

# A Revision of the Danish Species of *Hybomitra* End. (Dipt., Tabanidae).

With Description of Five New Species.

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## Introduction.

Since Lundbeck's paper on the Danish tabanids in "Diptera Danica", part I (1907) nothing has been written on these flies in Denmark. In January 1957 I began an examination of the total Danish material of *Tabanus* s. lat., among which was also Lundbeck's material. In the years from 1907 till now several papers on North- and Westeuropean tabanids have been published, e. g. Verrall (1909), Kröber (1925 and 1932). Goffe (1931), Oldroyd

(1939) and Kauri (1951 and 1954). Besides these works I have used the papers of Olsoufieff (1937) and Leclercq (1952 and 1957), and of course various older papers.

It was very soon evident that there were extensive deviations in the various authors' views on several species. Therefore it was necessary to borrow material of the different authors' species from various collections. I am very indebted to the following persons for valuable help: Dr. Max Beier, Naturhistorisches Museum, Vienna, Austria; Mr. J. E. Collin, Newmarket, Suffolk, England; Dr. Elli Franz, Museum "Senckenberg", Frankfurt a/M, Germany; Dr. K. W. Harde, Staatl. Mus. für Naturkunde, Stuttgart, Germany; Prof. Dr. W. Hennig, Deutsch. Ent. Inst., Berlin, Germany; fil. lic. Hans Kauri, Zool. Institutionen, Lund, Sweden; Dr. Fr. Kühnhorn, Zool. Staatsammlung, München, Germany; Dr. M. Leclercq, Beyne-Heusay (Lg.), Belgium; Dr. B. Mannheims, Zool. Museum Alex. Koenig, Bonn, Germany; Dr. H. Oldroyd, British Museum, London, England; Cand. mag. Schjøtz-Christensen, Naturhist. Museum, Aarhus, Denmark; Prof., Dr. H. Weidner, Zool. Museum, Hamburg, Germany.

Finally I wish to thank Dr. S. L. Tuxen, Zool. Museum, Copenhagen, for his never failing interest in my investigations and for the permission to work at the Zool. Museum of Copenhagen.

The results of my comparative studies are given in table 1. Only the most important synonymies are mentioned in the table, further information is given in the "Discussion" of every species. It was necessary to describe five new species, which are the following: *H. colini*, *schineri*, *lundbecki*, *tuxeni* and *staegeri*.

In a following paper the Danish species of *Theriopectes*, *Atylotus* and *Tabanus* s. str. will be dealt with.

In the treatment of every species there are six sec-

tions: Identification, Description, Discussion, Occurrence in Denmark, Distribution, and Biology. In the first section is given a summary for the distinction of the closely related species. For the same reason also the "Description" is rather comprehensive, since all details are of importance. The following characters are used: Pubescence of eyes, size of facets in the male, in the female the width of frontal stripe, form of frontal callus, length of hairs on vertex, colour of frontal triangle, colour of 1st and 2nd antennal joint, in the male also length of the hairs on upper side of 1st antennal joint, shape and colour of 3rd antennal joint, width of antennal bow, shape, colour and pubescence of palpi, colour of notopleural callus, colour of halteres, extension and pubescence of sidemarkings on abdomen dorsally and ventrally, width of middle stripe of abdomen and dark coloration of 1st and 2nd sternite.

Collin (1940, p. 178) has shown that the shape of 8th sternite and anal-lamellae is a valuable help for the distinctions between the *Hybomitra*-females of the *bimaculata*-group, see fig. 2. As a rule the 8th sternite and anal-lamellae are hidden in the abdominal tip, but they can easily be seen when a part of the hind margin of 7th sternite and tergite is removed by means of a pin.

In the section "Discussion" I have dealt with my opinion on the connections between the various authors' species. A summary of these results is given in the table 1.

In all species the Danish localities, where the species in question has been collected, are mentioned, in more seldom species also further dates. In some species I have drawn maps on the distribution in Denmark. Because the intensity of collecting has been very different in the various regions of the country, and as the collections as a whole are too scattered, it is still too early to give definitive statements on the distribution of the *Hybomitra*-species in Denmark. Several of the species seem to show

**Table 1.** Survey over the synonymous relations between the Danish species and the species of various European authors.

	Lundbeck (1907)	Kröber (1925 and 1932)	Oldroyd (1939)	Kauri (1951 and 1954)
1. <i>H. micans</i> Meig.	not known	<i>micans</i> Meig. (Not seen)	<i>micans</i> Meig. (Not seen)	not known
2. <i>H. lurida</i> Fall.	<i>luridus</i> Fall.	<i>luridus</i> Fall. (Not seen)	<i>luridus</i> Fall. (Not seen)	<i>luridus</i> Fall. (Not seen)
3. <i>H. collini</i> n. sp.	<i>tropicus</i> Pz. partim	<i>tropicus</i> Pz. partim <i>montanus</i> Meig. mel. form pt.	<i>tropicus</i> L. partim (Only the Worcester-specimen)	<i>tropicus</i> Pz.
4. <i>H. bimaculata</i> Macq.	<i>tropicus</i> Pz. partim	<i>tropicus</i> Pz. partim	<i>bisignatus</i> Jaen. partim (Light form)	?
5. <i>H. bisignata</i> Jaen.	<i>tropicus</i> Pz. partim	<i>tropicus</i> var. <i>bisignatus</i> Jaen. (Not seen)	<i>bisignatus</i> Jaen. partim (Dark form)	?
6. <i>H. solstitialis</i> Meig.	not known	?	<i>solstitialis</i> Meig.	?
7. <i>H. schineri</i> n. sp.	<i>solstitialis</i> Schin. partim	<i>solstitialis</i> Schin. partim <i>tropicus</i> Pz. partim <i>montanus</i> Meig. var. partim	not known, see p. 115	<i>solstitialis</i> Schin. partim
8. <i>H. distinguenda</i> Verr.	<i>solstitialis</i> Schin. partim <i>mühlfeldi</i> Brau. partim	<i>distinguendus</i> Verr. (Not seen) <i>tropicus</i> Pz. partim <i>solstitialis</i> Schin. partim <i>montanus</i> Meig. partim	<i>distinguendus</i> Verr.	<i>distinguendus</i> Verr.
9. <i>H. mühlfeldi</i> Brau.	<i>solstitialis</i> Schin. partim <i>mühlfeldi</i> Brau. partim	<i>solstitialis</i> Schin. partim <i>tropicus</i> Pz. partim	<i>tropicus</i> L. partim (All ÷ the Worcester-specimen)	<i>solstitialis</i> Schin. partim
10. <i>H. lundbecki</i> n. sp.	<i>montanus</i> Meig. partim	<i>montanus</i> Meig. partim <i>fulvicornis</i> Meig. partim	not known, see p. 133	<i>fulvicornis</i> Meig.
11. <i>H. tuxeni</i> n. sp.	<i>montanus</i> Meig. partim	<i>montanus</i> Meig. partim <i>fulvicornis</i> Meig. partim	not known, see p. 137	?
12. <i>H. m. montana</i> Meig.	<i>montanus</i> Meig. partim	<i>montanus</i> Meig. partim	<i>montanus</i> Meig. (Not seen)	<i>montanus</i> Meig.
13. <i>H. m. flaviceps</i> Zett.	not known	?	?	<i>montanus flaviceps</i> Zett.
14. <i>H. staegeri</i> n. sp.	<i>mühlfeldi</i> Brau. partim	<i>mühlfeldi</i> Brau. ?	?	?

interesting distribution-patterns. A southern species is *micans* Meig. *H. lurida* Fall., *solstitialis* Meig., *m. montana* Meig. and *montana flaviceps* Zett. have a distinctly western distribution, almost exclusively in Jutland. A more eastern distribution-pattern, e. g. in the islands, shows

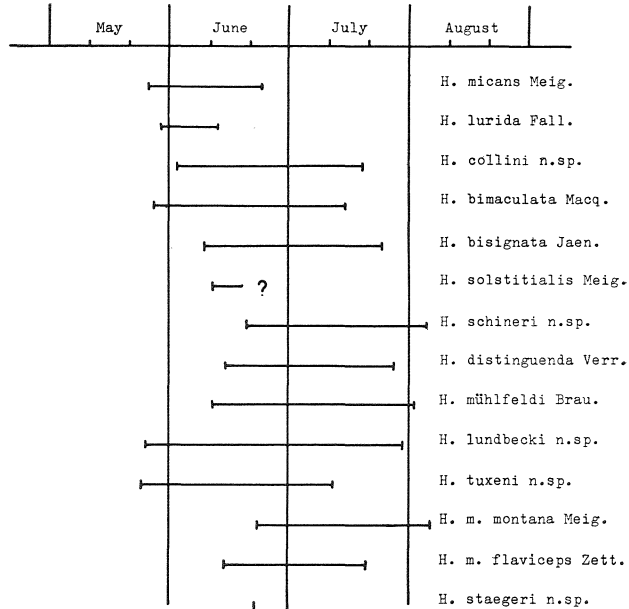


Fig. 1: The seasonal distribution of the Danish *Hybomitra*-species.

*schineri* n. sp., *mühlfeldi* Brau. and *tuxeni* n. sp., all of which are very sparse in Jutland. The other species are either sparse or show a more or less even distribution all over the country. In the synopsis further remarks on the distribution are given.

Regarding the distribution in other countries there are difficulties in several species, because various names are used for the same species and various species have the same name. Before revisions have been undertaken

in the various countries only little may be said with certainty on the total distribution. In this paper I have mentioned details on the distribution in Sweden, Germany and England, and at the same time I have considered the synonymous differences. The total distribution is reproduced after a table in Leclercq (1957), in a few cases I have also used Olsoufieff (1937).

The sections on the "Biology" are the weakest parts, because the informations are very scattered. Best known is the flying-period of imagines. In fig. 1 is given a survey over the seasonal distribution of the Danish *Hybomitra*-species. *H. micans* Meig. and *lurida* Fall. are both early species. The species of the *bimaculata*-group (*collini* to *mühlfeldi*) have all flying-periods of remarkably equal length, viz. about 1½ month. In the *montana*-group *lundbecki* n. sp. and *tuxeni* n. sp. both have a flying-period, which is placed several weeks earlier than that of *m. montana* Meig.

**Key to the Danish subgenera of *Tabanus* s. lat.**

(After Leclercq 1952, p. 43).

- 1. Eyes un haired. Lower frontal callus distinct. Middle frontal callus also distinct, sometimes free, but more often downwards connected with the lower callus. *Tabanus* s. str. L.
- Eyes short and sparsely haired. Vertex only slightly produced, never forming a shining ocellar callus, more or less divided by a longitudinal groove. Lower frontal callus distinct..... *Theriopectes* Zeller
- Eyes distinctly haired with longer or shorter hairs. Vertex with a distinct shining ocellar callus. Lower frontal callus distinct, as a rule also a middle frontal callus..... *Hybomitra* Enderlein
- Eyes more or less haired. Vertex plain. Lower and middle frontal callus very small or quite wanting..... *Atylotus* Osten-Sacken

***Hybomitra* Enderlein, 1922**

Includes a number of the most common Danish species of middle size, 12—18 mm. The eyes are always

distinctly haired. Lower frontal callus well developed of varying form. As a rule also a middle frontal callus is present. On vertex a distinct and shining black or brown ocellar callus. Abdomen as a rule with brown sidemarkings on the first tergites.

### Key to the Danish species:

♀♀.

1. Legs entirely black. Frontal triangle shining black (fig. 5 d).  
Abdomen black with three rows of grey spots..... 1. *micans* Meig. (p. 89).
- Legs not entirely black, tibiae more or less brownish... 2.
2. Frontal triangle shining black (fig. 6 c). Frontal stripe broad (fig. 6 c). Abdomen shining black, on the first tergites often yellowish brown sidemarkings ..... 2. *lurida* Fall. (p. 91).
- Frontal triangle grey dusted (may partly be rubbed off).. 3.
3. Halteres yellowish white. Frontal stripe broad. Lower frontal callus broader than high, shining brown (fig. 23 c). Abdomen dorsally with yellow sidemarkings on 1st—4th tergite; the middle stripe narrow, about  $\frac{1}{8}$  of the width of third tergite..... 14. *staegeri* n. sp. (p. 145).
- Halteres brownish or blackish, at least at the base..... 4.
4. Frontal stripe narrow, 4—6 times higher than broad below (fig. 7 c, 10 c, 11 c, 13 c, 14 c). Lower frontal callus higher than broad and transversely wrinkled, not plain (fig. 7 c, 10 c, 11 c, 13 c, 14 c). Palpi more or less thickened at the base, with long hairs on the under side (fig. 7 b, 10 b, 11 b, 13 b, 14 b). The antennal bow of equal width (fig. 7 c, 10 c, 11 c, 13 c, 14 c). 2nd sternite as a rule without a large, dark quadratic spot (*bimaculata*-group)..... 5.
- Frontal stripe broader, 3—4 times higher than broad below (fig. 16 c, 18 c, 21 c). Lower frontal callus often broader than high and plain, not transversely wrinkled (fig. 16 c, 18 c, 21 c). Palpi more slender (fig. 16 b, 18 b, 21 b), with shorter hairs on under side. The antennal bow broader towards the middle line (fig. 16 c, 18 c, 21 c). 2nd sternite with a large, dark, quadratic spot (*montana*-group)..... 11.
5. Sidemarkings on not more than the three first tergites, or if small sidemarkings also on 4th tergite, then the two basal antennal joints distinctly grey dusted..... 6.
- Sidemarkings on the first four tergites, or if only on the three first then at the same time the basal antennal joints reddish brown and notopleural calli brown..... 10.

- 6. Notopleural calli brown. Yellowish brown sidemarkings on the three first tergites. Middle stripe of  $\frac{1}{3}$  or a little less than  $\frac{1}{3}$  the width of the tergites. 8th sternite and anal-lamellae of type 3 (fig. 2)..... 9. *mühlfeldi* Brau. (p. 119).
- Notopleural calli black. 8th sternite and anal lamellae of type 1 (fig. 2)..... 7.
- 7. Sidemarkings on the three first tergites ..... 8.
- Sidemarkings on at most the two first tergites ..... 9.

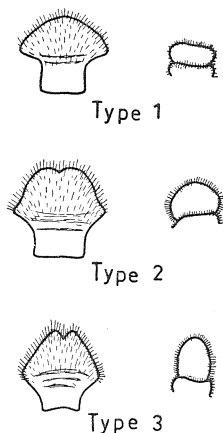


Fig. 2: Shape of 8th sternite (left row) seen ventrally and the right anal-lamel (right row) seen dorsally in the *Hybomitra*-species of the *bimaculata*-group. To type 1 belong *H. collini* n. sp., *bimaculata* Macq., *bisignata* Jaen., *solstitialis* Meig. and *schineri* n. sp. To type 2 belongs *distinguenda* Verr. and to type 3 *mühlfeldi* Brau.

- 8. The two basal antennal joints greyish black. Abdomen with broad, black middle stripe, which occupies more than  $\frac{1}{3}$  the width of the tergites. Sidemarkings dark yellowish brown and not sharply divided from the middle stripe. Pleurae with mainly dark greyish and black pubescence ..... 3. *collini* n. sp. (p. 94).
- The two basal antennal joints lighter, always grey dusted, but the brown ground coloration can be seen. Abdomen with more narrow, black middle stripe, which occupies less than  $\frac{1}{3}$  the width of the tergites. Sidemarkings light (partly whitish) yellowish brown and sharply divided from the middle stripe. Pleurae with light grey pubescence. . . . . 6. *solstitialis* Meig. (p. 106).
- 9. Abdomen dorsally with reddish brown or yellowish brown sidemarkings on the first two tergites. Reddish brown or yellowish brown coloration on the under side to a varying degree ..... 4. *bimaculata* Macq. (p. 101).



- Abdomen dorsally uniformly black with grey spots, sometimes there are small reddish brown sidemarkings at the hind margin of 1st and/or the fore margin of 2nd tergite. Under side uniformly grey, sometimes a weak brown tinge on the sides of 2nd—3rd sternite. . . . . 5. *bisignata* Jaen. (p. 104).
- 10. The two basal antennal joints brown. 2nd tergite always with many black hairs on the sidemarkings. Genitalia of type 1 (fig. 2) . . . . . 7. *schineri* n. sp. (p. 109).
- The two basal antennal joints greyish black. 2nd tergite without black hairs on the sides. Genitalia of type 2 (fig. 2) . . . . . 8. *distinguenda* Verr. (p. 115).
- 11. 3rd antennal joint broad and reddish brown (fig. 16 a). Notopleural calli black . . . . . 10. *lundbecki* n. sp. (p. 127).
- 3rd antennal joint more narrow and mainly black, only basally more or less brownish (fig. 18 a, 21 a). Notopleural calli brown . . . . . 12.
- 12. 3rd antennal joint rather narrow, more or less brownish at the base (fig. 18 a). Abdominal pubescence golden-yellow. Larger species . . . . . 11. *tuxeni* n. sp. (p. 133).
- 3rd antennal joint narrow, only little brownish at the base (fig. 21 a). Abdominal pubescence grey. Smaller species. . . . . 13.
- 13. Abdomen dorsally with distinct yellowish brown sidemarkings on the first three or four tergites. Under side with distinct yellowish brown coloration on the sides of the first sternites . . . . . 12. *m. montana* Meig. (p. 139).
- Abdomen dorsally without yellowish brown sidemarkings or these very small. Under side mainly uniformly greyish black, sometimes a faint tinge of yellowish brown coloration on the sides of 2nd and 3rd sternite . . . . . 13. *montana flaviceps* Zett. (p. 144).

## ♂♂.

- 1. Legs entirely black. Fore tarsi with long, erect hairs (fig. 5 a) . . . . . 1. *micans* Meig. (p. 89).
- Legs not entirely black, tibiae more or less brownish. Fore tarsi without such hairs . . . . . 2.
- 2. Eye-seam shallow, only 1½ times higher than height of frontal triangle. Palpi strongly thickened. A shining black species . . . . . 2. *lurida* Fall. (p. 91).
- Eye-seam twice as high as height of the frontal triangle . . . . . 3.
- 3. Halteres yellowish white. Under side with dark middle spot on 2nd sternite and eye-facets in the upper two thirds of the eyes about 2—3 times larger than those in the lower

- third (after Olsoufieff 1937, p. 379). 14. *staegeri* n. sp. (p. 145).  
 — Halteres brownish or black, at least at the base. . . . . 4.  
 4. Palpi more or less thickened (fig. 3 c). On vertex a tuft of longer hairs (fig. 3 a). Hairs on upper side of 1st antennal joint longer than 1st and 2nd joint together (fig. 3 b). The antennal bow of equal width (fig. 3 a) (*bimaculata*-group) . . . . . 5.  
 — Palpi more slender (fig. 4 c). On vertex none or some few shorter hairs (fig. 4 a). Hairs on upper side of 1st antennal

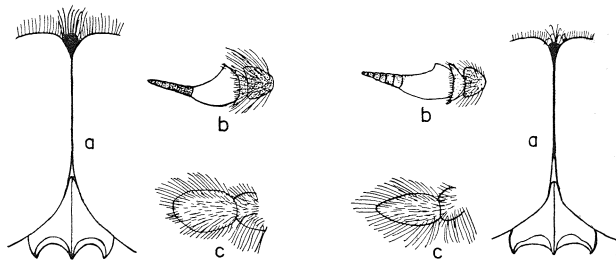


Fig. 3

Fig. 4

Fig. 3: *H. collini* n. sp. (male) a: Eye-seam and frontal triangle, b: Antenna and c: Palp.

Fig. 4: *H. lundbecki* n. sp. (male) a: Eye-seam and frontal triangle, b: Antenna and c: Palp.

- joint shorter than 1st and 2nd joint together (fig. 4 b). Antennal bow broader towards the middle line (fig. 4 a) (*montana*-group) . . . . . 11.  
 5. Eye-facets of almost equal size, the middle facets only little larger than lower facets. Notopleural calli black. Brown sidemarkings on 1st—3rd tergite. Middle stripe on upper side of abdomen comparatively broad, on 3rd tergite  $\frac{1}{5}$ — $\frac{1}{3}$  the width of the tergite . . . . . 6.  
 — Eye-facets in the middle parts of the eyes considerably enlarged. Brown sidemarkings as a rule on 1st—4th tergite, or if only on 1st—3rd tergite, then the notopleural calli brownish. Notopleural calli black or brown. Middle stripe on upper side of abdomen comparatively narrow, on 3rd tergite about  $\frac{1}{8}$  the width of the tergite. . . . . 9.  
 6. Thorax, especially the pleurae, with pale greyish pubescence. Middle stripe on abdomen rather narrow, about  $\frac{1}{5}$

- of the width of 3rd tergite. Brown sidemarkings on upper side very light, without greyish shadows.....
- ..... 6. *solstitialis* Meig. (p. 106).
- Thorax with dark grey and black pubescence. Middle stripe broader,  $1/4-1/3$  the width of 3rd tergite. The brown sidemarkings on upper side with grey shadows..... 7.
7. At the base of 2nd sternite a flat, more or less rounded dark spot (fig. 9 a). 1st and 2nd sternite with mainly whitish hairs..... 3. *collini* n. sp. (p. 94).
- At the base of 2nd sternite a larger, more or less triangular dark spot (fig. 9 b and c)..... 8.
8. At the base of 2nd sternite a flat triangular spot, the tip of which is placed at the middle of the sternite (fig. 9 b). Some whitish hairs on the sides of the first sternites... .. 4. *bimaculata* Macq. (p. 101).
- At the base of 2nd sternite a larger, dark spot, the tip of which is placed at the hind margin of the sternite (fig. 9 c). The first sternites with mainly black hairs..... 5. *bisignata* Jaen. (p. 104).
9. The middle facets strongly enlarged and sharply divided from the lower and smaller facets. 1st and 2nd antennal joint brownish..... 7. *schineri* n. sp. (p. 109).
- The middle facets less strongly enlarged and gradually smaller downwards. 1st and 2nd antennal joint grey or greyish black..... 10.
10. Abdominal middle stripe with broad, low, whitish grey middle triangles. Along the hind margin of 1st tergite a broad border of golden hairs. At the base of 2nd sternite a flat, rounded spot..... 8. *distinguenda* Verr. (p. 115).
- Abdominal middle stripe with narrow, high, grey middle triangles. Along the hind margin of 1st tergite a narrow border of golden hairs or none at all. At the base of 2nd sternite a triangular or pentangular spot..... 9. *mühlfeldi* Brau. (p. 119).
11. 3rd antennal joint mainly reddish brown and with a distinct dorsal tooth. Notopleural calli black..... 10. *lundbecki* n. sp. (p. 127).
- 3rd antennal joint mainly blackish and with an indistinct dorsal tooth. Notopleural calli brown..... 11. *tuxeni* n. sp. (p. 133),  
12. *m. montana* Meig. (p. 139),  
and 13. *montana flaviceps* Zett. (p. 144).

1. *Hybomitra micans* Meigen, 1820.

Identification.

This species may easily be identified. In the female this species and the following one, *lurida* Fall., are the only Danish species with shining black frontal triangle and from *lurida* and all other Danish species it may be distinguished by its black legs. Besides the male has long, erect hairs on the fore tarsi.

Description.

♀: The head seems broad and shallow owing to its very broad frontal stripe, which is  $2\frac{1}{2}$ —3 times as high

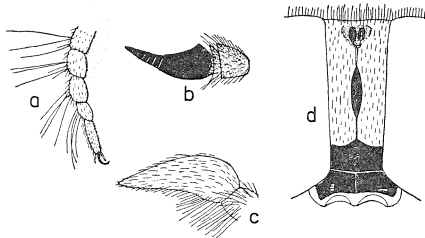


Fig. 5: *H. micans* Meig. a: Fore tarsus in the male, b: Antenna, c: Palp and d: Frontal stripe, b—d in the female.

as broad below and greyish dusted. Lower frontal callus broad and shallow, shining black. It is by means of a narrow, black line connected with the middle frontal callus, which again upwards continues as a narrow line to the upper frontal callus (= the ocellar callus). The palpi are slender and blackish, often grey dusted and with rather long hairs at the base. The antennae black, 1st and 2nd joint grey dusted and 3rd joint with a small, obtuse tooth on the dorsal side. Frontal triangle black.

Thorax black, mesonotum with five indistinct, grey stripes. The wings greyish with dark brownish veins. Legs black.

Abdomen is dorsally black, but seen from behind bluish grey. 2nd tergite with two grey spots on the sides. On 2nd—5th tergite a bundle of white hairs in the middle

of the hind borders of the segments. The under side with bluish grey dust.

♂: May easily be identified by its very long, erect hairs on the fore tarsi. The palpi are long-ovale, black or dark-brown. Antennae black, 1st and 2nd joint with long, close-set hairs. Otherwise as in female.

Length: 13—17 mm.

Occurrence in Denmark.

The species has not earlier been recorded from Denmark. Hitherto it has only been met with in Stensbæk plantation at Gram in the southern Jutland, where J. G. Worm-Hansen in June 1949 caught 9 females. A male was taken by the same collector on May the 25th 1952 at the same place. The species occurs probably in several places in the southernmost part of the country.

Distribution.

The species is not mentioned from Sweden by Kauri (1954) in his work on the Swedish tabanids. Germany: "Ist im ganzen Gebiet von April bis August häufig" (Kröber 1932, p. 73). In Schleswig-Holstein the species is known from 11 localities NE and 6 localities S of the Elbe (Kröber 1930, p. 30). In Britain *micans* is not common, but is, however, known from several places from the south coast to Inverness in Scotland (Goffe 1931, p. 91). The species is also known from Holland, Belgium, France, Austria, Czecho-Slovakia, Switzerland, Greece, Bulgaria, and U. S. S. R. (Leclercq 1957). *H. micans* seems therefore to be a southern species with its northern limit through southern Denmark and Scotland.

Biology.

Kröber (1932, p. 73) states, that the species can be met with along roads with flowering hedges. In the early morning both males and females can be seen on flowers, especially of *Heracleum*. According to some notes from England (Kloet 1941, p. 202 and Hamm 1941, p. 285) *mi-*

*cans* is several times taken on honey dew (from aphids), and furthermore it has also been seen drinking on damp soil and at small streams.

The flying-period is April—August (Kröber 1932, p. 73). According to Goffe (1931, p. 31) it is a very early species: May—June. Oldroyd (1939, p. 90) proposes, that the infrequency of the species is due to its early occurrence, because in spring and the beginning of the summer there is only very few hot days, which are the only days, when tabanids are caught. The Danish material dates as follows: 25th May (1 male), 7th June (7 females), 17th June (1 female), 18th June (1 female), 20th June (1 female) and 23rd June (1 female).

## 2. *Hybomitra lurida* Fallen, 1817.

### Identification.

Like *micans* the female has a black, shining frontal triangle, but may easily be distinguished from it by not having the legs completely black. In addition there is often yellowish red sidemarkings on the first tergites. The male is distinguished from all other Danish *Hybomitra*-species by its very short eye-seam, which is only  $1\frac{1}{2}$  times as high as the height of the frontal triangle (in other species at least 2 times as high as the frontal triangle).

### Description.

♀: A small, dark species with broad and short frontal stripe, which is  $3-3\frac{1}{2}$  times as high as broad below. The frontal triangle shining black or brownish black. Lower frontal callus triangular-semicircular, the middle frontal callus is surrounded by a black, haired area. On the vertex (behind the ocellar callus) a tuft of long, black hairs. The eyes with brown hairs. Antennae black, 1st and 2nd joint greyish dusted. The 3rd joint reddish brown at the base, with a distinct tooth dorsally. The palpi short and thickened at the base with a short, blunt point, its anterior edge forming a sector of a circle, the posterior edge an almost straight line. The colour is very pale brown with black and white hairs.

Thorax and abdomen very shining, mostly black. 2nd—3rd tergite often with reddish brown sidemarkings. In addition there may be grey sidemarkings on 3rd and 4th or 3rd—6th tergite by means of which 2 rows of grey spots are formed. The underside is black, but a reddish yellow coloration on 2nd to 4th sternite may be seen in several cases. Femora black and light grey dusted. Tibiae dark brown, tarsi blackish.

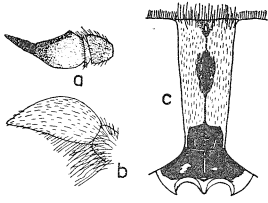


Fig. 6: *H. lurida* Fall. (female). a: Antenna, b: Palp and c: Frontal stripe.

♂: Easily recognized by its short eye-seam, which is only  $1\frac{1}{2}$  times as high as the height of the frontal triangle. All eye-facets of the same size. Palpi strongly thickened, grey with yellowish brown point. First antennal joint grey, with long, black hairs. Third joint reddish brown.

Thorax and abdomen shining black, 1st to 3rd tergite with reddish brown sidemarkings. The underside reddish yellow with broad, light seams behind. The second sternite with a dark marking in the middle, the two last segments completely black.

Length: 12—15 mm.

Occurrence in Denmark.

In the collections of the Zool. Mus. in Copenhagen there are 11 females (of these 4 without dates from Staegers collection) and 1 male (from Staegers collection). Localities in Jutland: ♀ Silkeborg 29th May 1904 (Axel Petersen), ♀ Frijsenborg July 1884 (Løvendal), ♀ Stensbæk plantation at Gram 12th June 1949 (Worm-Hansen). In Zealand the species has only been met with twice: 2 ♀♀ in Mus. Westermann labelled Zealand August 1831 and a ♀ from Dyrehaven at Copenhagen 19th June 1923 (Lundbeck).

According to this sparse material *H. lurida* seems to

be a species with greater frequency in Jutland than on the islands, especially when the greater intensity of collecting on the islands is taken into consideration. The explanation is perhaps, that the species is connected with the most humid areas.

#### Distribution.

Sweden: Rather commonly distributed all over the country from Scania to Lapland (Kauri 1954, p. 241). Seems to be connected with hilly and wooded regions (Ringdahl 1951, p. 119). Germany: Known from the southern Bayern till North-Germany. Occurs locally, but presumably it is often overlooked (Kröber 1932, p. 77). Very scarce in Schleswig-Holstein, but often confused with *tropicus* (Kröber 1930, p. 30). *H. lurida* is known only from one locality in England, while it is rather abundant in Scotland (Oldroyd 1939, p. 91). Though according to Leclercq (1957) the species also occurs in Holland, Belgium, France, Austria and U. S. S. R., it seems to be a typical northern species.

#### Biology.

According to Ringdahl (1943, p. 170) the earliest *Hybomitra*-species, thus it occurs in the southern Sweden from 21st May to 11th July. Kröber (1932, p. 77) states the flying-period as May—August. From Schleswig-Holstein is given a date as early as 29th April (Kröber 1930, p. 30). The Danish takings (only 3 with exact dates) originate from 29th May to 19th June. On the biology of *H. lurida* only little is known. Kröber (1932, p. 77) states that the species can be seen on pasturing cattle. One of the Danish specimens has been caught by our Simuliid-expert Axel Petersen, and this fact indicates, that Kröber's remarks are also valid as to Danish conditions. In Scotland both sexes have been seen sitting on a sandy road in May (Oldroyd 1939, p. 91).



### ***Bimaculata*-group.**

#### 3. *Hybomitra collini* sp. nov.

Syn.: partim *tropicus* auct. nec L.

##### Identification.

The females of this and the following six species may be distinguished from the two preceding species by their grey frontal triangle and from the *montana*-group (*lundbecki* n. sp., *tuxeni* n. sp., *m. montana* Meig., *montana flaviceps* Zett.) by the following characters: 1) frontal stripe narrow, 4—6 (not 3—4) times higher than broad below, 2) lower frontal callus higher than broad and transversely wrinkled (not shining plain), 3) palpi more or less thickened at the base, with long hairs on the under side, 4) the antennal bow of equal width and 5) 2nd sternite as a rule without a dark, quadratic spot. The shape of the 8th sternite and the anal-lamellae (of type 1, see fig. 2) distinguish it from *distinguenda* Verr. (of type 2, see fig. 2) and *mühlfeldi* Brau. (of type 3, see fig. 2). *H. schineri* n. sp. has the two first antennal joints mostly brown, the notopleural callus brown and abdominal sidemarkings on the 4th tergite, whereas *collini* n. sp. has the basal antennal joints greyish black, the notopleural callus black and sidemarkings only on 1st—3rd tergite. In *solstitialis* Meig. the yellowish brown sidemarkings on 1st—3rd tergite are very pale and the middle stripe hardly  $\frac{1}{3}$  the width of the tergites and sharply contrasted from the sidemarkings, whereas *collini* n. sp. has the sidemarkings darker, the black middle stripe broader than  $\frac{1}{3}$  the width of the tergites and not so sharply contrasted from the sidemarkings as in *solstitialis* Meig. In *bimaculata* Macq. there are sidemarkings on the two first tergites and in *bisignata* Jaen. the under side is greyish black, whereas *collini* n. sp. has sidemarkings on the three first segments and the under side always with distinct reddish brown coloration.

The male *H. collini* n. sp. may be distinguished from *micans* Meig. and *lurida* Fall. respectively by the absence of long, erect hairs on the front tarsi and by the length of the eye-seam, which in *collini* n. sp. is more than twice as high as the frontal triangle. From the species in the *montana*-group, *collini* n. sp. and the following six species may be distinguished by: 1) longer hairs on vertex, 2) palpi more thickened at the base, 3) the hairs on upper side of 1st antennal joint longer than 1st and 2nd joint together. In *schineri* n. sp. and *distinguenda* Verr. the eye-facets are strongly enlarged, whereas *collini* n. sp. has the eye-facets of almost equal size. It may most easily be confused with *solstitialis* Meig. and

*mühlfeldi* Brau. together with *bimaculata* Macq. and *bisignata* Jaen. On p. 102 is given a table by means of which *collini* n. sp. may be distinguished from the two latter species. From the two former species, *collini* n. sp. may be distinguished by its broad, black, abdominal middle stripe (not less than  $\frac{1}{4}$  the width of the segments at the base of 3rd tergite), whereas *solstitialis* Meig. and *mühlfeldi* Brau. have the middle stripe greyish black or greyish brown and more narrow (in *mühlfeldi* Brau. not more than  $\frac{1}{6}$  the width of the segments, in *solstitialis* Meig. a little broader). In *mühlfeldi* Brau. the notopleural callus is brown, not black. In *solstitialis* Meig. the pleurae have whitish grey hairs, in *collini* n. sp. the hairs are black and greyish black.

#### Description.

♀: The frontal stripe yellowish grey to silvery grey dusted, 4–5 times as high as broad below and gradually narrowed downwards. Lower frontal callus brownish black to black, with transverse wrinkles and well separated from the eye-margin. The shape is rectangular, higher than broad, but the upper margin often rounded. Upwards it continues as a narrow, black line. The ocellar callus oval, shining brown. The degree of hairing is somewhat variable, as a rule there is a lot of stiff, downwards directed, black hairs, which are decreasing in length towards the base of the frontal stripe. On the vertex a tuft of black hairs. The frontal triangle with yellowish grey to silvery grey dust. On the eyes a dense covering of greyish brown hairs.

1st and 2nd antennal joint grey dusted, with black and some pale hairs. The 3rd joint somewhat broad and with a distinct tooth on the dorsal side. The colour is reddish brown to yellowish brown, the upper margin and the style darker. The palpi thickened at the base and then abruptly attenuated into a fine, straight point. The colour yellowish brown, more or less grey dusted and with short, black hairs.

Thorax greyish black to black, mesonotum with 3–5 indistinct grey stripes. The notopleural callus black. The halteres brownish black. The wings grey with brown veins.

Abdomen dorsally with a broad, black middle stripe on the first three tergites, the sides of which are yellowish brown to reddish brown. The middle stripe occupies at least  $\frac{1}{3}$  the width of the tergites. The last tergites completely black. All tergites with a pale middle triangle of various extensions. The under side somewhat varying, but always with reddish brown or yellowish brown coloration on the basal sternites (including the 4th). Dark

markings always present, but they vary in extension from a small triangle or a greater, rectangular spot at the base of the 2nd sternite to a black middle stripe of varying width. The last sternites (5th—7th) are black. 8. sternite and the anal-lamellae of type 1 (see fig. 2).

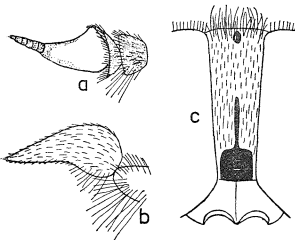


Fig. 7: *H. collini* n. sp. (female, holotype), a: Antenna, b: Palp and c: Frontal stripe.

Femora black, but grey dusted, tibiae and tarsi brown, fore tibiae only basally.

♂: The eye-facets of almost equal size, the middle facets only a little greater than the external facets. The eye-seam twice as long as the height of the frontal triangle (fig. 3a). The eyes densely covered with greyish brown hairs. The ocellar tubercle shining brown, behind it a tuft of black hairs (fig. 3a). 1st and 2nd antennal joint greyish black with long, black hairs. 3rd antennal joint not so broad as in the female, but still with a distinct, acute angled tooth (fig. 3b). The palpi thickened, their colour greyish brown (not greyish black), sometimes lighter brownish, with black and white hairs (fig. 3c). The dark abdominal stripe on the first three tergites is more narrow than in the female. The stripe is formed like an hour-glass and is most narrow at the base of 3rd tergite, where the width is about  $\frac{1}{4}$  the width of the tergite. On the under side 1st sternite is brownish

black, more or less grey dusted. 2nd to 4th sternite yellowish, sometimes also a narrow yellow area along the front margin of the 5th sternite. At the base of 2nd sternite a flat, rounded, dark spot, the height of which is only  $\frac{1}{4}$  the length of the sternite (fig. 9a). Sometimes also a narrow, blurred dark middle stripe. The hairs on 1st—3rd sternite chiefly soft and pale, but some black, stiff hairs can be seen in the middle of the sternites, especially on the third. Otherwise as in the female.

Length: 14—17 mm.

Type-material.

Holotype: ♀ taken on 3rd July 1958 at Bagsværd NW of Copenhagen (author collected).

No allotype is selected.

The type in Zool. Museum of Copenhagen.

Discussion.

I have given the name *collini* n. sp. to the species, which by Brauer (1880, p. 146) is mentioned as *tropicus* Meig. = *tropicus* Panz. Meigen (1820, p. 57) names the species *tropicus* L.

An examination of the 4 specimens under the name *tropicus* in the Linnean Collection in London has been undertaken by Mr. J. E. Collin, Newmarket, and has given the following results: "There are only two of the four specimens in the Linnean Collection which need be seriously studied, because one bears a label showing that it was from the East Indies, and cannot therefore be one of the original syntypic series, and this also applies to another, much larger specimen of the restricted genus *Tabanus*, because the only detailed description (that in Fauna Suecica, and quoted in Systema Naturae of 1758) states that the species was of "magnitudo Bombylii", and this particular specimen is much larger than the other two. These two therefore constitute all that remains of the original syntypic series of *Tabanus tropicus*, and one

of them bears a label in the handwriting of Linnaeus of "9. *tropicus*". Neither of these two specimens can be the "*tropicus*" described by Brauer because the notopleural callus is yellowish, not dark as in Brauer's *tropicus*, while the shape of the frontal callus is not the same" (Collin in litt. 3rd July 1958). — "The type of *tropicus* answers in all visible characters with a form of *montanus* Meig." (Collin in litt. 15th October 1958) (see fig. 19). Zetterstedt (1842, p. 111), Loew (1858, p. 586) and Schiner (1862, p. 31) have identified their *tropicus* in accordance with the Linnean species. In 1880 Brauer, in all probability on the basis of specimens of *tropicus* L. sensu Meig. from Winthem's Collection (not seen by Loew and Schiner), introduces his *tropicus* according to the species, misidentified by Panzer and Meigen as *tropicus* L., and since then the opinion of Brauer has been followed by most Continental authors, though other species are intermixed with their *tropicus*. It is a part of this *tropicus*, I here have given the name: *collini* n. sp.

7 females and 1 male from Sweden sent me as *tropicus* Panz. have shown, that Kauri's (1954, p. 242) *tropicus* is identical with *collini* n. sp. Lundbeck's (1907, p. 114) *tropicus* Panz. is a species mixed of *collini* n. sp. and *mühlfeldi* Brau. A minority of Kröber's *tropicus* Panz. is *collini* n. sp. according to material from various German collections (see p. 79). A single female with the determination *montanus* Meig. (Kröber det. 1921) was a *collini* n. sp. In order to get in agreement with the British nomenclature I have been in connection with Mr. J. E. Collin, and the following is the result of our correspondence and exchange of specimens. In Britain the following use of the name *tropicus* has been practised:

Verrall 1909, p. 355: *tropicus* Meig.

Goffe 1931, p. 93 : *tropicus* L., partim Panzer.

Oldroyd 1939, p. 96 : *tropicus* L.

Mr. Collin states (in litt. 21st December 1957) that only

one of the specimens mentioned as *tropicus* by the above named authors belongs to *tropicus* Brau. (= *collini* n. sp.). It is the specimen from Worcester 3rd July 1869 (see Verrall 1909, p. 359 and Oldroyd 1939, p. 96). In 1939 Oldroyd separated Verrall's and Goffe's *tropicus* into two species: *tropicus* L. and *bisignatus* Jaen. In the former is included the Worcester-specimen, but the rest of Oldroyd's *tropicus* L. is neither the Linnean species nor *tropicus* Brau. (= *collini* n. sp.), but is the species mentioned in the present paper as *mühlfeldi* Brau. (nec Olsoufieff et al.). The two species (*collini* n. sp. and *mühlfeldi* Brau.) may easily be distinguished by the form of the 8th sternite and the anal-lamellae, in *collini* n. sp. of type 1 (see fig. 2) and in *mühlfeldi* Brau. of type 3 (see fig. 2). Also *bisignatus* Jaen. sensu Oldroyd (in the present paper identical with *bimaculata* Macq. + *bisignata* Jaen.) has the 8th sternite and the anal-lamellae formed as in fig. 2, type 1.

From the above mentioned facts it can be seen that the *tropicus*-name has been used for several species. It will be very inappropriate to remove the *tropicus*-name to the Linnean species, which probably belongs to the species mentioned below as *tuxeni* n. sp. I therefore propose the name *tropicus* L. to be deleted.

I have named my species after Mr. J. E. Collin, Newmarket. The problems about *tropicus* would not have been cleared up without his help.

#### Occurrence in Denmark.

*H. collini* n. sp. is a rather common species in Denmark. The collection of Zool. Mus. of Copenhagen contains 29 ♀♀ and 11 ♂♂ and in Naturhistorisk Museum in Aarhus there is 8 ♀♀ and 1 ♂. My own collection consists of 10 ♀♀, all taken in the area about Hareskoven—Jonstrup NW of Copenhagen.

It is known from all provinces: Jutland: Dollerup at Viborg, Silkeborg, Sinding, Mausing and Funder (all at Silkeborg), Hansted skov N of Horsens, Stensbæk planta-

tion at Gram, Sønderborg, Kjelstrup, — Funen: Middelfart, — Zealand: Boserup at Roskilde, Tisvilde, Asserbo,

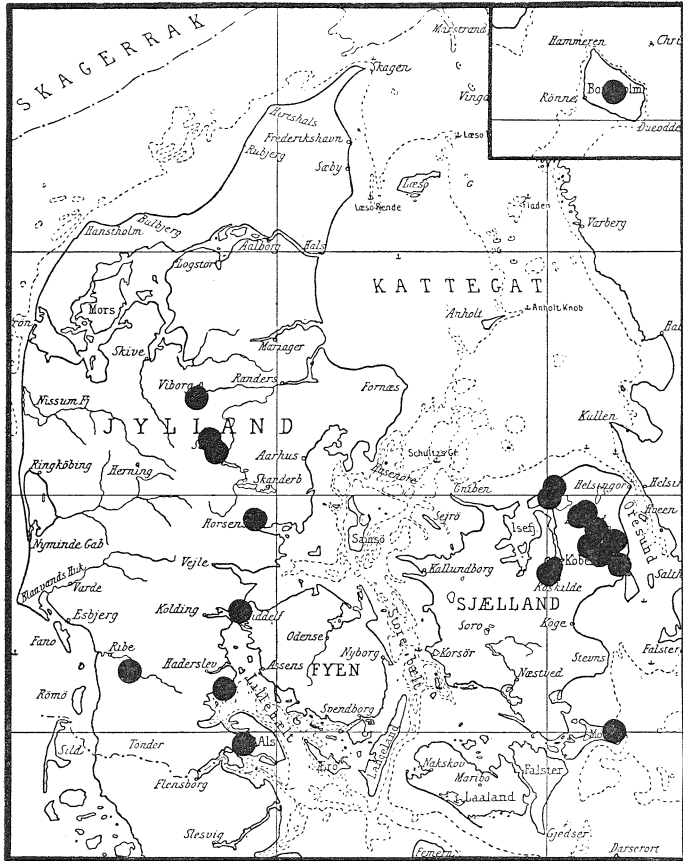


Fig. 8: The distribution of *H. collini* n. sp. in Denmark.

Hillerød, Stenholtsvang, Kattehale Mose\*) at Allerød, Frerslev hegn\*\*), Ryget at Værløse, Sortemose at Farum, Jonstrup, Frederiksdal, Bagsværd, Søllerød, Rudehegn, Geel

\*) Mose = bog

\*\*) Hegn and skov = wood

skov, Utterslev Mose, — Møen: Liselund, — and Bornholm: Almindingen.

The species seems to be connected with wooded regions.

#### Distribution.

A common species in Sweden (Kauri 1954, p. 242). 7 ♀♀ and 1 ♂ of Kauri's *tropicus* Panz. was identical with the Danish *collini* n. sp. In Britain only one specimen is known (Collin in litt. 21st December 1957), namely the specimen from Worcester July 1869 (Verrall 1909, p. 359 and Oldroyd 1939, p. 96). Before a revision has been undertaken, its further distribution can not be given.

#### Biology.

The Danish material has been collected from 3rd June to 18th July. 17 specimens are from 1st and 18 specimens from 2nd half of June, 12 specimens from 1st half of July and a single specimen from 18th July. The flying period is June and 1st half of July.

#### 4. *Hybomitra bimaculata* Macquart, 1826.

Syn.: partim *tropicus* auctt. nec L.

#### Identification.

The female may be distinguished from the other *Hybomitra*-species by means of the summary given in the "Identification" under *H. collini* n. sp. (see p. 94). From *collini* n. sp. and *bisignata* Jaen. it may be distinguished by means of the tables below.

#### Description.

♀: An intermediate species between *H. collini* n. sp. and the following species: *H. bisignata* Jaen. It may be distinguished from these by means of the extension of the reddish brown or yellowish brown coloration on the abdomen.



Upper side of abdomen	<i>H. collini</i> n. sp. Reddish brown or yellowish brown sidemarkings on the first three tergites.	<i>H. bimaculata</i> Macq. Reddish brown or yellowish brown sidemarkings on the first two tergites.	<i>H. bisignata</i> Jaen. Reddish brown or yellowish brown sidemarkings often wanting, sometimes still small markings at the hind margin of 1st and/or the fore margin of 2nd tergite.
Under side of abdomen	Reddish brown or yellowish brown coloration of various extension. (See "Description" in <i>H. collini</i> ).		Grey coloured, but sometimes a faint brown coloration on the sides of 2nd and 3rd sternite.

♂: It is difficult to distinguish the males of the three species. My material is only small and until further collectings have been done, nothing about the association between the sexes of the three species can be said with certainty. The table below is an attempt to distinguish the males of the three species:

	<i>H. collini</i> n. sp.	<i>H. bimaculata</i> Macq.	<i>H. bisignata</i> Jaen.
Colour of palpi	As a rule greyish brown, sometimes darker.	Greyish brown	Greyish black
Colour of 1st—5th sternite	1st sternite brownish black, 2nd—4th yellow with a flat, rounded, dark spot at the base of 2nd sternite. Often a narrow, yellow fore margin of 5th sternite (fig. 9 a)	1st sternite brownish black. 2nd—4th sternite yellowish brown with a dark triangular spot at the base of 2nd sternite. Its vertex in the middle of the sternite. (fig. 9 b)	1st sternite greyish black. 2nd—4th yellowish brown with an equilateral triangular spot on the 2nd sternite. Its vertex in the hind margin of the sternite. 4th sternite with dark hind margin. (fig. 9 c)
Colour and length of hairs on 1st—3rd sternite	Always many soft and rather long, pale hairs, here and there mixed with a few black hairs, especially on the 3rd sternite.	In the middle of the sternite a good many short, black hairs, but on 1st and the sides of 2nd and 3rd sternite mixed with some white hairs.	Rather long, black hairs on all three sternites. Only single pale hairs.
Form and extension of middle stripe on 1st—3rd tergite	Formed as an hour-glass, most narrow at the base of 3rd tergite, where it is $\frac{1}{4}$ the width of the tergite.	Middle stripe with parallel borders, occupying $\frac{1}{3}$ the width of tergites.	Like the preceding species.

### Discussion.

*H. bimaculata* Macq. is by most authors (see Kröber 1925, p. 72) interpreted as synonym to *tropicus* Panz. Oldroyd's (1939, p. 91) *bisignatus* Jaen. is partly my *bimaculata* Macq. The species was described by Macquart in 1826, and Meigen (1838, p. 59) gives a translation of Macquart's description. I do not know whether the type is still in existence. There is no reference to it in "Cata-

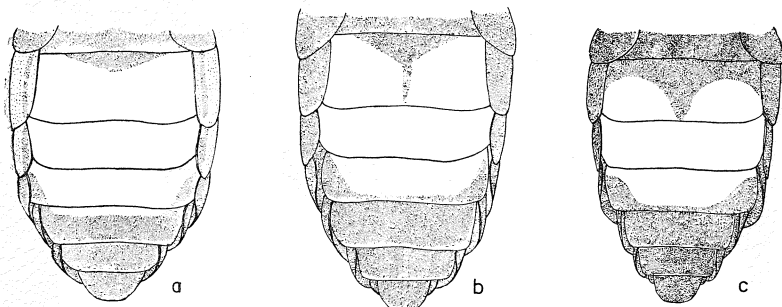


Fig. 9: Abdominal under side of the males of a: *H. collini* n. sp., b: *H. bimaculata* Macq. and c: *H. bisignata* Jaen.

logue de Musee d'Histoire Nat. de la Ville de Lille" (1850), where "Animaux invertèbres" were listed by Macquart, and it is most probably lost. I have in this paper tried to separate it as a distinct form (possible a subspecies of *collini* n. sp.), because together with *bisignata* Jaen. in Britain it seems to replace the Continental *collini* n. sp. One female of *tropicus* Pz. (Kröber det. 1921) from Deutsch. Ent. Inst. in Berlin was a *bimaculata* Macq.

### Occurrence in Denmark.

An uncommon species. 13 ♀♀ and 1 ♂ was found in the collection of Zool. Mus., Copenhagen, and from Aarhus naturhist. Museum I received 6 ♀♀ and 1 ♂. The following localities can be given: Jutland: Silkeborg, Mausing at Silkeborg, Stensbæk plantation at Gram, Hørup in the island Als, — Zealand: Alindelille fredskov,

Tisvilde, Hillerød, Stenholtsvang, Stasevang N. of Hørs-holm, Søllerød, Rudehegn, Dyrehaven, Hareskov, Rygetskov at Værløse, and Køge.

#### Distribution.

About the distribution only little can be said with certainty, but the species occurs in Britain (Collin in litt. 6th May 1957), and I have two British females from Mr. Collin in my collection, which in all details agree with Danish specimens. It occurs also in North-France (Meigen 1838, p. 59), but is mentioned as rare, and I have seen a female without dates from Deutsch. Ent. Inst. in Berlin.

#### Biology.

The most early date is 27th May, latest 14th July. The specimens disperse with 1 in May, 8 in 1st and 6 in 2nd half of June, and 5 in 1st half of July. After this sparse material *H. bimaculata* seems to be more early than *collini* (see fig. 1).

### 5. *Hybomitra bisignata* Jaenicke, 1866.

Syn.: partim *tropicus* auctt. nec L.

#### Identification.

The female has a close resemblance to *H. micans* Meig., but may easily be distinguished by its grey (not shining black) frontal triangle. From the other species it may be distinguished by means of the summary under "Identification" in *collini* n. sp. and from this one by means of the table under *bimaculata* Macq. The male has always reddish brown sidemarkings on 1st-3rd tergite, in *micans* Meig. these are wanting. Otherwise as in the female.

#### Description.

♀: May be distinguished from the two preceding species by the dorsal side of abdomen, which is black with 3 rows of grey spots, the middle row with triangular spots. The spots result from a combination of bluish grey dust and pale hairs. As a rule reddish brown or yellowish brown sidemarkings are wanting, sometimes indistinct reddish markings may be seen at the hind margin of 1st and/or the fore margin of 2nd tergite. The under

side dull greyish, sometimes still a faint shadow of reddish coloration on the sides of 2nd and 3rd tergite.

♂: See the table under *bimaculata* Macq.

#### Discussion.

The species was described by Jaennicke (1866, p. 74). from the neighbourhood of Paris. Like the preceding species it has been considered synonymous to or a variety of *tropicus* (in various senses). In England *bisignata* Jaen. was mixed with *collini* n. sp., *bimaculata* Macq. and *mühlfeldi* Brau. to *tropicus* Meig. sensu Verrall and *tropicus* L. partim Panz. sensu Goffe. Oldroyd (1939, p. 91 and 96) separated the *tropicus* of Verrall and Goffe into two species: *bisignatus* Jaen. and *tropicus* L. Oldroyd's *bisignatus* Jaen. consists of my two species: *bimaculata* Macq. and *bisignata* Jaen. while his *tropicus* L. is a compound of *collini* n. sp. (the Worcester-specimen) and *mühlfeldi* Brau. Because *bisignata* Jaen. is one of the most common species in England and only occurs sparsely on the Continent, and the reverse is the case with regard to *collini* n. sp., it seems obvious to separate them as two species.

#### Occurrence in Denmark.

An uncommon species. Only 7 specimens are known; Jutland: Stensbæk plantation at Gram ♀ 10th June 1949 (Worm-Hansen), Nørholm at Varde ♂ 23rd July 1956 (B. Degerbøl), — Funen: Veflinge ♀ (H. J. Hansen), — Zealand: Ryget skov at Værløse ♀ 28th June 1952 (Worm-Hansen), Sorte Mose at Farum ♂ 23rd June 1945 (Worm-Hansen), Bagsværd ♀ 30th June 1958 (Lyneb.) and Vestre Kirkegård, Copenhagen ♀ June 1919 (Klöcker). The specimens from Nørholm at Varde and Bagsværd in my own collection, the others in Zool. Mus., Copenhagen.

#### Distribution.

The species is not mentioned from Sweden by Kauri (1954). Kröber (1932, p. 78) writes, that his *tropicus* var. *bisignatus* Jaen. is as widely distributed as the *tropicus*

Panz., but always found singly. Oldroyd (1939, p. 92) writes from Britain, that it is one of the most common species and widely distributed in the southern and middle counties.

#### Biology.

My sparse material is collected from 10th June to 23rd July. At Chantilly, not far from Paris, Surcouf (1921, p. 18) found twenty-six larvae in a layer of fallen oak-leaves carpeting the bottom of a shallow pond not more than a few centimetres deep. In June 1930 several pupae were found in a swan's nest at Windsor, England, and both sexes were bred (Oldroyd 1939, p. 92).

#### 6. *Hybomitra solstitialis* Meigen, 1820.

##### Identification.

The female is closely related to *collini* n. sp., but may be distinguished from it by the following characters: Smaller, the two basal antennal segments distinctly reddish brown and only slightly covered with greyish dust. Thorax with very pale grey hairs, especially on the pleura. The middle stripe on 1st–3rd tergite more narrow (hardly  $\frac{1}{3}$  the width of the segments) and sharply contrasted to the sidemarkings, which are very pale yellowish brown. From the two following species it may be distinguished by never having yellowish brown sidemarkings on 4th tergite. Most easily to be confused with *mühlfeldi* Brau., but may be distinguished by the form of 8th sternite and anal lamellae (of type 1, see fig. 2), in *mühlfeldi* Brau. of type 3 (see fig. 2).

The male is smaller and more greyish than the male of *collini* n. sp. The eye-facets of almost equal size. Thorax, especially the pleura, with remarkably pale greyish hairs (not dark greyish and black hairs). As in *collini* n. sp. the male of *solstitialis* Meig. has yellowish sidemarkings only on the first three tergites, but the middle stripe is narrower. On the under side the 1st sternite is very pale brownish and 2nd–4th sternite yellowish, the second sternite with a dark spot as in *collini* n. sp. *H. schineri* n. sp. and *distinguenda* Verr. both have the middle eye-facets strongly enlarged and sidemarkings on the first four segments. As a rule also *mühlfeldi* Brau. has sidemarkings on 1st–4th tergite, and both *mühlfeldi* Brau. and *schineri* n. sp. have brown, not black notopleural callus.

### Description.

♀: Frontal stripe grey dusted, about 5 times as high as broad at the base, strongly haired with mainly black hairs. Lower frontal callus almost quadratic, upwards connected with the narrow, middle frontal callus. The ocellar callus shining brownish black. On the vertex a tuft of strong, black hairs. The frontal triangle grey. The eyes densely covered with rather long, light brownish hairs. 1st and 2nd antennal joint slightly grey dusted, but the yellowish brown ground coloration can easily be seen. 3rd antennal joint with a distinct tooth, the colour reddish brown, the dorsal margin and the style darkened. The palpi pale, yellowish brown with pale hairs and a few black hairs towards the tip. They are swollen basally and then quickly decreasing into a blunt point.

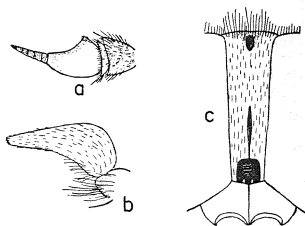


Fig. 10. *H. solstitialis* Meig. (female), a: Antenna, b: Palp and c: Frontal stripe.

Thorax greyish black with pale grey hairs, especially on the pleura. Halteres brownish black, paler on the tip.

Abdomen dorsally with pale, yellowish brown coloration on the sides of the first three segments. The middle stripe black with distinct, whitish middle triangles. The border to the yellowish sidemarkings is sharp, and the middle stripe occupies hardly  $\frac{1}{3}$  the width of the segments. 4th—7th tergites black with pale hairs along the hind border and whitish middle triangles. Black hairs are always present on the sides of 2nd and 3rd tergites. On the under side 1st and 2nd sternites are pale yellowish brown; 3rd—4th more or less yellowish brown, the remaining ones black. 2nd sternite always without black middle stripe (cfr. *mühlfeldi* Brau.), but with a small, flat spot at the base.

Femora grey, tibiae light brownish, front tibiae distally darker.

♂: The eye-facets of almost equal size, hairs as in the female. 1st and 2nd antennal joint with more grey dust than in the female, but on the second joint the yellowish brown ground coloration may easily be seen. The antennae darker than in the female, and more narrow. The palpi swollen, greyish brown, paler towards the tip. With mainly long, pale hairs, but intermixed with some black hairs towards the tip. Thorax with the notopleural callus black as in the female. Pleura greyish haired. Abdomen with pale yellowish brown sidemarkings on 1st—3rd tergite. The middle stripe most narrow at the base of 3rd tergite, where it is about  $\frac{1}{5}$  the width of the segment. 2nd—4th sternite pale, yellowish brown, this colour is also represented on the hind part of 1st sternite, at least on its sides. At the base of 2nd sternite a flat, rounded spot, almost as in *collini* n. sp. Otherwise as in the female.

Length: 14—15 mm.

#### Discussion.

This species is very little known, especially on the Continent, and it is not identical with *solstitialis* Schiner, according to a material consisting of 4 ♀ ♀ of Schiner's species, which I received from Vienna. Schiner (1862, p. 30) only knows Meigen's description (1820, p. 56), nor has Brauer (1880, p. 120) seen Meigen's specimens and he writes: "Ob *solstitialis* Meig. identisch sei mit Schiner's gleichnamiger Art, kann nicht nachgewiesen werden, da kein Originalexemplar Meigen's vorliegt". Verrall (1909, p. 380) writes: "I do not suppose that the species I have now described is the same as most authors have recorded as *T. solstitialis*, but I am convinced, that it is the same as the (apparently) type specimen of the female in Meigen's collection at Paris". Mr. J. E. Collin has identified the two Danish females according to Verrall's spe-

cies and has sent me an English male, after which I found one Danish male in my material. Because *solstitialis* Meig. differs considerably from Schiner's species, I have given the latter the new name: *schineri* n. sp. (see below). A material of eight Swedish females of *solstitialis* Schin. sensu Kauri (1954, p. 241) consists of two species: One specimen was *schineri* n. sp. (= *solstitialis* Schiner nec Meig.), the others were *mühlfeldi* Brau. and there were none of Meigen's species.

#### Occurrence in Denmark.

Only three specimens are known, all in Zool. Mus., Copenhagen. The specimens are all taken in Jutland in coastal regions. Dates: Vorsø in Horsens Fjord ♀ 12th June 1932 (S. L. Tuxen), Tipperne in Western Jutland ♀ 16th June 1940 (Søgård Andersen) and Frederikshavn ♂ July 1881 (H. J. Hansen).

#### Distribution.

Before a revision has been undertaken only little can be said on the distribution of this species. Oldroyd (1939, p. 95) states, that in British Museum there are only two British females, but Goffe (1931, p. 100) mentions a number of localities, all of which are hardly certain.

#### Biology.

Flying-period: See dates given above. In his key, Oldroyd (1939, p. 89) mentions, that *solstitialis* Meig. is a rather large inland species in opposition to *tropicus* L. (sensu Oldroyd = *mühlfeldi* Brau. nec Kröber et al.), which he mentions as a smaller, coastal species. The three Danish specimens are all from typical coastal regions, so probably Oldroyd has made a mistake.

### 7. *Hybomitra schineri* sp. nov.

Syn.: *solstitialis* Schiner nec Meig.

#### Identification.

From the six preceding species the female of *schineri* n. sp. may be distinguished by having, as a rule, yellowish brown side-



markings also on 4th tergite, the two first antennal segments yellowish brown and the notopleural callus brown. Also the following species *distinguenda* Verr. has sidemarkings on 4th tergite, but has greyish black antennal segments and only golden hairs on the sides of second tergite, never intermixed with black hairs as in *schineri* n. sp. *H. mühlfeldi* Brau. has only sidemarkings on the first three tergites and like *distinguenda* Verr., the first two antennal segments greyish black dusted. *H. distinguenda* Verr. (of type 2, see fig. 2) and *mühlfeldi* Brau. (of type 3, see fig. 2) have the 8th sternite and the anal lamellae different from *schineri* n. sp., where they are of type 1 (see fig. 2).

The males of the six preceding species have yellowish sidemarkings on only the first three tergites. In the males of *schineri* n. sp. and *distinguenda* Verr., and sometimes also in *mühlfeldi* Brau. there are sidemarkings also on 4th tergite. In *schineri* n. sp. the middle eye-facets are strongly enlarged and rather sharply contrasted to the smaller, lower facets and the basal antennal segments brownish (not greyish black), and the species forms by this a contrast to *distinguenda* Verr. and *mühlfeldi* Brau.

#### Description.

♀: Frontal stripe yellowish grey dusted, 4—5 times as high as broad below, gently narrowed downwards. Lower frontal callus higher than broad, well separated from the eye-margin. The colour brownish to brownish black, upper margin rounded and the shape nearly an ellipsis, which is cut off below. Upwards by a black line connected with the middle frontal callus. The ocellar callus shining brownish black. Frontal stripe strongly haired with black and pale hairs, most of the former. On the vertex a tuft of black hairs. Frontal triangle greyish or yellowish grey dusted. The eyes with a dense covering of long, pale brown hairs.

1st and 2nd antennal joint reddish yellow or yellowish brown, often a little grey dusted, but the ground colour is always distinctly seen, mainly black haired. 3rd antennal joint with a distinct, dorsal tooth. The colour yellowish brown, upper margin and the style black. The palpi pale brownish or yellowish grey, somewhat swollen basally and ending in a pointed, straight tip and

with fine, white hairs, and besides stiff, black hairs on the outer side.

Thorax greyish black with three indistinct, grey stripes. Notopleural callus more or less brownish, never completely black.

Abdomen dorsally with yellowish brown or reddish brown sidemarkings on the first four tergites. The sidemarkings on fourth tergite not reaching the hind margin, and may in rare cases be wanting. The dark middle stripe is dull greyish black, the width somewhat varying, but never more than  $\frac{1}{3}$  the width of the segments, on third tergite only  $\frac{1}{5}$ . Often there is a row of small, indistinct, grey middle triangles. The under side yellowish brown on the first four sternites and sometimes also on the fifth, the rest dull black. 1st sternite with a dark, quadratic spot, at the base of 2nd sternite a small, dark spot of varying form, often pentagonal. Abdomen partly with short, soft, golden hairs especially along the hind margin of the segments and on the under side, partly with longer and more stiff, black hairs, especially on the upper side, also on the sides of 2nd tergite. 8th sternite and anal lamellae of type 1 (see fig. 2). Femora greyish black, tibiae yellowish brown, front tibiae greyish brown on the distal half.

♂: Eye-facets on the middle part strongly enlarged, more than in the two following species. The limit between the middle enlarged facets and the lower smaller ones is rather sharp. 1st and 2nd antennal joint reddish brown with only little grey dust. 3rd antennal joint more narrow than in the female, of the same colour. The palpi swollen, brownish and with mainly black hairs. Thorax with brown notopleural calli.

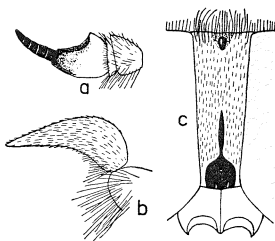


Fig. 11: *H. schinerei* n. sp. (female, holotype), a: Antenna, b: Palp and c: Frontal stripe.

Abdomen dorsally with yellowish brown sidemarkings on the first four segments. The dark, middle stripe very narrow, almost brown, not sharply contrasted to the sidemarkings. The stripe is most narrow on 3rd tergite and may sometimes be interrupted at the hind margins, due to which the middle stripe is dissolved into single spots. Otherwise as in the female.

Length: 15—18 mm.

Type-material.

Holotype: ♀ collected on 7th July 1958 in my garden at Bagsværd NW of Copenhagen (author collected).

No allotype is selected.

The type in Zool. Museum of Copenhagen.

Discussion.

I have given the name *schineri* n. sp. to Schiner's *solstitialis*, because Schiner's species is not identical with *solstitialis* Meig. (see p. 106). Four females of Schiner's *solstitialis*, which I received from Vienna, agree in all details with the Danish specimens. The *solstitialis* Schin. of various authors will partly be identical with *schineri* n. sp., though in many cases other species are intermixed under the name *solstitialis* Schiner. Of a material consisting of eight Swedish females, which I received from Mr. Kauri in Lund as *solstitialis* Schin., only one was Schiner's species, the others were *mühlfeldi* Brau.

In material from various German collections (see p. 79), I have seen 15 specimens (all females) with Kröber's determination: *solstitialis* Schin. (Kröber det. 1920-21). The 15 females belong to five species: only three are Schiner's species = *schineri* n. sp., eight are *mühlfeldi* Brau., one *distinguenda* Verr., two *tuxeni* n. sp. and one *arpadi* Szil. (not Danish). Among 29 females of *montanus* Meig. sensu Kröber and 13 females and 9 males of *tropicus* Panz. sensu Kröber from Deutsch. Ent. Inst. in Berlin two females and one female + two males respectively were *schineri* n. sp. I am afraid that very little reli-

ance can be placed upon Kröber's determinations of many species.

Meigen's *solstitialis* differs from *schineri* n. sp. in several essential points, see the summary under "Identification".

#### Occurrence in Denmark.

The species is rather common in Denmark. In Zool. Mus., Copenhagen, there are 11 females and 3 males of this species, and in Aarhus Naturhist. Museum there are 3 females. My own collection numbers 23 females all taken in the neighbourhood of Copenhagen in 1957 and 1958. Jutland: Sønderborg ♂ August 1895 (Wüstnei), Sønderborg ♀ June 1895 (Wüstnei), Gråsten ♀ August 1887 (Wüstnei), — Zealand: Jyderup ♀ 12th July 1913 (C. R. Larsen), Skibby in Hornsherred ♀ 23rd June 1890 (C. le Dous), Jægerspris ♀ June-July 1941 (Anthon), Tisvilde ♀ 11th July 1907 (Lundbeck), Ll. Esbønderup ♀ 2nd August 1909 (C. R. Larsen), Hillerød ♂ 1st August 1900 (Godskesen), Tokkekøb hegn ♀ 4th July 1904 (Klöcker), Kattehole at Allerød ♀ 6th July 1932 (Kryger), Rungsted ♀ 12th July 1941 (Tuxen), Rudehegn ♀ 27th July 1894 (C. R. Larsen), Frederiksdal ♀ 4th August 1909 and Jydelejet on Møen ♀ 31st July 1942 (K. Stephensen). Furthermore 1 ♀ and 1 ♂ without dates. My own specimens date as follows: Jonstrup 2 ♀ ♀ 20th June 1957, ♀ 29th June 1957, 6 ♀ ♀ 4th July 1957, ♀ 10th July 1957, 3 ♀ ♀ 1st July 1958, 2 ♀ ♀ 4th July 1958 and ♀ 9th July 1958, Hareskovby ♀ 7th July 1957, Bagsværd ♀ 6th July 1957, 2 ♀ ♀ 4th July 1958, ♀ 7th and 11th July 1958.

The species seems to be more common in the eastern part of the country, especially when the greater intensity of collecting in Zealand is taken into consideration. This distribution agrees with the fact that the species has not yet been recorded from Britain (see below).

#### Distribution.

Before a revision has been undertaken only little can

be said about its distribution, but *solstitialis* Schiner is according to Kauri (1951, p. 105) widely distributed in Sweden (only a part of Kauri's *solstitialis* Schiner is

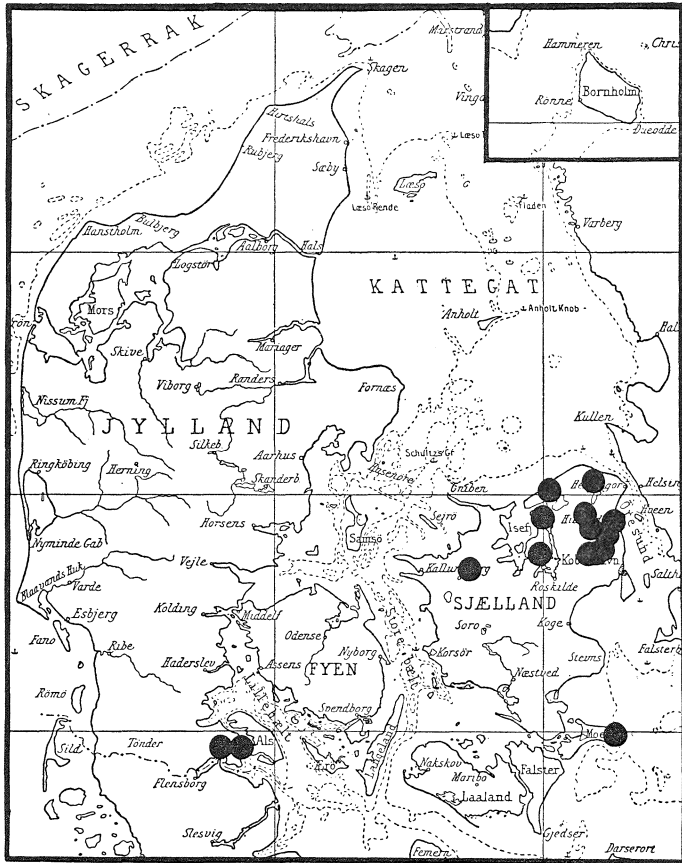


Fig. 12: The distribution of *H. schineri* n. sp. in Denmark.

Schiner's species, see above). Kröber (1932, p. 80) mentions from Germany, that his *solstitialis* Schiner occurs here and there from May to August and is widely spread. In Schleswig-Holstein the species is known from 5 loca-

lities NE and 4 localities S of the Elbe (Kröber 1930, p. 30).<sup>1)</sup> The species is not mentioned in British papers, and *solstitialis* Meig. sensu Verrall, Goffe and Oldroyd is not identical with Schiner's species = *schineri* n. sp. However, Mr. J. E. Collin writes (in litt. 6th May 1957) that he has 3 females of *schineri* n. sp. from England. This indicates, that the species occurs in Britain, though sparse.

#### Biology.

It seems to be a rather late species. The Danish material is collected from 20th June to 4th August, most of them are taken in the first half of July.

### 8. *Hybomitra distinguenda* Verrall, 1909.

#### Identification.

The females of this species and the preceding one (*schineri* n. sp.) are the only Danish *Hybomitra*-species of the *bimaculata*-group, which have yellowish brown sidemarkings on the first four segments. From *schineri* n. sp., *distinguenda* Verr. may be distinguished by its dark grey (not brownish) basal antennal joints, by the absence of blackish hairs on the sides of 2nd tergite and by the shape of 8th sternite and anal lamellae (of type 2, not type 1, see fig. 2). *H. distinguenda* Verr. may be distinguished from *mühlfeldi* Brau. by its more narrow middle stripe on abdomen, and by brownish sidemarkings also on 4th tergite, together with the shape of 8th sternite and anal lamellae (of type 2, not type 3, see fig. 2).

This species, *schineri* n. sp. and *mühlfeldi* Brau. are the only Danish species of the *bimaculata*-group in which the males have yellowish brown sidemarkings on the first four tergites, but *schineri* n. sp. has the basal joints of the antennae brownish (not greyish black) and the facets in the middle part of the eyes more enlarged and more sharply contrasted to the smaller, lower facets than in *distinguenda* Verr. More difficult it is to distinguish *distinguenda* Verr. from *mühlfeldi* Brau., but *distinguenda* Verr. is larger and has black middle stripe with shallow, pale middle triangles, while *mühlfeldi* Brau. has more brownish black middle stripe and as a rule very high greyish middle triangles, so that the middle stripe seems almost grey. Along the hind margin of 1st tergite *distinguenda* Verr.

<sup>1)</sup> Notice: Kröber's *solstitialis* Schiner obviously is a very intermixed species, see remarks under "Discussion".

a broad edge of golden hairs; in *mühlfeldi* Brau. these hairs are absent, or there may be a very narrow edge of golden hairs along a part of the hind margin of 1st tergite. In addition to this *distinguenta* Verr. has on 2nd sternite a flat, rounded spot, the height of which is about  $\frac{1}{4}$  the segment length. In *mühlfeldi* Brau. this spot is triangular and its height about half the segment length.

#### Description.

♀: Frontal stripe brownish grey or yellowish grey, about 5—6 times as high as broad below. Lower frontal callus black, separated from the eye-margin. The shape often quadratic, but sometimes a little higher than broad, transversely wrinkled. Upwards it continues as a narrow line to the middle frontal callus, which is narrow spindle-shaped. The ocellar callus is shining, brownish black. The frontal stripe is rather densely haired with pale and black hairs, most of the former. On the vertex a tuft of blackish hairs. The eyes densely haired with short, dark brownish hairs.

1st antennal joint greyish black dusted, with long, fine, pale hairs and shorter and stiffer ones. 3rd antennal joint with a distinct tooth. Its ground colour reddish brown, the distal half often very dark, the style completely black. The palpi swollen basally. The colour is greyish brown, distinctly darker than in the preceding species (*schineri*), ending in a pointed tip, covered with short, black hairs and longer white ones.

Thorax seems more greyish brown than greyish black because of the golden hairs. Three grey, indistinct longitudinal stripes. The notopleural callus various in colour from brown to greyish black, but often the brown colour occupies a smaller part.

Abdomen dorsally with reddish brown or yellowish brown sidemarkings on 1st—4th tergite, the rest black. The middle stripe on 1st—3rd tergite occupies about  $\frac{1}{4}$ — $\frac{1}{5}$  the width of the segments. A row of more or less distinct, whitish grey middle triangles are present. The under side yellowish on the first four sternites and often

also on 5th sternite. The 1st sternite has a dark, square spot, and the 2nd sternite a triangular or trapeze-shaped spot. The whole abdomen is covered with golden hairs, and the upper side also has longer and stiffer black hairs. These hairs often missing from the light parts of 1st—4th tergites, and always absent on the sides of 2nd tergite. 8th sternite and anal lamellae of type 2 (fig. 2).

Femora grey, tibiae light brown, front tibiae distally black and also hind tibiae always darkened at the tip.

♂: Eye-facets considerably enlarged in the middle part of the eyes, the enlarged facets not sharply contrasted to the lower and smaller facets, covered with short, brown hairs. The basal antennal joints always greyish dusted. 3rd joint as in the female, but more narrow. The palpi swollen, mostly at the tip, the part below the tip slightly concave. The colour brownish, grey dusted at the base.

The abdominal middle stripe black and narrow, sometimes interrupted. Sidemarkings on first four tergites. The stripe is narrowest on 3rd tergite, where it is  $\frac{1}{8}$ — $\frac{1}{10}$  the width of the segment. A row of low, pale middle triangles. 1st sternite partly, 2nd—4th completely yellowish brown, at the base of 2nd sternite a flat, rounded spot, the height of which is not more than  $\frac{1}{4}$  the length of the sternite. Along the hind margin of the first tergite a broad border of golden hairs, other hairs black. Otherwise as in the female.

Length: 14.5—17 mm.

#### Discussion.

Verrall (1909, p. 377) writes: "Lundbeck has consider-

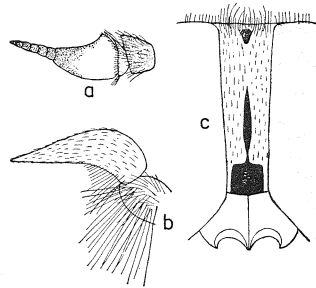


Fig. 13: *H. distinguenda* Verr. (female), a: Antenna, b: Palp and c: Frontal stripe.



ed the males of this species as conspecific with *mühlfeldi* Brau., but has only doubtfully identified the female; he has had Brauer's original type of the male before him and may be correct, but in view of the other closely allied species to which I have referred, I leave my description and name intact". An examination of the specimens, which are considered here as *distinguenda* Verr., shows that Lundbeck can only have seen two females and one male of this species, and thus he had only very little material on which to separate *distinguenda* Verr.

From various German collections I have seen five specimens (three females and two males) of *distinguenda* Verr. with other identifications. Three were named *tropicus* Pz. (Kröb. det. 1921), one *solstitialis* Schin. (Kröb. det. 1921) and one *montanus* Mg. (Kröb. det. 1921).

#### Occurrence in Denmark.

A rather common species. The collection of Zool. Mus., Copenhagen, numbers 21 ♀♀ and 2 ♂♂, but none was found in the material from Aarhus naturhistoriske Museum. In my own collection there are 2 ♀♀.

Localities in Jutland: Frijsenborg ♂ July 1884 (Løvendal), Nørholm at Varde ♀ 14th July 1915 and ♂ 17th July 1915 (Lundbeck), Funder at Silkeborg ♀ 2nd July 1906 (Esbén-Petersen), Grindsted June 1934 (Anker Ole-  
sen), Stensbæk plantation at Gram 3 ♀♀ 18th June 1949, ♀ 21st June 1949, ♀ 22nd June 1949, 2 ♀♀ 4th July 1950, 2 ♀♀ 14th July 1950 and ♀ 21st July 1950 (Worm-Hansen); — Zealand: Nordstrand at Nykøbing Sj. ♀ 26th July 1942 (Th. Mortensen), Tisvilde ♀ 7th July 1915 (Klök-  
cker), Tyvekrog i Grib skov ♀ 15th June 1898 (Godskesen), Hillerød ♀ ca. 1897 (Godskesen), Frerslev hegn ♀ 4th July 1906 (Lundbeck), Jonstrup ♀ 4th July 1957 (Lyneborg) and Stensved at Vordingborg ♀ 10th July 1912 (H. Weis). Furthermore 2 ♀♀ without dates from Mus. Westermann and 1 ♀ without date (Coll. N. P. Jørgensen).

Estimated from this sparse material the species seems to be as common in Jutland as in Zealand.

#### Distribution.

Sweden: Occurs in South-Sweden and along the east coast to Västerbotten (Kauri 1951, p. 105). Kröber (1932) gives no details on the distribution in Germany, but (1930, p. 30) he writes from Schleswig-Holstein, that *distinguenda* Verr. is known from 4 localities NE and 3 S of the Elbe. In Britain it is one of the most common species and widely distributed from the south coast to Scotland (Goffe 1931, p. 38). Its further distribution is according to Leclercq (1957): Belgium, Central-Europe, Austria, Czechoslovakia, Switzerland, Italy and U. S. S. R.

#### Biology.

The Danish material is collected from 15th June to 26th July and agrees with the statements given for the flying-period in Britain; Oldroyd (1939, p. 95) states that this is from the beginning of June to the end of July. Also in Sweden the flying-period is the second half of June and July (Kauri 1951, p. 105). A woodland species.

### 9. *Hybomitra mühlfeldi* Brauer, 1880.

Syn.: partim *tropicus* auctt. nec L.

„ *solstitialis* auctt. nec L.

nec *mühlfeldi* auctt.

#### Identification.

From the two preceding species (*schineri* n. sp. and *distinguenda* Verr.) the female of *mühlfeldi* Brau. may be distinguished by having yellowish brown sidemarkings only on the first three (not four) tergites, and from *schineri* n. sp. by having darker, basal antennal joints and from *distinguenda* Verr. by always having many black hairs on the sides of 2nd tergite. In the three species mentioned the 8th sternite and anal lamellae are also of different shape (see fig. 2). The species can not be confused with *micans* Meig. and *lurida* Fall. because of the grey dusted (not shining black) frontal triangle. *H. collini* n. sp., *bimaculata* Macq., *bisignata* Jaen. and *solstitialis* Meig. all have black notopleural calli and the 8th sternite and anal lamellae of type 1 (*schineri* n. sp. also belongs to type 1), while *mühlfeldi* Brau. has brown notopleural callus and

genital apparatus of type 3. *H. solstitialis* Meig. and *collini* n. sp. are very much like *mühlfeldi* Brau., but can always be separated by the above given characters.

Together with the species *schineri* n. sp. and *distinguenda* Verr. the male of *mühlfeldi* Brau. sometimes has sidemarkings also on 4th tergite, and this in connection with distinctly enlarged eye-facets and the narrow, brownish black middle stripe on abdomen distinguishes it from the species 1—6. *H. mühlfeldi* Brau. may be distinguished from *schineri* n. sp. by its grey dusted, basal antennal joints and less strongly enlarged middle eye-facets, which are not sharply contrasted to the smaller, lower facets. The species may be distinguished from *distinguenda* Verr. by the brownish (not blackish) middle stripe, which has high, narrow, grey (not broadly whitish) middle triangles, due to which the middle stripe seems greyish, especially when seen from behind. Along the hind margin of the first tergite in some cases a narrow (never broad) border of golden hairs is present. At the base of 2nd sternite a triangular (not flat and rounded) dark spot.

#### Description.

♀: Frontal stripe rather narrow, about 5 times as high as broad at the base, yellowish grey dusted and with many, mainly black hairs. Lower frontal callus quadratic, sometimes a little higher than broad. The colour black or brownish black, distinctly transversely wrinkled and not shining. By a narrow line upwards connected with the middle frontal callus, which is narrow spindle-shaped. The ocellar callus oval, shining brownish black. On the vertex many long, black hairs. 1st and 2nd antennal joints more or less grey dusted, in the latter case the reddish ground colour may faintly be seen. 3rd antennal joint broad, the dorsal tooth forming a right angle, the colour always reddish brown, the upper margin and the style darker. The palpi swollen at the base and gently narrowed towards the tip. With short, black hairs from base to tip, besides some pale hairs. The colour greyish brown or light brownish. The hairs on the eyes short and light brownish. Thorax dark greyish with five indistinct, grey stripes. Notopleural callus always partly brown. Halteres brown or black. Femora.

grey, tibiae brown, front tibiae black on the apical half.

Abdomen with yellowish brown or reddish brown sidemarkings on the first three tergites, often with greyish shadows. The middle stripe brownish black to black with high, grey middle triangles, which makes that the middle stripe seems almost greyish, especially when seen from behind. The width is not more than  $\frac{1}{3}$  the width of the segments. 4th—7th tergites with greyish middle triangles and pale hind margins. When seen from behind abdomen seems grey. 1st—4th sternites yellowish brown. Also the basal part of 5th sternite sometimes yellowish brown. 1st sternite with a quadratic spot and in connection with this a flat, pentagonal spot at the base of 2nd sternite. The tip of this spot sometimes continues as a dark, narrow longitudinal stripe. 8th sternite and anal lamellae of type 3 (see fig. 2).

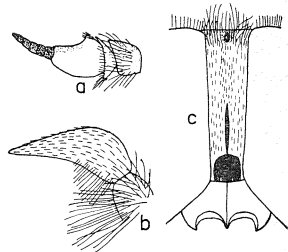


Fig. 14: *H. mühlfeldi* Brau. (female), a: Antenna, b: Palp, and c: Frontal stripe.

♂: Eye-facets of different size, the middle facets considerably larger than the lower facets and not sharply contrasted to these. The hairs on the eyes rather long and light brownish. The ocellar callus shining brownish, with about ten long, black hairs behind. The frontal triangle grey dusted. 1st and 2nd antennal joints grey dusted, the ground colour often visible, especially on 2nd joint. 3rd antennal joint yellowish brown, narrower than in the female, but with a distinct, dorsal tooth. The colour is darker dorsally and on the outer half, the style black. The palpi swollen at the tip, the shape almost as an egg, the region below the tip slightly concave. The colour greyish brown, the hairs mainly pale and long.

Thorax as in the female. Notopleural callus always brownish. Halteres brown. Abdomen with yellowish brown.

sidemarkings on the first three tergites. 4th tergite sometimes also with light markings, which do not reach the hind margin. The middle stripe is narrowest on 3rd tergite, where it is not more than  $\frac{1}{8}$  the width of the segment. The under side of 1st—4th sternites yellowish brown, 5th—7th black. 2nd sternite with an equilateral, dark triangle, the base of which is placed along the fore margin of the sternite, and the tip of which is placed in the middle of the sternite. On 1st sternite either a quadratic spot, the hind margin of which follows the base of the triangle on 2nd sternite, or a trapezoidal spot, the oblique sides of which form a continuation of the sides of the triangle on 2nd sternite. There are no intermediates between the two forms of coloration on 1st and 2nd sternite, and Brauer's type belongs to the second form.

Length: 14—16 mm.

#### Discussion.

*H. mühlfeldi* was described by Brauer (1880, p. 149) on the basis of a male, which by H. Megerle von Mühlfeld was sent to Meigen, who in 1820 (p. 53—54) mentioned it as *graecus* Fabr. Meigen's *graecus*, however, was not identical with Fabricius' species, and was therefore redescribed by Brauer (1880, p. 195) as *Miki* with exception of the specimen from Megerle von Mühlfeld, which gave rise to *mühlfeldi*. The type specimen is well-preserved and is found in "Alte Sammlung" in Naturhistorisches Museum in Vienna. It bears an old label: "*graecus*" and a newer one: "*mühlfeldi* Br. — *graecus* Mg. — Alte Sammlung". Owing to the kindness of Dr. Max Beier I was able to borrow the type and a pair of Brauer's females of his species.

In 1907 (p. 118) Lundbeck writes of *mühlfeldi* Brau.: "I was somewhat astonished in finding this species in Denmark on account of its hitherto known geographical range, and I thought I had committed some error in the

determination. By the courtesy of Dr. Handlirsch and the museum in Vienna I was allowed to see Brauer's type specimen, and I saw that my determination was correct." A re-examination of the type and Lundbeck's male-specimens has shown, that Lundbeck's determination was correct. On the other hand there has been some uncertainty with regard to the female of this species. I received two females of *mühlfeldi* Brau. from Vienna. One of them comes from Amur and was also determined by Szilady. This female is not identical with the female, here described as the true female to Brauer's *mühlfeldi*. As far as I can see, the Amur-specimen belongs to the *montana*-group, closely allied to *H. staegeri* n. sp. (= *mühlfeldi* auctt. nec Brau.). The frontal stripe is broad, lower frontal callus broad and shining brownish black, the colour of 3rd antennal joint in the basal half yellow, distally brown. The palpi slender, notopleural callus yellow, the venter entirely yellow on 1st—4th sternite and the basal part of 5th sternite. The middle stripe on the dorsal side is very narrow on 3rd tergite (only  $\frac{1}{8}$  the width of the tergites) and finally there are yellow (not yellowish brown or reddish brown) sidemarkings on the first four tergites.

Nor is the second specimen (from Sendschirli, N-Syria) identical with the true *mühlfeldi*-female, but is similar to *schineri* n. sp., though it is not this species, because the middle stripe is a little narrower, lower frontal callus of a different shape, and 8th sternite and anal lamellae are of type 3 (*mühlfeldi*-type) and not of type 1 as in *schineri* n. sp. Mr. Collin also has seen the specimen from Syria and he writes (in litt. 15th October 1958): "I do not consider that the female "*Mühlfeldi*" from Syria in the Vienna Museum, seen and described by Brauer, is the same as our *mühlfeldi* (= *tropicus* Oldroyd nec Brau.)." The specimen, however, belongs to the *bimaculata*-group. It is indeed doubtful, if Brauer has seen this specimen.

Nor has Lundbeck (1907, p. 117) identified his *mühlfeldi*-female in accordance with the female in the present paper considered as the true female to *mühlfeldi* Brau. On p. 118 Lundbeck writes: "Though the male of this species is not uncommon I am not at all sure with regard to the female. I possess only two specimens, which I refer with some doubt to this species." It has been possible to identify his two females, and the first is a *distinguenda* Verr., the second is the only Danish specimen of my species *staegeri* n. sp. (see p. 145) = *mühlfeldi* auctt. nec Brau. The reason why Lundbeck was unable to find the true female for his rather great material of *mühlfeldi*-males is, that he confused the female with *collini* n. sp., the female to *tropicus* Panz. sensu Lundb. and with *schineri* n. sp. and *distinguenda* Verr., female to *solstitialis* Schiner sensu Lundb. First by means of Collin's paper (1940, p. 178), where he describes the genitalia of his *tropicus* L., *solstitialis* Meig. and *distinguendus* Verr., it was possible to separate the female of *mühlfeldi* Brau. The result was a material of females, which agree in all details with the *mühlfeldi*-males of Brauer and Lundbeck.

The consequence of this discovery is that the British *tropicus* L. sensu Oldroyd (1939, p. 96) is now to be named *mühlfeldi* Brau. An exception is the Worcester-specimen (Oldroyd 1939, p. 96 and Verrall 1909, p. 359), which according to Collin (in litt. 3rd July 1958) is the only British specimen of *collini* n. sp.

Material from various German collections (see p. 79) has shown that many specimens of *solstitialis* Schin. sensu Kröber and *tropicus* Pz. sensu Kröber are *mühlfeldi* Brau. According to Kröber (1958, p. 48) his *mühlfeldi* Brau. in "Die Tierwelt Deutschlands" (1932, p. 78) is a misunderstanding. I have not seen German material of *mühlfeldi* Brau. sensu Kröb. 1932 from any of the German collections mentioned on p. 79.

Also in Sweden *mühlfeldi* Brau. has been confused with other species, especially with *schineri* n. sp. (= *solstitialis* Schiner). Of eight females of *solstitialis* Schiner sensu Kauri, which I received from Lund, only one was *schineri* n. sp., the others being *mühlfeldi* Brau. The species, which is mentioned as *mühlfeldi* Brau. by authors like Olsoufieff (1937, p. 190) and Dinulescu (1958, p. 146) is not Brauer's species, and I have given the *mühlfeldi* of the above mentioned authors (but not of Brauer) the new name: *staegeri* sp. nov. (see p. 145). *H. staegeri* n. sp. (= *mühlfeldi* auctt. nec Brau.) is only little known to me, and I have only one Danish specimen (a female) of this species.

#### Occurrence in Denmark.

*H. mühlfeldi* Brau. is a rather common species in Denmark, but seems to have an eastern distribution in our country, even when the stronger intensity of collecting on the islands is taken into consideration. In the collection of Zoologisk Museum of Copenhagen there are 25 females and 9 males and in Aarhus naturhistoriske Museum 11 females and 9 males. My own collection numbers 34 females, all taken in the neighbourhood of Copenhagen at Bagsværd and Jonstrup.

Localities: Jutland: Silkeborg; — Funen: Odense and Veflinge; — Zealand: Kærehave at Ringsted, Svenstrup, Boserup, Tisvilde, Asserbo, Hillerød, Tokkekøb hegn, Ryget skov at Værløse, Jonstrup, Bagsværd, Rudehegn, Geel skov, Søllerød, Dyrehaven, Ermelund, Ordrup mose and Copenhagen.

#### Distribution.

Because the name *mühlfeldi* Brau. has been applied to several species only little can be said on the distribution. As stated above seven females of this species were among eight Swedish females of *solstitialis* Schin. sensu Kauri, and no doubt the species is widely distributed in Sweden. The species *tropicus* L. sensu Oldroyd



(with exception of the Worcester-specimen = *collini* n. sp.) is identical with my *mühlfeldi* Brau., and Oldroyd (1939, p. 97) gives several localities from Britain, but the spe-

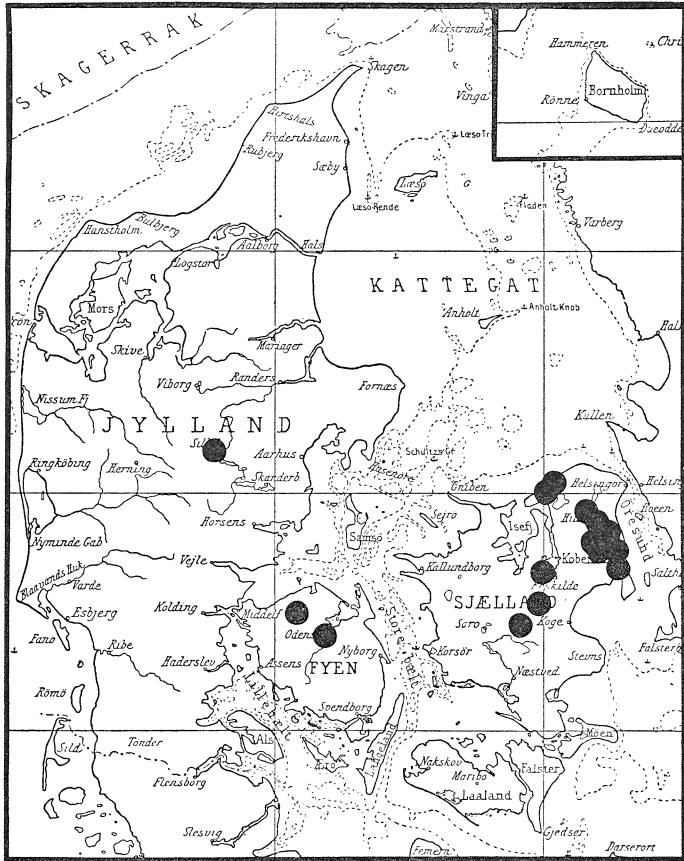


Fig. 15: The distribution of *H. mühlfeldi* Brau. in Denmark.

cies seems not to be as common as in Denmark. In material from various German collections (see p. 79) I have seen in all 22 specimens of this species.

#### Biology.

Oldroyd (1939, p. 97) mentions that all the British

records of this species are from coastal regions, and by this he places the species in contrast to *solstitialis* Meig. With few exceptions, however, the Danish records of *mühlfeldi* Brau., are from inland localities, so probably Oldroyd is in error here (see also the remarks under *solstitialis* Meig.). With regard to the flying-period all the Danish specimens were caught in June and July with 12th June and 1st August as the extremes. The climax is in the last half of June and the first half of July. My own specimens were taken in the summers 1957 and 1958 at Bagsværd and Jonstrup about 15 km NW of Copenhagen. It is a region with woods and many small lakes. They were caught on very hot days, when the females swarmed round me and sometimes settled on my clothes. In this way I have, besides the 34 females of *mühlfeldi* Brau., taken 10 females of *H. collini* n. sp., 1 female of *bisignata* Jaen., 22 females of *schineri* n. sp. and two females of *distinguenda* Verr. All the species caught belong to the *bimaculata*-group, and it is notable, that no specimens were taken of the following common species: *lundbecki* n. sp. belonging to the *montana*-group, though it is found in the region in question. This indicates that besides the morphological differences there may be a biological difference between the two groups.

### ***Montana*-group.**

#### **10. *Hybomitra lundbecki* sp. nov.**

Syn.: partim *montanus* auctt. nec Meig.

„ *fulvicornis* auctt. nec Meig.

#### Identification.

The females of this and the following three species (the *montana*-group) may be distinguished from the species no. 3—9 (forming the *bimaculata*-group) by the following characters: 1) frontal stripe broad, 3—4 (not 4—6) times as high as broad at the base; 2) lower frontal callus often broader than high and plain, shining black or brownish black, 3) the palpi more slender and with shorter hairs on the under side, 4) upper margin of the antennal bow broader towards the middle line, and 5) 2nd sternite with a large,

quadratic, dark spot. *H. lundbecki* n. sp. may be distinguished from *tuxeni* n. sp., *m. montana* Meig. and *montana flaviceps* Zett. by the following characters: 1) third antennal joint broad and brown, and 2) notopleural callus as a rule blackish.

*H. staegeri* n. sp. (= *mühlfeldi* auctt. nec Brau.) has whitish halteres, yellowish brown sidemarkings on 1st—4th tergite, 3rd antennal joint narrow and mainly black and may easily be distinguished from *lundbecki* n. sp. by means of these characters.

The males of the species of the *montana*-group may be distinguished from the preceding nine species by the following characters: 1) shorter hairs on vertex, 2) palpi more slender, and 3) the hairs on upper side of 1st antennal joint are shorter than the length of 1st and 2nd joint together. *H. lundbecki* n. sp. may be distinguished from *tuxeni* n. sp., *m. montana* Meig. and *montana flaviceps* Zett. by having 3rd antennal joint distinctly reddish brown and always with a distinct, dorsal tooth, and finally the notopleural callus as a rule is blackish. The male of *staegeri* n. sp. is not known to me, but has very pale halteres like the female.

#### Description.

♀: The frontal stripe broad, 3—4 times higher than broad at the base, yellowish grey or greyish brown dusted and with rather long, black and pale hairs. On the vertex a tuft of mixed pale and blackish, short hairs. Lower frontal callus of somewhat varying form, sometimes rectangular and then broader than high, more often of a rounded triangular or pentagonal form. The variation is due to rubbing off. Its colour is shining black or brownish black, plain and not transversely wrinkled as in the preceding species. Middle frontal callus black, broadly spindle-shaped, sometimes connected with the lower frontal callus by a narrow line. The ocellar callus dark and rounded triangular. The hairs on the eyes short and pale. 1st and 2nd antennal joint brownish with grey dust, 3rd joint broad and with a distinct dorsal tooth, the colour reddish brown, dorsally a little darker, the style completely black. Upper antennal bow somewhat broader towards the mid line. The palpi slender, not swollen basally; they are pale brownish with some black and

whitish hairs on the outer side. The under side of the palpi with rather short hairs.

Thorax greyish black and with rather distinct, grey longitudinal stripes. Notopleural callus black or almost black. Abdomen with 1st—3rd (seldom 1st—4th) tergites light yellowish brown or reddish brown. The dark middle stripe occupies not more than  $\frac{1}{3}$  the width of the segments, which have very distinct triangles in the middle, reaching the fore margins. 4th—7th tergites as a rule completely greyish black. The venter with 1st sternite mainly greyish black, the following two or three sternites with yellowish brown coloration on the sides. 2nd sternite always with a large, dark, quadratic spot, which reaches the hind margin and which is spread out basally along the fore margin. On the following two sternites a more or less broad middle stripe. The last sternites black. The hairs on abdomen yellowish grey and black.

Femora grey, tibiae brownish, distally darker. Tarsi dark brownish.

♂: Eye-facets of almost equal size. The hairs on the eyes longer and more dense than in the female, their colour whitish brown. 1st and 2nd antennal joint brownish, often strongly grey dusted. The hairs on upper side of 1st antennal joint shorter than the length of the two first joints together. 3rd joint not so broad as in the female, but still with a distinct tooth and the colour reddish brown, but darker distally (fig. 4b). The palpi slender and not swollen basally, their colour pale brownish (fig. 4c). Abdomen with light sidemarkings on 1st—4th tergite. The middle stripe narrower than in the female, on

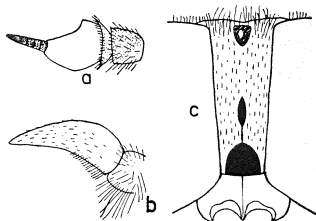


Fig. 16: *H. lundbecki* n. sp. (female, holotype), a: Antenna, b: Palp and c: Frontal stripe.

3rd tergite about  $\frac{1}{5}$  the width of the tergite. The under side as in the female. The hairs darker than in the female, pale hairs mostly along the hind margins of the segments. Otherwise as in the female.

Length: 15—17 mm.

Type-material.

Holotype: ♀ 5th June 1906, Hareskov N of Copenhagen (coll. Lundbeck).

Allotype: ♂ 5th June 1906, Hareskov N of Copenhagen (coll. Lundbeck).

Holotype and allotype taken in copula by C. R. Larsen. Both in Zool. Museum of Copenhagen. I have named the species in memory of the famous Danish dipterist W. Lundbeck (1863—1941).

#### Discussion.

I have given the name *lundbecki* n. sp. to parts of *montanus* Meig. of various authors and to *fulvicornis* of various authors but not Meigen. The description of *fulvicornis* Meig. (1820, p. 46) was drafted by Wiedemann from an Italian specimen (a female) in Germar's collection and this description was sent to Meigen, who published it without ever having seen the type-specimen. This description is that of a species of the restricted genus *Tabanus*, according to the statement: "Stirne mit schwarzer Längslinie über die Mitte", i. e. there was no lower callus as in the *Hybomitra*-species, but only a narrow, black line similar in this respect to the frons in species as *graecus* Fabr. and *apricus* Meig. Brauer was therefore correct, when he states (1880, p. 13): "*Graecus* Fabr. E. Syst. 1794 = *ferrugineus* Meig. et *fulvicornis* Meig. 1804". Mr. J. E. Collin has called my attention to the fact that the first person suggesting the use of the name: *fulvicornis* Meig. for a hairy-eyed *Hybomitra*-species was Villeneuve (1910), and he was mistaken in stating that Meigen's type of this species was in Paris. The type-specimen of *fulvicornis* Meig. may be either in Wiede-

mann's own collection or in Germar's collection, but I have not succeeded in finding it. In a material of *lundbecki* n. sp. sent me as *fulvicornis* Meig. from Vienna there was a female with one of Wiedemann's original labels: "Hercyn/trop.", but this specimen can not be the type, because it does not agree with the description.

The majority of Lundbeck's material of *montanus* Meig. is *lundbecki* n. sp., only two of his *montanus*-specimens being the true *montanus* of Meigen. Eight females of Kauri's *fulvicornis* Meig. were all *lundbecki* n. sp. Of a material of 63 specimens of *montanus* Meig. (Kröber det. 1920-21) from various German collections (see p. 79) the majority (42 specimens) was *lundbecki* n. sp. Three specimens of *fulvicornis* Meig. (Kröber det. 1921) were also *lundbecki* n. sp.

Various authors have considered their *fulvicornis* Meig. (= *lundbecki* n. sp.) to be only a variety of *m. montana* Meig. There is no doubt, however, that they are two well separated species, though the morphological differences are only small. *H. lundbecki* n. sp. has a flying-period, which is about two weeks earlier than that of *m. montana* Meig. Also the distribution-patterns in Denmark are different (see below).

#### Occurrence in Denmark.

*H. lundbecki* n. sp. seems to be the most common *Hybomitra*-species in Denmark. It is evenly distributed all over the country, though perhaps a little more frequent in Jutland than on the islands, especially when the stronger intensity of collecting in the islands is taken into consideration. In the collection of Zool. Museum of Copenhagen I could separate 30 females and 20 males, and in Aarhus naturhist. Museum there are 29 females and 13 males.

The following localities can be given. Jutland: Ø. Assels in Mors, Gravlev enge, Buderupholm, Rebild, Dolle-  
rup, Lemming bæk N of Silkeborg, Funder and Mausing at Silkeborg, Gindeskov at Skive, Nørholm at Varde, Stensbæk plantation at Gram, Kjelstrup; — Funen: Mid-

delfart; — Zealand: Tibirke, Tisvilde, Tyvekrog in Grib skov, Stenholtsvang, Strødam, Hillerød, Gandløse Ore, Ryget at Værløse, Hareskov, Rudehegn, Geel skov,

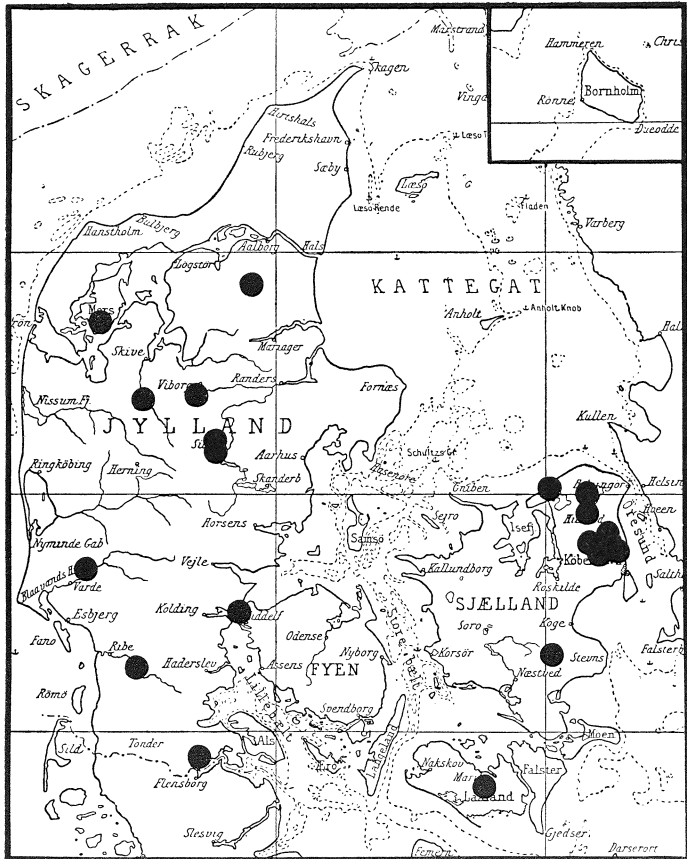


Fig. 17: The distribution of *H. lundbecki* n. sp. in Denmark.

Ermelund, Dyrehaven, Frerslev hegn; — and Lolland: Borgø at Maribo.

#### Distribution.

Sweden: Rather commonly distributed all over the country (Kauri 1951, p. 104). Germany: "Aus einzelnen

Teilen Deutschlands bekannt" (Kröber 1932, p. 80). The same author (1930, p. 30) names 8 localities for this species in Schleswig-Holstein. According to Collin (in litt. 6th May 1957) this species does not occur in Britain, though Goffe (1931, p. 97) states that he has seen some specimens (from Nethy Bridge) of this form or of a form intermediate between *fulvicornis* and *montanus*. It may be the following species: *tuxeni* n. sp.

Its further distribution is according to Leclercq (1957): Belgium, Central-Europe, Austria, Czecho-Slovakia, Switzerland, France, Italy, and U. S. S. R.

#### Biology.

The flying period according to Kröber (1932, p. 80) is May—August. In Denmark the flying-period is from 25th May to 28th July with the maximum in June and the first third of July and followed by a sudden decrease. A comparison with the distribution of the material of *m. montana* Meig. shows that the flying-period of this species occurs about two weeks later than that of *lundbecki* n. sp.

As mentioned under the preceding species (p. 127) I have never during my collecting-excursions in the region NW of Copenhagen been surrounded by this or other species of the *montana*-group. This curious fact indicates a biological difference between the two groups, a difference, about the nature of which nothing can be said with certainty.

### 11. *Hybomitra tuxeni* sp. nov.

Syn.: partim *montanus* auctt. nec Meig.

„ *fulvicornis* Kröb. nec Meig.

#### Identification.

The females of the *montana*-group are rather difficult to distinguish from each other. *H. lundbecki* n. sp. is most easily separated by means of its broad and brown 3rd antennal joint and black notopleural calli. *H. tuxeni* n. sp. is a rather large species (15.5—18 mm), the sides of abdomen with golden and black hairs, and 3rd antennal joint rather narrow and distinctly brown at the base,



whereas *H. m. montana* Meig. and *montana flaviceps* Zett. both are smaller species (12,5—16 mm) and have grey and black abdominal pubescence and 3rd antennal joint more narrow and mainly black.

The males of the *montana*-group are only little known to me. Besides 33 males of *lundbecki* n. sp., which may be distinguished by its rather broad third antennal joint and black notopleural callus, I have only seen eight males belonging to this group. A description of these males is given on p. 135.

#### Description.

♀: Frontal stripe broad, 3—4 times higher than broad below, yellowish grey dusted and with many yellowish and a few blackish hairs. Lower frontal callus of somewhat varying form, but often broader than high and always shining black or brownish black. Middle frontal callus spindle-shaped and black. The ocellar callus brownish with more or less grey dust. Behind the ocelli a tuft of rather short, yellowish hairs, intermixed with some black hairs. 1st and 2nd antennal joint rather strongly grey dusted. 3rd antennal joint more narrow than in *lundbecki* n. sp., the upper tooth less pronounced. Outer half of the joint always darkened, the basal half brownish. The style black. Upper margin of the antennal bow broader towards the middle line. The palpi not especially slender, light brownish, the tip blunt. With many pale and a few black hairs.

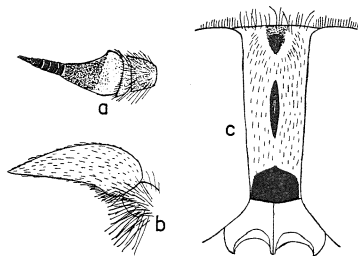


Fig. 18: *H. tuxeni* n. sp. (female, holotype), a: Antenna, b: Palp and c: Frontal stripe.

Thorax grey, notopleural callus distinctly brown. Abdomen dorsally with yellowish brown sidemarkings on 1st—3rd tergite, sometimes also a little brown spot on the sides of 4th tergite. The dark middle stripe is nearly  $\frac{1}{3}$  the width of the segments, with distinct yellowish middle triangles.

Pubescence on abdomen conspicuously golden (not greyish as in *montana* Meig.), and besides black hairs in various numbers. The under side greyish black with brown sidemarkings on 1st—4th tergite. On 2nd sternite a large, dark, quadratic spot. On the following sternites a more or less distinct, dark middle stripe. Legs as in *lundbecki* n. sp. Wings more or less distinctly darkened, especially along the veins.

Length: 15,5—18 mm (average of 18 Danish females: 16,7 mm).

♂: Eye-facets of equal size. The eyes with pale brownish pubescence which is longer and more dense than in the female. No black hairs behind the ocelli. 1st and 2nd antennal joint strongly grey dusted; hairs on upper side of 1st antennal joint shorter than 1st and 2nd joint together. 3rd joint a little more narrow than in the female, blackish distally, brownish at the base. Palpi not so slender as in *lundbecki* n. sp. (fig. 4c), the tip rounded (not pointed). Their colour pale brownish, often somewhat grey dusted. Thorax as in the female with brown notopleural callus.

Abdomen dorsally with dark, yellowish brown sidemarkings on 1st—4th tergites and dark middle stripe of about  $\frac{1}{5}$  the width of the tergites. The under side with 1st—4th sternites yellowish brown, 2nd sternite with a dark, quadratic spot, which is broader towards the base. On 3rd and 4th sternites as a rule no dark middle line. Otherwise as the female, the wings also more or less darkened, especially along the veins.

Length: 16—17,5 mm.

#### Discussion.

It is evident that there are several species (or subspecies) in most authors' *montanus* Meig. One of them I have separated here as *tuxeni* n. sp. It differs from the lectotype of Meigen's *montanus* in Vienna and from my further material of the true *montanus* Meig. by the mor-

phological characters given above. Besides the morphological differences between the two species there also seem to be different distribution-patterns in Denmark (see fig. 20 and 22). *H. tuxeni* n. sp. has an eastern distribution, *m. montana* Meig. a western distribution in Denmark, and these facts indicate that they are two subspecies. On the other hand both forms have been taken (three of each species) at Stensbæk plantation in S-Jutland, and I have therefore provisionally separated them as two species. Also the seasonal distribution indicates that they are two different species (see below).

From *montanus* Meig. sensu Lundb. I could separate three females and two males of this species. A female of *solstitialis* Schin. (Kröber det. 1920) from Staatliches Museum in Stuttgart belongs to this species, and from Deutsch. Ent. Inst. in Berlin I received three females of *tuxeni* n. sp., one labelled *fulvicornis* Meig. (Kröber det. 1931) and two labelled *montanus* Meig. (Kröber det. 1921 and 1931). These four females together with eighteen females and eight males from Denmark form my material of this species. As mentioned on p. 97, Mr. J. E. Collin has undertaken an examination of Linné's types of *tropicus* in "The Linnean Collection" in London. The result was that *tropicus* L. does not belong to the *bimaculata*-group, but in all visible characters correspond with a form of *montanus* Meig. "The abdomen of the type differs from most specimens of *montanus* in having a small isolated yellowish patch on fourth tergite. However, I possess both Scottish and English specimens of *montanus* which also have this patch, and these were taken at the same time and place as normal specimens without this patch. The *tropicus*-type also has rather darker wings than normal British *montanus* and a more noticeable small dark "cloud" about the base of the forked apical vein. In fact it is really more like your "dark" *montanus* [= *tuxeni*, author's remark]. Both type-specimens have

lost their antennae." (Collin in litt. 15th October 1958).

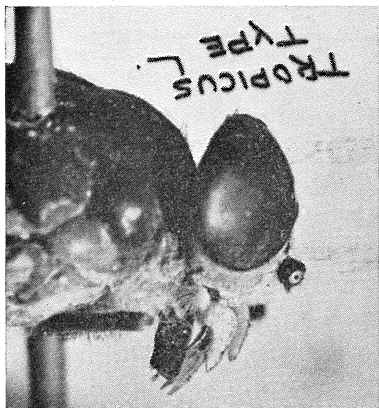


Fig. 19 a.

I have not myself seen the type-specimens, but the photographs (fig. 19) indicate that *tropicus* L. is identical with the species here described as *tuxeni* n. sp. In order to avoid the complications an exchange of names may cause, I have on p. 99 proposed that the name *tropicus* L. be deleted.

Type-material.

Holotype: ♀ 9th June 1918, Bremersvold in Lolland. No allotype is selected. The type in Zool. Museum, Copenhagen.

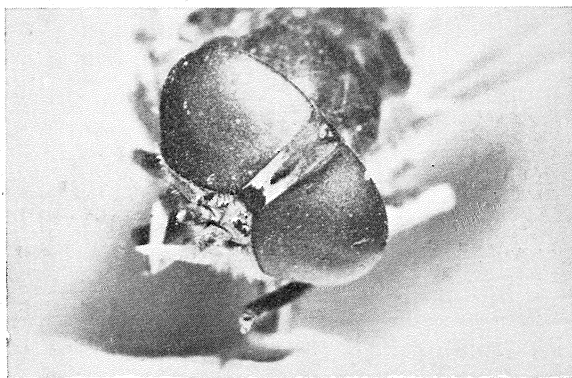


Fig. 19 b.

Fig. 19. Type-specimen of *tropicus* L., a: Showing the palpi and the brown notopleural callus, b: Frontal stripe. (Phot. Mr. Tams, South Kensington Museum, London).

I have named this species in honour of Dr. S. L. Tuxen, the head of the entomological department of Zool.

Museum, Copenhagen, where I have met much hospitality during the preparation of this paper.

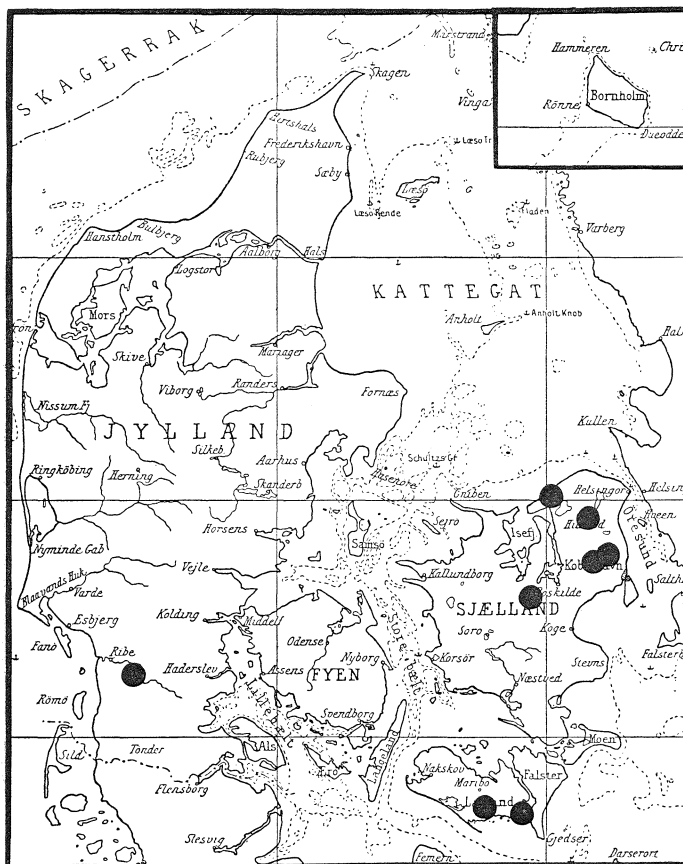


Fig. 20: The distribution of *H. tuxeni* n. sp. in Denmark.

#### Occurrence in Denmark.

A rather common species in the islands, but very sparse in Jutland, where it seems to be replaced by *m. montana* Meig. and *m. flaviceps* Zett. (Compare fig. 20 and fig. 22). Localities in Jutland: Stensbæk plantation at Gram; — Zealand: Hvalsø, Tisville, Hillerød, Jonstrup

at Ballerup, Hareskov, Frederiksdal; — Lolland: Rodenskov, Kærstrup and Bremersvold.

Distribution.

Nothing can be said with certainty before a revision has been undertaken in the various countries. I have seen four German specimens, one of which was labelled Berlin, Finkenkg.

Biology.

Flying-period according to the dated Danish specimens: 24th May to 11th July. One specimen in May, seventeen in June and eight in the first third of July. According to this rather sparse material it seems evident, that *tuxeni* n. sp. is an earlier species than *m. montana* Meig. and with a flying-period most resembling that of *lundbecki* n. sp. On 4th June 1958 and 2nd July 1958 I captured 2 + 2 males hovering in the early morning over a road near a wood N of Copenhagen.

## 12. *Hybomitra m. montana* Meig., 1820.

Identification.

On p. 127 characters are mentioned, by means of which the species of the *montana*-group may be distinguished from the species of the *bimaculata*-group. From *lundbecki* n. sp., *m. montana* Meig. may be distinguished by having 3rd antennal joint narrow and mainly black, the notopleural callus brown and the brown sidemarkings on 1st—3rd tergite of a darker coloration and with distinct, greyish shadows. From the preceding species *m. montana* Meig. is more difficult to distinguish. Both have brown notopleural calli, but in *m. montana* Meig. the third antennal joint is still more narrow and blackish, the ground coloration more blackish and the abdominal pubescence grey and black (not golden and black) and finally *m. montana* Meig. is a smaller species. In the other subspecies of *montana*: *m. flaviceps* Zett. the distinct brown sidemarkings on 1st—3rd tergites much reduced or absent. Further the venter is mainly greyish black and the antennae very narrow and black. *H. staegeri* n. sp. (= *mühlfeldi* auctt. nec Brau.) has whitish halteres, sidemarkings on 1st—4th tergites and very narrow middle stripe, especially on 3rd tergite.

The males of the *montana*-group may be distinguished from

the males of the *bimaculata*-group by means of the characters given on p. 128. My material of males of the *montana*-group is rather sparse. Of *lundbecki* n. sp., which may be distinguished by its black notopleural callus and rather broad, brownish 3rd antennal joint, I have seen 33 Danish specimens. Of males with brown notopleural calli I have only seen eight Danish specimens, all of which I consider as *tuxeni* n. sp. Therefore I can give no details on the distinction of *tuxeni* n. sp., *m. montana* Meig., *montana flaviceps* Zett. and *staegeri* n. sp.

#### Description.

♀: Frontal stripe broad, 3—4 times higher than broad below, grey dusted. Lower frontal callus often broader than high, upper margin straight or with a little point at the middle. Colour shining black, not transversely wrinkled. Middle frontal callus broad spindle-shaped and black, sometimes connected with the lower callus by a narrow line. Ocellar callus not so distinct as in the preceding species, brownish and more or less grey dusted. Behind the ocellar callus some blackish hairs, which are shorter than in the species of the *bimaculata*-group. The frontal stripe also has some rather short, pale and blackish hairs. Pubescence of the eyes sparse, consisting of short, whitish hairs. 1st and 2nd antennal joint grey dusted, 3rd antennal joint narrow with a weakly developed dorsal tooth. The colour mainly black, often a little brownish coloration at the base. The style black. The palpi light yellowish brown, slender and with pale and black hairs.

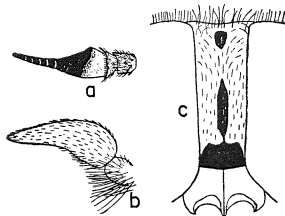


Fig. 21: *H. m. montana* Meig. (female), a: Antenna, b: Palp and c: Frontal stripe.

Thorax greyish black with indistinct grey longitudinal stripes. Notopleural calli brown. Halteres brownish with paler tips.

Abdomen with yellowish brown or reddish yellow sidemarkings on 1st—3rd tergite or 1st—4th tergite; sidemarkings often with greyish shadows. Middle stripe

black with distinct, grey middle triangles. The width is  $\frac{1}{3}$  the width of the tergites. The black middle stripe continues to the tip, and the sides of the last tergites of the same grey coloration as the middle triangles. Pubescence grey (not golden) and black. The venter somewhat variable in colour, but the sides of the first sternites always more or less distinctly yellowish brown or reddish brown. 2nd sternite with a quadratic dark middle spot. On the following sternites a more or less distinct, dark middle stripe. The legs with grey femora, tibiae brownish, the first pair darker. Tarsi brown, first pair blackish.

Length: 12,5—16 mm (average of 20 Danish females: 14,4 mm).

♂: See remarks under "Identification".

#### Discussion.

The species here mentioned as *H. m. montana* Meig. is only identical with part of *montanus* Meig. of various authors, which is a very mixed species. I have seen one of Meigen's types (a female) from "Hohe Ween". It was given by him to Winthem and is now found in Naturhistorisches Museum in Vienna. This specimen I herewith appoint as lectotype to *m. montana* Meig.

Lundbeck's (1907, p. 112) *montanus* Meig. is mainly *lundbecki* n. sp., though there are six specimens of *tuxeni* n. sp. among them. Of the present Danish material of the true *m. montana* Meig., none can have been seen by Lundbeck.

I have seen 66 specimens of Kröber's *montanus* Meig. (Kröber det. 1920—21) from various German collections (see p. 79). Of these one was *collini* n. sp., two *schineri* n. sp., one *distinguenda* Verr., fortythree *lundbecki* n. sp., four *tuxeni* n. sp. and only seventeen the true *m. montana* Meig.

For the specific distinction between *tuxeni* n. sp. and *m. montana* Meig. see p. 136.



## Occurrence in Denmark.

The species is in Denmark only known from Jutland as seen on the map (fig. 22), and it seems to be at-

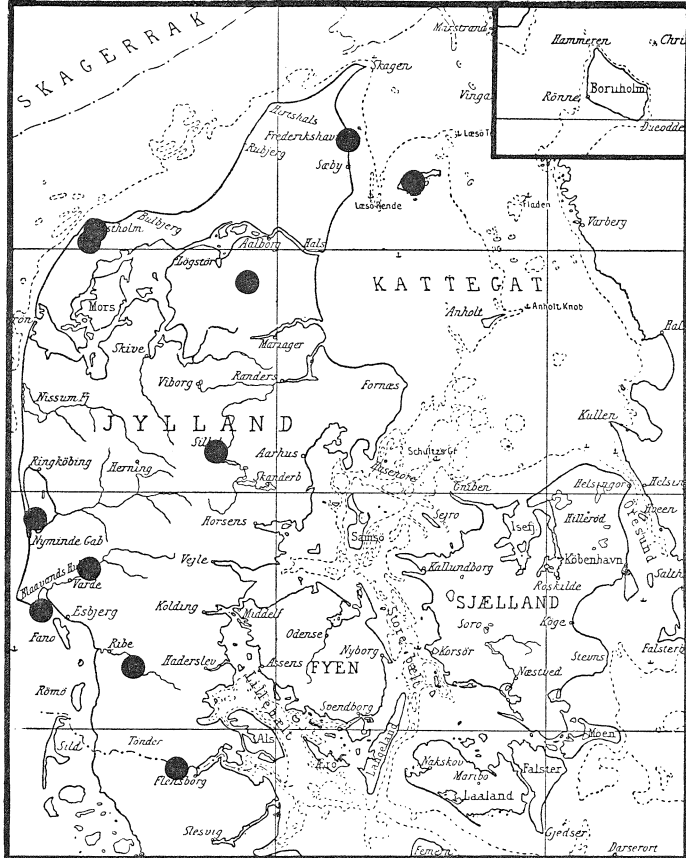


Fig. 22: The distribution of *H. m. montana* Meig. in Denmark.

tached to the coastal region farthest to the west. In accordance with this, Goffe (1931, p. 97) writes about the distribution in Great Britain: "The species appears to be quite common in the Scottish Highlands and in a number of places in mountainous districts in S.W. Ireland".

Later on the species has also been found in several places in England, but it seems not to occur in the southeastern counties (Oldroyd 1939, p. 93). The explanation of these distribution-patterns may be that *m. montana* to a higher degree than other *Hybomitra*-species can hold its own in humid and windy districts.

The material in the Zool. Museum of Copenhagen consists of 21 females, no males. Naturhist. Museum in Aarhus has a single female and in my own collection there is also one female.

Localities in Jutland: Læsø, Frederikshavn, Ørgård at Nors (Thy), Sårup at Hanstholm, Buderupholm, Silkeborg, Tipperne, Nørholm hede at Varde, Skallingen, Stensbæk plantation at Gram, and Frøslev.

#### Distribution.

In Sweden frequent all over the country, but replaced in the northernmost districts of Lapland and along the Scandinavian mountain-range by the darker subspecies: *m. flaviceps* Zett. (Kauri 1954, p. 242).

As mentioned above *m. montana* Meig. in Britain is distributed, though locally, all over the country with exception of the southeastern counties, and is mainly frequent in the Scottish Highlands and in Ireland (Oldroyd 1939, p. 93). According to Kröber (1932, p. 80) it is common in Germany and is also known from Schleswig-Holstein (Kröber 1932, p. 30), but only a minority of Kröbers *montanus* Meig. is Meigen's species in my sense, see above.

Leclercq (1957) gives the further distribution as: Holland, Belgium, France, Central-Europe, Austria, Switzerland, N. Italy, Czecho-Slovakia, Bulgaria, U. S. S. R. and Finland.

#### Biology.

Occurs from May to August on pastures and roads. The males often hover in great numbers in the sunshine over roads in woods and in similar places (Kröber 1932, p. 80). With regard to the flying period the Danish ma-

terial is from the period 23rd June to 5th August and with a distinct maximum in the first half of July. Accordingly this species seems to have a flying-period, which is some weeks later than that of *lundbecki* n. sp. and *tuxeni* n. sp. (see fig. 1). Oldroyd (1939, p. 93) mentions that the species is mainly met in mountainous or hilly districts, but is not restricted to such places. This is also the case in Denmark, where most of the localities are situated in low-lying and only little undulated districts.

### 13. *Hybomitra montana flaviceps* Zett., 1842.

#### Identification and Description.

♀: Differs from *m. montana* Meig. by the following characters: 1) the brownish sidemarkings on the first tergites lacking or reduced into very small markings; 2) the under side mainly greyish black, sometimes a faintly reddish brown coloration on the sides of 2nd and 3rd sternite; and 3) antennae still more narrow and darker than in the nominate form. Ringdahl (1943, p. 171) mentions that specimens with completely black notopleural calli are common. Otherwise as in the female of *m. montana* Meig.

♂: Not known by the author, see p. 140.

#### Discussion.

This form was described as a subspecies of *montana* Meig. by Kauri (1954, p. 242), but Ringdahl (1943, p. 171) had mentioned *flaviceps* Zett. and stated that it was probably only a melanistic variety of *montana* Meig.

#### Occurrence in Denmark.

Only three females known, all from Jutland. Dates: Højen at Skagen 19th July 1908 (Coll. Lundbeck) and Tipperne 2 spp. 15th June 1940 (Søgård Andersen). On basis of this sparse material *m. flaviceps* seems to be a form connected with the west coast of Jutland.

Distribution.

In Sweden *m. flaviceps* Zett. replaces the nominate form in the northern Lapland and along the Scandinavian mountain-range. Though specimens are caught in southern Sweden the species occurs here singly and accidentally (Kauri 1954, p. 242). From the description by Goffe (1931, p. 96) of his *montanus* Meig. the present subspecies also occurs in Great Britain, but he has not separated the form. According to Ringdahl (1943, p. 171) *m. flaviceps* is identical with *montanus* f. *obscura* of Olsoufieff (1937, p. 378), and the latter states the distribution of his form as: North-Europe, northern part of the European U. S. S. R. and Siberia.

14. *Hybomitra staegeri* sp. nov.

Syn.: *mühlfeldi* auctt. nec Brau.

Identification.

The female of this species may be distinguished from all other *Hybomitra*-species by its completely whitish yellow halteres. The frontal stripe, antennae and palpi almost as in *m. montana* Meig., but it may be distinguished from this species by its very light abdominal sidemarkings on 1st—4th tergites and a middle stripe, which on 2nd and 3rd tergites is very narrow (about  $\frac{1}{8}$  the width of the tergites),

The males is not known by the author. According to Olsoufieff (1937, p. 379) it has whitish yellow halteres like the female, eye-facets in upper two thirds of the eyes 2—3 times larger than those in the lower third and the venter with a dark middle spot on 2nd sternite.

Description.

♀: Frontal stripe about four times higher than broad below, yellowish grey dusted. Pubescence of pale and blackish hairs. Lower frontal callus broader than high, upper margin rounded, the colour shining brownish black. Middle callus rather broad, about  $\frac{1}{3}$  the width of the frontal stripe, pointed in the ends, and downwards by a narrow line connected with lower callus. The ocellar callus flat and rounded triangular, the colour brownish and

partly grey dusted, placed on a somewhat protruding vertex. Behind the vertex some blackish hairs. Pubescence on the eyes very sparse, short and whitish. 1st and 2nd antennal joints yellowish brown, only little dusted. 3rd antennal joint rather narrow, but with a distinct tooth dorsally. The colour black in the distal part, at the base somewhat brownish. Palpi rather slender, ending in a blunt tip, the colour pale, with some short black and many whitish hairs.

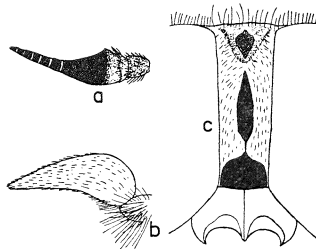


Fig. 23: *H. staegeri* n. sp. (female, holotype), a: Antenna, b: Palp and c: Frontal stripe.

Thorax greyish black, notopleural callus and upper part of mesopleura brownish. The suture from wing-root to scutellum is very deep and forms a U-shaped groove, which is as deep as broad. This characteristic suture is not found in other Danish *Hybomitra*-species, where a flat and broad depression is formed. Halteres yellowish white.

Abdomen dorsally with broad, yellowish brown side-markings on 1st—4th tergites. Middle stripe brownish black, with greyish middle triangles at the middle. The width of the middle stripe is on 2nd and 3rd tergites about  $\frac{1}{8}$  the segment's width. At the hind margins of 2nd and 3rd tergites the middle stripe is interrupted, but continues on 4th tergite being  $\frac{1}{3}$  the width of this tergite. The remaining tergites greyish black. On the under side 1st—4th sternites are yellowish brown, 3rd and 4th a little greyish along the hind margin. At the middle of 2nd sternite a quadratic spot in the hindmost half of the sternite. Also the middle part of 1st sternite darkened, but only faintly. 5th—7th sternites mainly pale greyish, 5th with small yellowish sidemarkings.

Femora greyish, tibiae light brownish, 1st pair distal-

ly somewhat darker. Tarsi brownish, 1st pair almost black.

Length: 17 mm.

♂: See the "Identification".

#### Discussion.

The description above is based on the single Danish specimen of this species, which by Olsoufieff (1937, p. 190) and Dinulescu (1958, p. 146) is named *mühlfeldi* Brau. I have not seen specimens of the two authors' species, but my specimen agrees in all details with their description and figures. As mentioned on p. 123 two females of Brauer's *mühlfeldi*, which I received from Vienna, do not agree with the type-specimen of Brauer's species, which is a male sent by v. Mühlfeld to Meigen. Meigen mentions it as *graecus* (not *graecus* Fabr.). Later on Meigen's *graecus* was separated into *mühlfeldi* and *miki* by Brauer (1880, p. 149). The type-specimen of *mühlfeldi* Brau. belongs to the *bimaculata*-group, while the *mühlfeldi* Brau. sensu Olsoufieff and Dinulescu belongs to the *montana*-group.

One of the *mühlfeldi*-females from Vienna is from Syria. As mentioned on p. 123 it belongs to the *bimaculata*-group, but is not identical with my true *mühlfeldi*-females. The other specimen (from Amur) is closely related to the specimen here described as *staegeri* n. sp. It has like the Danish specimen a very deep suture from wing-root to scutellum, and also the abdominal middle stripe is of a similar form. On the other hand it is much paler than the Danish specimen, antennae yellow in the basal half and brownish distally, and also the abdominal coloration is much paler. The differences, however, are of such a nature that I consider the Amur-specimen to be a *staegeri* n. sp. It has not been possible to get German material of Kröber's (1932, p. 79) *mühlfeldi* Brau. from the German collections mentioned on p. 79, and I regard his *mühlfeldi* as a mistake (see also Kröber 1958, p. 48).

## Type-material.

Holotype: ♀, 21st June 1908, Hareskov N of Copenhagen (Coll. Lundbeck). The type in the Zool. Museum of Copenhagen.

## Occurrence in Denmark.

Only one female known, the holotype.

## Distribution.

Only little can be said with certainty. Olsoufieff (1937, p. 380) gives the following information: "Middle- and South-Europe, the Ukraine, the Caucasus, the steppe of Sibiria, Transbaikalien, Asia Minor and Mongolia"

## Biology.

No information. The flying-period by Kröber (1932, p. 79) established as April—August.

**Literature.**

- Brauer, F., 1880: Die *Tabanus*-arten der Europäischen, Meditteranen und Sibirischen Subregionen (in Zweifl. d. Kaiser. Mus. zu Wien). Denks. Mat.-Nat. Cl. K. Akad. d. Wiss. Wien XLII: 119—216, 6 Taf.
- Collin, J. E., 1932: A review of Mr. E. Rivenhall Goffe's paper on *Tabanidae* (Trans. Ent. Soc. S. of England 1930). Entomologist's Record XLIV: 37—39.
- 1940 a: Review of "British Blood-sucking Flies". By F. W. Edwards, H. Oldroyd and J. Smart. London 1939. Ent. Mon. Mag. 76: 70—72.
- 1940 b: A Note on Certain structural Distinctions between the Females of *Theriopectes tropicus* L., *solstitialis* Mg., and *distinguendus* Verr. (*Dipt. Tabanidae*). *ibid.*: 178—179, 6 figs.
- Colyer, Charles N., 1951: Flies of the British Isles. London.
- Dinulescu, Gh., 1958: *Diptera*, Familia *Tabanidae*. Fauna Republicii Populare Romîne.
- Edwards, F. W., Oldroyd, H., & Smart, J., 1939: British Blood-sucking Flies. London.
- Enderlein, G., 1922: Ein neues Tabanidensystem. Mitt. Zool. Museum Berlin, X, H. 2: 335—351.
- Fallén, C. F., 1814—17: *Diptera Sveciæ*. Vol. I. Lund.

- Goffe, E. Rivenhall, 1931: British *Tabanidae* (*Diptera*). With an account of the principal variation. With descriptions of a number of New Forms, and of some Additions to the British List. Trans. Ent. Soc. S. of England 1930: 43—114, 2 pls.
- Hamm, A. H., 1941: Habits of *Tabanus micans* (*Dipt.*). Ent. Mon. Mag. 77: 235.
- Henriksen, Kai L., 1921—37: Oversigt over Dansk Entomologis Historie. Ent. Medd. 15.
- Jaenicke, F., 1866: Beiträge zur Kenntnis der Tabaniden Europa's. Berlin. Ent. Zeitschr. X: 65—91.
- Kauri, Hans, 1951: Bemerkungen über schwedische Tabaniden. Opusc. Ent. XVI: 97—109.
- 1954: Bemerkungen über schwedische Tabaniden II. *ibid.* XIX: 239—244.
- Kloet, G. S., 1941: Habits of *Tabanus micans* Mg. (*Dipt.*). Ent. Mon. Mag. 77: 202.
- Kröber, O., 1923: Beiträge zur Kenntnis palaearktischer Tabaniden. (II. Teil: Die Untergattung *Theriopectes* Zell. nebst Bemerkungen zu den mir bekannt gewordenen Bigot'schen Tabaniden-Typen der Kollektionen Mr. Collin's in Newmarket). Arch. f. Naturg. 88, A 12: 55—118.
- 1925: *Tabanidae*. In Lindner: Die Fliegen der Palaearktischen Region. Lief. 5—8.
- 1930: Dipterenfauna von Schleswig-Holstein und den benachbarten westlichen Nordseegebieten. Verh. Ver. Naturw. Heimatforsch. Hamburg 22: 29—31.
- 1932: *Tabanidae*. Tierwelt Deutschlands 26: 55—99.
- 1958: Nachträge zur Dipteren-Fauna Schleswig-Holsteins und Niedersachsens (1933—35). Verh. Ver. Naturw. Heimatforsch. Hamburg 33: 39—96.
- Leclercq, M., 1952: Introduction à l'étude de Tabanides et revision des espèces de Belgique. Mem. Inst. Sci. nat. Belg., Brussels no. 123, 80 pp., 30 maps.
- 1957: Révision systématique et biogéographique des *Tabanidae* (*Dipt.*) de France, I—II. Annales de Parasit. Hum. et Comp. XXXII, 3—4: 303—327, 398—425 + tabel.
- Linné, C., 1761: Fauna Suecica. Stockholmiae.
- Loew, H., 1858: Zur Kenntnis der europäischen *Tabanus*-arten. Verh. zool.-bot. Ges. Wien 8: 573—612.
- Lundbeck, W., 1907: Diptera Danica I. København.
- Macquart, M., 1850: Animaux invertébrés. "Catalogue de Musée d'Histoire Nat. de la Ville de Lille."



- Meigen, J. W., 1820: Systematische Beschreibung der Europäischen zweiflügeligen Insekten. II. Aachen.
- 1838: Systematische Beschreibung der bekannten europäischen zweiflügeligen Insekten. VII. Hamm.
- Oldroyd, H., 1939: see Edwards, F. W.
- Olsoufiey, N. G., 1937: *Tabanidae*. Faune de l'URSS. Moskva—Leningrad.
- Panzer, C. W. F., 1794: Fauna Insectorum Germaniæ Initia. Antliata I.
- Philip, C. B., 1948: Notes on Egyptian *Tabanidae* with comment on certain supraspecific categories of Old World *Tabanidae*. Bull. Soc. d'Ent. d'Egypte 32: 77—83.
- Ringdahl, O., 1917: Fyndorter för *Diptera*. Ent. Tidskr. 38: 302—311.
- 1943: Anteckningar till svenska bromsar av undersläktet *Tylostypia* End. *ibid.* 64: 167—172.
- Schiner, J. R., 1862: Fauna Austriaca. Die Fliegen (*Diptera*). Wien.
- Séguy, E., 1926: Diptères (Brachycères). Faune de France 13.
- Surcouf, J., 1921: *Diptera*. Fam. *Tabanidae*. In Wytsman: Genera Insectorum. 175. Fasc. Bruxelles.
- Wahlgren, Einar, 1912: Svensk Insektfauna 11. Tvåvingar. *Diptera*. 2. *Orthorapha: Brachycera*. Uppsala.
- Verrall, G. H., 1909: British Flies. Vol. V. London.
- Villeneuve, J., 1910: À propos quelques *Tabanus*-types de Brauer. Wien. entom. Zeit. XXIX: 82—85.
- Zetterstedt, J. W., 1842: *Diptera Scandinaviæ*. I. Lund.
-