

The third-instar larvae of *Hydroporus fuscipennis*, *H. gyllenhalii* and *H. lapponum* (Coleoptera, Dytiscidae)

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The third-instar larva of *Hydroporus gyllenhalii* Schiödte is described for the first time from SE England, and those of *H. fuscipennis* Schaum and *H. lapponum* (Gyll.) from northern Sweden and Norway respectively. Larvae of *H. fuscipennis* were reared from eggs laid in captivity, and those of the other two species collected together with adults. All three species seemed to have univoltine life cycles with overwintering adults and larval development from spring to autumn. Intraspecific variation in leg chaetotaxy is emphasized.

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Introduction

The genus *Hydroporus* Clairville is in Fennoscandia represented by 34 species of small dytiscid water beetles of a rather similar habitus. The identification of the third-instar larvae is now possible for most species in this region (Nilsson 1986a, 1987, 1989). However, the larvae of six species have remained undescribed until now, a fact that restricts the use of the available identification keys. As material now has become available, we will provide descriptions of two of the missing species. In addition, we will present the first formal description of the larva of *H. fuscipennis* Schaum, emphasizing the intraspecific variation in leg chaetotaxy. This species was included in Nilsson's (1989) key, although no description was offered. The following descriptions corroborate the pronounced uniformity of these larvae. Consequently, no new characters have been found.

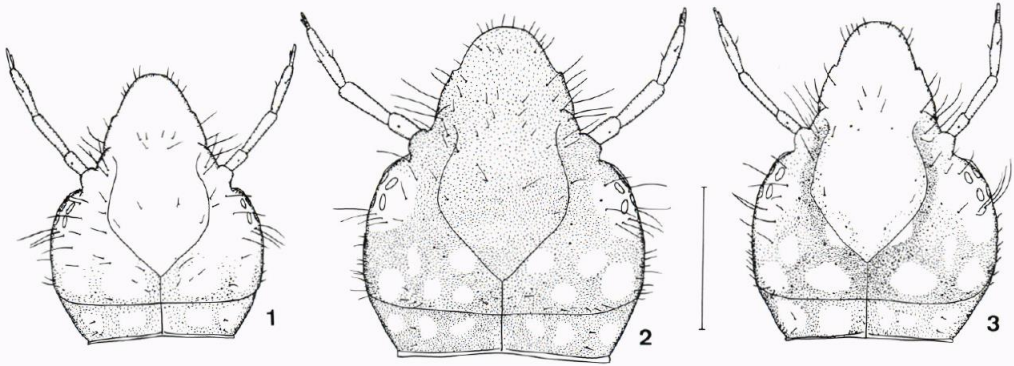
Methods and materials

Adults of *H. fuscipennis* were collected on 5 May 1987 in a seasonal pond 25 km NW of Vindeln in northern Sweden [see Nilsson (1986b) for description]. The rearing method followed Nils-

son (1989), and resulted in about 60 eggs and 20 third-instar larvae. Five third-instar larvae of *H. lapponum* (Gyll.) were collected together with adults on 21 July 1988 in northernmost Norway: Fi, Lappoluobal, small stream, and Fn, Varanger Peninsula, SW of Gedjne, shallow lake. The identity of these larvae could be determined as those of all other large *Hydroporus* species of the region are known (Nilsson 1989), and material was available for comparison. About ten third-instar larvae of *H. gyllenhalii* Schiödte were collected by the junior author from 24 March to 5 May 1988 in a small seasonal pond on Chislehurst Common, Kent, in SE England [see Carr (in press) for a description]. This pond was studied intensively for a period of 18 months, and besides numerous adults of *H. gyllenhalii* the only other *Hydroporus* species found was *H. planus* (Fabr.).

Larvae were preserved in 70% ethanol and dissected larvae were mounted in Euparal on glass slides. All measurements were taken with a micrometer eyepiece. The preserved material is deposited at the Department of Animal Ecology, University of Umeå.

Sensillar nomenclature and other abbreviations follow Nilsson (1989): HL = total head length,



Figs 1—3. *Hydroporus*, third-instar larva, head without mandibles and palpi, dorsal view. —1. *H. fuscipennis* Schaum. —2. *H. lapponum* (Gyll.). —3. *H. gyllenhalii* Schiödte. Scale bar 0.5 mm.

Huvud utan mandibler och palper uppifrån av tredje larvstadiet. Skälstreck 0,5 mm.

HW = maximum head width, LAS = last abdominal segment, P3-D/P2-P3 = ratio between distance from P3 to apex of U1 and distance between P2 and P3, U1 = basal segment of urogomphus. Sensillar counts and length measurements and ratios are at least from five specimens of each species.

Descriptions of third-instar larvae

Hydroporus fuscipennis Schaum
(Figs 1, 4)

Hydroporus puberulus Mannerheim, 1853:163 (not LeConte, 1850).

Hydroporus fuscipennis Schaum, in Schaum & Kiesenwetter, 1868:64 (replacement name for *Hydroporus puberulus* Mannerheim, 1853, not LeConte, 1850).

Hydroporus criniticoxis Larson, 1975:301.

Diagnosis. A medium-sized larva of a light, relatively uniform coloration. Nasale narrow with lateral notches weak. Basal urogomphal segment about a quarter longer than last abdominal segment, with proximal setae closely set. Each coxa with secondary V spines. Each femur with secondary A spines. Meso- and metatibiae with AD and AV spines only, protibia with a single AD spine or not. Tarsi without secondary spines.

Description

Colour. Head pale yellow with diffuse brownish markings subbasally (Fig. 1); antenna testaceous with apical segment grey; body pale yellowish-

brown with weak yellow spots on thoracic terga; legs and urogomphi testaceous.

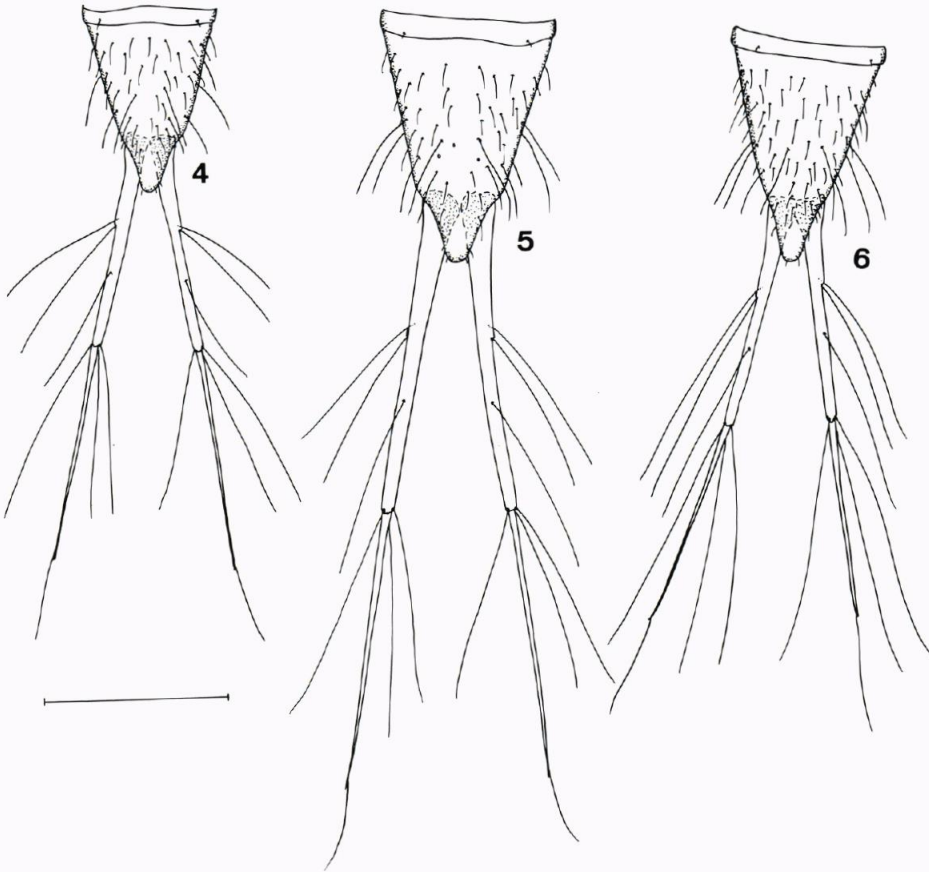
Head (Fig. 1). Length 0.86—0.90 mm, width 0.69—0.74 mm; nasale relatively narrow with lateral notches weak; HL/HW 1.21—1.25.

Body. Length 4.0—4.9 mm; length of LAS (Fig. 4) 0.44—0.48 mm; length of U1 0.49—0.59 mm, U2 slightly longer; U1/LAS 1.18—1.28; position of P3 varying, P3-D/P2-P3 1.2—2.5.

Legs (Tab. 1). Each coxa with V spines present; each trochanter with VSt4 absent; each femur without A spines; meso- and metatibiae with AD and AV spines only, protibia with a single AD spine or not; each tarsus without secondary spines.

This species is widespread in the Holarctic Region where it occurs from North and Central Europe to Siberia, and from Alaska to Newfoundland. It has been recorded from most parts of Fennoscandia (Hebauer 1979), but markedly more frequently to the north. The main habitat is more or less temporary ponds with at least some vegetation, mainly outside forest. In early May 1987, 5♂8♀ were collected in the seasonal pond in northern Sweden described by Nilsson (1986b). Oviposition started after a few days in captivity, and after a week more than 60 eggs had been found. Embryos with pigmented stemmata were observed two weeks after oviposition had started, and the first young larvae appeared three days later. At the termination of the culture on 7 June almost all larvae had reached their third instar.

Mature larvae occurred about one month after



Figs 4—6. *Hydroporus*, third-instar larva, last abdominal segment with urogomphi, dorsal view. —4. *H. fuscipennis* Schaum. —5. *H. lapponum* (Gyll.). —6. *H. gyllenhalii* Schiödte. Scale bar 0.5 mm.

Sista bakkroppssegmentet med stjärtspröten uppifrån av tredje larvstadiet. Skallstreck 0,5 mm.

oviposition had started, and the larval development lasted for about two weeks. A single mature larva was found in the pond on 13 June. Teneral adults were observed in late July in Finnish Lapland (Eriksson 1972), and from early June to mid August in Alberta, Canada (Larson 1975, as *H. criniticoxis*). Flight muscles were well developed in four specimens from Finnish Lapland (Eriksson 1972), and flight was observed in late May and early July in Canada (Larson 1975).

Hydroporus lapponum (Gyllenhal)
(Figs 2, 5)

Hyphydrus lapponum Gyllenhal, 1808:532.
Hydroporus kolstromi J. Sahlberg, 1875:145, 146.
Hydroporus obtusipennis J. Sahlberg, 1875:146, 147.
Hydroporus labradorensis Fall, 1923:71.

Diagnosis. A large larva of a brownish-yellow coloration with indistinct pale spots on head and terga. Head and nasale relatively broad with lateral notches distinct. Basal urogomphal segment about a third longer than last abdominal segment. Each coxa without secondary V spines. Each tibia with secondary AD, PD, AV (on fore leg single or absent), and PV spines. Each tarsus without secondary spines.

Description

Colour. Head brownish-yellow with weak paler spots in posterior half (Fig. 2); antenna testaceous with apical segment grey; thoracic terga with distinct, abdominal terga with weak lateral pale yellow spots; legs and urogomphi testaceous.

Tab. 1. Number of secondary setae or spines in the sensillar series showing interspecific variation in the three species *Hydroporus fuscipennis* Schaum (fusc), *H. lapponum* (Gyll.) (lapp) and *H. gyllenhalii* Schiödte (gyll). Not listed series are absent on all legs in all three species. [Antal sekundära (saknas hos larvstadiet 1) hår eller taggar i rader med olika position på ben av larver till *Hydroporus fuscipennis*, *H. lapponum* och *H. gyllenhalii*.]

Sensillar series		Fore leg			Mid leg			Hind leg		
		fusc	lapp	gyll	fusc	lapp	gyll	fusc	lapp	gyll
Coxa	D	4-5	6-7	7-8	5-6	5-6	8-10	5-6	5-6	8-10
	A	2-3	3-4	3-4	3-5	3-4	3-5	3-5	3-4	4-5
	V	4-7	—	5-6	1-3	—	5-6	2-3	—	4-7
Femur	A	—	3-4	2	—	3-4	2	—	4-5	2-4
	D	2-3	4-5	2-4	2-3	3-5	4-5	2-4	4-5	4-6
	AV	6-8	9-10	6-8	6-8	10-15	8-10	6-10	10-15	10-12
	PV	4-5	7-9	4-6	7-8	10-13	11-12	8-9	10-14	11-13
Tibia	A	—	—	—	—	0-1	—	—	0-2	—
	AD	0-1	1-2	1-2	1-2	1-2	2-3	1-3	2-3	3-4
	PD	—	1	—	—	1	0-1	—	1	0-1
	AV	—	0-1	—	1-2	2-3	1-3	1-3	3-5	2-3
	PV	—	1-3	—	—	2-4	1	—	2-4	2
Tarsus	D	—	—	0-1	—	—	1	—	—	1-3
	AV	—	—	—	—	—	0-1	—	—	2-3
	PV	—	—	—	—	—	0-1	—	—	1-2

Head (Fig. 2). Length 1.15–1.22 mm, width 1.00–1.05 mm; nasale broad with lateral notches visible from above; HL/HW 1.14–1.16.

Body. Length 4.8–6.1 mm; length of LAS (Fig. 5) 0.62–0.72 mm; length of U1 0.85–0.90 mm, U2 slightly shorter; U1/LAS 1.32–1.41; position of P3 varying P3-D/P2-P3 1.21–2.10 (in most specimens near 1.6).

Legs (Tab. 1). Coxa without V spines; trochanter with VSt4 absent; each tibia with secondary AD, PD, AV (rarely absent on fore leg), and PV spines; A spines often present on mid and hind leg; each tarsus without secondary spines (an AV spine may occur on one of the hind legs).

This is a northern Holarctic species that occurs from Scandinavia to Siberia, and from Alaska to Newfoundland. The main habitat is shallow tundra pools, and in Finnish Lapland rock pools and dystrophic waters were preferred (Eriksson 1972). It is also a regular inhabitant of roadside silt ponds of recent origin in the northernmost coniferous forests of Fennoscandia. Larvae of the two later instars were collected together with adults in northernmost Norway on 21 July. In Finnish Lapland, Eriksson (1972) collected mature larvae in early September, and teneral adults were observed from late June to mid September, with a peak in the autumn. Seemingly, the life cycle is principally

univoltine with overwintering adults and summer larvae, but a few larvae may overwinter and pupate in early summer. Most adults apparently have their flight muscles degenerated (Eriksson 1972).

Hydroporus gyllenhalii Schiödte
(Figs 3, 6)

Hydroporus gyllenhalii Schiödte, 1841:434.
Hydroporus piceus auct., not Stephens, 1828.

Diagnosis. A relatively large larva with a contrastive coloration. Head and nasale narrow with lateral notches distinct. Basal urogomphal segment about a fifth longer than last abdominal segment. Each coxa with secondary V spines. Protibia with AD spine(s) only. Meso- and metatibiae with AD, AV, PV, and frequently also PD spines. Protarsus rarely with a D spine. Meso- and metatarsi with D, AV, and PV spines (AV and PV frequently absent on mid leg).

Description

Colour. Head (Fig. 3) pale yellow with a brown meshwork in basal third and a brown V-mark posterior to frontal suture; antenna testaceous; body

brownish-yellow with yellow spots on thoracic terga.

Head (Fig. 3). Length 1.08–1.13 mm, width 0.84–0.93 mm; nasale relatively long and narrow with lateral notches visible from above; HL/HW 1.23–1.29.

Body. Length 4.2–5.0 mm; length of LAS (Fig. 6) 0.55–0.58 mm; length of U1 0.63–0.71 mm, U2 of about same length; U1/LAS 1.14–1.23; P3-D/P2-P3 1.27–1.62.

Legs (Tab. 1). Each coxa with V series present; each trochanter without VSt4; each femur with few A spines; protibia with AD spine(s) only; meso- and metatibiae with AD, AV, PV, and in some specimens also with PD spines; protarsus rarely with a D spine; mesotarsus with a D spine and often with single AV and PV spines; metatarsus with D, AV, and PV spines.

This species is restricted to North and Central Europe, and it is common in Great Britain and from northern France to NW Germany. In Fennoscandia it is distributed south of latitude 62° N. The main habitat is forest fens and other shaded small water bodies, often with peatmoss or sedges. In the Netherlands, it was classified as an acidobiontic species (Cuppen 1986).

In a seasonal pond in England, Carr (in press) recorded adults of *H. gyllenhalii* throughout the wet phase, and larvae chiefly in May and June. These data indicate a type 1 life cycle (Nilsson 1986c), i.e. univoltine with overwintering adults and larvae in late spring/early summer.

Comparison with other species

H. fuscipennis was included in the key given by Nilsson (1989). The larva of this species is very similar to those of *H. pubescens* (Gyll.), *H. glabrisculus* Aubé, *H. nigrita* (Fabr.), and some other species. The characters used for the identification of these larvae are not fully reliable because of intraspecific variation. In *H. fuscipennis*, the metatibial AV spines were absent on one of the legs in one of ten studied larvae. The protibial AD spine was absent on both legs in five, present on one leg only in three, and present on both legs in two larvae. As long as no better characters have been found, the best way to identify species is to collect long series of larvae together with adults, which should limit the number of possible species and show the variation.

The larva of *H. lapponum* is most similar to that of *H. arcticus* Thomson. It differs from this species chiefly in the broader head, and the lower number of AV spines on the metatibia. *H. lapponum* can be included in the Nilsson (1989) key if the second alternative of couplet 16 is changed to "U1/LAS 1.3 or more", and couplet 19 is rephrased as follows:

- 19 Larva small, HW about 0.7 mm. Nasale blunt, lateral notches hardly visible from above. Protibia only with a secondary PV spine *morio*
 — Larva large, HW 0.9–1.1 mm. Nasale narrower with lateral notches distinct. Protibia also with secondary AD and AV or PD spines 19a
 19a Head relatively broader, HL/HW 1.14–1.16. Protibia with a single secondary AV spine or not *lapponum*
 — Head relatively narrower, HL/HW 1.26–1.32. Protibia with 2–3 secondary AV spines *arcticus*

The larva of *H. gyllenhalii* is most similar to those of *H. tristis* (Payk.), *H. umbrosus* (Gyll.), and the species of the group *H. palustris* (L.). All these species have metatarsi with numerous secondary spines. In Nilsson's (1989) key *H. gyllenhalii* will run to couplet 23, where it can be inserted with the following addition to this couplet:

- 23 Protarsus with a single secondary D spine or not, and mesotarsus with at least a secondary D spine. Protibia with secondary AD spine(s) only. HL 1.08–1.13 mm, HW 0.84–0.93 mm .
 *gyllenhalii*
 — If protarsus without D spine, HW 0.73 mm or less, or mesotarsus without secondary spines. If protarsus with D spine, protibia with secondary PV spine(s), or HL 1.02 mm or less 23.

H. gyllenhalii larvae without the protarsal D spine are most similar to *H. tristis*, from which they differ chiefly in the larger size, and the presence of a mesotarsal D spine. Larvae with the protarsal D spine are almost identical with those of *H. incognitus* Sharp, but the head is slightly larger in *H. gyllenhalii*.

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