

## Remarks on the genus *Hydraena* and revision of the subgenus *Phothydraena* (Coleoptera : Hydraenidae)

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Keywords : Coleoptera, taxonomy

The elytral striations of species belonging to the main groups of *Hydraena s.l.* are compared and some taxonomic conclusions are drawn from this study. The homologies of the male abdominal sterna and of the different parts of the aedeagus are discussed. Subgeneric and specific characters are described and illustrated for the five species of the western Palearctic taxon *Phothydraena*.

Remarques sur le genre *Hydraena* et révision du sous-genre *Phothydraena* (Coleoptera : Hydraenidae)

Mots clés : Coleoptera, taxonomie.

L'auteur compare les striations élytrales d'espèces appartenant aux principaux groupes d'*Hydraena s.l.* et en tire certaines conclusions taxonomiques. Il discute des homologies des sternites abdominaux du mâle et des différentes parties de l'édéage. Il décrit et figure les caractères subgénériques et spécifiques des cinq espèces du sous-genre *Phothydraena*, propre à la région paléarctique occidentale.

### 1. — Limits of the genus *Hydraena*

The taxonomy of *Hydraena* has been modified in the last twenty years. Ieniștea (1968, 1978, 1982) elevated to the generic level all the subgenera of Rey (1886) and Kuwert (1888). Janssens (1972) erected the genus *Hydraenopsis* for tropical species and Perkins (1981) the genus *Spanglerina* for some American ones. None of these authors mention any good synapomorphic characters linking the species left in the genus *Hydraena* to the type-species *Hydraena riparia* Kugelann, 1794.

In two previous papers (Berthélemy & Terra 1977, 1980), I adopted Ieniștea's generic level for *Phothydraena* and *Haenydra*, which are both obviously monophyletic. But the taxa of the so-called « obligatory categories » (genus, family, order etc.) are so widely used by non-specialists that taxonomists should keep them as stable as possible, changing

them only for good theoretical reasons. Therefore I consider now that we should keep a wide monophyletic genus *Hydraena* as long as we have no good synapomorphies, not only for genera extracted from it, as *Haenydra*, but also for all the species remaining in the genus *Hydraena*. *Hydraena s.l.* is well characterized by the long and slender second article of its maxillary palpus and its procoxal cavities closed behind by the lateral expansions of the interprocoxal process (Perkins 1981, Fig. 148 C).

### 2. — Striation of the elytra

The number of striae, first used by Rey a century ago for subgeneric subdivision, has not been studied from a phylogenetic point of view.

Outgroup comparisons with other Hydraenidae (*Parhydraenida*, *Podaena*, *Homalaena*, *Orchymontia*, several *Ochthebius* etc.) as well as with more distantly related taxa (e.g. *Hydrochus*, *Helophorus*, *Berosus*, *Spercheus*, *Hydrous*... cf. Balfour-Browne 1958) show that the primitive number of distinct

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elytral series of punctures was low (d'Orchymont 1936 b). It was most likely ten, with, in several species, the addition of an accessory scutellar stria and an incomplete submarginal one. The punctures associated with the submarginal line of setae are best seen in immature adults. Tracheae can be seen within the intervals 3, 5, 7, 9 and 11. At the dorsal surface of the same intervals, lines of sensilla follow the courses of nerves. These intervals correspond to the nervures of the elytra and will be designated below by the letters a, b, c, d, e, from the suture to the outer edge.

**2.1. — Descriptions of the striations observed in some *Hydraena* s.l.**

**2.1.1. — *Haenydra* Rey, 1886.** Type-species: *Hydraena gracilis* Germar, 1824 - subsequent designation by Sainte-Claire Deville (1905); the later choice of *Hydraena lapidicola* Kiesenwetter, 1849 by A. d'Orchymont (1936 b) is invalid.

There are ten long striae (Fig. 1 - 2), the 6th somewhat irregular or even looking duplicated in the anterior third of the elytra, behind the humeral callus. Two punctures, at most, may be attributed to a very short scutellar stria. Submarginal stria incomplete, except in species with a broad margin such as *H. bicuspidata* Ganglbauer, 1901 or *H. polita* Kiesenwetter, 1849 (Fig. 3 - 4).

**2.1.2. — *Hadrenya* Rey, 1886.** Type-species: *Hydraena minutissima* Stephens, 1829 - subsequent designation by Sainte-Claire Deville (1905), sub nom. *H. atricapilla* Waterhouse, 1833.

The striation of *H. minutissima* is similar to that of *Haenydra* in the middle part of the elytra. In the narrow anterior part, the region where there is only one line of punctures, between the nervures c/d and d/e, is longer (Fig. 5). Scutellar stria of three or four punctures.

*H. pygmaea* Waterhouse, 1833 has several apotypic characters in common with *H. minutissima*: small size, cordiform pronotum, distal enlargement of the male meso- and metatibiae, narrow metasternal plaques, short parameres, same size and orientation of the two pairs of setae on the aedeagus (Berthélemy 1964, Fig. 16 and 18). Although these characters can be found individually in other species, their common occurrence suggests that *H. pygmaea* is the sister-species of *H. minutissima* and is a

*Hadrenya*, as proposed by Rey (1886). On the other hand, in *H. pygmaea*, there is only one stria between c and d, and additional punctures are unevenly distributed between the suture and nervure c (Fig. 8), perhaps in relation with the oval shape of the elytra. Whatever its phylogenetic position, *H. pygmaea* is an old species: although its hind wings are not longer than the metanotum and it is unable to fly, its range spreads from the British Isles, the Iberian Peninsula and Corsica to Armenia.

**2.1.3. — *Hydraena sharpi* Rey, 1886.**

Striation regular, only one line of punctures between c and d, three punctures in the scutellar stria (Fig. 6).

**2.1.4. — *Phothydraena* Kuwert, 1888.** Type-species by monotypy: *Hydraena testacea* Curtis, 1830.

Striae 2, 4 and 6 duplicated, only one stria between the nervures c and d (Fig. 14).

**2.1.5. — *Hydraena* s. str.**

Striation regular in the type-species, *H. riparia*, with striae 2, 3, 4, 5 and 6 duplicated, five punctures in the scutellar stria and some submarginal punctures (the elytron represented in Fig. 9 belongs to *H. brachymera* d'Orchymont, 1936 which is very closely related to *H. riparia*).

**2.1.6. — *Taenhydraena* Kuwert, 1888.** Type-species by monotypy: *Hydraena exarata* Kiesenwetter, 1865.

Same striation as in *H. riparia* but the intervals between the duplicated striae are slightly elevated (see the orientation of the setae in Fig. 10).

**2.1.7. — *Holcohydraena* Kuwert, 1888.** Type-species by monotypy: *Hydraena rugosa* Mulsant, 1844.

Punctuation more irregular but of the same type as that of the two preceding taxa, generally with a line missing between nervures a and c (Fig. 11). Submarginal stria well developed.

**2.1.8. — *Hoplydraena* Kuwert, 1888.** I designate *H. armipes* Rey, 1886 as the type-species of *Hoplydraena* (see d'Orchymont 1936 a for the numerous misidentifications of Kuwert).

Same duplications as in *H. riparia* (the elytron of *H. grandis* Reitter, 1885 represented in Fig. 12 is similar to that of *H. armipes*).

2.1.9. — *Hydraenopsis* Janssens, 1972.

I have not seen the type-species, *H. vietnamensis* Janssens, 1972, but several *H. quadricollis* Wollaston, 1864 (= *H. nilotica* Rey, 1886) labelled « *Hydraenopsis* » by Janssens himself in d'Orchymont's Collection (Institut Royal des Sciences Naturelles de Belgique). I have also studied *H. abyssinica* Regimbart, 1905 and unidentified species of the same group from a tributary of the Congo (= Zaire). All these species have the same duplications as *H. riparia* (Fig. 13).

## 2.2. — Discussion

The present study cannot solve all the problems of the phylogeny of *Hydraena* s.l. but may be a step toward this goal.

## 2.2.1. — Taxa without duplication of striae

It is not parsimonious to suppose that the regular striae of *Haenydra*, *H. minutissima* and *H. sharpi* were ever duplicated. In other words, their lineages were separated from that leading to *Phothydraena* or to *Hydraena* s. str. before any duplication, and I consider *Haenydra* and *Hadrenya* as valid subgenera. A third one should be erected for *H. sharpi*, whose external anatomy is very simple and whose aedeagus does not share synapomorphies with any other, but I shall not take this step now.

## 2.2.2. — Taxa with duplicated striae

The striation of *Phothydraena* is characteristic and this subgenus possesses several other synapomorphies (see below, part 4).

The only apotypic character proper to *Hydraena* s. str. is the duplication of striae 2,3,4,5 and 6. For the time being, this subgenus should contain all *Hydraena* with fifteen striae or with a striation deriving from this pattern (*Hydraena* s.str. + *Taenhydraena* + *Holcohydraena* + *Hoplydraena* + *Hydraenopsis*). *H. rugosa*, for example, has lost some punctures through a and c but it is related to *H. exarata* by the surelevation of the middle of the clypeus and the frons, by the shape of the pronotum, the lack of metasternal plaques, the very narrow intercoxal abdominal sternum and the structure of its aedeagus. I consider that « *Holcohydraena* » and « *Taenhydraena* » are mere synonyms of *Hydraena* s. str. and that both species constitute only a species-group within it. « *Hoplydraena* » includes large species

with prominent sexual characters on the male tibiae, probably as a result of positive allometry. Its synonymy with *Hydraena* s. str. has already been proposed by Ganglbauer (1901). « *Hydraenopsis* » was not recognized as a valid taxon by Perkins (1981). There are certainly differences between Gondwanian and Laurasian *Hydraena* but synapomorphies must be found for both before any taxonomic subdivision is made.

*Hydraena* (s.str.) *stussineri* Kuwert, 1890 (Fig. 15) is an example of a narrow species with reduced and irregular punctation. But its aedeagus shows that it is a member of the *rufipes*-group (*angulosa*-subgroup). In the same subgroup, *H. rigua* d'Orchymont, 1931 has fifteen striae.

2.2.3. — *Hydraena* with punctures indistinctly aligned and of dubious affinities

The following species were classified by A. d'Orchymont (1936 b, 1944) in a « Phylum *Hydraena* (s.str.) *pulchella*-pygmaea ». But as the characters of this group were considered by A. d'Orchymont himself as primitive, it has in fact no phylogenetic value. As an illustration of the difficulty of the problem, *H. pulchella* Germar, 1823 was put in *Haenydra* by Rey (1866), in *Hydraena* s.str. by A. d'Orchymont and in *Hadrenya* by Ienıştea (1978, 1982) and Pirisinu (1981).

A homogeneous *pulchella*-group may be based on the chaetotaxy of the aedeagus. It contains two subgroups, one with *H. pulchella*, *H. phassilyi* d'Orchymont, 1931, *H. ariana* Janssens, 1962, *H. çanakçioğlu* Janssens, 1965, *H. aydini* Janssens, 1968, and the other with *H. phallerata* d'Orchymont, 1944, *H. phillya* d'Orchymont, 1944, *H. byzantina* Janssens, 1965. But it is not yet possible to decide whether the irregular punctation of *H. pulchella* (Fig. 16) derives by reversion from the *Hydraena* s.str. type or by the addition of some punctures from a more primitive one. A detailed study of the striation and aedeagus of *H. attaleiae* Ferro, 1984 may show that the first hypothesis is more likely.

The Iberian *H. servilia* d'Orchymont, 1936 (Fig. 7) is another puzzling species, not closely related to *H. sharpi* as thought by A. d'Orchymont.

As long as the affinities of these species are not established on clear synapomorphies, it is better to designate them simply as *Hydraena* rather than to

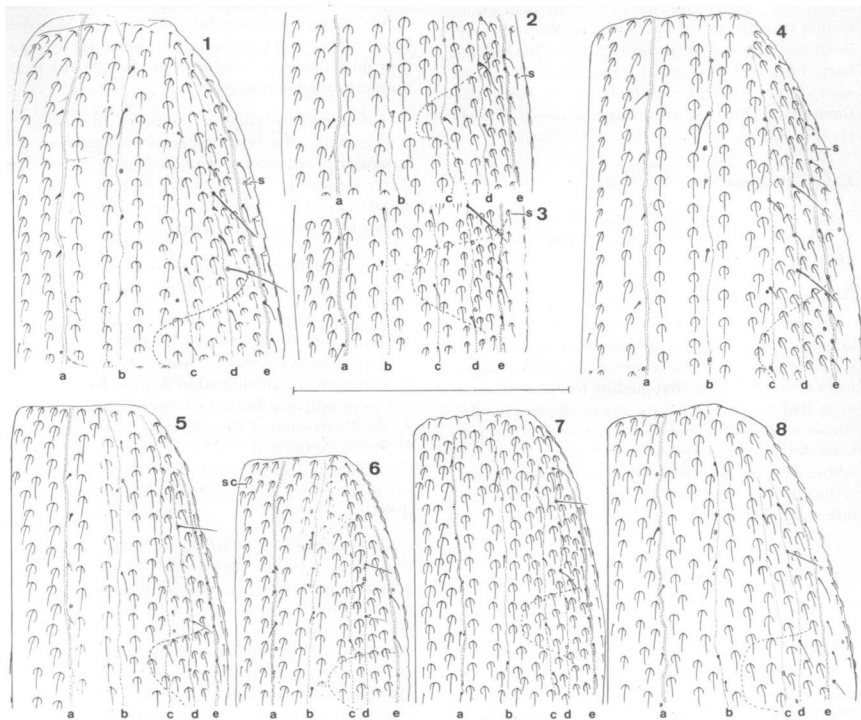


Fig. 1-8 : anterior or middle part of the right elytron of *Hydraena* s.l. 1, *H. (Haen.) truncata* Rey, 1885 ; 2, *H. (Haen.) gracilis* ; 3, *H. (Haen.) bicuspidata* ; 4, *H. (Haen.) polita* ; 5, *H. (Hadrenya) minutissima* ; 6, *H. sharpi* ; 7, *H. servilia* ; 8, *H. (Hadrenya ?) pygmaea* ; a, b, c, d, e, nervures of the elytron (see text) ; s, eleventh submarginal stria ; sc, scutellar accessory stria ; the dashed line circumscribes the patch of cuticular formations on the under-side ; scale bar : 0,5 mm.

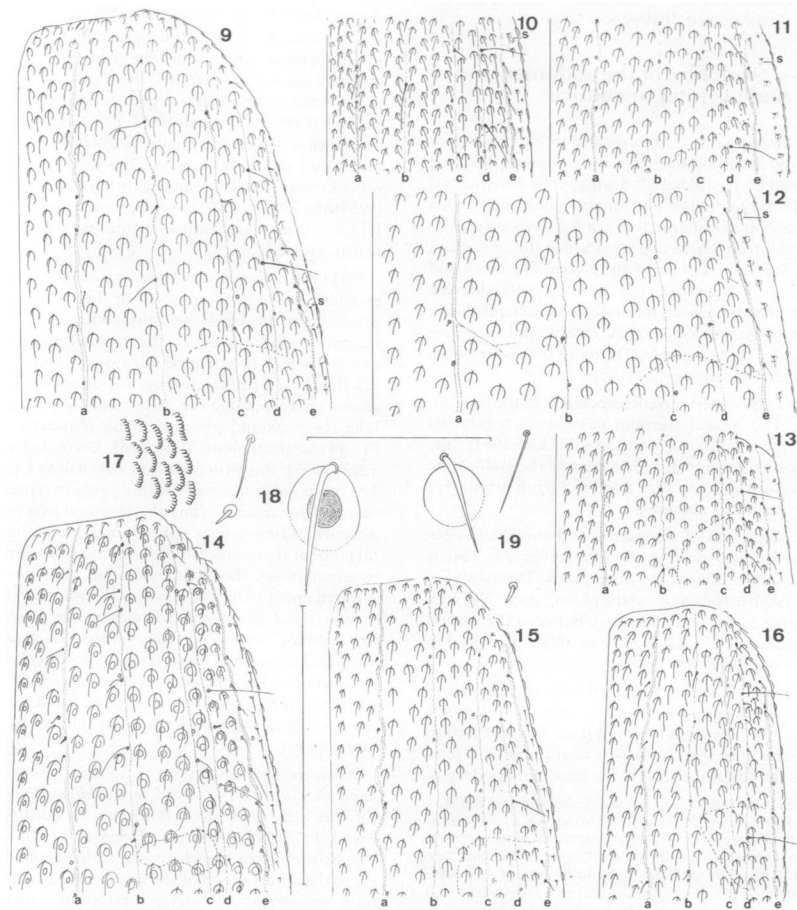


Fig. 9-16 : anterior or middle part of the right elytron of *Hydraena* s.l. (same abbreviations as in Fig. 1-8 ; vertical scale bar : 0,5 mm). 9, *H. (s. str.) brachymera* ; 10, *H. (s. str.) exarata* (« *Taenhydraena* ») ; 11, *H. (s. str.) rugosa* (« *Holcohydraena* ») ; 12, *H. (s. str.) grandis* (« *Hoplydraena* ») ; 13, *H. (s. str.) quadricollis* (« *Hydraenopsis* ») ; 14, *H. (Ph.) testacea* ; 15, *H. (s. str.) stussineri* ; 16, *H. pulchella*. — Fig. 17 : cuticular formations on the under-side of the elytron of *H. (Ph.) testacea* (horizontal scale bar : 50  $\mu$ m). — Fig. 18-19 a puncture and two sensilla of *H. (Ph.) testacea* (18) and *H. (s. str.) brachymera* (19) ; horizontal scale bar : 50  $\mu$ m.

use paraphyletic taxa. And it is one more reason to keep a wide genus *Hydraena* s.l..

### 3. — Structure of the abdomen and of the male genital armature

In *Hydraena* (s.str.) *riparia* and in *Phothydraena*, the first six abdominal terga are complete, thin, and covered by the folded hind wings. The seventh and eighth terga, longer and thicker, bear numerous microtrichia similar to those of the ventral respiratory plastron. These two terga are in direct contact with the inner surface of the elytra. The ninth and tenth terga, heavily sclerotized, may protrude from under the elytra when the abdomen is extended. The ninth tergum expands to the lateral and even ventral sides of the segment. The tenth is an operculum closing the genito-anal orifice.

There is no sternum corresponding to the first tergum. The second sternum possesses an external part, the « intercoxal sternum » (Perkins 1981), and, on both sides, constitutes a part of the wall of the metacoxal cavities. The third to eighth sterna are as wide as the abdomen.

The female ninth sternum is undivided in *H. riparia* and most Palearctic *Hydraena* (Fig. 23). This is a rare condition in the Coleoptera. The two very short styli each bear a bundle of long setae. The sternal area of the tenth segment, between the genital orifice and the anus, is very weakly sclerotized in some old females.

In males, the ninth tergum wraps around a small plate with a long anterior strut. These two elements constitute the ninth sternum (Fig. 20 and Balfour-Browne 1958, Fig. 77). A pair of retractor muscles joins the end of the strut to the base of the aedeagus.

In his excellent revision of the Hydraenidae of the Western Hemisphere, Perkins (1981) supposes that the anterior half of the strut is homologous to the ninth sternum, the posterior half and the plate belonging to the tenth sternum. I disagree with this hypothesis for the following reasons :

The plate is connected on both sides to the ninth tergum and is in exactly the same position as the female ninth sternum. In Coleoptera, as in most Pterygota, the genital cavity, in which lies the aedeagus, is an ectodermic invagination situated behind the ninth sternum, rather than behind the tenth. The small membrane attached to the strut, which may, according to Perkins, represent the vestiges of the intersegmental membrane between the ancestral ninth and tenth sterna, is a part of the wall of the genital cavity. Its

fixation to the strut limits the folding of this wall during the protrusion of the aedeagus (Fig. 20).

The aedeagus is formed by a heavily sclerotized proximal piece, which bears the parameres, and by a highly diversified terminal structure, the distal piece. According to A. d'Orchymont (1930), Balfour-Browne (1958) and Perkins (1981, Fig. 2 F), the proximal piece is homologous to the phallobasis (= basal piece) and the distal piece to the median lobe of other Coleoptera. But Jeannel (1940, 1955), Crowson (1955) and Zwick (1977) have suggested that the distal piece is an endophallus (= internal sac) permanently everted.

Perkins's observations allow the solution of this problem, but to a different result than his original conclusions. In American *Limnebius*, as in some Palearctic species, the endophallus is a typical internal duct which is extended during copulation (Fig. 21). But the « terminal process » of these *Limnebius* cannot correspond to the distal piece of *Hydraena*. Like the proximal piece of many *Hydraena* (Fig. 31 - 39 and Berthélemy 1964, 1965, Berthélemy and Terra 1977), this process bears two pairs of setae. The other setae inserted on this process represent vestigial parameres. Thus the terminal process of American *Limnebius* is not homologous to the distal piece of *Hydraena* but is the terminal part of the proximal piece. The Hydraenidae possess either an internal endophallus (*Limnebius*, *Gymnochthebius*) or a « distal piece » which cannot be retracted (*Hydraenida*, *Hydraena*, *Ochthebius*, *Meropathus* etc...) and these structures are homologous. Taking into account the presence of the parameres, the proximal piece is the phallobasis fused to the median lobe, a suggestion made but rejected by Perkins (op. cit. p. 18).

When the aedeagus is at rest in the abdomen, its concavity is dorsal or, often, on the left side (*Orchymontia* and Australian *Hydraena*, according to Zwick 1975, 1977, and most Palearctic *Hydraena*). The two retractor muscles connecting the phallobasis to the anterior end of the strut of the ninth sternum are contracted. During copulation, they relax and the two protractor muscles attaching the phallobasis to the ninth tergum contract (Fig. 20). The aedeagus extends and swings to the copulatory position (Perkins 1981). Its concavity is then in continuity with the abdominal sterna. I have seen several preserved specimens of *Hydraena* s.str., *H. (Hadrenya) minutissima*, *H. (Haenadra) emarginata* Rey, 1885

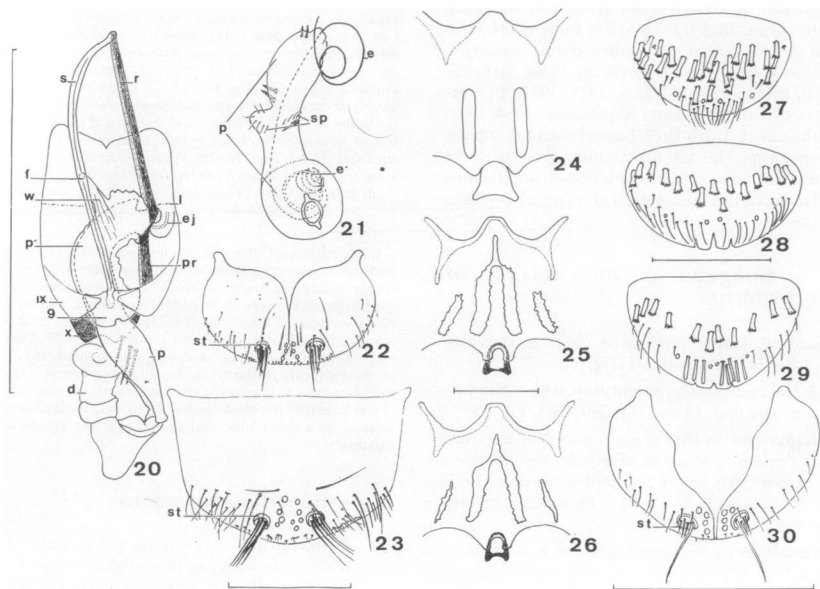


Fig. 20: ventral view of the ninth and tenth abdominal segments of *H. (Haenhydra) emarginata* Rey, 1885, with the aedeagus partially protruded (after a dissection); d, distal piece of the aedeagus; ej, ejaculatory duct entering the aedeagus; f, fixation point of the wall of the genital cavity to the strut; l, limit between the internal and the external parts of the 9th tergum; p and p', proximal piece of the aedeagus; pr, protractor muscles of the aedeagus; r, retractor muscles; s, strut of the 9th sternum; w, membranous wall of the genital cavity; 9, 9th sternum; IX, 9th encircling tergum; X, under-side of the 10th tergum; vertical scale bar: 1 mm. — Fig. 21: aedeagus of *Limnebius ozapalachiensis* Perkins, 1981, with the internal tube (endophallus, e and e') partially extended; p, structure homologous to the proximal piece of the *Hydraena* aedeagus; sp, setae of the vestigial parameres (after Perkins 1981, Fig. 75 D, slightly modified). — Fig. 22-23: 9th sternum of female *H. (s.str.) rugosa* (22) and *H. (s.str.) brachymera* (23); st, stylus, scale bar: 0,1 mm. — Fig. 24-26: metasternum and intercoxal abdominal sternum of *H. (s. str.) riparia* (24), *H. (Ph.) paganettii* (25) and *H. (Ph.) serricollis* (26); scale bar: 0,2 mm. — Fig. 27-29: 10th tergum of male *H. (Ph.) paganettii* (27), female *H. (Ph.) paganettii* (28) and female *H. (Ph.) atrata* (29); scale bar: 0,1 mm. — Fig. 30: 9th sternum of female *H. (Ph.) paganettii*; st, stylus; scale bar: 0,1 mm.

and *H. (Phothydraena) testacea* with the aedeagus in this position.

The rotation of the aedeagus, which is common in the Coleoptera, has led to two opposite conventions for the definition of the right and left sides of this organ. A. d'Orchymont (1930 and following publications), Jäch (1982 a, b) and Ferro (1984) have used the position at rest, with a dorsal concavity. Apfelbeck (1912, in d'Orchymont 1930), Hrbáček (1951), Pretner (1970), Zwick (1975, 1977), Perkins (1981), Ordish (1984) and I (Berthélemy 1964, 1965, Berthélemy & Terra 1977) have chosen the copulatory position. This last orientation agrees with the general recommendations of Lindroth and Palmén (in Tuxen 1970, Taxonomist's glossary of genitalia in Insects).

#### 4. — Subgeneric characters of *Phothydraena*

- a) Striae 2, 4 and 6 duplicated, only one stria between the nervures c and d (Fig. 14).
- b) Elytral punctures large and deep, with a membranous center (Fig. 18 and Binaghi 1965, Fig. 1b).
- c) Metasternal shining plaques joined by an inverted Y; presence of a pair of supplementary external plaques (Fig. 25 - 26 and Balfour-Browne 1958, Fig. 82, Binaghi 1965, Fig. II a, reproduced by Piri-sinu 1981).
- d) Female ninth sternum divided by a large membrane (Fig. 30).
- e) Insertion of the parameres ventral (Fig. 31 - 39 and Berthélemy 1965, Fig. 1 - 4).

Characters a to c are synapomorphic and justify the monophyly of *Phothydraena*. Character d is probably also a synapomorphy. The female ninth sternum is divided in most Coleoptera but not in other *Hydraena* s.l. (Fig. 23), except in *H. (s.str.) rugosa* in which there is a narrow and incomplete separation of two hemisterna (Fig. 22). I consider the structures of *Phothydraena* and *H. rugosa* as reversions, but more precise descriptions of the female ninth sternum in exotic genera are needed (the ninth sternum of the Palearctic *Ochthebius* and *Limnebius* sp. that I have studied is undivided).

The parameres are also inserted ventrally in the Ochthebiinae but not in the primitive hydraenid genera of New Zealand and South America

(Zwick 1975, Perkins 1981, Ordish 1984). In this case (character e), we need more informations on the intergeneric relationships of the Hydraenidae.

#### Other characters of *Phothydraena*

Posterior ridge of genae well developed. Pronotum with deep antero- and postero-external foveolae, and shallow antero- and postero-internal foveolae, more or less difficult to see according to the density of the punctures (Fig. 40 - 43). Prosternum with a median keel. Under-side of the elytra with a small patch of cuticular formations of a type common in insects (Fig. 14 and 17). In the middle of the length of the elytra, the margin forms a shelf perpendicular to the lateral side. Intercostal sternum of the abdomen longer than wide, with the posterior margin arcuate and the sides thicker (Fig. 25 - 26). Microtrichia of the plastron long, inserted at about 6  $\mu$ m from one another (instead of 3  $\mu$ m in *H. riparia* and 12  $\mu$ m in *H. quadricollis*, see Binaghi 1965 for the shape of the air bubble and the biology of *H. testacea*).

External sexual dimorphism limited to the last three abdominal segments. Females with an arcuate row of setae on the seventh sternum, a pair of long setae inserted at the hindmost corners of the ninth tergum and styli on the ninth sternum. Female tenth tergum with one or three small notches in the posterior margin (Fig. 28 - 29). Posterior margin of the male tenth tergum rounded (Fig. 27), at most slightly flattened in the middle, without a deep median recess as in most Palearctic *Hydraena*. Distal piece of the aedeagus poorly delimited from the proximal piece, formed by a short tube and probably a part of the left dilatation.

#### 5. — Specific characters

- 1 Posterior punctures along the elytral outer margin not larger or only slightly larger than the others (Fig. 52 and Binaghi 1965, Fig. I c).
- 2 Apical posterior punctures much larger than the others (Fig. 53 - 54) . . . . . 3
- 2 (1) Interspace between the metasternal plaques as wide as the plaques (Fig. 25); intervals between the punctures of the pronotal disc often narrower than the punctures (Fig. 44); setiferous denticles of the posterior margin of the elytra well developed (Fig. 48); parameres with two leaf-like setae and a subapical process bearing short stout spines (Fig. 31 - 33 and Binaghi 1965, Fig. III b); female tenth tergum with three notches and without stout submarginal setae (Fig. 28); 1.65 - 1.9 mm. *H. (Ph.) paganettii*
- 2' (1) Interspace between the metasternal plaques wider than the plaques (Fig. 26), as in the three following species; most intervals between the punctures of the pronotal disc wider than the

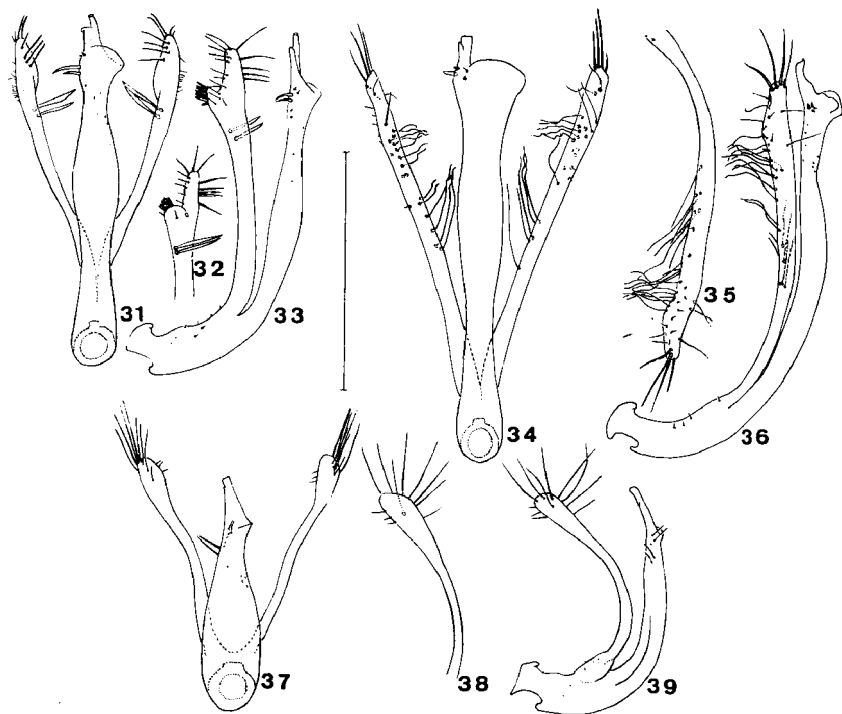


Fig. 31-39: aedeagi of *Hydraena* (*Phoehydraena*) topotypes; *H. (Ph.) paganettii* (31-33), *H. (Ph.) serricollis* (34-36) and *H. (Ph.) pallidula* (37-39); 31, 34, 37, dorsal aspect; 33, 36, 39, right lateral aspect; 32, inside aspect of the apex of the left paramere; 35, outside aspect of the left paramere; 38, inside aspect of the left paramere; scale bar: 0,2 mm.

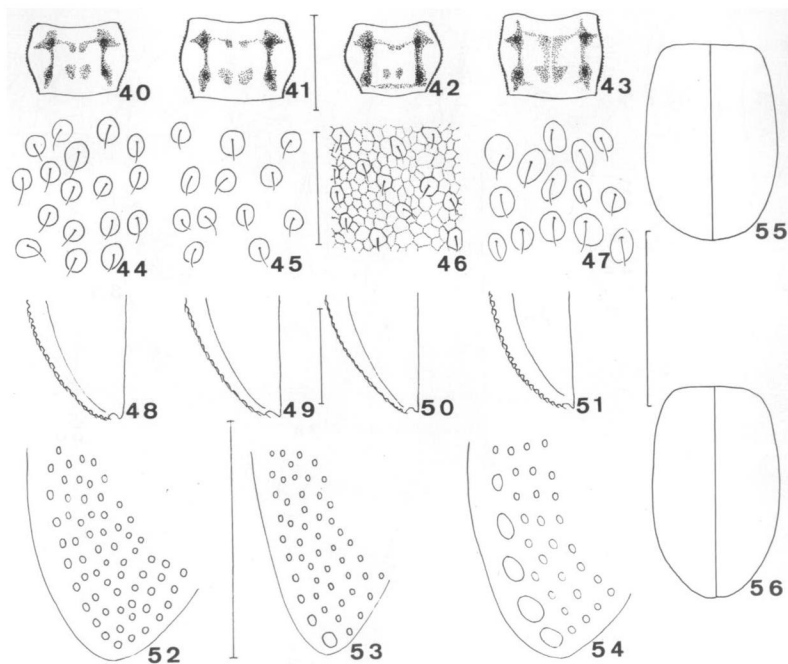


Fig. 40-43: pronota of *Hydraena (Phoehydraena) paganettii* (40), *serricollis* (41), *pallidula* (42) and *atrata* (43); scale bar: 0,5 mm. — Fig. 44-47: punctures of the pronotal disc of *H. (Ph.) paganettii* (44), *H. (Ph.) serricollis* (45), *H. (Ph.) pallidula* (46) and *H. (Ph.) atrata* (47); scale bar: 0,1 mm. — Fig. 48-51: under-side aspect of the apex of the right elytron of *H. (Ph.) paganettii* (48), *H. (Ph.) serricollis* (49); *H. (Ph.) pallidula* (50) and *H. (Ph.) atrata* (51); scale bar: 0,2 mm. — Fig. 52-54: lateral aspect of the apex of the left elytron of *H. (Ph.) paganettii* (52), *H. (Ph.) pallidula* (53) and *H. (Ph.) atrata* (54); scale bar: 0,5 mm. — Fig. 55-56: outlines of the elytra of *H. (Ph.) testacea* (55) and *H. (Ph.) atrata* (56); scale bar: 1 mm.

punctures (Fig. 45); setiferous denticles of the posterior margin of the elytra smaller (Fig. 49); apical half of the parameres with numerous setae (Fig. 34 - 36); posterior margin of the female tenth tergum with one notch and about 14 submarginal stout setae; 1.7 - 2.2 mm

..... *H. (Ph.) serricollis*

3(1') Width of the eyes in dorsal view only one-twelfth of the interocular space, instead of one-sixth in the four other species; pigmentation reduced; pronotum cordiform (Fig. 42); ratio: maximal width/width of the posterior margin, 1.37 instead of 1.2 to 1.3 in the other species); punctures of the pronotal disc small, separated by reticulations (Fig. 46); only two or three large apical punctures on the elytra (Fig. 53); elytral margin narrow near the suture (Fig. 50); mesosternal median keel short, not reaching the level of the anterior margins of the mesocoxal cavities; hind wings not longer than the elytra; supplementary external metasternal plaques small, sometimes not longer than wide; proximal piece of the aedeagus wide near the base, parameres long, with an enlarged and rounded apex bearing a few setae (Fig. 37 - 39); posterior margin of the female tenth tergum with one notch and without submarginal stout setae; 1.5 - 1.8 mm

..... *H. (Ph.) pallidula*

3(1') Normal eyes; stronger pigmentation, at least on the head and the pronotal disc; median dilatation of the pronotum slight (Fig. 43); ratio: width/length, 1.25 - 1.3, instead of 1.4 - 1.5 in the three other species); punctures of the pronotal disc separated by narrow shining intervals (Fig. 47); several large punctures along the outer margin of the elytra (Fig. 54 and Balfour-Browne 1958, Fig. 83, Binaghi 1965, Fig. 1a, reproduced by Pirisinu 1981); elytral margin wide near the suture (Fig. 51); median mesosternal keel prominent, reaching the level of the anterior margins of the mesocoxal cavities, as in *H. paganettii* and *H. serricollis* (Binaghi 1965, Fig. II a); hind wings fully developed, as in *H. paganettii* and *H. serricollis* .....

4(3') Elytra oval shaped (Fig. 56); parameres slightly asymmetric, each with an internal subapical brush of setae (Berthélemy 1965, Fig. 3 - 4); posterior margin of the female tenth tergum

with three notches and 7 - 12 stout submarginal setae (Fig. 29); 1.8 - 2.1 mm. *H. (Ph.) atrata* 4(3') Elytra more rounded (Fig. 55); proximal piece of the aedeagus short, generally leaf-like, bearing two curved setae; parameres with a base partly membranous and a characteristic chaetotaxy (Berthélemy 1965, Fig. 1 - 2 and Binaghi 1965, Fig. III a, reproduced by Pirisinu 1981); posterior margin of the female tenth tergum with one notch and setae not stouter than the lateral ones (as in Fig. 28);

1.8 - 2.2 mm ..... *H. (Ph.) testacea*

The distribution of the specific characters is not congruent and homoplasy precludes the construction of a coherent cladogram.

## 6. — Species list and distributions

*Phothydraena* is a typical Palearctic taxon.

**H. (Ph.) testacea** Curtis, 1830

Terra typica: Great Britain.

From western Europe (British Isles, France, Iberian Peninsula) to Rumania (see Ieniștea 1978); western Mediterranean islands (Majorca, Sardinia, Corsica, Capraia, Elba); N.W. Africa from Morocco to Tunisia.

The specimens from southern Spain and N.W. Africa are more heavily pigmented. Their parameres and the proximal piece of their aedeagus are more narrow than in specimens from northern Spain and France. In some localities (Sierra de Segura, Spain; Ceuta, Morocco), the curved setae of the proximal piece are shorter. Much more material would be needed to decide whether these intraspecific variations are clinal or whether subspecies may be distinguished within *H. testacea*.

**H. (Ph.) serricollis** Wollaston, 1864; loc. typ.: Agua Garcia (Tenerife, Wollaston leg.)

*H. (Ph.) sinuaticollis* Wollaston, 1864; loc. typ.: Ycod el Alto (Tenerife, Crotch leg.); synonym. fide Wollaston (1865)

*H. serricollis* - Gemminger and de Harold (1868), de Marseul (1871, 1882)

*H. sinuaticollis* - Knisch (1924), Winkler (1925), d'Orchymont (1940).

The inversion of the synonymy by the last three authors is invalid as Wollaston acted in 1865 as the « first reviser » of his own previous work (I.C.Z.N., art. 24).

Types in the British Museum (Natural History), one male paratype in the Coll. Peyerimhoff (Muséum National d'Histoire Naturelle de Paris).

*H. serricollis* has been collected in two of the Canaries, Tenerife and la Gomera (Wollaston 1865, d'Orchymont 1940).

**H. (Ph.) atrata** Desbrocher des Loges, 1891

*H. testacea* « variété noire » Rey (1886)

Loc. typ. : Saint-Raphaël (Var, France).

Type : a male in the Coll. Rey (Musée Guimet d'Histoire Naturelle, Lyon).

Central and southern France, northern and central Spain (Valladares leg. and Coll. Instituto Español de Entomología, Madrid) ; Algiers (Coll. Bedel, M.N.H.N., Paris). The actual range is probably continuous. *H. atrata* was confused with *H. testacea* until 1965.

**H. (Ph.) paganetti** Ganglbauer, 1901

nec *H. paganetti* sensu Berthélemy (1965) ; this mistake was corrected in the same year by Binaghi.

Loc. typ. Černovice (= Czernowitz, in Moravia, R. Formanek leg.).

Czechoslovakia, Austria, Hungary, northern halves of Italy (to Molise) and of the Balkan Peninsula (to Crna Gora = Montenegro) ; Talish Mts (Azerbaijan).

**H. (Ph.) pallidula** Sainte-Claire Deville, 1909

Loc. typ. : Ain (= spring) Takrarat, in the Mouzaïa Mts, (near Blida, Algeria, Peyerimhoff leg.).

I have designated a lectotype (female) in the Coll. Sainte-Claire Deville (M.N.H.N., Paris) ; paralectotypes : a female in the same Coll., another female in the Coll. A. d'Orchymont (Institut Royal des Sciences Naturelles de Belgique).

Other specimens : nine females in the Coll. Sainte-Claire Deville and Peyerimhoff (M.N.H.N., Paris) ; one male (Coll. Pic, M.N.H.N., Paris).

*H. pallidula* is presently known only from the typelocality. The sex-ratio is unusual for *Hydraena s.l.* collected in their normal habitat. The reduction of the eyes and of the pigmentation suggests that it lives inside the sediment (Sainte-Claire Deville 1909).

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