

Phenetic and ecological relationships between species of the subgenus *Hercostomus* (*Gymnopternus*) in western Europe with the description of two new species (Diptera: Dolichopodidae)

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Abstract. As revised here, the subgenus *Gymnopternus* Loew of the genus *Hercostomus* (Diptera: Dolichopodidae) comprises nine western European species. *H. aerosus*, *H. metallicus* and *H. assimilis* are re-described, and *H. silvestris* and *H. blankaartensis* are described as new. Keys to males and females are given which include all western European species of this subgenus. A phenogram based on twenty-seven morphological attributes is compared with cluster analyses based on the habitat preferences and seasonal activity patterns. The results are discussed in the light of the niche separation versus coexistence principles.

Introduction

Species of the genus *Hercostomus* Loew, 1857 (Dolichopodidae, Diptera) reach their highest diversity in the Palaearctic and Nearctic regions. Stackelberg (1933, 1934) mentions ninety-one species for the former, whereas Foote *et al.* (1965) lists eighty species for the latter region. Since the publication of these synopses, separate descriptions by several authors resulted in an additional thirty-one and seventeen species for the Palaearctic and Nearctic region respectively. A much smaller number of species is known from the Oriental region (forty-five species, including the Palaearctic species *H. chetifer* (Walker, 1849; Dyte, 1975)) and the Afrotropical region (twenty-four species; Dyte & Smith, 1980), whereas thus far only five *Hercostomus* species are reported from the Neotropical region (Robinson, 1970). Finally, four species are recorded from the Australasian region, all of which are found in New Zealand (Parent, 1933).

In North America, most authors generally treat *Gymnopternus* as a full genus quite different from *Hercostomus* (e.g. Curran, 1933;

Robinson, 1964; Corpus, 1986). European investigators, on the contrary, mostly lump these genera together under *Hercostomus* (e.g. Stackelberg, 1933, 1934; Parent, 1938; d'Assis Fonseca, 1978). However, the *Gymnopternus* species investigated here seem to be clearly monophyletic as opposed to the species belonging to the nominal subgenus.

Species of the subgenus *Gymnopternus* Loew all show a very similar habitus, mostly without conspicuous ornaments on legs and antennae and with rather simple genital lamellae (=cerci) in the males. Robinson (1964) reports that these characteristics occur in Nearctic species of this subgenus too. Another, though less conspicuous, characteristic of *Gymnopternus* is the presence of a group of fine hairs on the metapleura, just in front of each posterior spiracle (Curran, 1933). Among the western European species of this subgenus, *H. cupreus* (Fallén, 1823) and *H. angustifrons* (Staeger, 1842) are easily distinguished by the presence of mainly dark legs. *H. celer* (Meigen, 1824) and *H. brevicornis* (Staeger, 1842), on the other hand, are recognized by the swollen basal part of the costal vein in the wings. The remaining species, *H. aerosus* (Fallén, 1823), *H. metallicus* (Stannius, 1831) and *H. assimilis* (Staeger, 1842),

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are very alike, especially the females. Consequently, females are sometimes hard to identify correctly. Moreover, while sorting material from different sites in Belgium, some new species were discovered which are closely related to *H. assimilis*. In this paper, *Hercostomus assimilis*, *H. aerosus* and *H. metallicus* are redescribed and *H. silvestris* and *H. blankaartensis* are described as new species. Additionally, a key is included for all nine western European species of the subgenus *Gymnopternus*.

Material and Methods

Concerning the investigated species, as many samples as possible were checked for the presence of one or more of these species. From the largest samples, a holotype and paratypes for each of *H. silvestris* and *H. blankaartensis* were selected. The constancy of the specific characteristics were checked in a large number of specimens (if possible, $n = 30$).

For each species (*H. assimilis*, *H. aerosus*, *H. metallicus*, *H. silvestris* and *H. blankaartensis*), drawings were made of the wing, the general habitus of the hypopygium and some of its important diagnostic structures (the genital lamella (=cercus), the telomere (TM) and the caudal appendage of the basimere (CAB) (terminology as in Ulrich, 1974)). Moreover, several measurements were taken concerning the wing and the wing venation. Some of these features are used in keys to distinguish *H. metallicus*, *H. aerosus* and *H. assimilis* and consequently I thought they might be of diagnostic value for the identification of the other species too. Samples of *H. assimilis* collected at several sites were investigated in that way to give an idea of the spatial variability of the indices.

In order to have a general view of the distribution of the newly described and redescribed species in Europe, many scientists were asked for their cooperation (see Acknowledgments). In this way, data from eleven countries were available which enabled us to present an updated distribution pattern of *H. aerosus*, *H. metallicus*, *H. assimilis*, *H. silvestris* and *H. blankaartensis*.

Finally, since the species belonging to this species-group seem to be very closely related, at least morphologically, the interspecific relationship was only phenetically investigated.

Subsequently, the results of this analysis were compared with between-species similarities based on habitat preferences and seasonal activities (see further).

Collector and collection abbreviations

BRC: private collection of Dr C. Brunel, France; BRU: pr. coll. of Dr J. Brunhes, France; CAS: Czechoslovakian Academy of Sciences, Czechoslovakia; CRO: pr. coll. of Mr R. Crossley; HNHM: Hungarian Natural History Museum, Budapest, Hungary; KBIN: Koninklijk Belgisch Instituut voor Natuurwetenschappen, Brussels, Belgium; MEU: pr. coll. of Mr H. Meuffels, The Netherlands; MHNP: Musée de l'Histoire Naturelle de Paris, France; NRS: Naturhistoriska Riksmuseet, Stockholm, Sweden; OLE: pr. coll. of Dr J. Olejnick, Czechoslovakia; POL: pr. coll. of the author; RBB: Research Branch, Bray, Ireland; SPE: pr. coll. of Dr M. Speight, Ireland; SUG: State University, Ghent, Belgium; UC: Université de Clermont-Fd II, France; UP: Université de Picardie, France; VER: pr. coll. of Mr C. Verbeke, Belgium; ZMB: Zoologisches Museum Berlin, DDR; ZMK: Zoologisk Museum Kobenhavn, Denmark.

Sampling device abbreviations. MT: Malaise traps, WT: water traps, PT: pitfall traps, SW: sweepnet.

Genus *Hercostomus* Loew, 1857

Subgenus *Gymnopternus* Loew, 1857

Type species of subgenus *Dolichopus cupreus* (Fallén, 1823) subsequent designation by Coquillett, 1910: 548.

Subgeneric diagnosis. The nine western European species of this subgenus have the following characters in common.

Head. Face mostly silvery to greyish white (except for males of *H. aerosus*). Epistoma sparsely to densely pubescent; clypeus pubescent or bare. Frons metallic green to bronze, mostly heavily dusted with grey. Eyes pubescent. Palpi brownish black with dark pubescence and a single dark apical bristle. All postoccipital setae dark. About 4–5 pairs of postocellar bristles present. Antennae black, first and second segments pubescent on dorsal surface; third segment mostly obtuse to slightly acute and about as long as deep. Arista strictly

dorsal, inserted about middle of third antennal segment; arisal pubescence highly variable between species.

Thorax variable in colour, shining green to bronze on dorsum, pleurae heavily dusted with grey. Propleura with pale or dark pubescence and one black prothoracal bristle. Metapleura with a group of 6–10 mostly black setulae (mostly pale in *H. celer*) in front of the posterior spiracle. Remaining part of metapleura entirely bare. Acrostichals well developed, strictly biserial and extending to the posterior margin of the thorax. Six pairs of dorsocentrals present, the fifth pair situated somewhat more towards the middle of the mesonotum. From this fifth pair to the posterior margin of the scutum, a pubescence is formed by acrostichal-sized bristles. Scutellum with dense black pubescence on dorsum and black marginal fringe.

Wings mostly brown (except for *H. aerosus*), distal and postical vein mostly parallel, only rarely somewhat converging (in *H. assimilis*). Squamal fringe black. Halteres pale.

Legs. Coloration of coxa I very diverse, varying from mainly yellow to entirely dark. All coxal bristles and hairs black. Coxae II and III mainly dark, except for apical fourth to third. Coxa III with a large erect black bristle at about middle and sometimes with an additional smaller bristle near apex laterally. Femora variable in colour, from mainly yellow, sometimes with a distinct dorsal darkening, to almost entirely black except for the knees. Femora II and III each with one preapical bristle. Tibiae yellow to pale yellow. Tibia I with 2 dorsal bristles; 1 erect anterodorsal bristle, followed by a row of short strong black spines; no ventral bristles present; elongate area with short pale pubescence on apical half of anteroventral side. Tibia II with 1 anteroventral (except for *H. cupreus*), 3 anterodorsal and 2 posterodorsal black bristles; 1 small and 4 strong apical bristles. Tibia III with 3 anterodorsal, 3 posterodorsal and 1 dorsal subapical black bristle; anterodorsal bristles on apical third followed by a row of small dark strong spines; ventrally with 1–3 bristles somewhat larger than remaining pubescence. Tarsal coloration variable between species, from almost entirely yellow with slight infuscation of segments 2–5 to completely dark except for proximal part of metatarsus.

Abdomen metallic green to bronze, pleura

from the stigmata downwards heavily dusted with grey. All bristles and hairs black. Hypopygium (in males): general habitus varying from stout to slender; aedeagus sheet straight and caudal appendage of the basimere ('lobus ventralis' of Stackelberg, 1930; Buchmann, 1961) slender; cerci small to relatively large, ovoid to more or less quadrate-shaped with strong bristles at the margins.

Previously, the main diagnostic characters used to distinguish the subgenera *Gymnopternus* and *Hercostomus* were the non-convergence of the cubital and discal veins and the presence of a group of small hairs above the hind coxa in front of the posterior spiracle in *Gymnopternus* (Curran, 1933; Robinson, 1964). Contrary to these authors, I consider these criteria insufficient and suggest that a larger set of features should be involved in defining these subgenera. On the basis of the two previously mentioned characters only, *H. (Hercostomus) chalybeus* (Wiedemann, 1817) might indeed be classified as *H. (Gymnopternus)*, as was suggested by Collin (1940). On the basis of a thorough diagnosis of this species, however, I conclude it belonging to the subgenus *Hercostomus*. In the first place, *H. (H.) chalybeus* appears to be intermediate for the two diagnostic features mentioned above: the cubital and discal veins are parallel along most of their length but show a distinct convergence just before the wing apex. Besides the group of small hairs, seemingly characteristic for the subgenus *Gymnopternus*, a large part of the metapleura has a short black pubescence. Moreover, apart from these attributes and a different general habitus, *H. (H.) chalybeus* differs from the other species by the following morphological characters (coloration is not taken into account). Bare epistoma, clypeus distinctly protruding. Acrostichals only reaching the level of the fifth pair of dorsocentral bristles; no supplementary pubescent area present on pronotum. Scutellum bare with a conspicuous marginal fringe of large bristle-like hairs. Coxa II with a large erect bristle laterally. Tibia I with 2 erect anterodorsals and 1 posteroventral; anterodorsal row of small black spines and anteroventral elongate area with pale pubescence absent. Tibia II with 2 anteroventrals. Tibia III with 5–6 anterodorsal, 4 posterodorsal and 4 ventral bristles. Wing: proximal section of postical vein more than 2.5 times as long as apical section.

Hypopygium: CAB with enlarged apex, not slender; cerci very large, *Dolichopus*-like, pale with black margins.

Key to the Western European species of the subgenus *Hercostomus* (*Gymnopternus*)

Males

1. Femora mainly dark, at most yellow on extreme apex 2
 - Femora mainly yellow, at most infuscated on posterodorsal side 3
2. Middle tibia swollen, somewhat curved and armed ventrally with 3–4 short spine-like bristles which arise from small tubercles. Ventral side of middle tibia without pubescence. Costa of wing conspicuously thickened beyond end of subcostal vein. Hind tibia completely yellow. Larger species, total wing length more than 3.5 mm *cupreus*
 - Middle tibia simple, bearing normal pubescence and 1 anteroventral bristle. Costa not thickened as above. Hind tibia distinctly infuscated on apex. Smaller species, total wing length less than 3.5 mm *angustifrons*
3. Wing with costa strongly thickened between humeral crossvein and tip of subcostal vein (in *H. silvestris* this section is sometimes slightly thickened) 4
 - Above section of costa not thickened, distinctly thinner than next section 5
4. Genital lamella yellow. Hind metatarsus yellow on proximal half. Hind tibia mostly entirely yellow, at most slightly infuscated on apical fifth *celer*
 - Genital lamella brownish black. Hind metatarsus mostly entirely dark. Hind tibia slightly to distinctly infuscated on apical fifth *brevicornis*
5. Face velvet-black. Clypeus with short black pubescence. Wings clear. Hypopygium: genital lamellae distinctly black, well developed *aerosus*
 - Face silvery white. Clypeus entirely bare. Wings distinctly dark. Hypopygium: genital lamellae either brownish black or yellow 6
6. Proximal section of postical vein more than twice as long as apical section measured from outer crossvein. Proximal section of discal vein slightly longer than apical section measured as above. Hypopygium: genital lamellae well-developed, somewhat round, piceous except for ochreous yellow base. Larger species, total wing length on average more than 4 mm *metallicus*

- Proximal section of postical vein less than twice as long as apical section. Proximal section of discal vein somewhat shorter than apical section. Hypopygium: genital lamellae rather small. Smaller species, total wing length on average less than 4 mm 7
- 7. Hypopygium: genital lamellae ochreous yellow, quadrat. Front coxa mostly yellow, especially on lateral side. Femora and tibiae entirely yellow, tarsi only feebly infuscated *blankaartensis*
 - Hypopygium: genital lamellae mainly to largely dark. Front coxa mostly dark. Either femora or tibiae at least partly infuscated 8
- 8. Front and hind femora distinctly infuscated at least on posterodorsal side. Hind tibiae entirely yellow. Hypopygium remarkably stout. Genital lamellae small, ellipsoid, piceous with pale base *silvestris*
 - All femora pale yellow. Hind tibiae slightly to distinctly infuscated on apical fourth to third. Hypopygium moderately slender. Genital lamellae well developed, quadrat, black *assimilis*

Females

1. Femora mainly dark, at most yellow at extreme apex 2
 - Femora mainly yellow, at most infuscated posterodorsally 3
2. Clypeus bare. Middle tibia with several anteroventral bristles. Face about twice as wide as third antennal segment. Hind tibia mostly entirely yellow. Larger species, total wing length more than 3.5 mm *cupreus*
 - Clypeus pubescent. Middle tibia with only one anteroventral bristle. Face distinctly smaller. Hind tibia distinctly infuscated on apex. Smaller species, total wing length distinctly less than 3.5 mm *angustifrons*
3. Costa of wing with a distinct, even if only slight, thickening between humeral crossvein and end of subcostal vein, at thickest part at least as thick as next section of costa (in some specimens of *H. silvestris*, the costa is also slightly thickened) 4
 - Costa without the above thickening, this section distinctly and uniformly thinner than next section 5
4. Epistoma with long pale pubescence. Clypeus with short rather dark pubescence. Third antennal segment mostly slightly acute. Front coxa mainly

- dark, mostly yellow on apical half to third. Femur I entirely yellow, rarely slightly infuscated dorsally. Hind tibia at most slightly infuscated on apical fifth. Hind metatarsus yellow at least on proximal half. Parameres pale brown with white tip *celer*
- Epistoma with long dark pubescence. Clypeus with short dark pubescence. Third antennal segment mostly obtuse. Front coxa mainly dark, mostly yellow only on extreme apex. Femur I yellow, distinctly infuscated posterodorsally along whole length. Hind tibia mostly slightly to distinctly infuscated on apical fifth. Hind metatarsus mostly completely dark (when yellow, still darker than proximal part of tibia). Parameres black with white tip *brevicornis*
5. Clypeus with conspicuous pubescence 6
- Clypeus entirely bare 7
6. Front and hind femora distinctly infuscated at least posterodorsally. Wings clear. Proximal section of postical vein less than twice as long as apical section. Proximal section of discal vein somewhat shorter than apical section. Smaller species, total wing length on average about 3 mm *aerosus*
- All femora entirely pale yellow. Wings clearly dark. Proximal section of postical vein more than twice as long as apical section. Proximal section of discal vein slightly longer than apical section. Larger species, total wing length on average more than 4 mm *metallicus*
7. Front and hind femora distinctly infuscated at least on posterodorsal side. Wings distinctly infuscated *silvestris*
- All femora entirely pale yellow. Wings more slightly infuscated 8
8. Hind tibiae distinctly infuscated on apical third to fourth. Front and middle tarsi distinctly infuscated from apex of metatarsi onwards. Hind metatarsus darker than proximal half of hind tibia. Front coxae mostly dark *assimilis*
- Hind tibiae and metatarsi entirely yellow. Front and middle tarsi only feebly infuscated. Front coxae largely yellow, in particular on lateral side *blankaartensis*

Discussion. When using the key for the females presented above, a few problems might become apparent especially when identifying poorly preserved specimens. Therefore, we briefly discuss here the most important diagnostic characters in these cases. In *H. metallicus* and *H. silvestris*, the clypeus is more protruding

compared to the other species. The third antennal segment is obtuse in *H. blankaartensis* and *H. assimilis*, quadrat in *H. metallicus* and *H. silvestris* and acute in *H. aerosus*. In *H. metallicus*, this segment is particularly similar to those found in *Hydrophorus* species. Females of *H. metallicus* sometimes lose the pubescence on the clypeus, which might cause problems in distinguishing them from *H. blankaartensis*. Nevertheless, the following characters in the first species will solve the problem: (i) the total wing length mostly outreaches 4 mm, (ii) the front coxa is mainly dark, at least laterally, (iii) tarsal segments, in particular tarsus III, are clearly infuscated, and (iv) there are different ratios in the wing venation (Table 1). The same problem might occur with *H. aerosus*, which, in that state, closely resembles *H. silvestris*. The former species can, however, be distinguished by its clear wings and the abrupt infuscation of the hind metatarsus. Finally, few females of *H. assimilis* show a very feebly infuscation on the hind tibia, which makes them very similar to *H. blankaartensis*. Useful diagnostic features for the identification of the former species are (i) total wing length on average smaller than 3.5 mm, (ii) tarsal segments more strongly infuscated, and (iii) frons more heavily dusted with grey.

Hercostomus (Gymnopternus) aerosus (Fallén) (Fig. 1)

Dolichopus aerosus Fallén, 1823: 98

Gymnopternus dahlbomi Zetterstedt, 1843: 573
syn.n.

Gymnopternus aerosus Verrall, 1905: 53

Diagnosis. Male. Face velvet-black, epistoma and clypeus pubescent. Femora yellow, at least front and hind femora infuscated dorsally. Wings clear. Hypopygium moderately slender. Genital lamellae distinctly black, well developed. Female. Face greyish white, epistoma and clypeus with dark conspicuous pubescence; coloration of femora and wings as in the male.

Description

Male. Head. Face velvet-black with somewhat paler central furrow which extends upon clypeus. Epistoma and clypeus with dark pubescence; pubescence on clypeus more dense

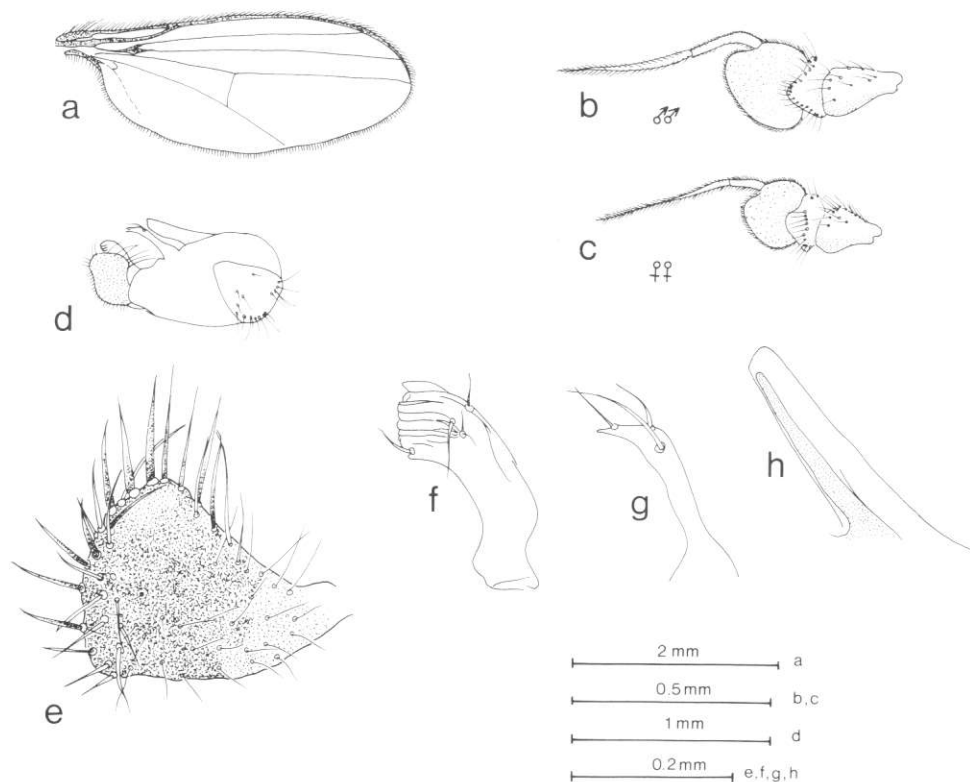


Fig. 1(a–h). Diagnostic characters of *Hercostomus* (*Gymnopternus*) *aerosus*. a, wing; b, antenna of male; c, antenna of female; d, general habitus of hypopygium; e–h, more detailed parts of hypopygium; e, cercus (genital lamella); f, telomer (TM); g, caudal appendage of basimer (CAB); h, aedeagus sheath.

and therefore conspicuous. Face about as wide as third antennal segment. Palpi rather small, dark brown with short black pubescence and each with a dark apical spine. About 4 pairs of postocellar bristles present. All postoccipital bristles black. Antenna entirely black. Third antennal segment (Fig. 1b) remarkably large, distinctly obtuse, clearly longer than deep. Arista with short pubescence, inserted at about middle of third antennal segment. Thorax metallic bronze, pleura dusted with grey. Six pairs of dorso-centrals present, bristles of fifth pair situated somewhat more towards centre of pronotum. Acrostichals biserial until hind border of mesonotum, from about level of fifth pair of dorsocentrals onwards forming a dense pubescence of dark bristles. Scutellum with short dark pubescence on dorsum and 2 large black bristles and fringe of short dark hairs on hind margin. Propleura with short black

pubescence. One black prothoracical bristle present. Squamal fringe black, halteres pale. Wings (Fig. 1a) clear, total length on average 3.4 mm; proximal part of discal vein on average not longer than apical part; proximal part of postical vein on average less than twice as long as apical part (see Table 1).

Legs. Coxa I mainly dark, yellow at most on apical fifth; all hairs and bristles black. Coxa II dark with less than apical third yellow anteriorly; black hairs and bristles on anterior side. Coxa III dark except for apical third on anterior and lateral side pale yellow; lateral side with one large black bristle at about middle and a small black bristle near the apex in addition to short black pubescence. Femur I yellow, slightly to largely infuscated, at least posterodorsally. Femur II yellow with one black preapical bristle. Femur III yellow, mostly largely infuscated dorsally; with 1 black preapical bristle. All tibiae

pale yellow. Tibia I with two dorsal and one anterodorsal black bristles, the latter followed at about proximal fourth by a row of short strong black spines; without ventral bristles. Tibia II with 1 anteroventral, 3 anterodorsal and 2 posterodorsal black bristles; 4 large and 1 small black apical bristles. Tibia III with 3 posterodorsal, 3 anterodorsal and 1 dorsal black bristles; at less than apical half of tibia posterodorsal bristles followed by a row of small strong black spines; on ventral side, 1–3 ventral bristles distinctly longer than remaining bristles. Tarsus I pale yellow, from apical third of metatarsus onwards slightly but distinctly infuscated. Tarsus II dark except for basal four-fifths of metatarsus and basal third of second segment. Tarsus III dark except for proximal half to two-thirds of metatarsus and sometimes basal third of second segment. Abdomen metallic bronze, from stigmata downwards dusted with grey. Hypopygium (Fig. 1d–h) moderately slender, brownish black except for piceous ventral appendages. Genital lamella rather large, completely black, broadly triangular with large ventral black bristles, distinctly stronger than caudal ones. Aedeagus sheet rather short, brown and blunt tipped. CAB piceous with white base, remarkably slender with pointed tip, broadest at about middle seta; setae separated by equal distances. TM large, brownish black with many ridges and 4 setae.

Female. The same as male except for the following characters. Head. Face silvery white, not as wide as twice the third antennal segment. Epistoma with sparse and clypeus with dense conspicuous dark pubescence. Epistoma about 3 times as high as clypeus, showing a central longitudinal furrow on basal half. Frons bronze, heavily dusted with grey. Postocellar bristles numbering 4 or 5 pairs. Third antennal segment (Fig. 1c) somewhat acute, about as long as deep. Arista with long pubescence. Legs. Coxa I mostly entirely dark except for extreme apex, sometimes yellow to a larger extent anteriorly. Tibia III in general with 2 ventral bristles in addition to other rather erect bristles. Tarsus I pale yellow, from apical fourth onwards distinctly infuscated. Tarsus II dark except for proximal four-fifth of metatarsus. Tarsus III dark except for proximal two-thirds of metatarsus.

Initially, *H. (Glymnopternus) dahlbomi* was generally considered (Verrall, 1905; Kertész, 1909) as a variety of *H. aerosus*. More recently, most authors regarded it a synonym of *H. aerosus* (Stackelberg, 1933; Parent, 1938). In distinguishing two forms, Verrall (1905) mentioned the distinctly obscured femora (especially the front pair) and the somewhat larger size of var. *dahlbomi*. It seems to occur mainly in northern Europe and is the most common form of this species in Scotland. The examination of a fine series of Scottish specimens (a loan from Dr I. MacGowan, Scotland) revealed no significant morphological differences between the two forms. The front femora are indeed clearly infuscated, but this has been found in lowland specimens from Belgium also. Moreover, the Scottish specimens proved to be not distinctly larger than the typical *H. (G.) aerosus*. Consequently, it can be concluded that *H. (G.) dahlbomi* must indeed be considered as a synonym of *H. (G.) aerosus*, which is thus in agreement with the statements of Stackelberg (1933) and Parent (1938).

Distribution. This species seems to be common all over Europe (Finland, Sweden, Poland, Denmark, Germany, Czechoslovakia, Romania, Hungary, Great Britain, Ireland, The Netherlands, Belgium, France, Italy, European Russia), Caucasia, eastern Siberia. Dyte (1975) mentioned this species from Formosa. However, this author overlooked the paper by Hennig (1941), which showed that records of *H. (G.) aerosus* from the oriental region were based on misidentification of *H. congruens* Becker.

Type material. Lectotype here designated, 1♂, SWEDEN: Esperöd (Fallén) (NRS). Paralectotypes here designated, 4♂, 4♀, SWEDEN: Esperöd (Fallén) (NRS).

Other material examined, 149♂, 159♀, BELGIUM: Limburg, Rekem, Vallei van de Zijpbeek, 15.viii.1987, SW (Pollet) (POL); 138♂, 143♀, West Flanders, Ichtegem, Wijnendalebos, 1987, MT + WT (Pollet) (KBIN); 23♂, 36♀, Oostduinkerke, Hannecartbos, 1987, PT + MT + WT (Pollet) (KBIN); 15♂, 13♀, De Panne, De Westhoek Nature Reserve, 1987, SW (Pollet) (KBIN); 110♂, 66♀, Houthulst, Houthulstbos Military Depot, 1988, WT (Pollet) (KBIN); 56♂, 228♀, Wingene, De Gulke Putten Nature Reserve, 1987, MT (Decler) (KBIN).

Table 1. Morphometrics of the wing of *Hercostomus* (*Gymnopternus*) species.*

Morphometrics	A	B	C	D	E
<i>Hercostomus aerosus</i> (Rekem, Vallei van de Zijpbeek, 1987)					
♂♂ (<i>n</i> = 30), mean	3.35	0.82	0.60	3.51	2.09
min.	2.93	0.74	0.51	3.25	1.78
max.	3.72	0.92	0.72	3.77	2.43
♀♀ (<i>n</i> = 30), mean	3.38	0.81	0.59	3.44	2.02
min.	3.09	0.71	0.45	2.80	1.65
max.	3.66	0.92	0.70	3.86	2.38
<i>Hercostomus metallicus</i> (Ichtegem, Wijnendalebos, 1987)					
♂♂ (<i>n</i> = 30), mean	4.38	1.11	0.40	3.76	1.52
min.	3.96	0.87*	0.34	3.46	1.25
max.	4.80	1.22	0.45	4.33	1.70
♀♀ (<i>n</i> = 30), mean	4.25	1.04	0.42	3.65	1.53
min.	3.75	0.98	0.36	3.25	1.28
max.	4.71	1.11	0.50	4.05	1.70
<i>Hercostomus assimilis</i> [†] (Woumen, De Blankaart, 1984)					
♂♂ (<i>n</i> = 20), mean	3.05	0.87	0.62	3.29	2.03
min.	2.82	0.80	0.54	3.07	1.79
max.	3.33	0.97	0.69	3.85	2.38
♀♀ (<i>n</i> = 30), mean	3.18	0.86	0.59	3.43	2.02
min.	2.96	0.81	0.48	3.05	1.65
max.	3.49	0.95	0.64	3.78	2.36
(De Panne, De Westhoek, 1987)					
♂♂ (<i>n</i> = 30), mean	3.16	0.86	0.61	3.39	2.05
min.	2.92	0.76	0.54	3.00	1.71
max.	3.33	0.99	0.72	3.71	2.38
♀♀ (<i>n</i> = 31), mean	3.31	0.87	0.56	3.37	1.91
min.	2.90	0.78	0.48	3.11	1.56
max.	3.45	1.00	0.64	3.81	2.25
(Lokeren, Het Molsbroek, 1984)					
♂♂ (<i>n</i> = 27), mean	3.18	0.86	0.60	3.25	1.94
min.	2.90	0.80	0.52	2.82	1.47
max.	3.45	0.95	0.68	3.62	2.27
♀♀ (<i>n</i> = 33), mean	3.40	0.88	0.57	3.40	1.93
min.	3.10	0.82	0.50	3.00	1.60
max.	3.61	1.13*	0.68	4.07	2.27
(Zeebrugge, De Fonteintjes, 1984)					
♂♂ (<i>n</i> = 14), mean	2.98	0.87	0.60	3.45	2.08
min.	2.78	0.80	0.52	3.20	1.67
max.	3.22	0.97	0.66	3.69	2.38
♀♀ (<i>n</i> = 18), mean	3.12	0.87	0.58	3.42	1.98
min.	3.06	0.79	0.49	3.06	1.50
max.	3.47	1.02	0.64	3.92	2.29
<i>Hercostomus silvestris</i> (Ichtegem, Wijnendalebos, 1987)					
♂♂ (<i>n</i> = 30), mean	3.26	0.87	0.55	3.47	1.90
min.	2.88	0.79	0.49	3.24	1.65
max.	3.57	0.94	0.60	3.86	2.07

Table 1 (continued)

Morphometrics	A	B	C	D	E
♀ ♀ (<i>n</i> = 30), mean	3.47	0.84	0.55	3.36	1.85
min.	3.14	0.74	0.48	3.11	1.61
max.	3.84	0.90	0.65	3.69	2.02
<i>Hercostomus blankaartensis</i>					
(Woumen, De Blankaart, 1984)					
♂ ♂ (<i>n</i> = 27), mean	3.71	0.87	0.53	3.69	1.95
min.	3.33	0.78	0.48	3.32	1.68
max.	4.12	0.93	0.60	4.23	2.54
♀ ♀ (<i>n</i> = 36), mean	3.78	0.89	0.53	3.74	1.97
min.	3.29	0.81	0.47	3.28	1.68
max.	4.14	1.00	0.62	4.25	2.44

Morphometrics: A, total wing length (in mm); B, ratio proximal/apical section of discal vein; C, ratio apical/proximal section of postical vein; D, ratio proximal section of postical vein/outer cross vein (tp); E, apical section of postical vein/outer cross vein; proximal sections were measured from root till outer cross vein, apical sections from outer cross vein till outer border of wing.

* Single values outreaching the value of 1.

† Several samples of *H. assimilis* were studied in order to examine the constancy of the features.

***Hercostomus (Gymnopternus) metallicus* (Stannius) (Fig. 2)**

Dolichopus metallicus Stannius, 1831: 262

Gymnopternus metallicus Verrall, 1905: 52

Diagnosis. Male. Face yellowish white, epistoma with pale pubescence, clypeus bare. Femora and tibiae entirely pale yellow. Wings distinctly dark; total length more than 4 mm. Proximal part of postical vein on average more than twice as long as apical part. Hypopygium slender. Genital lamellae rather large, round, piceous but becoming ochreous yellow towards base; no strong bristles, bristles on ventral margin somewhat longer than caudal ones. Female. Face greyish white, epistoma and clypeus with dark conspicuous pubescence. Coloration of legs and wings and venation characteristics similar to those of male.

Description

Male. Head. Face not as wide as third antennal segment; silvery white (sometimes with a slight yellow tinge), showing a longitudinal central furrow along whole length of face and extending upon clypeus. Epistoma with pale

pubescence, clypeus entirely bare. Frons bronze, dusted with grey when seen from behind. Palpi rather small, dark brown with short black pubescence and a dark apical spine. Postocellar bristles numbering 4 or 5 pairs. All postoccipital bristles black. Antenna black. Third antennal segment (Fig. 2b) mostly rather acute, about as long as wide. Arista with rather long pubescence, inserted at about middle of third antennal segment. Eyes pubescent.

Thorax metallic bronze. Pleura dusted with grey. Six pairs of dorsocentrals present, bristles of fifth pair situated somewhat more towards centre of pronotum. Acrostichals strictly biserial until hind border of mesonotum, from about level of fifth pair of dorsocentrals forming a dense pubescence of dark bristles. Scutellum with dark pubescence on dorsum and 2 large black bristles on hind margin; marginal fringe of dark hairs present. Propleura with short dark pubescence and 1 black prothoracal bristle. Squamal fringe black, halteres pale. Wings (Fig. 2a) distinctly dark, total length on average more than 4 mm (see Table 1). Proximal part of discal vein on average longer than apical part. Proximal part of postical vein on average more than twice as long as apical part (see Table 1).

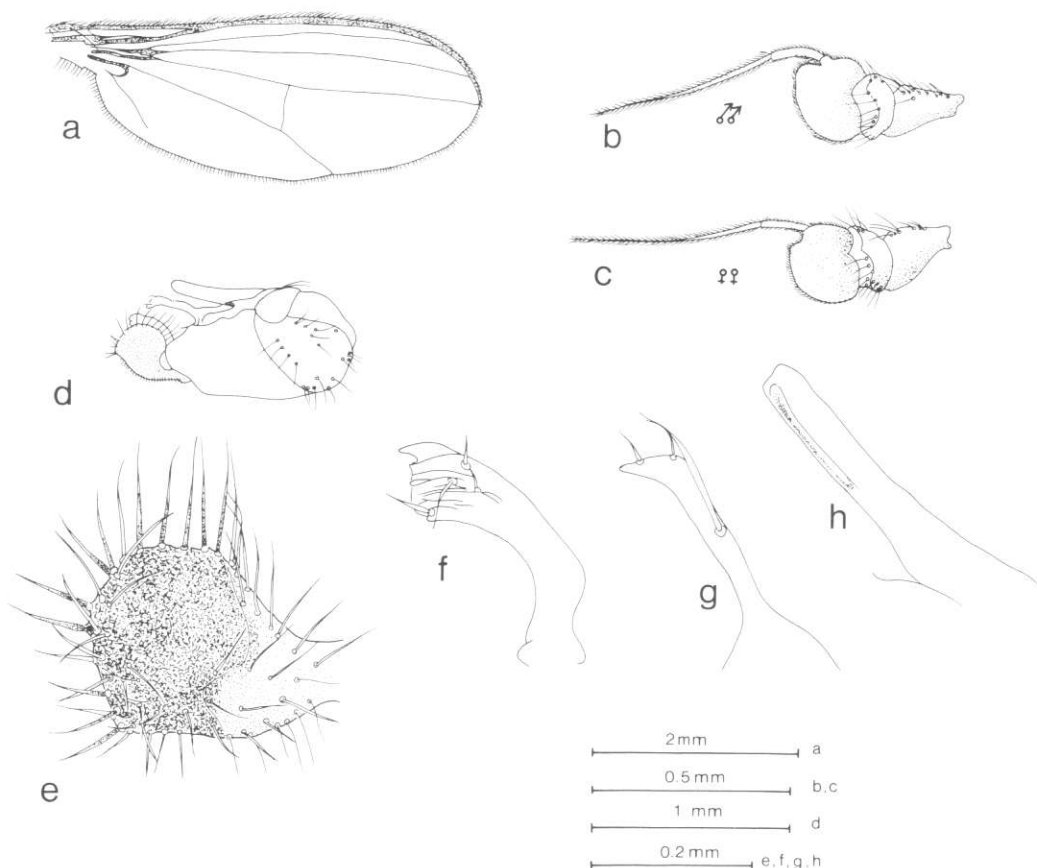


Fig. 2(a–h). Diagnostic characters of *H. (Gymnopternus) metallicus*. See legend of Fig. 1 for more information.

Legs. Coxa I mainly dark, at most yellow laterally on apical third and anteriorly on apical two-thirds. Hairs and bristles black. Coxa II dark with less than apical third yellow anteriorly. Black hairs and bristles present on anterior side. Coxa III dark except for apical third anteriorly and laterally pale yellow; lateral side with one large black bristle at about middle and a small black bristle near the apex in addition to short black pubescence. Femur I, II and III: pale yellow, femur II and III each with a black preapical bristle. Tibia I pale yellow; with two dorsal and one anterodorsal black bristles, the latter followed at about proximal fourth by a row of short strong black spines; without ventral bristles; elongate area with short white pubescence on apical half of anteroventral side. Tibia II pale yellow; with 1 anteroventral, 3 anterodorsal and 2 posterodorsal black bristles; 4 large and 1 small black apical bristles. Tibia

III pale yellow; with 3 posterodorsal, 3 anterodorsal and 1 dorsal black bristles; at about apical half of tibia posterodorsal bristles followed by a row of small strong black spines; on posteroventral side, about 2 ventral bristles distinctly longer than remaining bristles. Tarsus I pale yellow, metatarsus and second segment slightly to distinctly infuscated on apex; remaining segments entirely, sometimes slightly infuscated. Tarsus II pale yellow, infuscated as tarsus I. Tarsus III pale yellow, from apex of metatarsus or apical half of second segment gradually and distinctly infuscated.

Abdomen metallic bronze, from stigmata downwards dusted with grey. Hypopygium (Fig. 2d–h) slender, dark brown except for paler ventral margin and appendages. Genital lamella rather large, somewhat round, piceous and becoming ochreous yellow towards base; no strong bristles present, bristles on ventral margin

somewhat longer than caudal ones. Aedeagus sheet brown, with blunt tip. CAB yellow, broadest at the insertion of second seta, narrowest near base; distance between basal and middle setae about 2.5 times the distance between apical and middle seta. TM rather large and slender, ochreous yellow with many ridges and 4 setae.

Female. Similar to the male except for the following characters. Face silvery white, epistoma about twice as high as clypeus. Face not as wide as twice the width of third antennal segment. Epistoma with rather long but scarce pubescence, clypeus with conspicuous dark and dense pubescence. Frons metallic green, heavily dusted with grey. Third antennal segment with rather specific shape, similar to that of *Hydrophorus* species (Fig. 2c), distinctly acute, somewhat deeper than long. Pubescence of arista rather long. Legs. Coxa I always entirely dark laterally, yellow anteriorly at least on proximal third; sometimes anterior yellow spot extending towards base. Tibia III with 2–3 erect ventral bristles. Tarsus I pale yellow, on less than apical third slightly to distinctly infuscated. Tarsus II pale yellow, infuscated from about apical fifth of metatarsus. Tarsus III pale yellow, infuscated from apical half or third of metatarsus.

Distribution. This species appears to be more scarce than the previous species, but is also known from all over Europe: Finland, Norway, Sweden, Denmark, Germany, Hungary, Czechoslovakia, Great Britain, Ireland, The Netherlands, Belgium, France, Italy, Corsica, European Russia and Iran.

Material examined. 546♂, 735♀, BELGIUM: West Flanders, Ichtegem, Wijnendalebos, 1987, MT + WT (*Pollet*) (KBIN); 27♂, 37♀, Houthulst, Houthulstbos Military Depot, 1988, WT (*Pollet*) (KBIN); 157♂, 299♀, Ruiselede, De Vorte Bossen, 30.v.1987, SW (*Pollet*) (KBIN); 29♂, 69♀, Oostduinkerke, Hannecartbos, 1987, MT + WT (*Pollet*) (KBIN); 70♂, 56♀, Ingelmunster, De Mandelhoeck Nature Reserve, 1987, MT + WT (*Pollet*) (KBIN).

***Hercostomus (Gymnopternus) assimilis* (Staeger) (Fig. 3)**

Dolichopus aerosus Zetterstedt, 1838 (nec Fallen, 1823): 711

Dolichopus assimilis Staeger, 1842: 41
Gymnopternus assimilis Verrall, 1905: 53.

Diagnosis. Male. Face silvery white, epistoma with sparse pale pubescence, clypeus entirely bare. Femora and tibiae pale yellow, hind tibia slightly to distinctly infuscated on apical fourth to third. Wings distinctly dark, total length about or somewhat more than 3 mm. Proximal part of discal vein not longer than apical part. Proximal part of postical vein less than twice as long as apical part. Discal and postical veins very slightly converging in apical half. Hypopygium rather slender. Genital lamellae rather large, quadrat and completely brownish black; strong black bristles present on ventral and caudal margins, the latter being somewhat stronger. Female. Face greyish white, clypeus bare. Coloration of legs and wings and venation characteristics similar to male.

Description

Male. Head. Face not as wide as third antennal segment, silvery white with longitudinal central furrow present along whole length of face and extending upon clypeus. Epistoma with moderately long pale pubescence, clypeus entirely bare. Frons bronze to metallic green, heavily dusted with grey. Palpi rather small, dark brown with short black pubescence and a dark apical spine. With 4 or 5 pairs of post-ocellar bristles. All postoccipital bristles black. Antenna black. Third antennal segment (Fig. 3b) relatively large, mostly clearly obtuse, about as long as deep. Arista with short pubescence, inserted at about middle of third antennal segment. Eyes pubescent.

Thorax dark metallic green. Pleura dusted with grey. Six pairs of dorsocentrals present, bristles of fifth pair situated somewhat more towards centre of pronotum. Acrostichals strictly biserial until hind border of mesonotum, from about level of fifth pair of dorsocentrals forming a dense pubescence of dark bristles. Scutellum with dark pubescence on dorsum and 2 large black bristles on hind margin; marginal fringe of dark hairs present. Propleura with short pale pubescence; 1 black prothoracical bristle. Squamal fringe black, halteres pale. Wings (Fig. 3a) slightly dark, average total length about, or somewhat more than, 3 mm. Proximal part of discal vein usually not longer

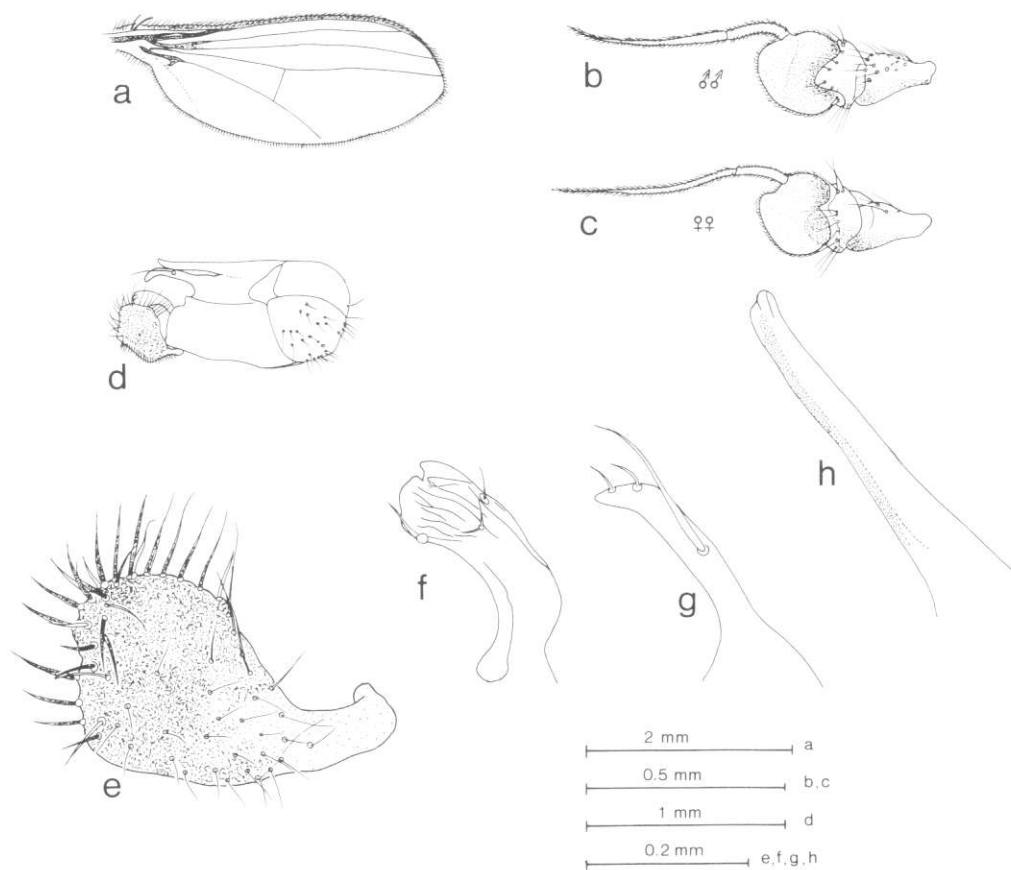


Fig. 3(a–h). Diagnostic characters of *H. (Gymnopternus) assimilis*. See legend of Fig. 1 for more information.

than apical part. Proximal part of postical vein usually less than twice as long as apical part. Discal and postical veins mostly very slightly converging from shortly beyond outer crossvein to tip (see Fig. 3a). Legs. Coxa I dark, at most yellow on apical half anteriorly. All hairs and bristles black. Coxa II dark with less than apical third pale yellow anteriorly. Black hairs and bristles on anterior side. Coxa III dark except for apical third anteriorly and laterally which are pale yellow; lateral side with one large black bristle at about middle and a small black bristle near the apex in addition to short black pubescence. Femora I, II and III pale yellow, femora II and III with a single black preapical bristle. Tibia I pale yellow; with 2 dorsal and 1 anterodorsal black bristles, the latter followed at about proximal fourth by a row of short strong black spines; without ventral bristles; elongate area with short white pubescence on

apical half of anteroventral side relatively narrow. Tibia II pale yellow; with 1 anteroventral, 3 anterodorsal and 2 posterodorsal black bristles; 4 large and 1 small black apical bristles. Tibia III pale yellow, apical third to fourth slightly to distinctly infuscated; with 3 posterodorsal, 3 anterodorsal and 1 dorsal black bristles; at about apical half of tibia posterodorsal bristles followed by a row of small strong black spines; on posteroventral side, 1–3 ventral bristles distinctly longer than remaining bristles. Tarsus I pale yellow, from apical fourth to fifth of metatarsus clearly infuscated (sometimes basal half of second segment or even basal parts of the first four segments pale). Tarsus II pale yellow, infuscated from apical fifth of metatarsus onwards (sometimes basal part of second segment also pale). Tarsus III almost entirely dark, except for proximal half of metatarsus; in any case, darker than the proximal part of tibia III.

Abdomen metallic bronze, from stigmata downwards dusted with grey. Hypopygium (Fig. 3d–h) rather slender, brownish black except for ventral margin and appendages. Genital lamella rather large, quadrat and entirely black; strong black bristles present on ventral and caudal sides, the latter being shorter but stronger. Aedeagus sheet brown, somewhat tapering to the end. CAB pale yellow, yellowish white at base, more or less equal in width along its whole length; distance between basal and middle seta about 3 times the distance between apical and middle seta. TM moderately large and slender, ochreous yellow with many ridges and 3 setae.

Female. Similar to the male except for the following characters. Face silvery white, epistoma about 3 times as high as clypeus. Face not as wide as twice the width of third antennal segment. Epistoma with moderately long pale pubescence, clypeus entirely bare. Frons metallic green, heavily dusted with grey only on anterior half. Third antennal segment (Fig. 3c) obtuse, about as wide as long. Arista with rather short pubescence. Legs. Coxa I dark, at most yellow anteriorly on apical fourth. Tibia III: pale yellow, less than apical third slightly to distinctly infuscated; with 2 or 3 erect posteroventral bristles. Tarsus I pale yellow, distinctly infuscated from apical fourth of metatarsus onwards. Tarsus II pale yellow, infuscated from about apical fifth of metatarsus. Tarsus III almost entirely dark except for at most proximal half of first and extreme base of second segment.

Distribution. This species is only known from Europe, where it is rather widespread: Sweden, Denmark, Poland, Germany, Hungary, Czechoslovakia, Great Britain, Ireland, Belgium, The Netherlands and France.

On the basis of the generally used keys (Stackelberg, 1933, 1934; Parent, 1938; d'Assis Fonseca, 1978), I was not able to distinguish the new species from *H. assimilis*. In order to ascertain the identity of *H. assimilis*, I tried to check the holotype, which, unfortunately, appeared to be destroyed (Lyneborg, *in litt.*). Thanks to a translation of Staeger's (1842) original description of *H. assimilis* and the loan of two specimens from the Zoological Museum at Kobenhavn by Dr L. Lyneborg (Kopenhagen, Denmark), a neotype of this species could be designated.

Type material. Neotype here designated,

1♂, DENMARK: Sonderjylland, Sondersborg, iv.1889 (*Wüstmei*) (ZMK).

Other material examined. BELGIUM: 20♂, 30♀, West Flanders, Woumen, De Blankaart Nature Reserve, 1984, PT (*Decleer*) (POL); 198♂, 130♀, De Panne, De Westhoek Nature Reserve, 1987, PT (*Pollet*) (POL) 14♂, 18♀, Zeebrugge, De Fonteintjes Nature Reserve, 1984, PT (*Decleer*) (POL); 1♂, 4♀, Oostduinkerke, Hannecartbos, 1987, PT (*Pollet*) (POL); 17♂, 7♀, Harelbeke, 1988, MT + WT (*Pollet*) (POL); 1♂, Ichtegem, Wijnendalebos, 6–14.vi.1987, WT (*Pollet*) (POL); 1♂, 1♀, East Flanders, Destelbergen, Damvallei, 1.vi.1987, SW (*Decleer*) (POL); 27♂, 56♀, Lokeren, Het Molsbroek Nature Reserve, 1984, PT (*Decleer*) (POL); 1♂, 1♀, St. Jan-in-Eremo, De Oostpolderkreek Nature Reserve, 14.v.–1.xi.1988, WT (*Pollet*) (POL); CZECHOSLOVAKIA: 1♂, Southern Moravia, Nesyt, edges of pond, 3.vi.1973 (*Olejnick*) (OLE); 1♂, 1♀, Valtice, 2.vi.1977 (*Olejnick*) (OLE); 1♀, Valtice, 26.vi.1973 (*Olejnick*) (OLE); 1♂, Dolni Vestonice, forest pools, 25.vi.1976 (*Olejnick*) (OLE); DENMARK: 1♀, Isle Bornholm, Hasle, no date (*Hansen*) (ZMK); EIRE: 1♂, Galway, Lough Fingall, fen, 24.viii.1979, SW (*Speight*) (SPE); FRANCE: 21♂, Artois, Pas de Calais, Berck, 1936 (*Parent*) (MHNP); 1♂, Oisy-le Verger, 24.vi.1913 (*Parent*) (MHNP); 15♂, 7♀, Franche Comte, Ain, Lavours, marais de Lavours, 230 m, 1.vi.1987 (*Brunhes*) (BRU); 33♂, 24♀, Picardie, Somme, la Chaussée-Tirancourt, Somme Valley, 1984, WT (*Brunel C.*) (BRC, POL); GERMANY: 1♂, Brandenburg, Berlin, Jungfernheide, 4.vi.1899, labelled '53218' (ZMB); 1♂, Cottbus, Annaburg, labeled '31647' (ZMB); GREAT BRITAIN: 2♂, Wales, Dyfed, Pembury, forest pool, 6.vii.1986 (*Crossley*) (CRO); 2♂, Suffolk, Walberswick, coastal marsh, 11.vi.1985 (*Crossley*) (CRO); 1♂, Yorkshire, York, Derwent Ings Nature Reserve, 16.vi.1987 (*Crossley*) (CRO); 1♂, York, Derwent Ings Nature Reserve, 25.vii.1987 (*Crossley*) (CRO); HUNGARY: 2♂, 1♀, Hejőbába, 29.v.1964 (*Toth*) (HNHM); 1♂, Hejőbába, 14.vi.1963 (*Toth*) (HNHM); 1♂, Hejőbába, 6.vi.1963 (*Toth*) (HNHM); 1♀, Hejőbába, Hejő-p, régi medei, 31.v.1962 (*Toth*) (HNHM); POLAND: 1♂, Legnica (= Liegnitz), labelled '29/5 18180' (ZMB); SWEDEN: 1♂, Gotland, no date (*Boheman*) (NRS); THE NETHERLANDS: 1♂, Zeeland,

Aardenburg, Bakkersdam, 13.vii.1982 (*Verbeke C.*) (VER); 1♂, Goeree, Kwadenhoek, 31.v.1980 (*van Aartsen*) (MEU); 5♂, Noord Holland, Ilperveld, Den Ilp, 24.vi.1979 (*Brugge*) (MEU).

***Hercostomus (Gymnopternus) silvestris*
sp.n. (Fig. 4)**

Diagnosis. Male. Face silvery white, epistoma with few pale hairs, clypeus entirely bare. Femur I largely infuscated dorsally, femur II and III only feebly infuscated dorsally. Wings distinctly dark, total length somewhat more than 3 mm. Proximal part of discal vein less than apical part. Proximal part of postical vein not more than twice as long as apical part. Hypopygium remarkably stout. Genital lamellae relatively small, ellipsoid and brown with somewhat paler base; strong black bristles on ventral and caudal margin, the latter being somewhat shorter but

stronger. Female. Face greyish white, clypeus bare. Coloration of legs and wings and venation characteristics similar to those of male.

Description

Male. Head. Face not as wide as third antennal segment, silvery white with shallow longitudinal central furrow along whole length of face and extending upon clypeus. Epistoma with sparse pale pubescence, clypeus entirely bare. Frons bronze, slightly dusted with grey. Palpi rather small, dark brown with short black pubescence and each with a dark apical spine. About 5 pairs of postocellar bristles. All postoccipital bristles black. Antenna black. Third antennal segment (Fig. 4b) moderately large, rather obtuse, about as long as wide. Arista with long pubescence, inserted at about middle of third antennal segment. Eyes pubescent.

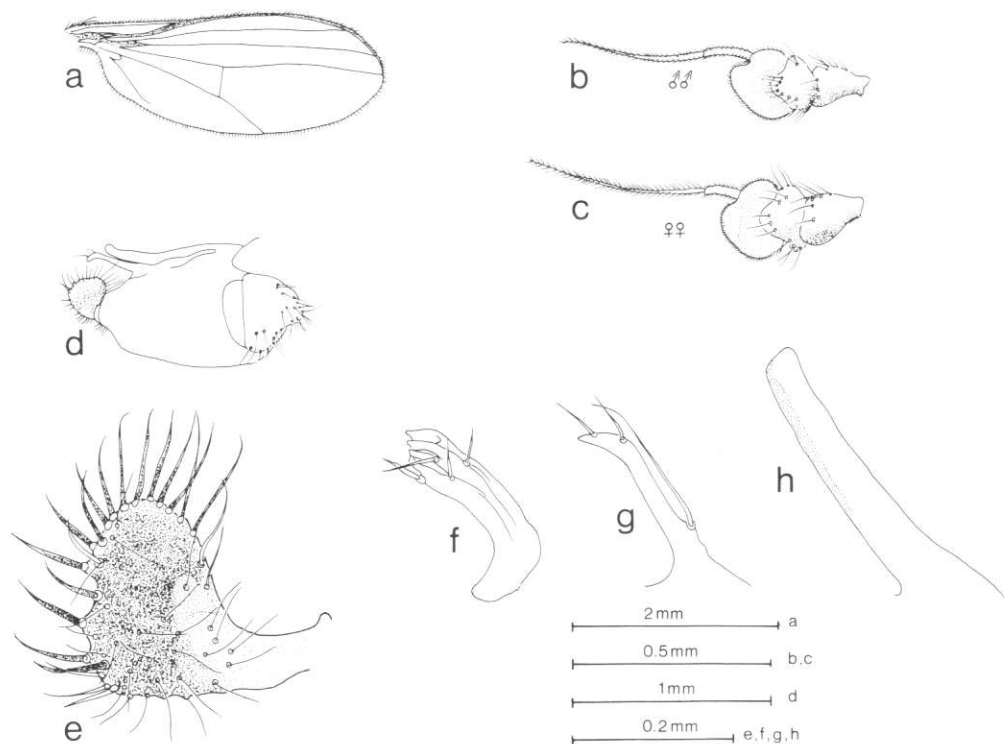


Fig. 4(a-h). Diagnostic characters of *H. (Gymnopternus) silvestris* sp.n. See legend of Fig. 1 for more information.

Thorax dark metallic green. Pleura dusted with grey. Six pairs of dorsocentrals present, bristles of fifth pair situated somewhat more towards centre of pronotum. Acrostichals biserial until hind border of mesonotum, from about level of fifth pair of dorsocentrals forming a dense pubescence of dark bristles. Scutellum with short dark pubescence on dorsum and 2 large black bristles on hind margin; marginal fringe of dark hairs present. Propleura with short pale pubescence; 1 black prothoracical bristle present. Squamal fringe black, halteres pale. Wings (Fig. 4a) distinctly darkened, average total length somewhat more than 3 mm. Proximal part of discal vein usually not longer than apical part. Proximal part of postical vein usually less than twice as long as apical part. Discal and postical veins almost parallel along whole length. Legs. Colour of coxa I variable but usually largely yellow; when mainly dark, then yellow at least on apical two-thirds of anterior side. All hairs and bristles black. Coxa II mainly dark, at most yellow on less than apical third anteriorly. Black hairs and bristles present on anterior side. Coxa III mainly dark, yellow on apical third anteriorly and laterally. Lateral side with one large black bristle present at about middle and a small black bristle present near the apex in addition to a short black pubescence. Femur I yellow, largely infuscated brown along whole length at least posterodorsally. Femur II yellow, at most very slightly infuscated dorsally. Femur III yellow, often feebly infuscated on posterodorsal side. Femora II and III with a single black preapical bristle. Tibia I pale yellow; with two dorsal and one anterodorsal black bristles, the latter followed at about proximal fourth by a row of short strong black spines; without ventral bristles; elongate area with short white pubescence on apical half of anteroventral side. Tibia II pale yellow; with 1 anteroventral, 3 anterodorsal and 2 posterodorsal black bristles; 4 large and 1 small black apical bristles. Tibia III pale yellow; with 3 posterodorsal, 3 anterodorsal and 1 dorsal black bristles; at about apical third of tibia posterodorsal bristles followed by a row of small strong black spines; on posteroventral side, 2–3 ventral bristles distinctly longer than remaining (sometimes also rather erect) but smaller bristles. Tarsus I pale yellow, distinctly infuscated from apical fifth or fourth of metatarsus onwards. Tarsus II dark except for proxi-

mal four-fifths to five-sixths of metatarsus and at most proximal half of second segment; usually second segment almost entirely dark except for extreme base. Tarsus III dark except for proximal two-thirds of metatarsus and extreme apex of second segment being pale yellow.

Abdomen metallic bronze, from stigmata downwards dusted with grey. Hypopygium (Fig. 4d–h) very stout, dark brown except for ventral margin and appendages. Genital lamella rather small, ellipsoid and piceous except for paler base; strong black bristles present on ventral and caudal sides, the former being somewhat longer than the caudal ones. Aedeagus sheet brown, blunt tipped. CAB pale yellow, remarkably slender, widest at base; distance between basal and middle seta about 4 times the distance between apical and middle seta. TM remarkably small, ochreous yellow with many ridges and 4 setae.

Female. Similar to the male except for the following characters. Epistoma about 3 times as high as clypeus. Face not as wide as twice the width of third antennal segment. Epistoma with rather long pubescence, clypeus entirely bare. Frons metallic green, heavily dusted with grey on anterior half only. Third antennal segment (Fig. 4c) obtuse to slightly acute, about as wide as long. Arista with rather long pubescence. Legs. Coxa I mainly dark, at most yellow anteriorly on apical two-thirds and laterally on apical third. Tarsus I pale yellow, distinctly infuscated from apical fourth of metatarsus onwards. Tarsus II mainly dark, pale yellow at most on proximal four-fifths of metatarsus and proximal third of second segment. Tarsus III almost entirely dark except for at most proximal half of metatarsus and extreme base of second segment.

Distribution. Thus far, this species is only known from Belgium, Czechoslovakia and France but is undoubtedly more widespread and might be caught wherever its preferred habitats occur.

Holotype. ♂, BELGIUM: West Flanders, Ingelmunster, De Mandelhoek Nature Reserve, 24–31.v.1987, WT (Pollet) (KBIN).

Paratypes. BELGIUM: 146♂, 293♀, West Flanders, Ingelmunster, De Mandelhoek Nature Reserve, 1987, WT + MT (Pollet) (POL); 47♂, 71♀, Ingelmunster, De Mandelhoek Nature Reserve, 1988, MT (Pollet) (POL); 9♂, 11♀, Ichtegem, Wijnenalebos, 1986, MT

+ WT (Pollet) (POL); 62♂, 100♀, Ichtegem, Wijnendalebos, 1987, MT + WT (Pollet) (POL); 2♂, Beernem, Lippensgoed-Bulskampveld Provincial Domain, 28.vi.1986, SW (Pollet) (POL); 2♂, Houthulst, Houthulstbos Military Depot, 30.v.–6.vii.1988, WT (Pollet) (POL); 1♀, Ingelmunster, deciduous woodland relict, 2.vii.–13.viii.1988, WT (Pollet) (KBIN); 1♀, Oostende, Maria Hendrika park, 22.vii–1.viii.1988, MT (Haghebaert) (KBIN); 1♀, Raversijde, Prins Karel Domain, 1986, MT (Haghebaert) (KBIN); 2♂, 4♀, Raversijde, Prins Karel Domain, 1987, MT (Haghebaert) (POL); 3♂, 2♀, Wingene, De Gulke Putten Nature Reserve, 1987, MT (Decler) (POL); 2♂, 3♀, Woumen, De Blankaart Nature Reserve, 1984, PT (Decler) (POL); 1♂, Zedelgem, Vloetenveld Military Depot, 24.v.–21.vi.1986, PT (Pollet) (POL); 15♂, 34♀, Henegouwen, Chimay, Lake of Virelles, 1986, MT (Magis)

(KBIN); CZECHOSLOVAKIA: 1♂, 2♀, Southern Moravia, Lanzhot, 12.ix.1977 (*Olejnicek*) (OLE); 2♂, Lanzhot, 23.vi.1977 (*Olejnicek*) (OLE); FRANCE: 3♂, Aunis, Charante Maritime, Marans, vii.1931 (*Parent*) (MHNP); 3♂, Provence, Alpes Maritimes, Antibes, 29.v.1984 (*Haghebaert*) (VER); 2♀, Picardie, Somme, la Chaussée-Tirancourt, Somme Valley, 1984, WT (*Brunel C.*) (BRC).

Etymology. The species is named after its stenotopic occurrence in humid woodland sites.

***Hercostomus (Gymnopternus) blankaartensis* sp.n.** (Fig. 5)

Diagnosis. Male. Face silvery white. Epistoma with scarce pale pubescence, clypeus entirely bare. Femora and tibiae entirely pale yellow, tarsi only feebly infuscated. Wings distinctly

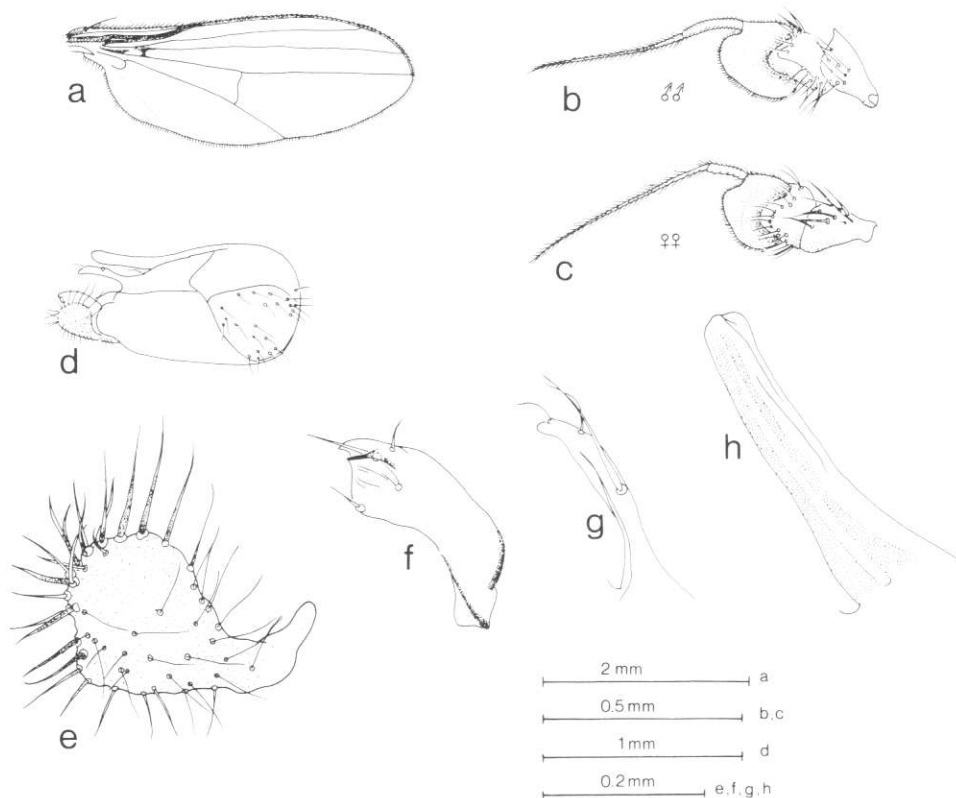


Fig. 5(a–h). Diagnosite characters of *H. (Gymnopternus) blankaartensis* sp.n. See legend of Fig. 1 for more information.

dark, total length approximately 3.7 mm. Proximal part of discal vein not longer than apical part. Proximal part of postical vein less than twice as long as apical part. Hypopygium moderately slender. Genital lamellae relatively small, quadrat and ochreous yellow; with ventral and caudal black bristles, the former being much stronger than the caudal ones. Female. Face greyish white, clypeus bare. Coloration of legs and wings and venation characteristics similar to those of male.

Description

Male. Head. Face about as wide as third antennal segment, silvery white with shallow longitudinal central furrow along whole length of face and extending upon clypeus. Epistoma with sparse pale and rather long pubescence, clypeus entirely bare. Frons bronze, heavily dusted with greyish white. Palpi rather small, dark brown with short black pubescence and a dark apical spine. About 4 or 5 pairs of small postocellar bristles present. All postoccipital bristles black. Antenna black. Third antennal segment (Fig. 5b) relatively large, mostly obtuse, about as long as wide. Arista with long pubescence, inserted at about middle of third antennal segment. Eyes pubescent.

Thorax dark metallic green, pleura dusted with grey. Six pairs of dorsocentrals present, bristles of fifth pair situated somewhat more towards centre of pronotum. Acrostichals strictly biserial until hind border of mesonotum, from about level of fifth pair of dorsocentrals onwards forming a dense pubescence of dark acrostichal-sized bristles. Scutellum with short dark pubescence on dorsum and 2 large black bristles on hind margin; marginal fringe of dark hairs present. Propleura with short pale pubescence and 1 black prothoracal bristle. Squamal fringe black, halteres pale. Wings (Fig. 5a) slightly dark, average total length about 3.7 mm. Proximal part of discal vein usually not longer than apical part. Proximal part of postical vein usually less than twice as long as apical part. Discal and postical veins more or less parallel along whole length. Legs. Coxa I mainly yellow at least laterally, dark at most on basal third to fourth. All hairs and bristles black. Coxa II dark with less than apical third anteriorly pale yellow. Black hairs and bristles present on anterior side. Coxa III dark

except for apical third anteriorly and laterally which is pale yellow; lateral side with one large black bristle at about middle and a small black bristle near the apex in addition to short black pubescence. Femora I, II and III yellow, femora II and III with a single black preapical bristle. Tibia I pale yellow, 2 dorsal and 1 anterodorsal black bristles, the latter followed at about proximal fourth by a row of short strong black spines of subequal size; without ventral bristles; elongate area with short white pubescence on apical half of anteroventral side. Tibia II pale yellow; with 1 anteroventral, 3 anterodorsal and 2 posterodorsal black bristles; 4 large and 1 small black apical bristles. Tibia III pale yellow; with 3 posterodorsal, 3 anterodorsal and 1 dorsal black bristles; at about apical third of this posterodorsal bristles followed by a row of small strong black spines; on ventral side, 1–2 ventral bristles distinctly longer than remaining smaller bristles. Tarsi I and II yellow, only feebly darkened from extreme apex of metatarsus onwards. Tarsus III yellow, feebly infuscated from extreme apex of second segment onwards. Abdomen metallic bronze, from stigmata downwards dusted with grey. Hypopygium (Fig. 5d–h) moderately slender, brown except for paler ventral margin. Genital lamellae small, quadrat, ochreous yellow; strong black bristles present on ventral and caudal sides, the former being longer than the caudal ones. Aedeagus sheet pale brown, blunt tipped. CAB rather stout, distinctly brown, widest at middle; distance between basal and middle seta about 2.5 times the distance between apical and middle setae. TM large, piceous with very few ridges but with 4 setae.

Female. Similar to male except for the following characters. Face silvery white, epistoma slightly more than twice as high as clypeus. Face not as wide as twice the width of third antennal segment. Epistoma with scarce pale and rather long pubescence, clypeus entirely bare. Frons bronze, intensively dusted with greyish white. Third antennal segment (Fig. 5c) obtuse. Coxa I mainly yellow, dark at most on basal half of posterior side and extreme base of anterior side. Tibia III with 1–3 ventral erect bristles. Tarsus II yellow, feebly infuscated from third segment onwards. Tarsus III yellow, from second segment slightly but gradually darker.

Distribution. Thus far this species is only known from Hungary, Belgium, The

Netherlands and France but it most probably occurs in other western European countries too.

Holotype. 1♂, BELGIUM: West Flanders, Woumen, De Blankaart Nature Reserve, 1984, PT (*Decler*) (KBIN).

Paratypes. BELGIUM: 26♂, 36♀, West Flanders, Woumen, De Blankaart Nature Reserve, 1984, PT (*Decler*) (POL); 2♀, Damme, De Stadswallen Nature Reserve, 1982, PT (*Decler*) (POL); 1♀, Oostkamp, De Leiemeersen Nature Reserve, 1982, PT (*Decler*) (POL); 3♀, Eastern Flanders, St. Laureins, Blokkreek, 1988, WT (*Pollet*) (POL); 3♂, 3♀, FRANCE: Picardie, Somme, la Chaussée-Tirancourt, Somme Valley, 1983, WT (*Brunel C.*) (BRC, POL); HUNGARY: 1♀, labelled 'Südungarn 61555.7' (ZMB); THE NETHERLANDS: 1♂, Overijssel, Giethoorn, De Wieden Nature Reserve, 28.v.1988, SW (*Decler*) (POL).

Etymology. The species is named after the De Blankaart Nature Reserve at Woumen, Belgium, where the species was first found and which has thus far yielded the largest population.

Discussion. Checking the key by Robinson (1964) on Nearctic *Gymnopternus* species revealed that *H. silvestris* and *H. blankaartensis* do not occur in North America, nor do the other western European species. The subgenus *Gymnopternus* shows a remarkably high diversity in the Nearctic region: Robinson (1964) records sixty-seven species mainly from the southeastern United States, which is more than sevenfold the number occurring in western Europe. About forty Nearctic species have proved to be closely related to the species discussed in this paper (corresponding to the subgeneric diagnosis). As in the latter species, interspecific differences in these Nearctic species are mainly based on coloration, the shape of the antenna, the shape and size of the genital lamella and its bristles. Unfortunately, Robinson (1964) did not draw more attention to the CAB and the TM of the species, which might provide important diagnostic information.

From the descriptions and the key comment, it can be concluded that biometry proves to be very useful for the identification of closely related species (Table 1). The character 'total wing length' enables the distinction between *H. metallicus*, *H. blankaartensis* and the other

species. Ratios of vein sections, on the contrary, only separate *H. metallicus* from its congeners.

Phenetic relationship versus similarities of habitat affinity and seasonal occurrence

We compared the species on the basis of three categories of features: (i) morphological and biometric (phenetic) features, (ii) habitat preferences, and (iii) seasonal activity patterns. For each category, a cluster analysis (Average Ranky Clustering) was used to investigate the similarities. In these cluster analyses, all *Gymnopternus* species were considered. However, due to lack of quantitative ecological information on *H. angustifrons*, this species was not included in the two latter analyses.

Phenetic relationships. Most of the diagnostic characters, used in the descriptions, were considered in this analysis. Subgeneric features identical for all species were not included. Since males did not differ substantially from females and, moreover, yielded more valuable characters due to the large hypopygia in particular, mainly this sex was considered for the comparison. Only one typical feminine feature (no. 27) was added. In this way, the complete data set comprised twenty-seven characters, the states of which are given in Table 2. The analysis used was based upon the Sørensen similarity index (Southwood, 1978; see further).

Characters used in the phenetic analysis

Male characters

1. Coloration of the face silvery white (1) or velvet-black (0).
2. Epistoma not as wide (1) or as wide (0) as third antennal segment.
3. Pubescence of epistoma pale (1) or dark (0).
4. Clypeus pubescent (1) or bare (0).
5. Third antennal segment obtuse (1) or acute (0).
6. Arista pubescence long (1) or short (0).
7. Frons dusted heavily (1) or feebly (0).
8. 4–5 pairs of postocellar bristles (1) or more (0).
9. Propleural pubescence pale (1) or dark (0).
10. Wing infuscated (1) or clear (0).
11. Basal section of costal vein normal (1) or with thickening (0).

Table 2. Character states for phenetic analysis of the *Hercostomus* (*Gymnopternus*) species.*

Character	<i>H. cupreus</i>	<i>H. celer</i>	<i>H. brevicornis</i>	<i>H. aeneus</i>	<i>H. metallicus</i>	<i>H. assimilis</i>	<i>H. silvestris</i>	<i>H. blankaarensis</i>	<i>H. angustifrons</i>
Male									
1	1	1	1	0	1	1	1	1	1
2	1	1	1	0	1	1	1	0	1
3	0	1	1	0	1	1	1	1	1
4	0	1	0	1	0	0	0	0	1
5	1	0	0	1	0	1	1	1	1
6	1	1	0	0	1	0	1	1	0
7	1	1	1	1	1	1	0	1	0
8	1	1	1	1	1	1	0	1	1
9	0	1	0	0	0	1	1	1	0
10	1	1	1	0	1	1	1	1	1
11	0	0	0	1	1	1	1	1	1
12	1	1	1	1	0	1	1	1	1
13	1	1	1	1	0	1	1	1	1
14	0	1	1	1	0	1	1	1	1
15	1	1	1	1	1	1	0	1	1
16	1	0	1	1	1	1	1	0	1
17	1	1	1	1	1	1	0	0	1
18	0	0	0	1	1	0	1	1	1
19	0	1	1	0	1	1	1	0	0
20	1	1	1	1	1	1	0	0	1
21	0	1	1	1	1	1	1	1	0
22	1	1	0	0	1	1	0	1	1
23	0	1	1	1	1	1	1	1	1
24	1	1	0	1	1	0	1	1	0
25	1	1	1	1	0	1	1	0	1
26	1	1	0	1	1	0	1	1	0
Female									
27	0	1	1	1	1	0	0	0	1

* Characters are explained in the text; only interspecific discriminating characters were used in this matrix.

- | | |
|--|---|
| <p>12. Proximal part of discal vein shorter (1) or longer (0) than apical part.</p> <p>13. Proximal part of postical vein less (1) or more (0) than twice as long as apical part.</p> <p>14. Total wing length on average less (1) or more (0) than 4 mm.</p> <p>15. Hypopygium more or less slender (1) or distinctly stout (0).</p> <p>16. Colour of genital lamella mainly dark (1) or yellow (0).</p> <p>17. Genital lamella large (1) or small (0).</p> <p>18. Tip of aedeagus sheet blunt (1) or sharpened (0).</p> <p>19. Colour of CAB pale (1) or dark (0).</p> | <p>20. Colour of front coxa mainly dark (1) or yellow (0).</p> <p>21. Colour of femur mainly yellow (1) or dark (0).</p> <p>22. Dorsal or posterodorsal infuscation of femur absent (1) or present (0).</p> <p>23. Middle tibia with one (1) or more (0) anteroventral bristles.</p> <p>24. Hind tibia with apex pale (1) or infuscated (0).</p> <p>25. Tarsi I and II distinctly (1) or feebly (0) infuscated.</p> <p>26. Metatarsus III mainly yellow (1) or mainly dark (0).</p> |
|--|---|

Female characters

27. Clypeus pubescent (1) or bare (0).

The phenetic analysis (Fig. 6A) reveals no distinct groups although *H. silvestris* and *H. blankaartensis* seem to be somewhat different from the other species. Both show small cerci and mainly yellow front coxae. Among the remaining species, only *H. celer*, *H. brevicornis*, both with costal thickening, and *H. assimilis* are remarkably closely related phenetically.

Habitat preference. To determine the habitat preferences, we only used samples from complete or nearly complete year cycles, at least including the main flying activity period of the species concerned. Sampling was continuous and performed by means of Malaise traps, water traps and/or pitfall traps. Only samples consisting of twenty or more specimens of one or more species were kept for further consideration. In this way, we wanted to deal only with real populations only and to exclude occasional migrants from the analysis. Among more than sixty-five year cycles (=sites), thirty sites proved to be suitable for the analysis. In order to eliminate the effects of sampling efforts as well as the type of sampling devices, the cluster analysis was also based upon the Sørensen similarity index (Southwood, 1978). This index calculates the proportion of the sites, at which both species were found, to the total number of capture sites for both species. Thus it is based on the presence (1) – absence (0) criterion and does not take numbers into account. The original data matrix is given in Table 3.

Two distinct groups can be seen in the cluster based upon the spatial distribution of the different species (Fig. 6B): *H. assimilis* and, in particular, *H. blankaartensis* are confined to open marshland, preferably reed marshes near open mesotrophic ponds, pools and creeks. The remaining species prefer woodland areas. Though a true woodland species, *H. brevicornis* is separated from the others due to the fact that it was only found very abundantly at woodland sites of 'Zoniënwood', a vast and very old beech woodland situated in the centre of Belgium. *H. cupreus*, *H. metallicus* and *H. aerosus* are clearly more eurytopic than their congeners. This also explains the high similarity level between those species. In Sweden also, these species are mostly found together (Hedström, 1969).

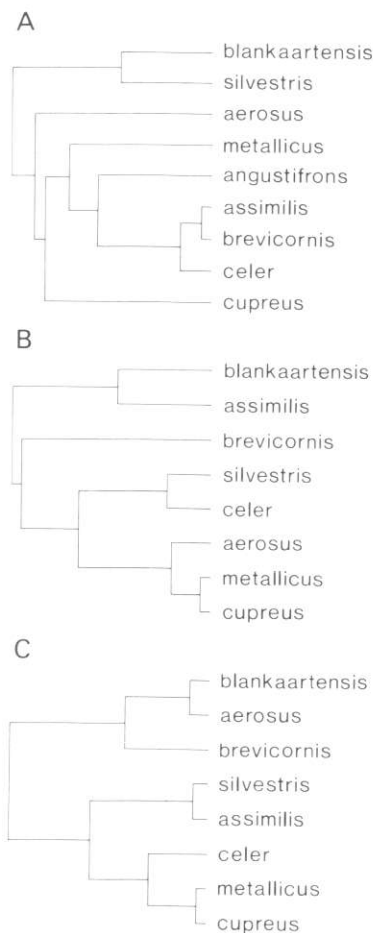


Fig. 6(A–C). Phenetic and ecological similarities between species of *Hercostomus* (*Gymnopternus*). A, phenetic phenogram, based on Table 2 matrix; B, phenogram of spatial occurrence, based on Table 3 matrix; C, phenogram of temporal occurrence, based on Table 4 matrix. Cluster analyses are based on the Average Rankage Clustering and according to the Sørensen (A, B) and Renkonen (C) similarity indices.

Seasonal activity. The same year cycles as for the habitat affinities were applied for the cluster analysis of the phenology patterns of the species. In this case, only samples with fifty or more specimens of a species were considered. Sampling was performed mainly during weekly or fortnightly intervals. Since sampling periods differed greatly, data had to be extrapolated. Therefore, the year was divided into twenty-four artificial periods of 15.2 days. We preferred these intervals to those of 7.6 days in order to

Table 3 (continued)

Sampling sites (habitat type) (method, year cycle)	<i>H. cupreus</i>	<i>H. celer</i>	<i>H. brevicornis</i>	<i>H. aereus</i>	<i>H. metallicus</i>	<i>H. assimilis</i>	<i>H. silvestris</i>	<i>H. blankaartensis</i>
25. Wingene (heathland) (MT, 1986)	110	+	+	296	48	—	—	—
26. Wingene (woodland site 1) (MT, 1987)	132	+	—	60	+	—	—	—
27. Wingene (woodland site 2) (MT, 1987)	159	+	+	112	+	—	+	—
28. Wingene (woodland site 3) (MT, 1987)	60	+	+	167	109	—	+	—
29. Woumen (reed marsh) (PT, 1984)	—	+	—	39	91	105	+	104
30. Zedelgem (woodland) (PT, 1985)	39	+	—	+	+	—	—	—

* Occurrence of the abundant species ($n > 20$) expressed as the total number of specimens per species collected by continuous sampling during a year cycle.

† Species collections of less than twenty specimens are indicated by + and are not included in the cluster analysis.

avoid large deviations due to extrapolation. Thus per species, the different samples were separately extrapolated and the numbers of the corresponding periods summed afterwards. Subsequently, the final values were converted into percentages to eliminate effects of differential abundances. The cluster analysis used here was based on the Renkonen similarity index (Renkonen, 1938), which takes the numbers also into account. Table 4 presents the data matrix of the seasonal activity patterns.

On the basis of their seasonal activity patterns, three groups can be distinguished: a first group contains true spring species (*H. cupreus*, *H. metallicus*, *H. celer*), which already appear at the beginning of May and exhibit their highest activity during the first half of June. A second group consists of early summer species (*H. silvestris*, *H. assimilis*) with an activity peak during the second half of June. *H. brevicornis*, *H. blankaartensis* and *H. aereus* are true summer species, either demonstrating an equally distributed abundance during summer (first two species) or having a flying activity extending into autumn (most probably due to a second generation in *H. aereus*).

Discussion

At first sight the three clusters do not show a similar pattern. However, it is remarkable that species which prove to be very closely related phenetically demonstrate distinct habitat affinities and phenology patterns. Nevertheless, this does not at all confirm the 'niche separation principle' suggested by Gause (1934). As Den Boer (1980, 1985) pointed out correctly, in order to investigate this principle, it is necessary to compare the similarities among *H. (Gymnopternus)* species with those between *H. (Gymnopternus)* species and species from other genera and subgenera. Although an investigation of the phylogeny of all Palaearctic *Hercostrabus* species is beyond the scope of this paper, it can be concluded that at least the species of the subgenus *Gymnopternus* are undoubtedly monophyletic (see descriptions). Despite the results of the cluster analyses, all species are also ecologically quite similar. As mentioned earlier, almost all species prefer woodland sites. However, although *H. assimilis* and *H. blankaartensis* occur almost exclusively at more open sites, they always seem to require a canopy of

Table 4. Summary of the phenology patterns of *Hercostomus* (*Gymnopternus*) species in Belgium.*

Half monthly periods	<i>H. cupreus</i>	<i>H. celer</i>	<i>H. brevicornis</i>	<i>H. aerosus</i>	<i>H. metallicus</i>	<i>H. assimilis</i>	<i>H. silvestris</i>	<i>H. blankaartensis</i>
1. 1–15.v.	0.29	0.17	—	—	0.29	—	0.19	—
2. 16–31.v.	9.08	22.32	0.06	1.12	10.80	4.68	6.65	0.92
3. 1–15.vi.	56.44	35.13	1.26	8.77	42.51	14.32	24.95	9.27
4. 16–30.vi.	26.90	19.68	11.06	29.91	29.22	47.81	36.85	28.61
5. 1–15.vii.	6.87	17.07	40.57	28.24	12.89	20.75	18.81	22.29
6. 16–31.vii.	0.39	4.04	27.60	12.68	3.62	9.46	7.63	27.71
7. 1–15.viii.	0.03	1.12	12.91	13.07	0.62	2.94	4.81	10.04
8. 16–31.viii.	—	0.22	4.96	3.67	0.05	0.04	0.11	1.16
9. 1–15.ix.	—	0.25	1.57	2.13	—	—	—	—
10. 16–30.ix.	—	—	0.02	0.28	—	—	—	—
11. 1–15.x.	—	—	—	0.12	—	—	—	—

* Seasonal activity expressed as the percentages of the total number per species caught during complete year cycles over all suitable sites ($n > 50$), data per half monthly period obtained after extrapolation (see text); before 1.v. and from 15.x. onwards, no specimens of the species concerned were collected.

large herbs or reed. Moreover, almost all species are univoltine with an activity peak during spring or summer. Only *H. aerosus* sometimes shows a small second generation during autumn. Finally, the latter species seems to be clearly divergent from the other species in its courtship behaviour too (Hedström, 1969).

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Table 3. Occurrence of *Hercostomus* (*Gymnopternus*) species at different sites in Belgium,*[†]

Sampling sites (habitat type) (method, year cycle)	<i>H. cupreus</i>	<i>H. celer</i>	<i>H. brevicornis</i>	<i>H. aerosus</i>	<i>H. metallicus</i>	<i>H. assimilis</i>	<i>H. silvestris</i>	<i>H. blankaartensis</i>
1. Beernem (woodland) (WT, PT, 1986)	599	+	+	74	533	—	—	—
2. De Panne (dune slack) (PT, WT, SW, 1987)	+	+	—	29	+	328	—	—
3. Harelbeke (marshland) (MT, WT, 1988)	—	—	—	—	—	22	—	—
4. Houthulst (woodland site 1) (WT, 1988)	240	+	—	+	64	—	—	—
5. Houthulst (heathland site 1) (WT, 1988)	+	+	—	86	+	—	—	—
6. Houthulst (heathland site 2) (WT, 1988)	50	—	—	43	+	—	—	—
7. Houthulst (woodland path) (WT, 1988)	40	+	—	—	+	—	—	—
8. Houthulst (woodland site 2) (WT, 1988)	62	+	—	+	+	—	—	—
9. Houthulst (woodland site 3) (WT, 1988)	92	—	—	+	+	—	—	—
10. Houthulst (woodland pool 1) (WT, 1988)	112	+	—	+	+	—	—	—
11. Houthulst (woodland pool 2) (WT, 1988)	1190	+	—	+	242	—	+	—
12. Houthulst (woodland ditch) (WT, 1988)	279	—	—	+	32	—	—	—
13. Houthulst (woodland site 4) (WT, 1988)	113	—	—	+	20	—	+	—
14. Ichtegem (woodland) (PT, 1985)	99	+	—	45	36	—	—	—
15. Ichtegem (woodland) (MT, WT, PT, 1986)	1583	101	—	201	678	—	20	—
16. Ichtegem (woodland) (MT, WT, PT, 1987)	901	50	—	281	1281	+	162	—
17. Ingelmunster (willow car) (MT, WT, 1987)	84	—	—	—	126	—	410	—
18. Ingelmunster (meadow) (MT, WT, 1988)	+	+	—	—	+	—	118	—
19. Lokeren (marshland) (PT, 1984)	—	—	—	+	—	83	—	—
20. Oostduinkerke (woodland) (MT, PT, WT, 1987)	—	738	—	59	98	—	—	—
21. Oostduinkerke (reed marsh) (PT, 1987)	—	+	—	28	—	+	—	—
22. St. Genesius Rhode (woodland) (PT, 1985)	+	—	248	+	+	—	—	—
23. St. Genesius Rhode (woodland) (PT, 1986)	24	—	1010	+	—	—	—	—
24. St. Genesius Rhode (woodland) (WT, 1988)	2001	—	775	34	184	—	—	—