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Description of larvae of *Hydroporus rufifrons* (O.F. MÜLLER) (Coleoptera: Dytiscidae, Hydroporinae)

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Abstract

The first-, second-, and third-instar larvae of *Hydroporus rufifrons* (O.F. MÜLLER, 1776) are described and illustrated. Except for the third-instar larvae, which were collected, the larvae used in this study were reared ex ovo from adults. Larvae of *H. rufifrons* are characterized by large size and monotonous dark coloration. Data on biology and distribution of the species are given.

Key words: Coleoptera, Dytiscidae, *Hydroporus*, larvae, description.

Introduction

The genus *Hydroporus* CLAIRVILLE is one of the largest genera within Dytiscidae and includes about 75 species in Europe. The representatives of the genus are the most common and numerous inhabitants of a wide variety of waters. However, larval morphology of species of *Hydroporus* is still in need of research.

The third-instar larvae of 33 species of *Hydroporus* were examined by BERTRAND (1928, 1931, 1933, 1972), JEPPESEN (1986), NILSSON (1986, 1987a), NILSSON & CARR (1989), and an identification key of 27 species was proposed by NILSSON (1989). However, morphology of first- and second-instar larvae has been studied for only five species: *H. morio* AUBÉ, *H. palustris* (L.), *H. tristis* (PAYKULL), *H. striola* (GYLLENHAL), *H. fuscipennis* SCHAUM (BERTRAND 1928, JEPPESEN 1986, ALARIE 1991, SHAVERDO 1999).

This paper is aiming at describing the first- and second-instar larvae and at redescribing the third-instar larvae of *H. rufifrons* (O.F. MÜLLER). Data on the biology and distribution of the species are also provided.

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Material and methods

The first-instar (6 exs.) and second-instar (3 exs.) larvae of *H. rufifrons* were reared ex ovo according to the technique described by ALARIE et al. (1989). Adults and third-instar larvae (5 exs.) were collected in Belarus: Brest Prov., Kamenets Dist., near Bolshoe Selistche Village, temporal puddles, 22.IV.1998; Vitebsk Prov., Vitebsk Dist., near Shupy Village, flood-land of Shevinka River, 4.VIII.1998. The larvae were fixed in 70% ethanol. Then they were

disarticulated and mounted on slides in For's medium. The material is deposited in the Laboratory of Entomology, Institute of Zoology, Belarus.

All measurements were taken with MPSU-1 and MBB-1A stereoscopic microscopes equipped with a micrometer eyepiece. Morphometric characters are used after ALARIE (1991), except for following:

FCdsL length of distal part of frontoclypeus measured from apex of the nasale to the lateral notches
FCdsL/FCL relative elongation of the distal part of frontoclypeus

Chaetotaxy was studied with MBB-1A microscope. The primary setae and pores of legs were coded according to NILSSON (1988) and ALARIE et al. (1990). The relative position of secondary setae were determined after WOLFE & ROUGHLEY (1985) and NILSSON (1986, 1987a, 1987b). The series of secondary setae were divided into anterior (A), posterior (P), dorsal (D), ventral (V), and proximal (Pr) ones depending on their positions. All sensillar series include only the secondary setae.

Hydroporus rufifrons (O.F. MÜLLER, 1776)

Diagnosis: Larvae of *H. rufifrons* can be separated from other described *Hydroporus* larvae by the large size and dark brownish grey coloration.

Description of the first-instar larva (Figs. 1 - 3):

Colour. Dorsal surface of larva brownish grey, paler to the back end of body; head (dorsal and ventral surfaces) monotonous brownish grey sometimes with slightly paler distal part of frontoclypeus and pale areas around stemmata; some specimens have two oblong maculae on the frontoclypeus (at egg bursters) paler than coloration of head; epicranial suture pale yellow; terga of thorax and of abdominal segments 1 - 3 with narrow middle pale yellow line; head appendages and legs pale grey; mandibles brownish in their apex and inner margin; coxa and proximal part of trochanter whitish; urogomphus paler than legs, their setae brownish grey.

Head. HL = 0.52 - 0.57 mm ($\bar{x}$ = 0.54 mm), HW = 0.44 - 0.49 mm ($\bar{x}$ = 0.47 mm); frontoclypeus short: FCL = 0.39 - 0.43 mm ($\bar{x}$ = 0.41 mm), HL/HW = 1.17; distal part of frontoclypeus wide and short: FCdsL = 0.08 mm, FCdsL/FCL = 0.19; lateral notches well developed and visible dorsally, with large pointed bulges; gular sutures present; antenna shorter than width of head: AL/HW = 0.81; antennomere 2 shorter than antennomere 3: A2/A3 = 0.78; A3'/A4 = 0.70; mandible not toothed; maxillary and labial palpomeres 2 distinctly longer than palpomeres 1: PALmx2/PALmx1 = 1.57; PALlb2/PALlb1 = 1.61.

Legs. Metathoracic legs more than 2.5 times longer than width of head: MtlegL/HW = 2.65; setae of legs relatively short: length of longest between setae FE8 and FE9/MtFEW = 0.75, TI4/MtTIW = 1.27; MtClpL/MtTAL = 0.74.

Abdomen. LLAS = 0.23 - 0.27 mm ($\bar{x}$ = 0.24 mm); LLAS/HW = 0.52; SL = 0.11 - 0.13 mm ($\bar{x}$ = 0.12 mm); SL/LLAS = 0.49; seta AB2 longer than seta AB3: AB2/AB3 = 1.34, setae AB9 and AB11 subequal in length: AB9/AB11 = 1.13; UR = 0.95 - 1.00 mm ($\bar{x}$ = 0.97 mm); UR/LLAS = 3.98; UR1=0.60 - 0.67 mm ($\bar{x}$ = 0.63 mm); urogomphus 1 more than 2.5 times longer than last abdominal segment: UR1/LLAS = 2.57; urogomphus 1 distinctly longer than urogomphus 2: UR1/UR2 = 1.75; seta UR4 about 2 time farther from apex of urogomphus 1 than from seta UR3: (UR4-X)/(UR3-UR4) = 2.13; UR4/AB11 = 3.64.

Description of the second-instar larva (Figs. 4, 5):

As for first-instar larva, except for the following characters.

Colour. Dorsal surface of larva dark brownish grey with paler head appendages, legs, and urogomphus; head (dorsal and ventral surfaces) monotonous dark brownish grey with paler nasale and small pale areas around stemmata; terga of thorax and of abdominal segments without middle pale yellow line.

Head. HL = 0.80 - 0.85 mm ($\bar{x}$ = 0.83 mm), HW = 0.70 - 0.72 mm ($\bar{x}$ = 0.71 mm); FCL = 0.63 mm; HL/HW = 1.17; FCdsL = 0.11 - 0.13 mm ($\bar{x}$ = 0.12 mm); FCdsL/FCL = 0.19; AL/HW = 0.72; A2/A3 = 0.90; A3'/A4 = 0.63; maxillary and labial palpomeres 2 slightly longer than palpomeres 1: PALmx2/PALmx1 = 1.04; PALlb2/PALlb1 = 1.16.

Legs. MtlegL/HW = 2.50; MtClpL/MtTAL = 0.63; position and number of secondary setae as expressed in table 1; coxa without secondary V setae, tarsus without secondary setae.

Abdomen. LLAS = 0.46 - 0.49 mm ($\bar{x}$ = 0.48 mm); LLAS/HW = 0.68; SL = 0.20 - 0.22 mm ($\bar{x}$ = 0.21 mm); SL/LLAS = 0.44; UR = 1.13 - 1.18 mm ($\bar{x}$ = 1.15 mm); UR/LLAS = 2.40; UR1 = 0.61 - 0.80 mm ($\bar{x}$ = 0.67 mm); urogomphus 1 distinctly longer than last abdominal segment: UR1/LLAS = 1.40; UR1/UR2 = 1.25; (UR4-X)/(UR3-UR4) = 1.90.

Redescription of the third-instar larva (Fig. 6):

As for second-instar larva, except for the following characters.

Colour. Dorsal surface of head and terga of thorax 1, 2 sometimes with small faintly contrasting brownish maculae.

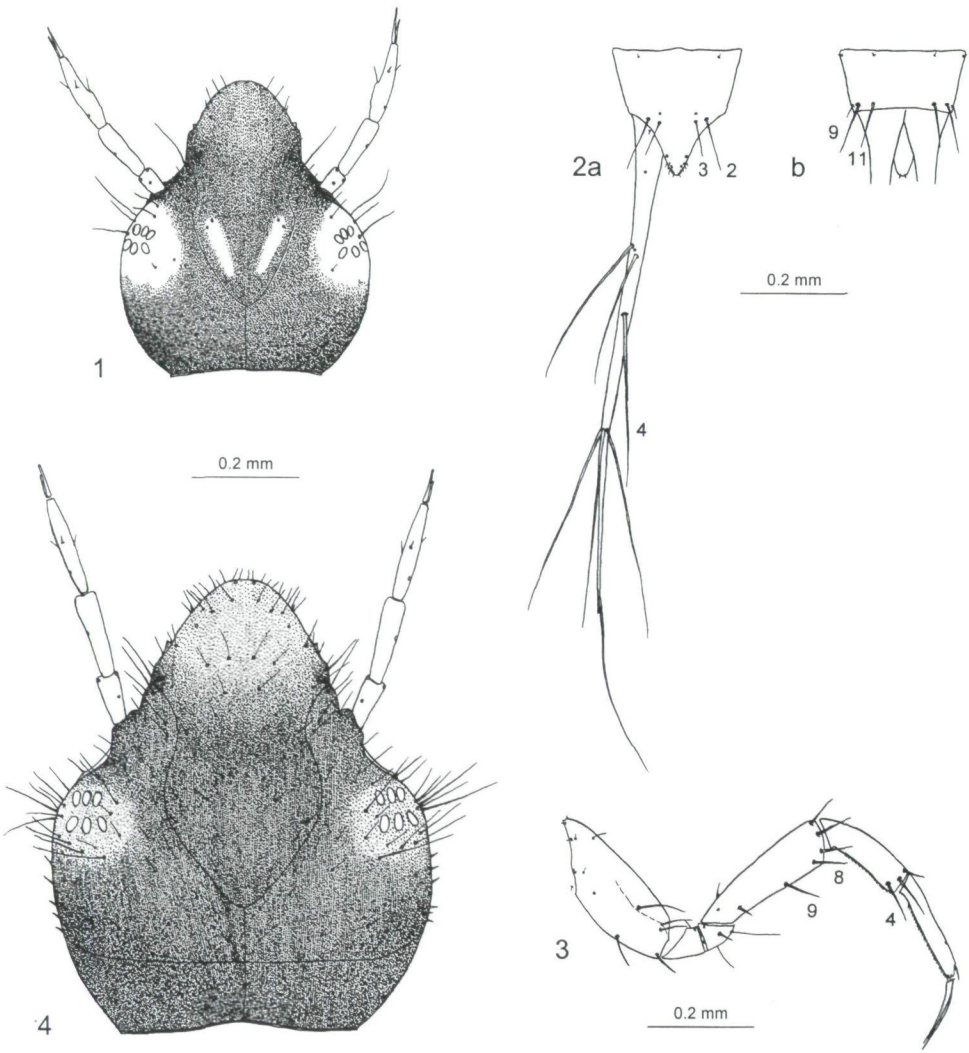
Head. HL = 1.06 - 1.10 mm ($\bar{x}$ = 1.09 mm), HW = 0.92 - 0.95 mm ($\bar{x}$ = 0.94 mm); FCL = 0.82 - 0.87 mm ($\bar{x}$ = 0.85 mm); HL/HW = 1.16; FCdsL = 0.14 - 0.15 mm ($\bar{x}$ = 0.15 mm); FCdsL/FCL = 0.18; AL/HW = 0.70; antennomere 2 slightly longer than antennomere 3: A2/A3 = 1.08; A3'/A4 = 0.78; maxillary and labial palpomeres 2 shorter than palpomeres 1: PALmx2/PALmx1 = 0.79; PALlb2/PALlb1 = 0.91.

Legs. MtlegL/HW = 2.60; MtClpL/MtTAL = 0.59; position and number of secondary setae as expressed in table 1; tarsus without secondary setae, 1 AV seta was found on one of metathorax legs in one larva.

Abdomen. LLAS = 0.71 - 0.76 mm ($\bar{x}$ = 0.74 mm); LLAS/HW = 0.79; SL = 0.27 - 0.28 mm ($\bar{x}$ = 0.27 mm); SL/LLAS = 0.36; UR = 1.30 - 1.48 mm ($\bar{x}$ = 1.42 mm); UR/LLAS = 1.92; UR1 = 0.67 - 0.81 mm ($\bar{x}$ = 0.76 mm); urogomphus 1 subequal to last abdominal segment: UR1/LLAS = 1.03; UR1/UR2 = 1.16; seta UR4 slightly farther from apex of urogomphus 1 than from seta UR3: (UR4-X)/(UR3-UR4) = 1.20.

Sensillar series	CO		TR	FE			TI				TA
	D	A	Pr	AD	AV	PV	AD	PD	AV	PV	AV
II instar											
Proleg	3	-	1	4-5	4-6	4-5	1	0-1	1-2	1-2	-
Mesoleg	3-4	-	1	3-7	6-8	6-8	1-3	0-1	2-3	2-4	-
Metaleg	3-4	0-1	1	5-8	6-9	6-7	3	1-2	2-4	1-4	-
III instar											
Proleg	5-9	1-3	1	6-10	7-12	3-8	1	1-2	0-1	1-2	-
Mesoleg	6-10	2-4	1-2	6-9	7-13	7-11	1-2	2-3	1	1-3	-
Metaleg	5-10	2-6	1-2	5-12	9-14	9-11	3-4	3-4	0-2	2-3	0-1

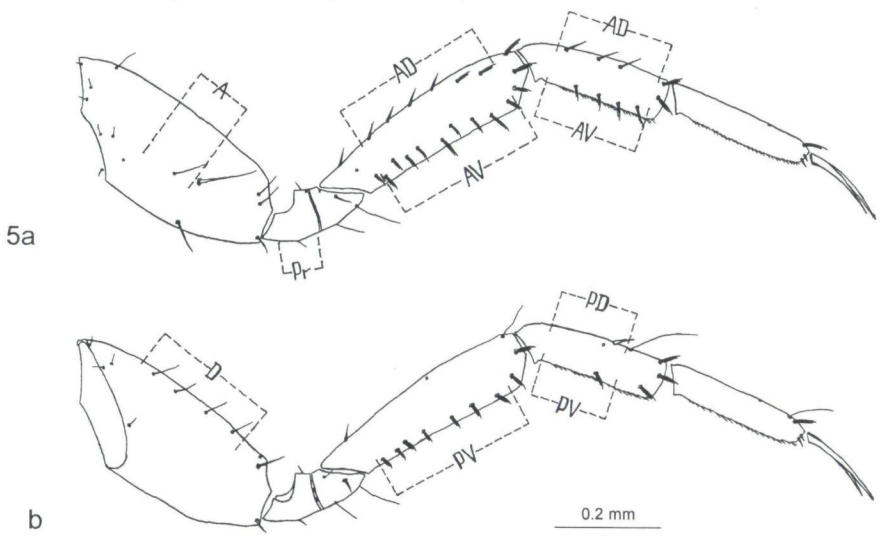
Table 1. Number of secondary setae in second- and third-instar larvae of *H. rufifrons*

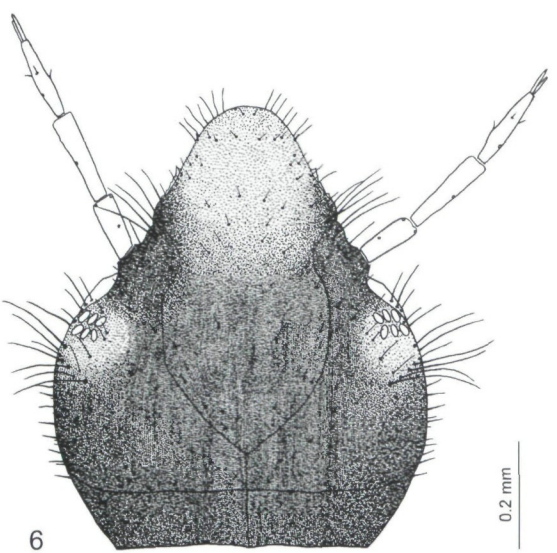


Figs. 1 - 3: *Hydroporus rufifrons*, first-instar larva, 1) head capsule (dorsal view); 2) last abdominal segment and urogomphus, (a) dorsal view, (b) ventral view; 3) metathoracic leg (anterior view).
Fig. 4: *Hydroporus rufifrons*, second-instar larva, head capsule (dorsal view).

Hydroporus rufifrons is distributed in northern, central, and eastern Europe, partly in southern Europe, and Siberia (ZAITZEV 1953). It occurs in small, seasonally (mainly in the spring) flooded waters, e.g. forest puddles, as well as in flood-lands of rivers and lakes and sphagnum bogs.

Adults of *H. rufifrons* were collected on 22.IV.1998 and deposited eggs after one day in captivity. Hatching was first observed on 28.IV.1998; the larvae reached their second instar on 1.V.1998. The third-instar larvae were collected in June and August. Accordingly, this species has life cycle of the type 1 (NILSSON 1996), with overwintering imagines and larvae developed during spring and early summer, as noticed by NILSSON (1986).





Figs. 5: *Hydroporus rufifrons*, second-instar larva, metathoracic legs, (a) anterior view, (b) posterior view.

Fig. 6: *Hydroporus rufifrons*, third-instar larva, head capsule (dorsal view).

References

ALARIE, Y. 1991: Description of larvae of 17 Nearctic species of *Hydroporus* Clairville (Coleoptera: Dytiscidae: Hydroporinae) with an analysis of their phylogenetic relationships. - The Canadian Entomologist 123: 627-704.

ALARIE, Y., HARPER, P.P. & MAIRE, A. 1989: Rearing dytiscid beetles (Coleoptera: Dytiscidae). - Entomologica Basiliensia 13: 147-149.

ALARIE, Y., HARPER, P.P. & MAIRE, A. 1990: Primary setae and pores on legs of larvae of Nearctic Hydroporinae (Coleoptera: Dytiscidae). - Quaestiones Entomologicae 26: 199-210.

BERTRAND, H. 1928: Les larves et nymphes des Dytiscides, Hygrobiides et Haliplides. - Encyclopédie Entomologique, Série A, 10: l-366.

BERTRAND, H. 1931: Captures et élevages de larves de Coléoptères aquatiques (5e Note). - Annales de la Société Entomologique de France 100: 87-98.

BERTRAND, H. 1933: Captures et élevages de larves de Coléoptères aquatiques (7e Note). - Annales de la Société Entomologique de France 102: 181-184.

BERTRAND, H. 1972: Larves et nymphes des Coléoptères aquatiques du globe. - Paris: Imp. Paillart, Abeville, 804 pp.

JEPPESEN, P.C. 1986: Dytiscid Beetles in Greenland, with Description of the Three Larval Stages of *Hydroporus melanocephalus* (Marscham, 1802). - Entomologica Basiliensia 11: 67-79.

NILSSON, A.N. 1986: Larval morphology and phenology of four Fennoscandian species of *Hydroporus* Clairville (Coleoptera: Dytiscidae), with a preliminary key to the known larvae. - Aquatic Insects 8 (3): 141-153.

NILSSON, A.N. 1987a: The 3rd-instar larvae of 8 Fennoscandian species *Hydroporus* Clairville (Coleoptera: Dytiscidae), with notes on subgeneric classification. - Entomologica scandinavica 17: 491-502.

NILSSON, A.N. 1987b: Larval morphology of Fennoscandian *Oreodytes* Seidlitz (Coleoptera: Dytiscidae), with notes on hydroporine leg chaetotaxy and taxonomy. - Entomologisk Tidskrift 108: 99-108.

NILSSON, A.N. 1988: A review of primary setae and pores on legs of larval Dytiscidae (Coleoptera). - Canadian Journal of Zoology 66: 2283-2294.

NILSSON, A.N. 1989: Larvae of northern European *Hydroporus* (Coleoptera, Dytiscidae). - Systematic Entomology 14: 99-115.

NILSSON, A.N. 1996: Coleoptera Dytiscidae, Diving Water Beetles. - In Nilsson A.N. (ed.): Aquatic Insects of North Europe - A Taxonomic Handbook. - Stenstrup: Apollo Books, pp. 145-172.

NILSSON, A.N. & CARR, R. 1989: The third instar larvae of *Hydroporus fuscipennis*, *Hydroporus gyllenhalii*, and *Hydroporus lapponum* (Coleoptera: Dytiscidae). - Entomologisk Tidskrift 110: 165-170.

SHAVERDO, E.V. 1999: Description of larvae of *Hydroporus tristis* (Paykull) (Coleoptera: Dytiscidae) - Vesti NAN Belarus, Ser. biol. scien, 4: 112-116. (in Russian)

WOLFE, G.W. & ROUGHLEY, R.E. 1985: Description of the pupa and mature larva of *Matus ovatus ovatus* Leech (Coleoptera: Dytiscidae) with chaetotaxal analysis emphasizing mouthparts, legs, and urogomphus. - Proceedings of the Academy of Natural Sciences of Philadelphia 137: 61-79.

ZAITZEV, F.A. 1953: Nasekomye zhestkokrylye. Plavuntsovye i vertyachki. Tom. 4. - Fauna SSSR, Academia Nauk SSSR, Novaya seria 58: 1-377. (in Russian)

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