Donacia thalassina*; 36: *D. vulgaris*; 37: *D. simplex*. 38 to 47. Labrum: 38: *D. tomentosa*; 39: *D. versicolora*; 40: *Macrolea appendiculata*; 41: *D. dentata*; 42: *D. jennica*; 43: *D. crassipes*; 44: *D. thalassina*; 45: *D. cinerea*; 46: *D. impressa*; 47: *D. bicolora*.

ment microsculpture present on the ventral side of the thoracic and abdominal segments and the membranous part of the femur.

Collecting locations: 30 and 31.

Neohaemonia voronovae L. Medvedev, 1977. Fig. 66

Body creamy-white, head, legs, and prothoracic shields pale yellow, spiracles, claws, abdominal

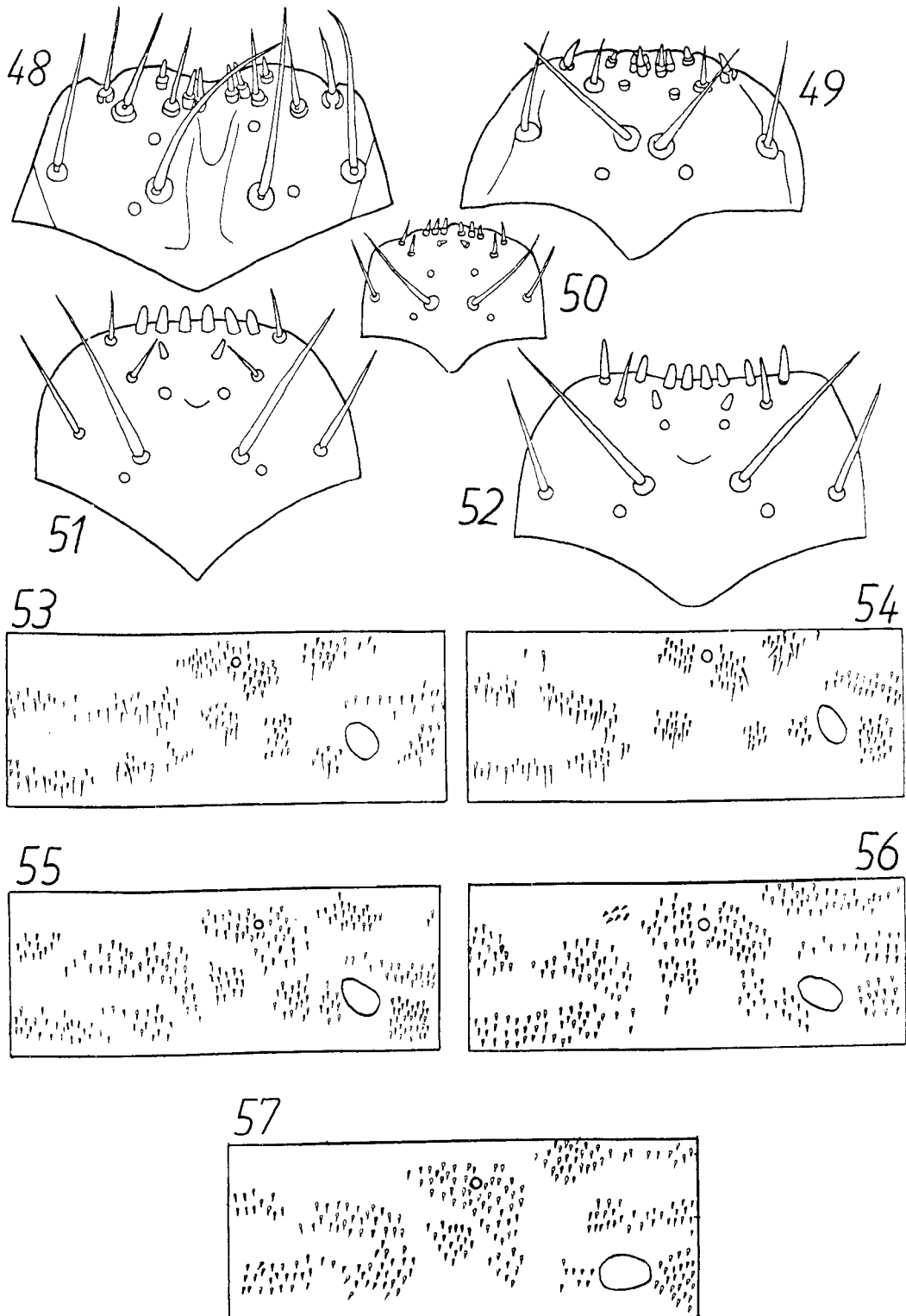
hooks, setae, and ocelli brown. Labrum with sixteen setae, its anterior margin has shallow, wide emargination between the outer marginal setae, sometimes with a small rounded projection on the bottom of the emargination; median seta is very long, slightly closer to the angular seta than to the proximal seta; the outer marginal seta is 1.5x closer to the angular seta than to the central marginal seta. Mandible: cutting edge has two denticles, the inner tooth one denticle. The mental sclerite is narrow, slightly broadened medially, 42-48x narrower near its ends than the distance between the ends. Integument microsculpture present on the ventral side of the thoracic and abdominal segments and the membranous part of the femur, occasionally also on the anterior side of the coxa.

Collecting location: 36.

Key to species of *Donacia* Fabricius, 1775

This genus is represented by 47 species in the Palearctic. The larvae of 26 species are known. The present key includes twenty species. The larva of *D. provosti* Fairmaire, 1885 was described by Chang (1965) and Kanazawa (1985), larvae of *D. gracilipes* Jacoby, 1885 and *D. ozensis* Nakane, 1954 by Kanazawa (1985), larva of *D. clavareatii* Jacobson, 1906 by Lee (1991) (under the name *D. fukiensis*) and Narita (1991), larvae of *D. hiurai* Kimoto, 1983 and *D. hirtihumeralis* Komiya & Kobuta, 1987 by Lee (1991). These species from Eastern Asia are not included in our key because we have no specimens at our disposal, and the descriptions given do not include characters used in our key.

- 1(26) Abdominal segments 2-4: posterior tergal patch narrow, consisting of one to two rows with several additional setae at the middle and sides, this patch is 3-20x narrower than the distance between it and the middle anterior tergal patch (Figs. 58, 60 and 61).
- 2(3) Body ventrally and membranous parts of the coxa and femur (Fig. 32) are densely covered with distinct microsculpture (spinules). Labrum has eighteen setae because of angular setae being doubled (Fig. 38). Live larvae are light green, those preserved in alcohol yellow. Europe, Central Asia, Kazakhstan, W Siberia. Larvae mostly found in leaf axils under water, rarely on roots of Butomaceae: *Butomus umbellatus*; Gramineae: *Scolochloa festucacea*.
D. tomentosa Ahrens, 1810
- 3(2) Ventral side of body with slightly visible microsculpture (spinules). Membranous part of the coxa without microsculpture or with few spinules, femur without spinules (Fig. 35). Labrum has sixteen setae (Figs. 39, 41, 42 and 44). Live larvae are white or pale cream-colored, those preserved in alcohol almost the same color.
- 4(9) Abdominal segments 1-4 with wide middle anterior tergal patch, consisting of three rows with additional setae or four rows of setae (Fig. 60).
- 5(6) Meso- and metathorax with narrower middle posterior tergal patch, consisting of one row with additional setae, lateral intercalary patch consists of twelve setae, sternal patch of four rows of setae. Europe. Larvae on roots of Cyperaceae: *Carex vesicaria*.
D. brevitarsis Thomson, 1884
- 6(5) Meso- and metathorax with wider middle posterior tergal patch, consisting of two to three rows of setae, lateral intercalary patch consists of nineteen to 30 setae, sternal patch of two to three rows of setae.
- 7(8) On each side of the labrum, all marginal setae are close together. On meso- and metathorax, the middle intercalary patch is absent. Europe, Kazakhstan, Central Asia, Siberia, Far East. Larvae on roots of Cyperaceae: *Carex rostrata*.
D. obscura Gyllenhal, 1813
- 8(7) On each side of the labrum, outer marginal seta is distant from central one. On meso- and metathorax, middle intercalary patch of one seta. N. Europe, S. Urals. Larvae on roots of Cyperaceae: *Carex* sp.
D. antiqua Kunze, 1818
- 9(4) Abdominal segments 1-4 with middle anterior tergal patch narrow, consisting of two to three rows of setae (Figs. 58 and 61).
- 10(11) On meso- and metathorax middle intercalary patch of five to ten setae (Fig. 57). Transpalearctic species. Larvae on roots of Sparganiaceae: *Sparganium angustifolium*; Haloragaceae: *Myriophyllum spicatum*.
D. sparganii Ahrens, 1810
- 11(10) On meso- and metathorax, middle intercalary patch is absent or consists of one to three setae (Figs. 53 and 54).
- 12(15) On meso- and metathorax and abdominal segments 1-3, numerous very long setae (three or four times longer than usual setae) placed among usual short setae (Figs. 53 and 54). On abdominal segments 1-6, medial posterior tergal patch of one row of setae with a few additional setae.
- 13(14) On each side of labrum, all marginal setae close together (Fig. 39). On meso- and metathorax, middle posterior tergal patch of one row of setae with a few additional setae, inner pedal patch broader, of three to four rows of setae medially and two to three rows at sides, rarely of two rows of setae over entire length (Fig. 54). Transpalearctic species. Larvae on roots of Typhaceae: *Typha latifolia*; Potamogetonaceae: *Potamogeton natans*.
D. versicolorea Brahm, 1790



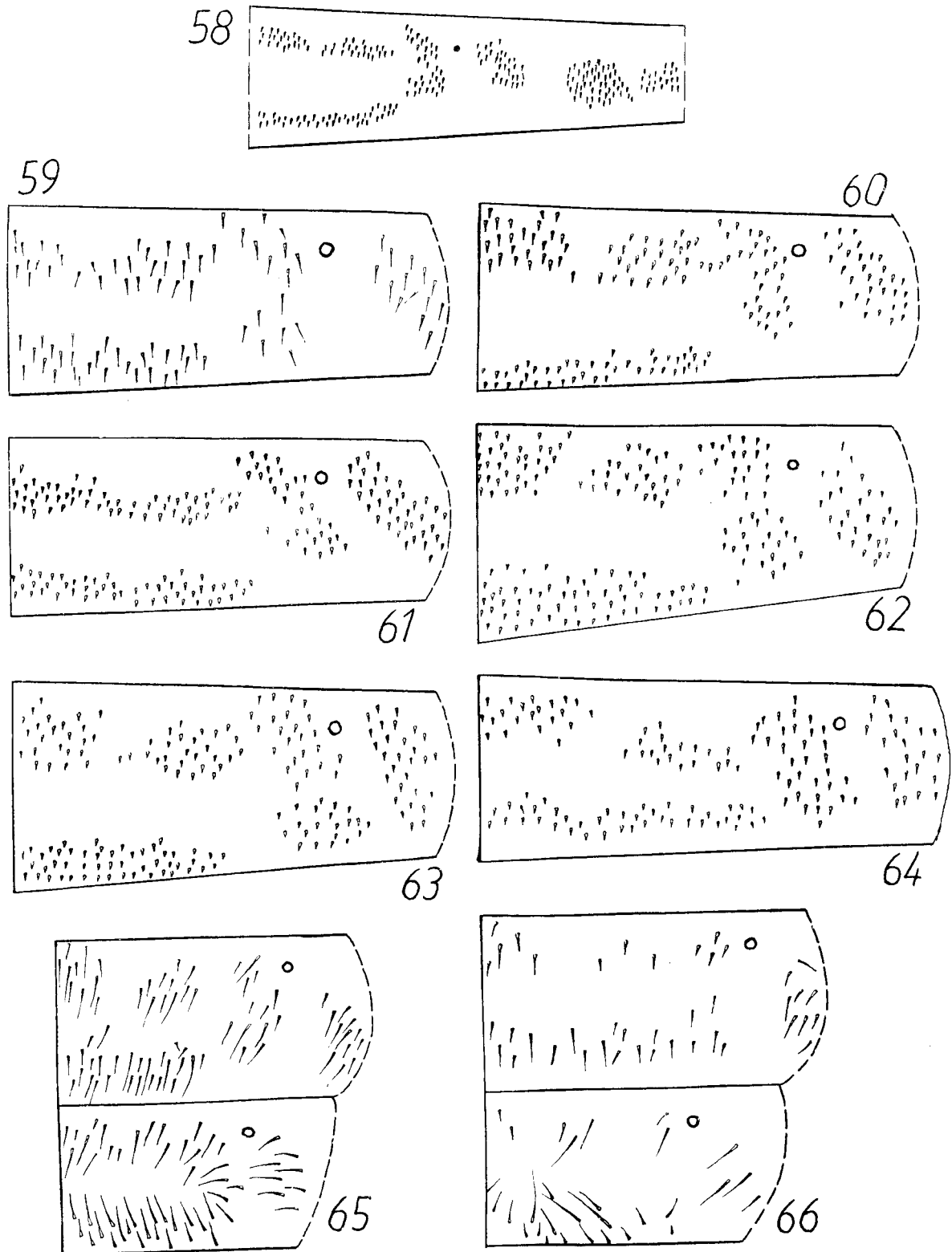
Figs. 48 to 57. Donaciinae larvae, structural details. 48 to 52. Labrum: 48: *Donacia marginata*; 49: *Plateumaris weisei*; 50: *P. discolor*; 51: *P. affinis*; 52: *P. braccata* (51 and 52, after Böving, 1910). 53 to 57. Setation of mesothorax: 53: *D. dentata*; 54: *D. versicolorea*; 55: *D. cinerea*; 56: *D. crassipes*; 57: *D. sparganii*.

14(13) On each side of labrum, outer marginal seta slightly distant from central one (Fig. 41). On meso- and metathorax, middle posterior tergal patch of two rows of setae, inner pedal patch narrower, of one to two (occasionally three) rows of setae (Fig. 53). Europe, Kazakhstan, W. Siberia. Larvae

in leaf axils under water and on roots of Alismataceae: *Alisma plantago-aquatica*, *Sagittaria sagittifolia*; Typhaceae: *Typha latifolia*.

D. dentata Hoppe, 1795

15(12) On meso- and metathorax and abdominal segments 1-3, anterior and posterior tergal

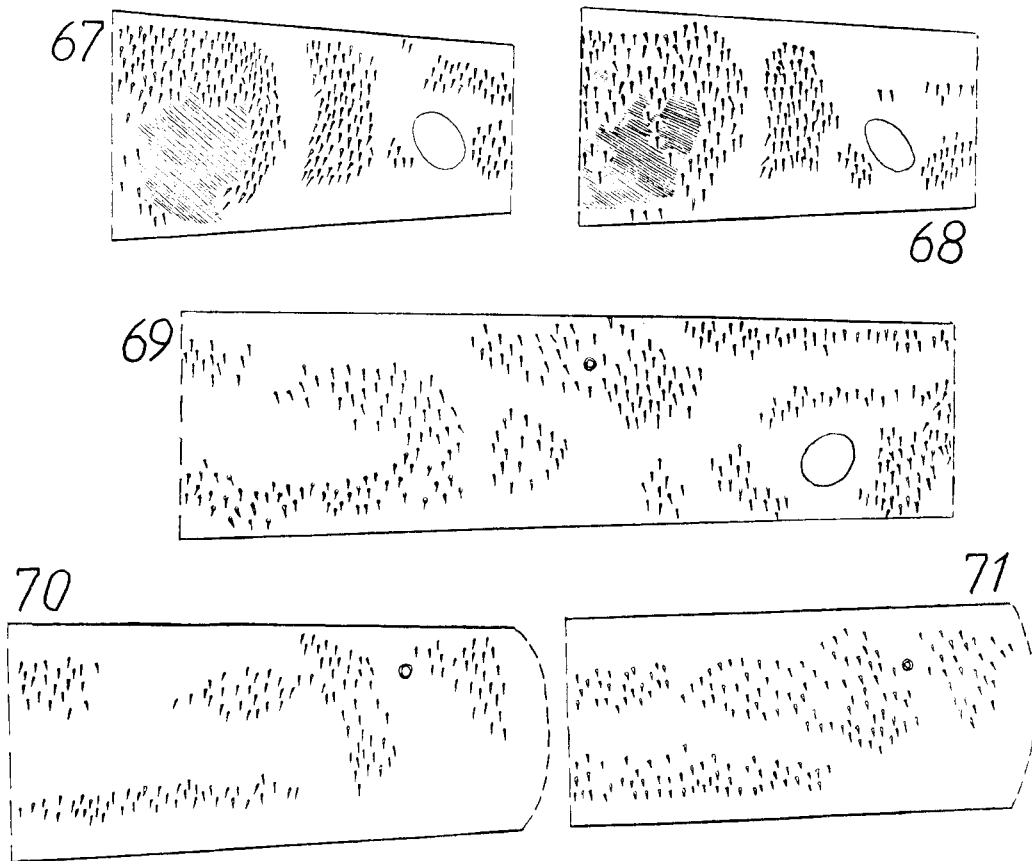


Figs. 58 to 66. Setation of abdominal segments. 58 and 59. 61 to 64. Second abdominal segment. 60. First abdominal segment. 65 and 66. Sixth and seventh abdominal segments. 58. *Donacia thalassina*; 59: *Macrolea appendiculata*; 60: *D. obscura*; 61: *D. aquatica*; 62: *D. bicolora*; 63: *D. marginata*; 64: *Plateumaris discolor*; 65: *M. appendiculata*; 66: *Neohaemonia voronovae*.

patches mostly consist of short setae (Fig. 58), if sparse long setae are placed among short ones, then posterior tergal patch of abdominal segments 1-6 consists of two to three rows of setae medially.

16(17) On abdominal segments 1-4 or 2-4, lateral

anterior tergal patches are joined to middle anterior tergal patch (Fig. 61). Transpalearctic species. Larvae on roots and in leaf axils of Cyperaceae: *Carex rostrata*, *Carex* spp., *Eleocharis palustris*, *Scirpus sylvaticus*; Sparganiaceae: *Sparganium erectum*,



Figs. 67 to 71. Setation of larval body. 67 and 68: prothorax; 67: *Donacia sparganii*; 68: *Plateumaris discolor*; 69: *P. discolor*, mesothorax; 70 and 71: second abdominal segment; 70: *D. sparganii*; 71: *D. cinerea*.

S. simplex, *S. angustifolium*, *Sparganium* sp.; Typhaceae: *Typha latifolia*; Potamogetonaceae: *Potamogeton natans*, *P. alpinus*; Juncaceae: *Juncus conglomeratus*; Alismataceae: *Alisma plantago-aquatica*, *Sagittaria sagittifolia*; Gramineae: *Glyceria fluitans*; Ranunculaceae: *Ranunculus lingua* (Böving, 1910).

D. aquatica (Linnaeus, 1758)

- 17(16) On abdominal segments 1-4, lateral anterior tergal patches widely distant from middle anterior tergal patch, sometimes with 1 row of several setae between lateral and middle anterior tergal patches along posterior margin (Fig. 58).
- 18(19) Mental sclerite broad, almost not broadened at middle (Fig. 30). Body including prothoracic shields milky-white colored. Europe, Siberia. Larvae on roots of Cyperaceae: *Carex* sp.; Gramineae: *Glyceria maxima*.
- D. semicuprea* Panzer, 1796
- 19(18) Mental sclerite narrow at sides, slightly broadened at middle (Fig. 31). Body pale cream-colored with prothoracic shields yellow or rufous.
- 20(23) Mandibular cutting edge straight or undulate (Fig. 26), with neither distinct denticles nor large triangular projection.
- 21(22) Anterior margin of labrum almost straight. On meso- and metathorax, middle posterior

tergal patch of two rows of setae. Transpalaeartic species. Larvae on roots and rhizomes of Gramineae: *Phragmites australis*, *Glyceria maxima*.

D. clavipes Fabricius, 1792

- 22(21) Anterior margin of labrum with weak emargination with triangular projection at bottom. On meso- and metathorax, middle posterior tergal patch of one row of setae with a few additional setae. Europe. Larvae on roots of Gramineae: *Glyceria maxima*.
- D. malinovskyi* Ahrens, 1810
- 23(20) Mandibular cutting edge with two denticles or large triangular projection (Figs. 23 and 24).
- 24(25) Anterior margin of labrum with distinct emargination (Fig. 44). Lateral intercalary patch of mesothorax and metathorax with twelve to 26 setae. Transpalaeartic species. Larvae on roots of Cyperaceae: *Eleocharis palustris*; Gramineae: *Glyceria fluitans*.
- D. thalassina* Germar, 1811
- 25(24) Anterior margin of labrum straight or with hardly any visible emargination (Fig. 42). N. Europe, Siberia (eastwards to Yakutia). Larvae on roots of Gramineae: *Scolochloa festucacea*.
- D. fennica* Paykull, 1800
- 26(1) Abdominal segments 1-4: wide posterior

- tergal patch, consisting of three to four rows of setae, this patch is no more than twice as narrow as the distance between it and the middle anterior tergal patch (Figs. 62 and 63).
- 27(28) On meso- and metathorax, middle intercalary patch consists of eight to fourteen setae, this patch is joined to lateral intercalary ones (Fig. 56). Europe, Kazakhstan, Siberia. Larvae on roots and rhizomes of Nymphaeaceae: *Nuphar lutea*, *Nymphaea candida*.
D. crassipes Fabricius, 1775
- 28(27) On meso- and metathorax, middle intercalary patch is absent or consists of one to four setae (Fig. 55).
- 29(32) Mandibular cutting edge undulate, sometimes with broad projection, but with no distinct denticles (Fig. 29).
- 30(31) Anterior margin of labrum with shallow and narrow emargination (Fig. 45). Membranous part of the coxa has no microsculpture (Fig. 34). Europe, Caucasus, Kazakhstan, Uzbekistan, Siberia. Larvae on roots and rhizomes of Typhaceae: *Typha latifolia*, *T. angustifolia*; Cyperaceae: *Carex* spp.
D. cinerea Herbst, 1784
- 31(30) Anterior margin of labrum with distinct emargination (Fig. 46). Membranous part of the coxa has microsculpture (spinules) anteriorly (Fig. 33). Europe, Kazakhstan, Siberia. Larvae in leaf axils under water and on roots of Cyperaceae: *Scirpus lacustris*.
D. impressa (Paykull, 1799)
- 32(29) Mandibular cutting edge with two to three (occasionally one) distinct denticles (Figs. 27 and 28). Inner mandibular tooth sometimes has one denticle.
- 33(36) Mandibular cutting edge has three denticles; the inner mandibular tooth one denticle (Fig. 28).
- 34(35) On abdominal segments 2-6, posterior tergal patch of four rows of setae (Fig. 62). On labrum, the median setae are longer than the distal ones (Fig. 47). Femur has seventeen to 27 setae. Europe, Kazakhstan, Uzbekistan, Siberia. Larvae in leaf axils under water, on roots and rhizomes of Sparganiaceae: *Sparganium erectum*, *Sparganium* sp.; Cyperaceae: *Carex vesicaria*.
D. bicolora Zschach, 1788
- 35(34) On abdominal segments 2-6, posterior tergal patch of three rows of setae (Fig. 63). On the labrum, median and distal setae of almost equal length (Fig. 48). The femur has nine to sixteen setae. Europe, Kazakhstan, Uzbekistan, Siberia. Larvae in leaf axils under water and on roots of Cyperaceae: *Carex vesicaria*, *Carex* sp.; Gramineae: *Scolochloa festucacea*; Sparganiaceae: *Sparganium erectum*.
D. marginata Hoppe, 1795
- 36(33) Mandibular cutting edge has one to two denticles; the inner mandibular tooth one or no denticles (Fig. 27).
- 37(38) Coxa has thirteen to 22 setae, its membranous part with microsculpture (spinules) anteriorly (Fig. 36). Transpalaeartic species. Larvae in leaf axils under water and on roots of Typhaceae: *Typha latifolia*; Gramineae: *Glyceria* sp.
D. vulgaris Zschach, 1788
- 38(37) Coxa has 25-28 setae, its membranous part has no microsculpture (Fig. 37). Transpalaeartic species. Larvae in leaf axils under water and on roots of Sparganiaceae: *Sparganium erectum*.
D. simplex Fabricius, 1775

Description of larvae

D. antiqua Kunze, 1818

This description is based on one larva mounted in Canada balsam, and therefore, body coloration is not included. The labrum has sixteen setae; its anterior margin with wide emargination; the outer marginal seta is distant from the central marginal seta; the distal seta is shorter than the median seta. Left mandible: cutting edge has two denticles; right mandible: cutting edge has three denticles, the inner tooth one denticle. The mental sclerite is narrow and arched. Meso- and metathorax: lateral anterior tergal patches widely separated from the middle anterior tergal patch. Abdominal segments 1-4: lateral anterior tergal patches are widely separated from the middle anterior tergal patch, with several setae between them on segment 4; the posterior tergal patch is 2.4-3.6x narrower than the distance between it and the middle anterior tergal patch. Dorsum of the meso-, metathorax, and abdominal segments 1-6 is covered with short, more or less similar setae. Integument microsculpture presents on the ventral side of the prothorax. Setation of thoracic and abdominal segments 1-4 is shown in Table 2.

Note: Larva from location 24 was identified by elimination. Adults of three species, namely *Donacia antiqua*, *D. thalassina*, and *D. aquatica* were found there on *Carex* sp. The larva found on roots of *Carex* sp. differs from all known *Donacia* species including *D. thalassina* and *D. aquatica*.

Collecting location: 24.

D. aquatica (Linnaeus, 1758). Fig. 61

Body pale cream-colored, the head, legs, and prothoracic shields yellow, ocelli, spiracles, setae, claws, and abdominal hooks brown. The labrum has sixteen setae; the anterior margin has shallow wide emargination; the outer marginal seta is slightly distant from the central marginal seta; the distal seta

Table 2. Setation of thoracic and abdominal segments in larvae of *Donacia* (number with apostrophe, e.g. 2', means a presence of several additional setae not forming a separate row besides two rows).

Characters	<i>tomentosa</i>	<i>obscura</i>	<i>brevitarsis</i>	<i>antiqua</i>
Meso- and metathorax:				
Lateral anterior tergal patch (rows of setae)	2-3	3	2-3	3
Middle anterior tergal patch (rows of setae)	2-3	ms:3; mt:4	3	ms:3;mt:4
Middle posterior tergal patch (rows of setae)	1'	3	1'	2'
Lateral intercalary patch (setae)	9-20	26-27	12	19-30
Middle intercalary patch (setae)	ms:0-1; mt:0	0	0	1
Sternal patch (rows of setae)	1-2	2'	ms:3; mt:4	2'-3
Abdominal segments 1-4:				
Lateral anterior tergal patch (rows of setae)	2	3-4	2'-3	3
Middle anterior tergal patch (rows of setae)	2	4	4	4
Posterior tergal patch (rows of setae)	1-1'	2'	2'	2'

Legends: ms - mesothorax, mt - metathorax.

is shorter than the median seta. Mandible: cutting edge has two denticles, the inner tooth sometimes has one denticle. The mental sclerite is broad, angular, broadened at the middle. Meso- and metathorax: lateral anterior tergal patches are separated from the middle anterior tergal patch, with several setae between them, or lateral and middle anterior tergal patches joined (only on the metathorax). Abdominal segments 1-4 or 2-4: lateral anterior tergal patches are connected to the middle anterior tergal patch; posterior tergal patch is 3-5x narrower than the distance between it and the middle anterior tergal patch. Dorsum of the meso-, metathorax, and abdominal segments 1-6 is covered with short setae, with sparse long setae. The membranous part of the coxa has no integument microsculpture. Setation of thoracic and abdominal segments 1-4 is shown in Table 6. *Collecting locations*: 2, 3, 7, 9, 10, 11, 15, 23 and 25.

D. bicolora Zschach, 1788. Figs. 28, 47 and 62

Body pale cream-colored, the head, legs, and prothoracic shields yellow, ocelli, spiracles, setae, claws, and abdominal hooks brown. The labrum (Fig. 47) has sixteen setae; its anterior margin with emargination; outer marginal seta is distant from the central marginal seta; the distal seta is shorter than the median seta. Mandible (Fig. 28): cutting edge has three denticles, the inner tooth one denticle. The mental sclerite is arched. Meso- and metathorax: lateral anterior tergal patches are separated from the middle anterior tergal patch. Abdominal segments 1-4: lateral anterior tergal patches are separated from the middle anterior tergal patch, sometimes with a few setae between them; posterior tergal patch is 1.3x narrower than the distance between it and the middle anterior tergal patch. Dorsum of the meso-, metathorax, and abdominal segments 1-7 is covered with short setae, with sparse longer setae on abdominal segments 6-7. The membranous part of the coxa has integument microsculpture anteriorly. Setation of thoracic and abdominal segments 1-4 is shown in Table 4.

Collecting locations: 2, 6, 10, 16, 17 and 29.

D. brevitarsis Thomson, 1884

Body pale cream-colored, the head, legs, and prothoracic shields yellow, ocelli, spiracles, setae, claws, and abdominal hooks brown. The labrum has sixteen setae; the anterior margin has shallow, wide emargination; all marginal setae are close together; the distal seta is shorter than the median seta. Left mandible: cutting edge has two denticles, the inner tooth one denticle; right mandible: cutting edge has three denticles. The mental sclerite is narrow and arched. Meso- and metathorax: lateral anterior tergal patches are separated from the middle anterior tergal patch. Abdominal segments 1-4: lateral anterior tergal patches are widely separated from the middle anterior tergal patch, with one to three setae between them; posterior tergal patch is 4x narrower than the distance between it and the middle anterior tergal patch. Dorsum of the meso-, metathorax, and abdominal segments 1-6 is covered with short, more or less similar setae. The membranous part of the coxa has no integument microsculpture. Setation of thoracic and abdominal segments 1-4 is shown in Table 2.

Collecting location: 8.

D. cinerea Herbst, 1784. Figs. 5, 11, 13, 15, 19, 22, 29, 34, 45, 55 and 71

Body cream-colored, the head, legs, and prothoracic shields rufous, ocelli, spiracles, setae, claws, and abdominal hooks brown. The labrum (Fig. 45) has sixteen setae; its anterior margin is straight or with very shallow narrow emargination; all marginal setae are close together; the distal seta is shorter than the median seta. Mandible (Fig. 29): cutting edge undulated, with broad projection. The mental sclerite is arched, narrow at the sides, slightly broadened, and sometimes with a projection on the anterior margin at the middle (Fig. 11). Mesothorax (Fig. 55) and metathorax: lateral anterior tergal patches are separated from the middle anterior tergal patch. Abdominal segments 1-4 (Fig. 71): lateral anterior tergal patches are separated from the middle anterior tergal patch, with a few setae between them;

Table 3. Setation of thoracic and abdominal segments in larvae of *Donacia* (number with apostrophe, e.g. 2', means a presence of several additional setae not forming a separate row besides two rows).

Characters	<i>thalassina</i>	<i>fennica</i>	<i>cinerea</i>	<i>impressa</i>
Meso- and metathorax:				
Lateral anterior tergal patch (rows of setae)	2-3	2'-3'	3-4	3-4
Middle anterior tergal patch (rows of setae)	2	ms:2;mt:2'	3	ms:3; mt:3-4
Middle posterior tergal patch (rows of setae)	1-2	2	2'	3
Lateral intercalary patch (setae)	5-12	12-26	24-38	24-39
Middle intercalary patch (setae)	0	0	0-4	0-1
Sternal patch (rows of setae)	1-3	ms:2';mt:3	2'	2
Abdominal segments 1-4:				
Lateral anterior tergal patch (rows of setae)	2-3	2'	3-4	3-4
Middle anterior tergal patch (rows of setae)	2-3	2'	4	3-5
Posterior tergal patch (rows of setae)	1'-2	1-2	3	3

Legends: ms - mesothorax, mt - metathorax.

Table 4. Setation of thoracic and abdominal segments in larvae of *Donacia* (number with apostrophe, e.g. 2', means a presence of several additional setae not forming a separate row besides two rows).

Characters	<i>bicolora</i>	<i>marginata</i>	<i>vulgaris</i>	<i>simplex</i>
Meso- and metathorax:				
Lateral anterior tergal patch (rows of setae)	3-4	3'-4	3-4	3
Middle anterior tergal patch (rows of setae)	3-4	3'	2-3	3
Middle posterior tergal patch (rows of setae)	3'	2'-3'	ms:2';mt:3'	2'
Lateral intercalary patch (setae)	22-26	22-24	19-28	21-29
Middle intercalary patch (setae)	0-2	0-1	0-4	1-3
Sternal patch (rows of setae)	1-2	2	2-3	2
Abdominal segments 1-4:				
Lateral anterior tergal patch (rows of setae)	4	4	3-4	3'
Middle anterior tergal patch (rows of setae)	4	4-5	4	3-4
Posterior tergal patch (rows of setae)	4	3	3-4	3

Legends: ms - mesothorax, mt - metathorax.

posterior tergal patch is no more than 1.8x narrower than the distance between it and the middle anterior tergal patch. The dorsum of meso-, metathorax, and abdominal segments 1-7 is covered with short setae, with longer setae at abdominal segments 6-7. The membranous part of the coxa has no integument microsculpture (Fig. 34). Setation of thoracic and abdominal segments 1-4 is shown in Table 3. *Collecting locations*: 1, 2, 5, 7, 15, 19, 21 and 40.

D. clavipes Fabricius, 1792. Fig. 26

Body pale cream-colored, the head, legs, and prothoracic shields rufous, ocelli, spiracles, setae, claws, and abdominal hooks brown. The labrum has sixteen setae; its anterior margin is almost straight; the outer marginal seta is distant from the central marginal seta; the distal seta is shorter than the median seta. Mandible (Fig. 26): cutting edge is straight or undulated, but with neither distinct denticles nor a large triangular projection. The mental sclerite narrow is at the sides, slightly broadened at the middle. Meso- and metathorax and abdominal segments 1-4: lateral anterior tergal patches are widely separated from the middle anterior tergal patch, sometimes with

several setae arranged in a row between them. Abdominal segments 1-4: posterior tergal patch is 8-9x narrower than the distance between it and the middle anterior tergal patch. The dorsum of the meso-, metathorax, and abdominal segments 1-6 is covered with short setae, with sparse long setae on abdominal segments 4-6. The membranous part of the coxa has no integument microsculpture. Setation of thoracic and abdominal segments 1-4 is shown in Table 6.

Collecting locations: 7, 18 and 20.

D. crassipes Fabricius, 1775. Figs. 43 and 56

Body milky-white, the head, legs, and prothoracic shields yellow, ocelli, spiracles, setae, claws, and abdominal hooks brown. Labrum has sixteen setae; its anterior margin has emargination; the outer marginal seta is widely distant from the central marginal seta and close to the angular seta; the distal seta is shorter than the median seta (Fig. 43). Mandible: cutting edge has two to three denticles, the inner tooth one denticle. The mental sclerite is arched. Mesothorax (Fig. 56) and metathorax: lateral anterior tergal patches are separated from the middle anterior ter-

gal patch, with two setae between them. Abdominal segments 1-4: lateral anterior tergal patches are separated from the middle anterior tergal patch, with a few setae between them: posterior tergal patch is 1.3-1.5x narrower than the distance between it and the middle anterior tergal patch. The dorsum of the meso-, metathorax, and abdominal segments 1-7 is covered with short setae, with sparse long setae on abdominal segments 4-7. The membranous part of the coxa has integument microsculpture on the outer part. Setation of thoracic and abdominal segments 1-4 is shown in Table 5.

Collecting location: 7.

D. dentata Hoppe, 1795. Figs. 41 and 53

Body including prothoracic shields pale creamy-colored, the head and legs yellow, ocelli, spiracles, setae, claws, and abdominal hooks brown. The labrum has sixteen setae; its anterior margin has very shallow, wide emargination; the outer marginal seta is slightly distant from the central marginal seta; the distal seta is as long as the median seta (Fig. 41). Mandible: cutting edge with projection has two to three denticles, the inner tooth two denticles. The mental sclerite is narrow at the sides and strongly broadened at the middle. Mesothorax (Fig. 53) and metathorax: lateral anterior tergal patches are broadened laterally, separated from the middle anterior tergal patch on the mesothorax, separated from the middle one and with several setae between them, or lateral and middle anterior tergal patches connected on the metathorax. Abdominal segments 1-4: lateral anterior tergal patches are separated from the middle anterior tergal patch, with several setae between them, or lateral and middle anterior tergal patches connected: posterior tergal patch is 5-6x narrower than the distance between it and the middle anterior tergal patch. The dorsum of the meso-, metathorax, and abdominal segments 1-6 is covered with short, setae, with more or less numerous long setae (3-4x as long as short ones). The membranous part of the coxa has no integument microsculpture. Setation of thoracic and abdominal segments 1-4 is shown in Table 5.

Collecting locations: 2, 5, 7, 10, 21 and 40.

D. fennica Paykull, 1800. Fig. 42

Body pale cream-colored, the head and legs yellow, prothoracic shields pale yellow, ocelli, spiracles, setae, claws, and abdominal hooks brown. The labrum (Fig. 42) has sixteen setae; its anterior margin is straight or with very shallow, wide emargination; the outer marginal seta is distant from the central marginal seta; the distal seta is shorter than the median seta. Mandible: cutting edge has two denticles. The mental sclerite is narrow and broadly arched. Lateral anterior tergal patches are broadened laterally on the meso- and metathorax. Meso-, metathorax, and abdominal segments 1-4: lateral anterior tergal patches are separated from the middle anterior tergal patch, with several setae between

them. Abdominal segments 1-4: posterior tergal patch is 5-6x narrower than the distance between it and the middle anterior tergal patch. The dorsum of the meso-, metathorax, and abdominal segments 1-6 is covered with short setae, with sparse long setae mostly on abdominal segments 4-6, sometimes also on segments 1-3. The membranous part of the coxa has no integument microsculpture. Setation of thoracic and abdominal segments 1-4 is shown in Table 3.

Collecting location: 18.

D. impressa (Paykull, 1799). Figs. 33 and 46

Body pale cream-colored, the head, legs, and prothoracic shields yellow, ocelli, spiracles, setae, claws, and abdominal hooks brown. The labrum has sixteen setae; its anterior margin has emargination; all marginal setae are close together, or the outer marginal seta is slightly distant from the central marginal seta; the distal seta is shorter than the median seta (Fig. 46). Mandible: cutting edge is slightly undulated. The mental sclerite is arched. Meso- and metathorax: lateral anterior tergal patches are separated from the middle anterior tergal patch. Abdominal segments 1-4: lateral anterior tergal patches are separated from the middle anterior tergal patch, in some specimens with several setae, sometimes forming a narrow stripe between patches; posterior tergal patch is 1.7x narrower than the distance between it and the middle anterior tergal patch. The dorsum of the meso-, metathorax, and abdominal segments 1-7 is covered with short setae, with sparse longer setae on abdominal segments 6-7. The membranous part of the coxa has integument microsculpture anteriorly (Fig. 33). Setation of thoracic and abdominal segments 1-4 is shown in Table 3.

Collecting locations: 13 and 38.

D. malinovskyi Ahrens, 1810

Body pale cream-colored, the head, legs, and prothoracic shields yellow, ocelli, spiracles, setae, claws, and abdominal hooks brown. The labrum has sixteen setae; its anterior margin has narrow emargination and a small triangular projection on the bottom of the emargination; all marginal setae are close together or the outer marginal seta is slightly distant from the central one; the distal seta is shorter than the median seta. Mandible: cutting edge has a projection. The mental sclerite is arched, narrow at sides, broadened at middle. Meso- and metathorax: lateral anterior tergal patches are separated from the middle anterior tergal patch. Abdominal segments 1-4: lateral anterior tergal patches are separated from the middle anterior tergal patch, with several setae between them; posterior tergal patch is 4.3x narrower than the distance between it and the middle anterior tergal patch. The dorsum of the meso-, metathorax, and abdominal segments 1-6 is covered with more or less similar short setae, with sparse long setae on abdominal segments 5-6. The membranous part of the coxa has no integument microsculpture. Setation of thoracic and abdominal segments 1-4 is shown in Table 6.

Table 5. Setation of thoracic and abdominal segments in larvae of *Donacia* (number with apostrophe, e.g. 3', means a presence of several additional setae not forming a separate row besides three rows).

Characters	<i>crassipes</i>	<i>sparganii</i>	<i>versicoloreae</i>	<i>dentata</i>
Meso- and metathorax:				
Lateral anterior tergal patch (rows of setae)	5	3	2	2-3
Middle anterior tergal patch (rows of setae)	ms:3; mt:4	2-3	1'-2	ms:2; mt:3
Middle posterior tergal patch (rows of setae)	3-4	3	1'	2
Lateral intercalary patch (setae)	29-50	17-37	16-26	16-27
Middle intercalary patch (setae)	8-14	5-10	0	0-2
Sternal patch (rows of setae)	ms:2-3; mt:3-3'	2-4	1-3	4
Abdominal segments 1-4:				
Lateral anterior tergal patch (rows of setae)	5	2-3	1-2	2
Middle anterior tergal patch (rows of setae)	5	2-3	2	2
Posterior tergal patch (rows of setae)	4	1'-2	1'	1'-2

Legends: ms - mesothorax, mt - metathorax.

Table 6. Setation of thoracic and abdominal segments in larvae of *Donacia* (number with apostrophe, e.g. 2', means a presence of several additional setae not forming a separate row besides two rows).

Characters	<i>malinovskiyi</i>	<i>aquatica</i>	<i>semicuprea</i>	<i>clavipes</i>
Meso- and metathorax:				
Lateral anterior tergal patch (rows of setae)	3	3	1-2	2-3
Middle anterior tergal patch (rows of setae)	ms:3; mt:4	2'	2	2-3
Middle posterior tergal patch (rows of setae)	2	2-3	1-1'	2
Lateral intercalary patch (setae)	12-17	21-33	10-21	13-29
Middle intercalary patch (setae)	0	0-3	0	0
Sternal patch (rows of setae)	ms:2'; mt:3	2-3	2'-3	2'
Abdominal segments 1-4:				
Lateral anterior tergal patch (rows of setae)	3'	2'-3	1'-2	2'
Middle anterior tergal patch (rows of setae)	3'	3'	2	2-3
Posterior tergal patch (rows of setae)	1'-2	2-3	1'-2	1'-2

Legends: ms - mesothorax, mt - metathorax.

Note: The biology of *D. malinovskiyi* was studied by Olsufjev (1913). This monophagous species was found by him in abundance on the leaves of *Glyceria* sp. (Gramineae) in the lake in the environs of Baturin (Chernigov Oblast, Ukraine). In 1994, we collected several *Donacia* larvae on roots of *Glyceria* in that lake. We assume that they belong to *D. malinovskiyi*. Larvae of all Ukrainian *Donacia* species except *D. malinovskiyi* are known. The larvae collected differ from all described *Donacia* larvae, and the discovery of new species in the Ukraine is obviously impossible.

Collecting location: 33.

D. marginata Hoppe, 1795. Figs. 48 and 63

Body pale cream-colored, the head, legs, and prothoracic shields yellow, ocelli, spiracles, setae, claws, and abdominal hooks brown. The labrum has sixteen setae; its anterior margin has emargination; the outer marginal seta is distant from the central marginal seta; the distal seta is as long as the median seta (Fig. 48). Mandible: cutting edge has three denticles, the inner tooth one denticle. The mental sclerite is arched. Meso- and metathorax: lateral

anterior tergal patches are separated from the middle anterior tergal patch. Abdominal segments 1-4 (Fig. 63): lateral anterior tergal patches are separated from the middle anterior tergal patch, with two setae between them; posterior tergal patch is 1.8x narrower than the distance between it and the middle anterior tergal patch. The dorsum of the meso-, metathorax, and abdominal segments 1-7 is covered with short setae, sparse long setae mostly occur on abdominal segments 5-7, rarely on anterior abdominal segments. The membranous part of the coxa has integument microsculpture anteriorly. Setation of thoracic and abdominal segments 1-4 is shown in Table 4.

Collecting locations: 2, 17 and 18.

D. obscura Gyllenhal, 1813. Fig. 60

This description is based on the larval exuvium, and therefore, the coloration of body is not included. The labrum has sixteen setae; its anterior margin has emargination; all marginal setae are close together; the distal seta is shorter than the median seta. Left mandible: cutting edge has two denticles; right mandible: cutting edge has three denticles, the inner tooth

one denticle. The mental sclerite is arched. Meso- and metathorax: lateral anterior tergal patches are separated from the middle anterior tergal patch. Abdominal segments 1-4 (Fig. 60): lateral anterior tergal patches are separated from the middle anterior tergal patch, with one to three setae between them; posterior tergal patch is 3x narrower than the distance between it and the middle anterior tergal patch. The dorsum of the meso-, metathorax, and abdominal segments 1-6 is covered with short, more or less similar setae, with a few long setae on abdominal segments 5-6. The membranous part of the coxa has integument microsculpture anteriorly. Setation of thoracic and abdominal segments 1-4 is shown in Table 2.

Collecting location: 7.

D. semicuprea Panzer, 1796. Fig. 30

Body including prothoracic shields milky-white colored, the head and legs yellow, ocelli, spiracles, setae, claws, and abdominal hooks brown. The labrum has sixteen setae; its anterior margin has shallow wide emargination; the outer marginal seta is slightly distant from the central marginal seta; the distal seta is shorter than the median seta. Mandible: cutting edge is projected, undulated, or with three obsolete denticles. The mental sclerite is broad at its entire length, almost not broadened at its middle (Fig. 30). Meso- and metathorax: lateral anterior tergal patches are widely separated from the middle anterior tergal patch, sometimes with several setae arranged in a row between them. Abdominal segments 1-4: lateral anterior tergal patches are widely separated from the middle anterior tergal patch, sometimes with several setae arranged in a row between them; posterior tergal patch is 9-13x narrower than the distance between it and the middle anterior tergal patch. The dorsum of the meso-, metathorax, and abdominal segments 1-6 is covered with short, more or less similar setae, with sparse long setae on abdominal segments 4-6. The membranous part of the coxa has no integument microsculpture. Setation of thoracic and abdominal segments 1-4 is shown in Table 6.

Collecting locations: 4, 12 and 14.

D. simplex Fabricius, 1775. Fig. 37

Body pale cream-colored, the head, legs, and prothoracic shields yellow, ocelli, spiracles, setae, claws, and abdominal hooks brown. The labrum has sixteen setae; its anterior margin has emargination; the outer marginal seta is distant from the central marginal seta; the distal seta is shorter than the median seta. Mandible: cutting edge has one to two denticles, the inner tooth sometimes has one denticle. The mental sclerite is arched. Meso- and metathorax: lateral anterior tergal patches are separated from the middle anterior tergal patch, with a single setae between them. Abdominal segments 1-4: lateral anterior tergal patches are separated from the middle anterior tergal patch, sometimes with a few setae

between them; posterior tergal patch is 1.2x narrower than the distance between it and the middle anterior tergal patch. The dorsum of the meso-, metathorax, and abdominal segments 1-7 is covered with short setae, with sparse longer setae on abdominal segment 7. The membranous part of the coxa has no integument microsculpture (Fig. 37). Setation of thoracic and abdominal segments 1-4 is shown in Table 4.

Collecting locations: 9, 16, 18, 34 and 35.

D. sparganii Ahrens, 1810. Figs. 4, 8, 10, 14, 16, 57, 67 and 70

Body pale cream-colored, the head, legs, and prothoracic shields yellow, ocelli, spiracles, setae, claws, and abdominal hooks brown. The labrum has sixteen setae; its anterior margin is straight or has shallow wide emargination; the outer marginal seta is slightly distant from the central marginal seta or all marginal setae are close together; the distal seta is shorter than the median seta (Fig. 14). Mandible: cutting edge has two to three denticles, the inner tooth one denticle (Fig. 8). The mental sclerite is narrow at the sides and broad or angularly projected backwards at the middle (Figs. 9 and 10). Mesothorax (Fig. 57) and metathorax: lateral anterior tergal patches are broadened laterally, separated from the middle anterior tergal patch, with several setae between them. Abdominal segments 1-4 (Fig. 70): lateral anterior tergal patches are separated from the middle anterior tergal patch, with several setae between them; posterior tergal patch is 3-4x narrower than the distance between it and the middle anterior tergal patch. The dorsum of the meso-, metathorax, and abdominal segments 1-6 is covered with short, more or less similar setae, with sparse long setae on abdominal segments 5-6. The membranous part of the coxa has no integument microsculpture. Setation of thoracic and abdominal segments 1-4 is shown in Table 5.

Collecting location: 7.

D. thalassina Germar, 1811. Figs. 2, 3, 9, 23, 24, 31, 35, 44 and 58

Body pale cream-colored, the head, legs, and prothoracic shields yellow, ocelli, spiracles, setae, claws, and abdominal hooks brown. The labrum has sixteen setae; its anterior margin has emargination; the outer marginal seta is distant from the central marginal seta or all marginal setae are close together; the distal seta is shorter than the median seta (Fig. 44). Mandible (Figs. 23 and 24): cutting edge has a large triangular projection or is straight and has two denticles, the inner tooth one denticle. The mental sclerite is narrow at the sides, slightly broadened at the middle. Mesothorax (Figs. 2 and 31), metathorax, and abdominal segments 1-4: lateral anterior tergal patches are widely separated from the middle anterior tergal patch, sometimes with a few setae between them. Abdominal segments 1-4 (Figs. 2 and 58): posterior tergal patch is 6-16x narrower than

the distance between it and the middle anterior tergal patch. The dorsum of the meso-, metathorax, and abdominal segments 1-6 is covered by short setae. The membranous part of the coxa has no integument microsculpture (Fig. 35). Setation of thoracic and abdominal segments 1-4 is shown in Table 3.

Collecting locations: 2, 7, 11, 24, and 26.

D. tomentosa Ahrens, 1810. Figs. 32 and 38

Body pale-green (alive larvae) or yellow (preserved in alcohol specimens), the head, legs, and prothoracic shields yellow, ocelli, spiracles, setae, claws, and abdominal hooks brown. The labrum has eighteen setae, because of angular setae doubled (Fig. 38). Labrum: anterior margin is straight or has shallow emargination and three to four small projections; the outer marginal seta is slightly distant from the central marginal seta; the distal seta is shorter than the median seta. Mandible: cutting edge is straight with one to two weak denticles, the inner tooth two denticles. The mental sclerite is narrow at the sides and broadened medially. Meso- and metathorax: lateral anterior tergal patches are widely separated from the middle anterior tergal patch, with several setae between them. Abdominal segments 1-4: lateral anterior tergal patches are widely separated from the middle anterior tergal patch, with several setae between them; posterior tergal patch is narrow, 8-16x narrower than the distance between it and the middle anterior tergal patch. The dorsum of the meso-, metathorax, and abdominal segments 1-6 is covered with short, more or less similar setae, with a few long setae on abdominal segments 5-6. Integument microsculpture is present on the ventral side of the thoracic and abdominal segments and the membranous parts of the femur and coxa (Fig. 32). Setation of thoracic and abdominal segments 1-4 is shown in Table 2.

Collecting locations: 13 and 18.

D. versicolore Brahm, 1790. Figs. 39 and 54

Body pale cream-colored, the head, legs, and prothoracic shields yellow, ocelli, spiracles, setae, claws, and abdominal hooks brown. The labrum (Fig. 39) has sixteen setae; its anterior margin is straight or has very shallow, wide emargination; all marginal setae are close together; the distal seta is shorter than the median seta. Mandible: cutting edge with a wide projection, which has two or three obsolete denticles. The mental sclerite is narrow at the sides and very broad at the middle. Mesothorax (Fig. 54) and metathorax: lateral anterior tergal patches are separated from the middle anterior tergal patch. Abdominal segments 1-4: lateral anterior tergal patches and middle anterior tergal patch are widely separated from each other (segment 1), or separated with several setae between them, or connected (segments 2-4); posterior tergal patch is 9-20x narrower than the distance between it and the middle anterior tergal patch. The dorsum of the meso-, metathorax, and abdominal segments 1-6 is covered with short se-

tae, with more or less numerous long setae (4x as long as normal setae). The membranous part of the coxa has no integument microsculpture. Setation of thoracic and abdominal segments 1-4 is shown in Table 5.

Collecting locations: 2, 7, 10 and 11.

D. vulgaris Zschach, 1788. Figs. 27 and 36

Body milky-white, the head, legs, and prothoracic shields yellow, ocelli, spiracles, setae, claws, and abdominal hooks brown. The labrum has sixteen setae; its anterior margin has emargination; the outer marginal seta is distant from the central marginal seta; the distal seta is shorter than the median seta. Mandible (Fig. 27): cutting edge has two denticles, the inner tooth sometimes has one denticle. The mental sclerite is arched. Meso- and metathorax: lateral anterior tergal patches are separated from the middle anterior tergal patch, sometimes with two setae between them. Abdominal segments 1-4: lateral anterior tergal patches are separated from the middle anterior tergal patch, sometimes with two setae between them; posterior tergal patch is 1.6-2.0x narrower than the distance between it and the middle anterior tergal patch. The dorsum of the meso-, metathorax, and abdominal segments 1-7 is covered with short setae, with sparse longer setae on abdominal segments 5-7. The membranous part of the coxa has integument microsculpture anteriorly (Fig. 36). Setation of thoracic and abdominal segments 1-4 is shown in Table 4.

Collecting locations: 5, 6, 7 and 32.

Key to species of *Plateumaris* Thomson, 1859

This genus is represented by fifteen species in the Palearctic. The larvae of six species are known. The present key includes four species. The larvae of transpalearctic *P. sericea* Linnaeus, 1761 and *P. constricticollis* Jacoby, 1885 from Japan and Kurile Isls. have been described by Kanazawa (1985) and Lee (1991). These species are not included in our key because we do not have any specimens at our disposal.

- 1(2) On abdominal segments 1-6, lateral anterior tergal patches are rounded and consist of four to five rows of setae. Pedal patches consist of 40, 21, and eighteen setae on abdominal segments 4, 5, and 6, respectively; sternal patches consist of about 50, 30, and nine setae on abdominal segments 4, 5, and 6, respectively. On each side of the labrum, all marginal setae are placed at an equal distance from each other (Fig. 51). Mandible is 1.3x broader than long. Europe. Larvae on roots of Cyperaceae: *Carex vulgaris* (Böving, 1910).
P. affinis (Kunze, 1818)
- 2(1) On abdominal segments 1-6, lateral ante-

Table 7. Setation of thoracic and abdominal segments in larvae of *Plateumaris* (number with apostrophe, e.g. 2', means a presence of several additional setae not forming a separate row besides two rows).

Characters	<i>affinis</i>	<i>braccata</i>	<i>weisei</i>	<i>discolor</i>
Meso- and metathorax:				
Lateral anterior tergal patch (rows of setae)	3	3'-4	3'	4
Middle anterior tergal patch (rows of setae)	4	3'	3	3
Middle posterior tergal patch (rows of setae)	3	2'-3	2'	3
Lateral intercalary patch (rows of setae)	3'	3'	4	4
(setae)	?	60-65	45	28
Middle intercalary patch (rows of setae)	2	2	1	2
(setae)	?	20	4-16	26
Sternal patch (rows of setae)	2	2-3	ms:3;mt:4	3
Abdominal segments 1-4:				
Lateral anterior tergal patch (rows of setae)	4-5	2-3	2-3	2-3
Middle anterior tergal patch (rows of setae)	6-7	4-7	5	3-4
Posterior tergal patch (rows of setae)	3	2-3	2'	2

Legends: ms - mesothorax, mt - metathorax.

rior tergal patches elongated, transverse, and consist of two to three rows of setae (Fig. 64).

3(4) Pedal patches consist of 55-60, 35-47, and 25-30 setae on abdominal segments 4, 5, and 6, respectively; sternal patches consist of 75-90, 50-54, and five to 25 setae on abdominal segments 4, 5, and 6, respectively. Frontale is 1.4x longer than wide, angular setae are distant from lateral angles. On each side of the labrum, the outer marginal seta is distant from the central one; distal setae are shorter than marginal ones (Fig. 52). Europe, Caucasus, Kazakhstan, Siberia. Larvae on roots of Gramineae: *Phragmites australis*.

P. braccata (Scopoli, 1772)

4(3) On abdominal segment 4, pedal patch consists of 34-46 setae, the sternal patch 32-40 setae. Frontale is 1.2-1.3x longer than wide (Figs. 17 and 18).

5(6) On frontale, angular setae are placed close to lateral angles (Fig. 18). Mandibles are 1.2x longer than broad. On the labrum, distal setae are slightly longer than marginal ones (Fig. 49). Pedal patches consist of 34-38, 34-36, and six to nineteen setae on abdominal segments 4, 5, and 6, respectively; sternal patches consist of 40, 26, and eleven to fifteen setae on abdominal segments 4, 5, and 6, respectively. N. Europe, Siberia, Far East, Mongolia. Larvae on roots of Cyperaceae: *Carex* sp.

P. weisei Duvivier, 1885

6(5) On frontale, angular setae are distant from lateral angles (Fig. 17). Mandibles as long as they are broad. On the labrum, distal setae are shorter than marginal ones (Fig. 50). Pedal patches consist of 46, 35, and 24-27 setae on abdominal segments 4, 5, and 6, respectively; sternal patches consist of 32, 21, and thirteen to seventeen setae

on abdominal segments 4, 5, and 6, respectively. Europe. Larvae on roots of Cyperaceae: *Carex rostrata*, *Carex* sp.; Juncaceae: *Juncus* sp.

P. discolor (Panzer, 1795)

Description of larvae

Setation of thoracic and abdominal segments is shown in Table 7.

P. affinis (Kunze, 1818). Fig. 51

We have no specimens at our disposal. Systematic characters are cited in the key after Böving (1910).

P. braccata (Scopoli, 1772). Fig. 52

Labrum is 1.5x as wide as it is long, and has sixteen setae; its anterior margin has shallow, wide emargination; the outer marginal seta is distant from the central marginal seta (Fig. 52). The mandible as long as it is wide, the cutting edge is slightly projected. The mental sclerite is narrow and arched. Pedal patches consist of 55-60, 35-47, and 25-30 setae, sternal patches consist of 75-90, 50-54, and five to 25 setae on abdominal segments 4, 5 and 6, respectively. The membranous part of the coxa has no integument microsculpture.

Collecting location: 39.

P. weisei Duvivier, 1885. Figs. 18 and 49

Labrum is 1.4x as wide as it is long, and has sixteen setae; its anterior margin is straight or slightly emarginated; the outer marginal seta is distant from the central marginal seta (Fig. 49). The mandible is 1.2x as long as it is wide, the cutting edge has two to three denticles, the inner tooth one denticle. The mental sclerite is arched and narrow. Pedal patches consist of 34-38, 34-36, and six to nineteen setae on abdominal segments 4, 5, and 6, respectively; sternal patches consist of 40, 26, and eleven to fif-

teen setae on abdominal segments 4, 5, and 6, respectively. The membranous part of the coxa has no integument microsculpture.

Collecting location: 37.

P. discolor (Panzer, 1795). Figs. 6, 7, 12, 17, 20, 50, 64, 68 and 69

Labrum is 1.5x as wide as it is long, and has sixteen setae; its anterior margin is straight or slightly projected; all marginal setae are close together (Fig. 50). The mandible as long as it is wide, the cutting edge is slightly projected, with two denticles, the inner tooth one denticle (Fig. 7). The mental sclerite is arched, narrow at the sides, slightly broadened at the middle (Fig. 12). Pedal patches consist of 46, 35, and 24-27 setae on abdominal segments 4, 5, and 6, respectively; sternal patches consist of 32, 21, and thirteen to seventeen setae on abdominal segments 4, 5, and 6, respectively. The membranous part of the coxa has no integument microsculpture.

Collecting locations: 3, 7, and 27.

Host plants of *Donaciinae* larvae

These data are based on our findings of larvae on submerged parts of the host plants. Literature citations are added.

Family

Host plant

Donaciinae

Ranunculaceae

Ranunculus divaricatus

Macrolea appendiculata

Ranunculus lingua

Donacia aquatica (Böving, 1910)

Cyperaceae

Carex rostrata

Macrolea appendiculata

Donacia aquatica

Donacia obscura

Plateumaris discolor

Carex riparia

Macrolea appendiculata

Carex vesicaria

Donacia bicolor

Donacia brevitarsis

Donacia marginata

Carex vulgaris

Plateumaris affinis (Böving, 1910)

Carex sp.

Donacia aquatica

Donacia cinerea

Donacia marginata

Plateumaris discolor

Plateumaris weisei

Eleocharis palustris

Donacia aquatica

Donacia thalassina

Scirpus lacustris

Donacia impressa

Scirpus sylvaticus

Donacia aquatica

Cabombaceae

Brasenia schreberi

Macrolea mutica

Potamogetonaceae

Potamogeton alpinus

Donacia aquatica

Potamogeton filiformis

Macrolea mutica (Klefbeck, 1916)

Potamogeton lucens

Macrolea appendiculata (Böving, 1910)

Potamogeton nutans

Macrolea appendiculata

Donacia aquatica

Donacia versicoloreae

Potamogeton pectinatus

Macrolea appendiculata

Potamogeton perfoliatus

Macrolea appendiculata

Potamogeton praelongus

Macrolea appendiculata

Potamogeton sp.

Neohaemonia voronovae

Haloragaceae

Myriophyllum spicatum

Macrolea appendiculata

Donacia sparganii

Myriophyllum sp.

Neohaemonia voronovae

Zosteraceae

Ruppia maritima

Macrolea mutica (Medvedev & Zaitsev, 1978)

Zostera sp.

Macrolea mutica (Medvedev & Zaitsev, 1978)

Butomaceae

Butomus umbellatus

Donacia tomentosa

Gramineae

Glyceria fluitans

Donacia aquatica

Donacia thalassina

Glyceria maxima

Donacia clavipes

Donacia malinovskiyi

Donacia semicuprea

Glyceria sp.

Donacia vulgaris

Phragmites australis

Donacia clavipes

Plateumaris braccata

Scolochloa festucacea

Donacia fennica

Donacia marginata

Donacia tomentosa

Sparganiaceae

Sparganium angustifolium

Donacia aquatica

Donacia sparganii

Macrolea appendiculata

Sparganium erectum
Donacia aquatica
Donacia bicolora
Donacia marginata
Donacia simplex
Sparganium simplex
Donacia aquatica
Sparganium sp.
Donacia aquatica
Donacia bicolora

Typhaceae

Typha angustifolia
Donacia cinerea
Typha latifolia
Donacia aquatica
Donacia cinerea
Donacia dentata
Donacia versicolorea
Donacia vulgaris

Alismataceae

Alisma plantago-aquatica
Donacia aquatica
Donacia dentata
Sagittaria sagittifolia
Donacia aquatica
Donacia dentata

Juncaceae

Juncus conglomeratus
Donacia aquatica
Juncus sp.
Plateumaris discolor

Nymphaeaceae

Nuphar lutea
Donacia crassipes
Nymphaea candida
Donacia crassipes

Acknowledgments

We are greatly indebted to Dr P. Jolivet for his invitation to contribute to this book. We are grateful to Dr. Y. M. Zaitsev and Mr. S. Y. Kuptsov for placing *Donaciinae* larvae at our disposal, to Dr. G.S. Medvedev for generously allowing us to borrow material from the collection at the Zoological Institute of Russian Academy of Sciences (St. Peters-

burg). M.J. Orlova-Bienkowskaja was supported by a Science Support Foundation (Moscow, Russia) grant for talented young researchers.

References

- Bienkowski, A.O. 1992. New data on morphology and systematics of the larvae of *Donaciinae* (Coleoptera Chrysomelidae) from Palaearctic. *Russian Entomological Journal*, 1(2):3-15.
- Bienkowski, A.O. 1996. Life cycles of *Donaciinae* (Coleoptera, Chrysomelidae). In: Jolivet, P.H.A. and M.L. Cox (eds) *Chrysomelidae Biology, 3: General Studies*. Amsterdam, SPB Academic Publishing, pp. 155-171.
- Böving, A.G. 1910. Natural history of the larvae of *Donaciinae*. *Biological Supplement, 1st series, Internationale Revue der gesamten Hydrobiologie und Hydrographie*, 3, 108 pp.
- Chang, Ying-chien. 1965. On the external anatomy and the caudal claws of the larva of *Donacia provosti*. *Acta Ent. Sinica*, 14(6):613-616.
- Kanazawa, I. 1985. Immature stages. In: *Atlas of the Japanese Donaciinae (Guide for Identification of the Fossil Donaciine Beetles)*. Osaka, Fossil Insect Research Group for the Nojiriko Excavation, pp. 161-163.
- Klefbäck, K. 1916. Bidrag till kännedomen om *Macrolea curtisii* Lac. *Ent. Tidskr.*, 37:111-114.
- Lee, J.E. 1991. A taxonomic study on the larvae of the subfamily *Donaciinae* from Japan (Coleoptera: Chrysomelidae). *Ent. Res. Bull. (Korea)*, 17:33-46.
- Medvedev, L.N. and Zaitsev, Y.M. 1978. Larvae of Chrysomelid Beetles of Siberia and the Far East. Moscow, Nauka, 184 pp. (in Russian)
- Medvedev, L.N. and Zaitsev, Y.M. 1980. New data on chrysomelid-beetle larvae from Mongolia (Coleoptera, Chrysomelidae). In: *Nasekomye Mongolii*, 7. Leningrad, Nauka, pp. 97-106. (in Russian)
- Narita, Y. 1991. Description of the larva of *Donacia clavareauli* (Coleoptera, Chrysomelidae). *Elytra (Tokyo)*, 19(1):21-23.
- Ogloblin, D.A. and Medvedev, L.N. 1971. Larvae of chrysomelid beetles (Coleoptera, Chrysomelidae) of European part of the USSR. Leningrad, Nauka, 123 pp. (in Russian)
- Zaitsev, Y.M. 1982. Larvae of chrysomelid beetles (Coleoptera, Chrysomelidae) from Mongolia. In: *Nasekomye Mongolii*, 8. Leningrad, Nauka, pp. 296-307. (in Russian)
- Zaitsev, Y.M. and Pavlov, S.I. 1986. Ecology and morphology of larvae of chrysomelid beetles *Donacia marginata* and *D. antiqua* from Volga basin. In: *Ekologia zhivotnykh Povolzhia i Priuralia. Mezhdvuzovskiy sbornik nauchnykh trudov*. Kuibyshev, pp. 44-50. (in Russian)