

Circumpolar *Aedes* (*Ochlerotatus*)
Species in North Fennoscandia

by

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ABSTRACT

The distributional patterns found in Fennoscandian culicids are discussed. Northern circumpolar species of *Aedes* (*Ochlerotatus*), such as *hexodontus* Dyar and *diantaeus* H. D. K. are more common in Fennoscandia than previously assumed. *A. (O.) pionips* Dyar is for the first time recorded from Fennoscandia and *A. (O.) punctodes* Dyar is new to the Palaearctic. Minor taxonomic differences are established in the Lapland material of *pionips* Dyar and *pullatus* (Coq.) larvae, as well as of *punctodes* larvae, pupae and males. Descriptions of the basal lobe of *punctator*, *hexodontus* and *punctodes* are given for identification of males.

1. Introduction

Similarities between the northern Nearctic and Palaearctic culicid fauna were first recorded by Dyar (1922b). Since then our knowledge of species in the genera *Aedes* and *Culiseta* has increased considerably. An extensive compilation of more recent findings on the northernmost species of the Holarctic was made by Jenkins (1958), who distinguished several distributional patterns.

During the last few years additional data on distribution and biology of mainly *Aedes* (*Ochlerotatus*) species have been collected in Fennoscandia. This has broadened the knowledge of some black-legged *communis* - subgroup species, which are still, however, in need of much intensive studies before their distribution in Fennoscandia is sufficiently known. Recent biometric investigations on *A. (O.) communis* (DeG.), one of the most common northern species in the Holarctic, have shown that actually at least one sibling species and an autogenous form - given species status by the authors - is present in the Nearctic (Ellis and Brust 1973). In the *A. (O.) punctator* (Kirby) - complex, similar taxonomical problems may be found additional to the difficulties of identifying some species in the adult stage.

2. Material

Collections of larvae and adults were made during 1971-73 from various parts of northern Sweden (Dalarna, Härjedalen, Lule Lapmark). The material referred to here consists of larvae or reared adults associated with larval skin from the Messaure area (Lule Lpm.). About 600 larvae were collected for rearing from 11 localities. These localities can be grouped into four different types:

a) Semipermanent bog pools, varying in depth from 50 cm to several meters with dense *Carex*, often *Equisetum* in the shallower parts. Development of larvae is often much later than in temporary pools, loc. 139, 141, 142 a,b,c.

b) Small temporary pools, often between roots of *Betula* or *Salix*, depth 30-60 cm, along fast-flowing streamlets on ground covered with either *Carex* or *Vaccinium*. Bottom covered with *Betula*, *Salix* and *Vaccinium* leaves, loc. 151 - 158.

c) Small temporary rock pools, 30-90 cm depth, formed by melting water. Bottom covered by leaves and detritus, loc. 159 a,b,c, 160.

d) Temporary pools in ground depressions, 30-60 cm, situated in coniferous forest, along roads or large rivers, bottom covered with grass or with mosses, loc. 142 e, 143, 144, 149, 150.

A. (O.) communis (DeG.) s. str. (according to Ellis and Brust 1973)
15.-20.6.1972 loc. 142, 144 3 ♂ 8 ♀; 13.-22.6.1973 loc. 142, 144, 150, 159, 160 25 ♂ 30 ♀.

A. (O.) pionips Dyar
24.6.1972 loc. 143 1 IV. larva, 2 IV. exuviae; 22.6.1972 loc. 142 1 IV. larva; 10.-15.6.1973 loc. 150, 160 6 IV. larvae, 3 III. larvae. All attempts to hatch adults failed, probably because the IV instar larvae died from too high temperatures in the laboratory.

A. (O.) punctodes Dyar
21.-25.6.1972 loc 139, 141, 142 a, 144 23 IV. larvae, 10 ♂, 2 ♀; in 1973 development in loc. 142 was so late that only one male from loc. 149 20.6.1973 was obtained.

A. (O.) punctor (Kirby)
15.-20.6.1972 and 1973 loc. 142, 144 5 ♂, 5 ♀; 13.-24.6.1973 loc. 149, 150, 159, 160 24 ♂, 10 ♀.

A. (O.) hexodontus Dyar
15.-20.6.1972 loc. 141, 143 4 ♂, 5 ♀; 13.-22.6.1973 loc. 142, 149, 150, 159, 160 18 ♂, 1 ♀.

A. (O.) diantaeus H. D. K.
15.6.1973 loc. 150, 159 5 ♂, 4 ♀.

Drawings were prepared from larvae and exuviae, which had been fixed in 70% ethanol. From distilled water, they were transferred to glycerol on an excavated slide with cover glass. The hypopygia of either ethanol-stored or dried specimens were treated in the same way after having been boiled in KOH (15%). This prevented flattening and permitted an accurate view of the basal lobes, which otherwise in slide preparations do not retain their natural three-dimensional form. The figures were drawn with a Leitz Ortholux and to scale in every category and are thus comparable as to size.

3. Distribution of species

In Fennoscandia the tundra is restricted to the northernmost region of the peninsula and to the highest parts of the central Scandinavian mountain range (Ekman 1922). The distribution of the true tundra species *A. (O.) impiger* (Walk.) and *A. (O.) nigripes* Zett. reflects these conditions (Natvig 1948, Jenkins 1958). In Finland, however, both species are recorded from one locality in the birch-zone (regio subalpina) (Brummer - Korvenkontio et al. 1971). At the southernmost extension of the regio alpina inferior (tundra of high mountains, about 900 m a.s.l.) in Dalarna, Sweden, only *nigripes* occurs (Natvig 1948, Dahl unpubl.). On this fjell I also found *A. (O.) hexodontus* Dyar; but it was less abundant than *A. (O.) punctator* (Kirby), the dominating species in bog pools. As is seen from this example and the records of *hexodontus* and *impiger* from the Murmansk area (Solovey and Likhoded 1966) and northern Finland, taiga and tundra species occur together in northern Fennoscandia.

At present there seem to be 3 species of *Ochlerotatus* which are restricted to the taiga, viz. the northern coniferous boreal forest zone of the Palaearctic. The most abundant is *hexodontus* the larvae of which occur mostly together with those of *punctator* and *A. (O.) communis* DeG. in localities of types a and d (cf. p. 58) and as single species in those of type c. *A. (O.) hexodontus* occurs in Hårjedalen (Dahl, unpubl.) as well as in Lule Lapmark in forested areas. Its southern limits in Scandinavia are not known, but it has not been found in the southernmost parts of Sweden. From North America (Dyar 1920 a, Jenkins 1958) and northern Eurasia (Gutzevich et al. 1970) *hexodontus* is reported from the Subarctic and the northern zone of the coniferous forest belt with extensions southwards along mountain ranges.

A. (O.) pionips Dyar - recorded in Palaearctic high latitude localities in the U. S. S. R. (Sazanova 1958, Solovey and Likhoded 1966) - only larvae and females have been found in Lule Lapmark. The larvae lived in temporary flooded rather deep and cool pools along small rivers, but were also found in shallow temporary pools in the forest. From North America, where the species is widespread in the coniferous forest zone (Carpenter and LaCasse 1955) it was recorded from rather variable localities (Dyar 1922 b, 1924 a, Vockeroth 1952, 1954 b). The species is new to the Scandinavian peninsula.

A. (O.) punctodes Dyar has hitherto been recorded only from South Alaska and mainly from salt marshes and river valleys (Knight 1951, Frohne 1953, 1955 a, Darsie 1957). In Lule Lapmark the species is found in temporary and semi-permanent *Carex-Equisetum* bogs and only rarely in shallow temporary pools without vegetation. The larvae live together with *punctator*, *hexodontus* and *communis* larvae and were also found once with *A. (O.) excrucians* (Walk.). As the species can be mistaken for *punctator*, its distribution in the northern boreal forest merits attention. It is new to the Palaearctic.

The other two species that are very common in the taiga zone are also circumpolar, but in a much wider sense, as they also are frequent in deciduous forest. Of these *A. (O.) communis* DeG. is undoubtedly the more abundant in

northern localities of types b and d. Whether or not there exists an auto-genous sibling species of *communis*, as was found in North America (Ellis and Brust 1973) merits further study. A check of adults in one locality (Dahl 1974) and of larvae in the present material did not reveal the presence of *A. (O.) churchillensis* Ellis and Brust or *A. (O.) nevadensis* Chapman and Barr. *A. (O.) punctator* (Kirby) is the dominating species in localities of types a and c.

Species most likely to be nuisances locally are *A. (O.) excrucians* (Walk.), found mostly in *Carex* semipermanent bogs, and *A. (O.) intrudens* Dyar, a species best known from Norwegian material (Natvig 1948). They were recorded from the northernmost Eurasian taiga (Solovey and Likhoded 1966, Gracheva and Shevkunova 1959) in the Murmansk and Archangelsk provinces. Both are widespread Holarctic species with distribution patterns similar to *punctator*. *A. (O.) diantaeus* H. D. K., a circumpolar northern forest species (Carpenter and LaCasse 1955, Dyar 1922 c, Gutzevich et al. 1970, Smith 1952), belongs also to the significant species of the localities studied and occurs in types c and d. It is, however, rare. The females bite, but are easily disturbed when probing. It has also been found in Härjedalen and Scania. *Diantaeus* is new to Sweden.

The peculiar distribution of *A. (O.) pullatus* (Coq.) in the Holarctic with extensions along mountain ranges and in restricted areas within the northern coniferous forest has been discussed by Natvig (1948) and Jenkins (1958). The occurrence of the species in northern Finland, Kemi Lapmark (Hirvenoja 1961) and in the U. S. S. R., Archangelsk province (Gracheva and Shevkunova 1959), as well as from Leningrad to Saratov (Gutzevich et al. 1970), indicates that at least in Eurasia reinvasion of northern localities from a narrow, more southern belt of distribution may have taken place post-glacially.

Whether or not *A. (O.) flavescens* (Müll.), *A. (O.) riparius* D. K. and *A. (O.) sticticus* (Meig.) extend into Fennoscandian northern coniferous forest is not yet known. From North America (Jenkins 1948) and more eastern parts of Eurasia (Gutzevich et al. 1970) these species were reported from high latitudes (Solovey and Likhoded 1966). Records from the Archangelsk province of *A. (O.) leucomelas* (Meig.) and *A. (O.) cataphylla* Dyar and of the latter species also from Kuusamo and Trondhjem in Fennoscandia indicate that these species occur in northern boreal forest localities.

Whereas the subgenus *Ochlerotatus* is well represented in the northern circumpolar fauna, only single species of other subgenera extend into these northern regions. One of the most common, circumpolar species is *A. (Aedes) cinereus* Meig. (Jenkins 1958), which emerges later than most of the *Ochlerotatus* species. In Lule Lapmark the species is represented by a dark form, which was described by Zetterstedt (1850) under the name *C. nigrifulus*.

The Fennoscandian distribution of *A. (Aedimorphus) vexans* (Meig.) (Natvig 1948) seems to deviate from the more northern extension of the species in both U. S. S. R. (Gutzevich et al. 1970) and North America (Carpenter and LaCasse 1955), as there are no recent more northern records (Brummer - Korvenkontio et al. 1971). *Culiseta (Culiseta) bergrothi* (Edw.),

a Palaearctic, northern species, recorded from southern tundra and northern forest localities in the U. S. S. R. (Gutzevich et al. 1970) and known from Fennoscandia (Natvig 1948) is more abundant in the investigated localities (Härjedalen, Lule Lapmark) than *C. (Culiseta) alaskaensis* (Ludl.), a circumpolar species, confined to northern coniferous forest.

4. Taxonomy

On the basis of hypopygial characters in American species, Dyar (1920 a,c) divided the subgenus *Ochlerotatus* into ten species groups. Later comparisons (Dyar 1922 a,b) with European species, established the existence of Holarctic or Palaearctic members within these groups. Primarily on female leg ornamentation and secondarily on hypopygial features Edwards (1921, 1932) using both Palaearctic and world fauna erected eight species groups, of which four were represented in the Palaearctic.

This division was paralleled by the work of Martini (1931), whose four globi of the subgenus *Ochlerotatus* (then including species belonging to other subgenera) was based on hypopygial structures. And so in contrast to Edwards he grouped both black - and white-ring-legged species together.

Of 23 subgenera of *Aedes*, Mohrig (1967) studied species from 11 subgenera and found support for subgenus definition by female genitalia features. In females of European *Ochlerotatus* species differences in genital structures were in accordance with the species grouping of Martini (1931) and this was also substantiated by an analysis of the phallosome (Mohrig 1969).

On the basis of these investigations the European *A. (O.) rusticus* (Rossi) - group, which is synonymous with the American *A. (O.) trichurus* (Dyar) - group, appears to be monophyletic. The European *A. (O.) intrudens* Dyar - group corresponding to the American *A. (O.) pullatus* (Coq.) - group is, because of the inclusion of *pullatus*, not so uniform. The hypopygial pattern of *pullatus* differs from that of *intrudens*-type by the location of the lanceolate spines at the base of the basal lobe. The female genitalia have not yet been studied. The *pullatus* larvae also show deviating trends in the shape of the comb scales and the number of precratal tufts. In a numerical classification of Canadian *Ochlerotatus* species, *pullatus* keys out with *communis* (Stewards 1968). This position reflects better the principle of morphological similarity on which also other species groups are based in the subgenus. However, until the species has been studied from several aspects, *pullatus* may be tentatively placed in the *intrudens* - group.

If the concept of an *Ochlerotatus* s. str. - group (Mohrig 1969) is applied to the Holarctic fauna, the following European subgroups based on female leg ornamentation correspond to Nearctic group designations according to Dyar (1922b): the European *A. (O.) annulipes* (Meig.) - subgroup corresponds to the American *A. (O.) stimulans* (Walk.) - group; the European *A. (O.) dorsalis* (Meig.) - subgroup corresponds to the American *A. (O.) curriei* Coq. = syn. *dorsalis* (Meig.) - group; and finally the European *A. (O.)*

communis DeG. - subgroup covers the American *A. (O.) punctator* (Kirby) - group, the *A. (O.) impiger* Dyar = syn. *communis* DeG. - group, as well as the *A. (O.) inuitus* D. K. = syn. *A. (O.) nigripes* (Zett.) - group.

To understand which trends may have been operative in the formation of the different parts of the *communis* - subgroup and whether it really represents a phylogenetic unit comparable to the other subgroups, studies of species complexes comprising relevant species from the whole world fauna are needed. If a consideration of morphological features of all stages (Belkin 1962) is combined with an analysis of distributional and ecological trends, classification below subgeneric level may contribute to a better phylogenetic system also in higher categories (Mohrig 1969). The subgenus *Ochlerotatus* with nearly 150 species and representatives in all regions and recent main distribution in the Holarctic would be a good unit for such a study.

In *communis* - subgroup-species of the northern Holarctic two complexes are found, viz. the *punctator* complex and the *communis* - complex. Whether or not these are true evolutionary lines should be studied further. At least both larval and hypopygial structures exhibit close affinities.

As pointed out before, some members of these two species complexes are less well known in Fennoscandia. Therefore, for easier identification some taxonomical features are commented upon.

Communis - complex

Recently *A. (O.) communis* DeG. was shown to cover three sibling species in North America: *nevadensis* Chapman and Barr, *churchillensis* Ellis and Brust and *communis* DeG. s. str. sensu Ellis and Brust (1973). A study of females from Lule Lapmark (Dahl 1974) revealed no *churchillensis* or *nevadensis* specimens (recognizable by differences in the shape of unguis). Larval material yielded no *nevadensis* (recognizable by differences in the shape of the comb scale). Whether or not the two American forms actually occur in Europe can only be determined by studies of material from different areas.

A. (O.) pionips Dyar

Descriptions of all stages exist (Dyar 1919 a, Vockeroth 1952, Rempel 1950, 1953, Carpenter and LaCasse 1955, Gutzevich et al. 1970). Nevertheless, the present larvae from North Scandinavia reveal some peculiarities in chaetotaxy meriting description.

Antenna:

1-A: inserted below middle, not reaching the tip, about 8-11 - branched; antenna basally with small dorsal rows of spines (fig.1). Head hairs: 4-C: shafted, 4-5 - branched; 5-C: 4 - branched; 6-C: 3-4 - branched; 7-C: 8 - branched; 8 to 10-C: double. Prothoracic hairs: 1-P: single or double;

2 and 3-P: single, of unequal length; 4-P: single, rather long; 5-P: 3 - branched; 6-P: single; 7-P: 3 - branched (fig. 2); Hair 6: on abdominal segments double. Comb scales: about 60 or more; apex of scales fringed by similar spines (fig. 3). Siphon: uniformly tapered from middle; index: about 2.8 to 3; 1-S: 6-8 - branched, hairs of unequal length, inserted below middle of siphon; 2-S: equal to length of last pecten tooth; 8-S: single, stout. Pecten: closed; about 25-30 teeth, shape cf. fig. 4. Anal segment: not ringed by saddle; 1-X: single, shorter than saddle; 2-X: 10-14 - branched, dorsal and ventral branches shorter; 3-X: long, curved; 4-X (ventral brush): 3 precratal tufts shorter than the rest, which are rather long shafted. Gills: somewhat longer than the distal tufts of 4-X (fig. 5). Pattern of saddle spines: identical to that described by Frohne (1955b).

The examined larvae deviate from the Nearctic material (Rempel 1950, Carpenter and LaCasse 1955) by more even spinulation of pecten teeth, greater length of siphon, different shape of 8-S, the sometimes double 1-P and longer gills.

Females of *pionips* were identified in material caught on human bait in the same area in Lule Lapmark (Dahl unpubl.). In older North Fennoscandian museum material the females may be confused with *communis*. The postcoxal scale patch referred to in the keys of Gutzevich et al. (1970) and Vockeroth (1954b) brings the females to *punctator* in European keys in which the species is not considered. In such keys the males will come out under *communis* and the larvae under *A. (O.) pullatus* (Coq.).

There seems to exist discrepancies in interpretations of the larvae of *pullatus* between European (Kramář 1958, Skierska 1971) and the American and Russian literature. For comparison descriptions based on Finnish material (Kem. L.) are given here.

A. (O.) pullatus (Coq.)

Antenna: short, spiculated, especially at inner side; 1-A: inserted below middle of shaft, multiple, not reaching the tip (fig. 6). Head hairs: 4-C: short, 3 - branched; 5-C: 4 - branched. In III and IV instar; 6-C: 3-4 - branched, one hair conspicuously shorter than the rest; 8 to 10-C: double. Prothoracic hairs: 1-P: double, long; 2 and 3-P: single, same length; 4-P: single, short; 5-P: double; 6-P: single; 7-P: 3 - branched (fig. 7). Hairs 6 from seg. III on single. Comb scales: up to 56-58 scales; fringed by spines of equal length, except for the central one, which is slightly longer and stouter (fig. 8). Siphon: uniformly tapered from base; index: about 3; 1-S: 8 to 9 - branched, inserted at the middle of siphon; 2-S: shorter than 8-S, the latter double branched. Pecten: closed; about 20-23 teeth, shape cf. fig. 9. Anal segment: not ringed by saddle; 1-X: single, shorter than saddle; 2-X: about 8 - branched, 3 considerably shorter than the rest; 3-X: very long, slightly curved; 4-X: 1-2 precratal tufts which are considerably shorter than the following ones (fig. 10). Gills: at least twice as long as saddle. Pattern of saddle spines: identical to that described by Frohne (1955b).

From some European keys (Kramár^v 1958, Skierska 1971) the examined larvae as well as other Holarctic descriptions (Dyar 1920d, Carpenter and LaCasse 1955, Rempel 1950) deviate by the few precratal tufts and the shape of the comb scales. The midspine of the comb scale, 3-P single and abdominal hairs 6 single, are differences by which the examined larvae do not agree with Nearctic descriptions (Carpenter and LaCasse 1955).

In hypopygial features, shape of claspette filament, setae of claspette stem, and the lanceolate, transparent spines of the basal lobe, the Finnish specimens agree entirely with figures by Natvig (1948), but not by Martini (1931), Carpenter and LaCasse (1955), Gutzevich et al. (1970) and Rempel (1953).

The species has a mountainous - boreal distribution in Europe and a comparison of populations from different Holarctic localities might reveal the actual range of variation within the species in both larvae and adults.

Punctor - complex

At present five species can be referred to the *punctor* - complex in the Holarctic: *A. (O.) punctor* (Kirby), *hexodontus* Dyar, *punctodes* Dyar, *abserratus* (Felt and Young) and *aboriginis* Dyar. Of these the last two are Nearctic, whereas the rest are circumpolar. The larvae are all characterized by the nearly or entirely closed saddle, three to one precratal tuft, and comb scales with well-defined midspines. The males have in common the small clinging setae of the apical lobe, the bowl-like, triangular form of the basal lobe, in fresh specimens, and the prominent and curved spine on the basal lobe. The females all possess a postcoxal scale patch.

A. (O.) punctodes Dyar has now to be included in European keys of northern species. Its different stages have been described by various authors (Dyar 1919b, 1922, Knight 1951, Frohne 1955 a,b, Carpenter and LaCasse 1955 and Darsie 1957).

Comparison of larvae from loc. 142 (IV. instar, 6 spec.) and loc. 141 (IV. instar, 9 spec.) with descriptions of Knight (1951) and Carpenter and LaCasse (1955) and Frohne (1955b) reveal the following variations:

A. (O.) punctodes Dyar

Antenna: medium, spiculate (fig. 11); 1-A: 5-7 - branched, inserted before middle, usually not reaching the tip. Head hairs: 4-C: rather long, 3-4 - branched; 5-C: single; 6-C: single; 8 to 9-C: double; 10-C: triple. Prothoracic hairs: 1-P: double; 2-P and 3-P: single, all three are stout and equally long; 4-P: very small, single; 5-P and 6-P: single; 7-P triple (fig. 12). Abdominal hairs 6: single. Comb scales: with about 12-14 scales, long, with only very minute sidespines and a dominating, long midspine (fig. 13). Siphon: siphonal index 2.6-2.8, uniformly tapered from base; Pecten: closed, about 19-23 teeth, shape of the distal ones cf. fig. 14; 1-S: inserted at middle of the siphon, 4-6 - branched; 2-S: single, equally long to 8-S, which

is shafted triple. Anal segment: nearly completely ringed by saddle; 1-X: stout, equally long or longer as saddle; 2-X: 6-8 - branched; 3-X very long, rather straight; 4-X: two to three precratal tufts shorter than the two following inserted ones (fig. 15). Gills: 1 1/4 to 1 1/2 longer than saddle. The saddle integument pattern entirely in accordance with Frohne (1955b).

Thus from the description of Knight (1951) the present material deviates by the invariably single 5-C and the single abdominal hairs 6. From the description of Carpenter and LaCasse (1955) by the siphonal index, which is recorded as about 3 in the American material.

The pupa of *punctodes* has been described by Darsie (1957). A comparison with pupal skins from loc. 142 gave the following discrepancies in the pupal chaetotaxy: In Messaure material seta 4 - VIII (A of Darsie) not single, but double; I-IV to VIII (C of Darsie) always double; 5-IV to VII (B of Darsie) always single. Other setae as described.

The male of *punctodes* is said to be indistinguishable from those of *abserratus* (Felt and Young), but distinguishable from both *punctor* and *hexodontus* (Knight 1951). As *abserratus* is not present in Europe and no figure of *punctodes* exists, the hypopygium is given in fig. 16.

The basal lobe of *punctodes* was studied (4 larval skin associated males) and a characteristic pattern of the large bristles surrounding the main spine of the basal lobe was found. The main spine (1) is much longer before bend than in both *punctor* and *hexodontus*; bristle (2) as long as the rest, only slightly stouter than the others; bristle (3) shorter than 4-6. The basal lobe broad triangular (fig. 19). When viewed in original three-dimensional shape, the basal lobes of *punctodes* of Messaure specimens are not so profoundly different from *punctor* and *hexodontus* as indicated by Carpenter and LaCasse (1955). Even if the range of variation is not yet known from Fennoscandian material, the separation of the species on base of spines and setae on the basal lobe seems to be possible.

Of *A. (O.) punctor* (Kirby) and *A. (O.) hexodontus* Dyar descriptions of all stages are available (Dyar 1916, 1917, 1921, Knight 1951, Vockeroth 1954a, b, Frohne 1955b, Darsie 1957) and the species is included in the key of Gutzevich et al. (1970). However, older Scandinavian material has to be treated with caution, as no revision has been made.

The males of these species are considered to be indistinguishable (Carpenter and LaCasse 1955). However, some rather subtle differences were found in the basal lobes.

In *punctor* the basal lobe (specimens from L. Lpm. and Scania) gave a more rounded impression than *hexodontus*; the papillae on the inner parts of the lobe not so high as in *hexodontus*; spine (1) very stout, usually bent at half the length of the other bristles; bristle (2) medium stout; bristle (3) shortest; bristle (4) and (5) nearly equally long, somewhat shorter than 6. The examination of bristles is difficult, because exactly the same position of preparations can seldom be achieved (figs. 17,18).

In *hexodontus* (spec. from L. Lpm.) the basal lobe has a more conspicuous triangular shape and usually high conical papillae, especially towards the proximal part of the lobe; spine (1) very stout to a little more slender, a bit longer before bend than *punctor*; bristle (2) slightly stouter than in *punctor* - at least in Messaure material - and longer than bristle 3; 4 and 5 equally long, very often slightly shorter than 6 (fig. 20).

The results from the few hatched specimens were supplemented by attempts to separate a mixed lot of males of *punctor* and *hexodontus* from the same pool (Dahl 1974) and a comparison with hatched material from Scania. It was found that of 105 Lapland males 85% could be assigned to one of the two types, whereas the rest was intermediate. On the other hand, Scania *punctor* males more closely resembled the *hexodontus* type of Lapland with a stronger spine (2) and a more pronounced triangular basal lobe. *Hexodontus* has never been found in Scanian material.

The microsetae on the inner side of the "gonocoxite" (Knight and Laffoon 1971) near the distal protrusion of the basal lobe were found to have a somewhat different arrangement between the three species. *Hexodontus* has a more closed, hexagonal microsetae pattern, whereas *punctor* microsetae are arranged in more open rows. *Punctodes* exhibits an intermediate pattern (figs. 17-20).

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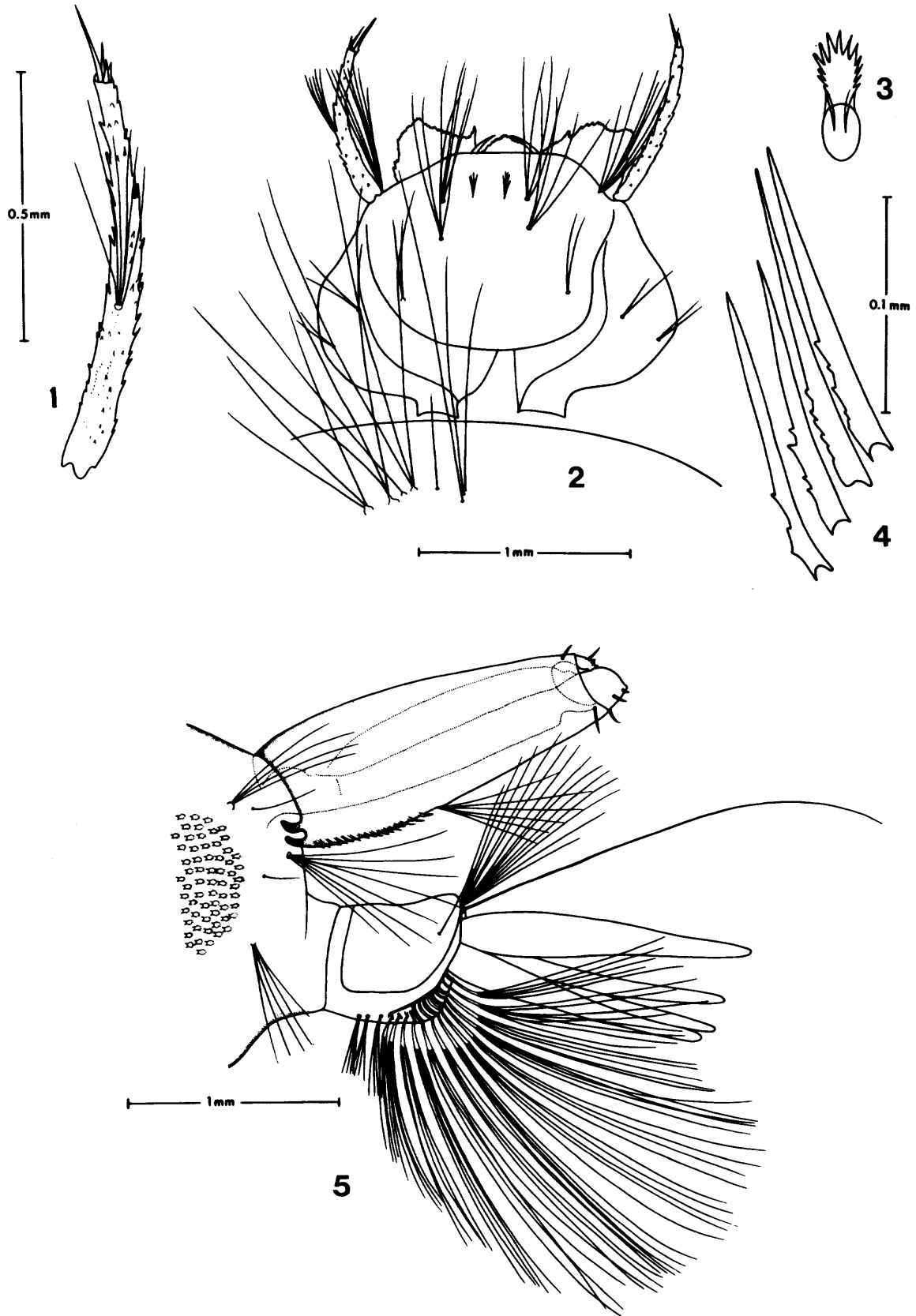
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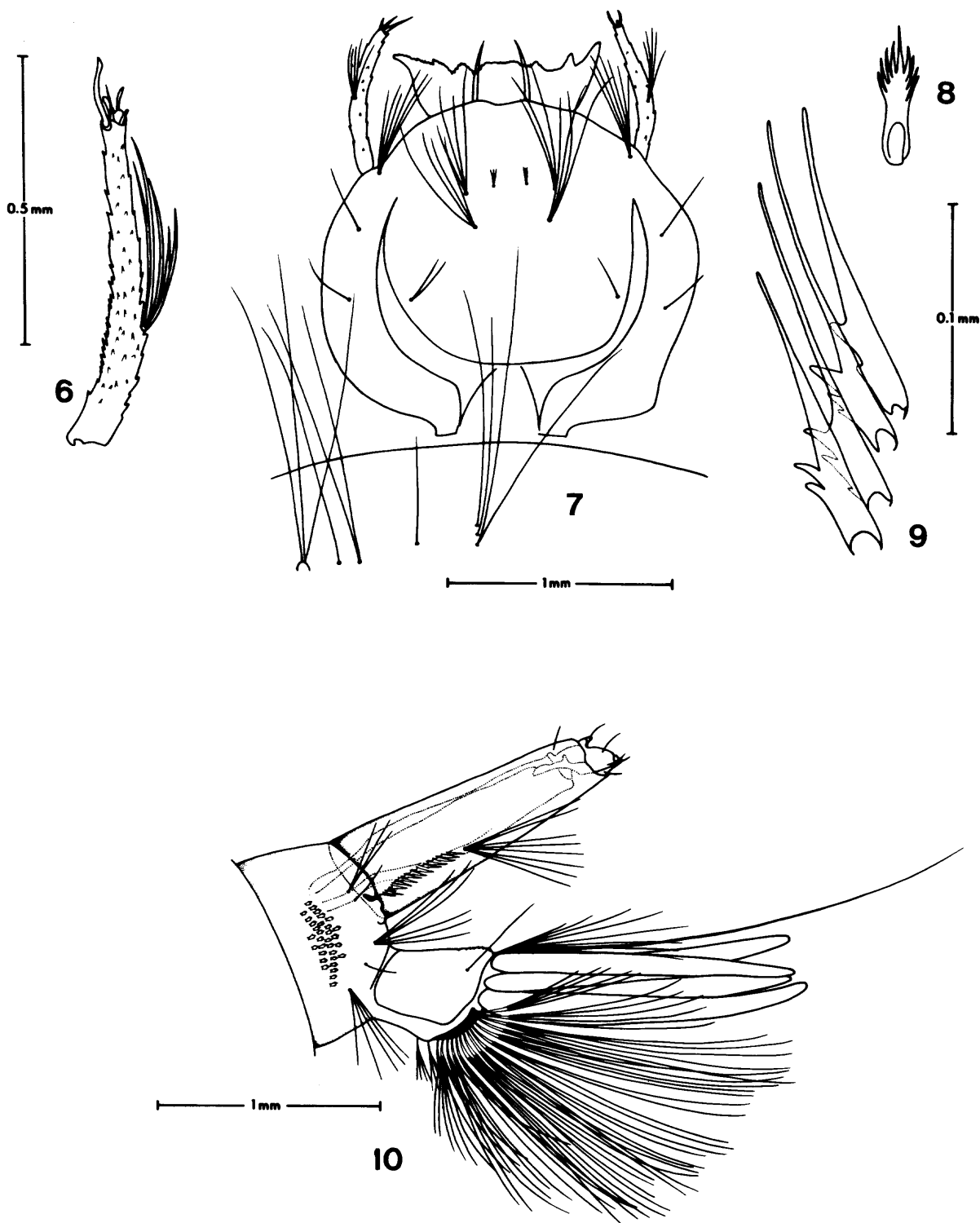
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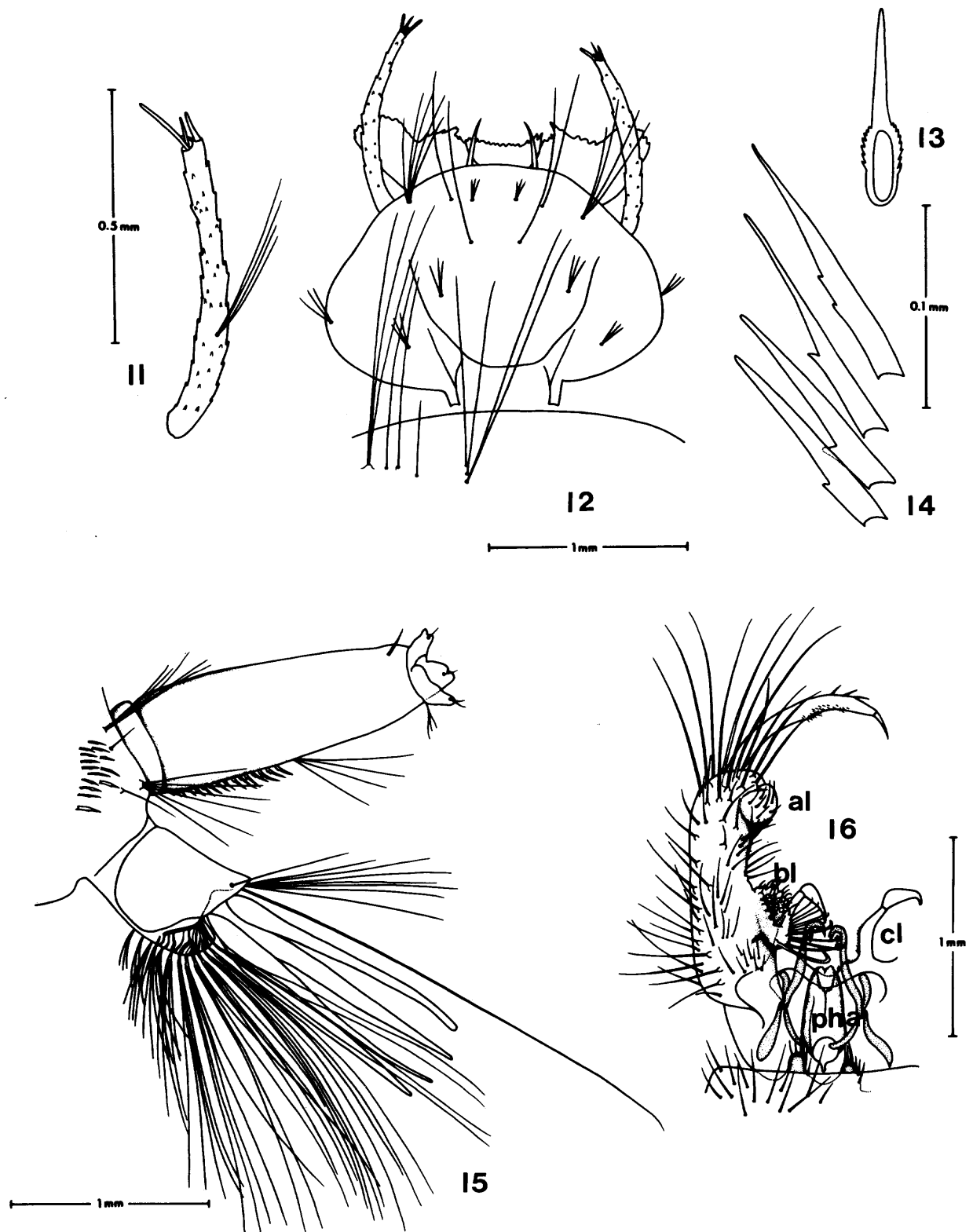
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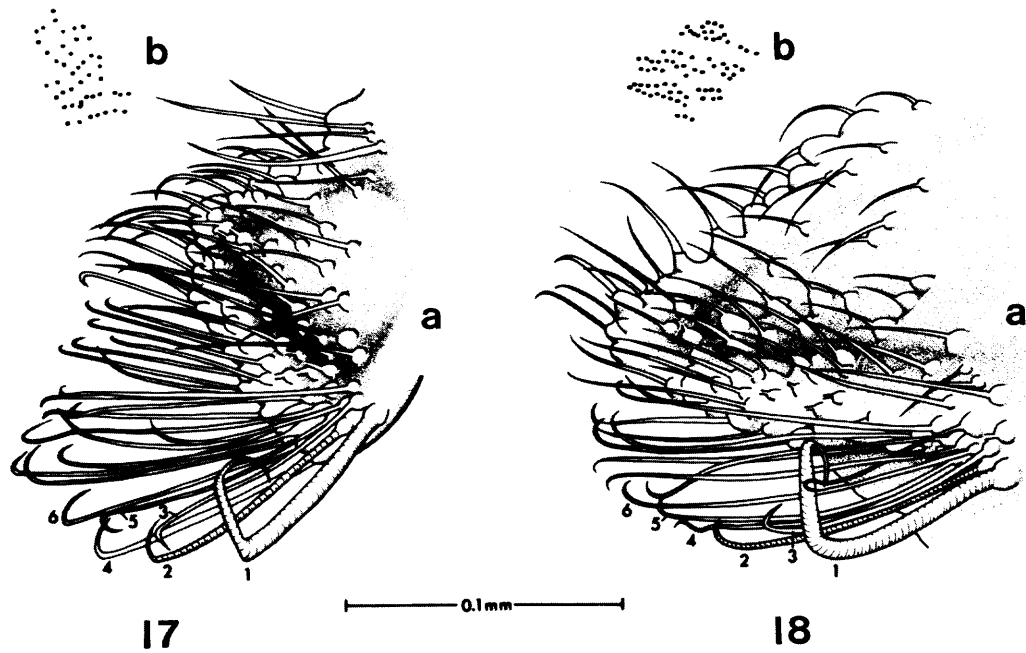
Figs. 1-5. *A. (O.) pionips* Dyar, Lule Lapmark, Sweden 1. Antenna. 2. Head capsule with prothoracic hairs. 3. Comb scale. 4. Pecten teeth. 5. Abdominal segment and siphon.



Figs. 6-10. *A. (O.) pullatus* (Coq.), Kem. L., Finland 6. Antenna. 7. Head capsule. 8. Comb scale. 9. Pecten teeth. 10. Abdominal segment and siphon.



Figs. 11-16. *A. (O.) punctodes* Dyar, Lule Lapmark, Sweden 11. Antenna. 12. Head capsule. 13. Comb scale. 14. Pecten teeth. 15. Abdominal segment and siphon. 16. Hypopygium, al - apical lobe, bl - basal lobe, pha - phallosome, cl - claspette.



Figs. 17-18. A. (*O.*) *punctor* (Kirby). Basal lobes (a) from Scania (17) and L. Lpm. (18) in a somewhat different view. b - microsetae on inner side of gonocoxite.

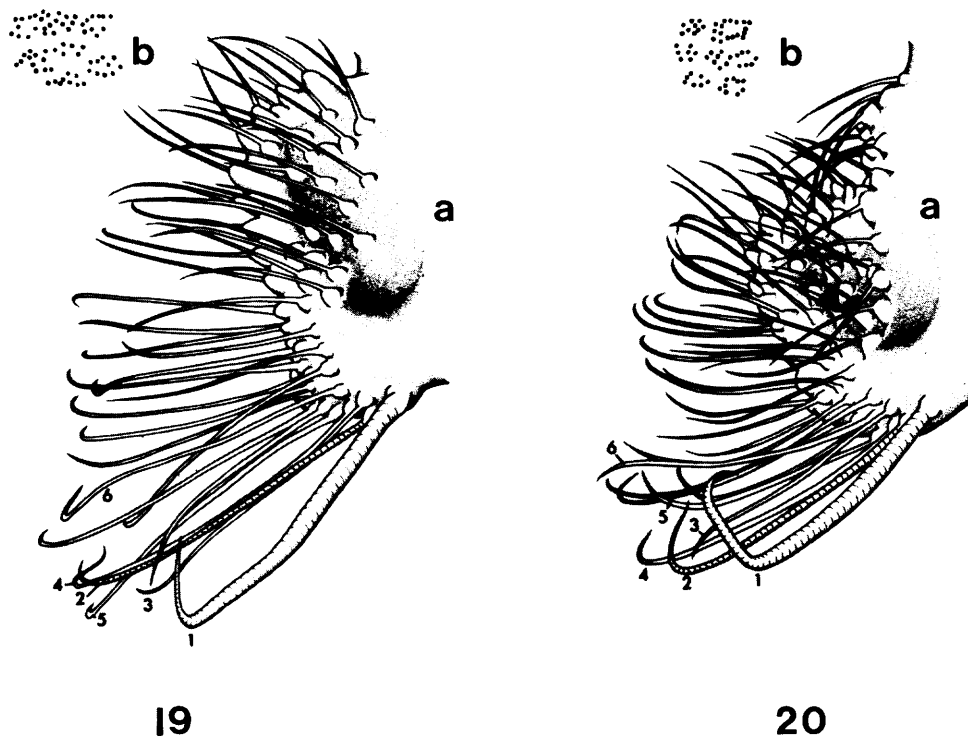


Fig. 19. A. (*O.*) *punctodes* Dyar, a - basal lobe, b - microsetae.

Fig. 20. A. (*O.*) *hexodontus* Dyar, a - basal lobe, b - microsetae.