

**Revision of the Finnish species of the genus *Caenis* Steph.
(Ephemeroptera).**

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I n t r o d u c t i o n .

Since the survey of the distribution of mayflies in Finland by TIENSUU (1939), very little has been published about them in this country (HIRVENOJA 1964, BAGGE 1965). However, interest in this group has been continuous and many excellent taxonomic and ecological papers have been published in other European countries, especially in England.

In the first account of our Ephemeropteran fauna, ARO (1928) mentioned only one species of the genus *Caenis*, viz. *C. dimidiata* STEPH. TIENSUU (1939) mentioned three others, viz. *C. horaria fennica* ARO, *C. undosa* TIENS., and *C. nivea* BENGTS. The last of these has not been recorded within the present area of Finland.

In the following taxonomic survey, all the species found in Finland are thoroughly discussed. Male genitalia and nymphs are figured for all of the species treated, as there are several errors and inaccuracies in the previously published figures due to poor optical conditions and misleading drawing techniques. All my figures have been made with the aid of Wild M5-Zeichentubus attached to a Wild M5 stereomicroscope. In this way an exact figure of the contours of the object is obtained. It is then magnified with an optic pantograph and the more detailed finishing and shadowing made with the aid of the more powerful Leitz stereomicroscope. During the course of drawing much care has been taken to ensure that the main axis of the object lies at right angles to the optical axis of the microscope. Thus all corresponding figures are comparable with each other. All the figures of the same character have been drawn to the same scale.

In my opinion, figures drawn from mounted slides alone, without thorough comparison under the high power stereomicroscope with an intact object, will always be misleading because of the flattening and distortion of the mounted object. Some difficulties will also arise in getting the object mounted at right angles for comparison with the corresponding figure, while a non-mounted one is fairly easy to handle in a preparation dish under a stereomicroscope.

For the terminology used for the different parts of the external genitalia, see BRINCK (1957).

Material used.

The initial basis for this revision has been my own collection created mainly during the last two years. Further I have checked all *Caenis* material in the collection of the Entomological Museum of Turku and Helsinki. For comparison I have had at my disposal all *Caenis* material collected by BENGTTSSON in Sweden as well as English material including all *Caenis* species known from England.

Synopsis of species.

Caenis horaria (LINNÉ) 1758.

Ephemera horaria LINNÉ 1758. Syst. Nat. 10. ed. 1, p. 547.

Caenis dimidiata STEPHENS 1835. Ill. Brit. Ent. 6, p. 61.

—, EATON 1884. Revis. Monogr., p. 142 – 143, Plate 15, Fig. 26b.

—, PETERSEN 1910. Danmarks Fauna 8, p. 89, Figs. 79b and 80c.

C. horaria, BENGTTSSON 1917. Ent. Tidskr. 38: 2, p. 181 (description of nymph).

C. dimidiata var. *fennica* ARO 1928. Otavan Hyönteiskirj. 3, p. 38 – 39, Figs. 28 – 29.

C. horaria, SCHOENEMUND 1930. Die Tierwelt Deutschlands 19, p. 61, Fig. 110 (imago) and p. 101, Fig. 183a (nymph).

C. horaria fennica, TIENSUU 1939. Ann. Ent. Fenn. 5: 2, p. 122, Fig. 15. n. syn.

C. horaria, KIMMINS 1954. Freshw. Biol. Ass. Sc. Publ. 15, p. 39, Fig. 12 H. — Key to imagos.

—, MACAN 1955. Ent. Gaz. 6, p. 129 and 131, Figs. 1 – 2. — Key to nymphs.

The concept of geographic race or subspecies and that of the less significant nongeographic variation have repeatedly been confused in the entomological literature until quite recently. Thus the Finnish population of *C. horaria* has been named var. *fennica* by ARO (1928) and later by TIENSUU (1935), but also *C. horaria fennica* ARO by TIENSUU (1939). In the latter paper, however, the variation status has also been used alternatively. ARO (op. c.) described this taxon, stating that the black spots on the tip of the hind femora are lacking in Finnish specimens, although they are generally regarded as characteristic of this species. TIENSUU (1939) gave the figure of the male genitalia of this form

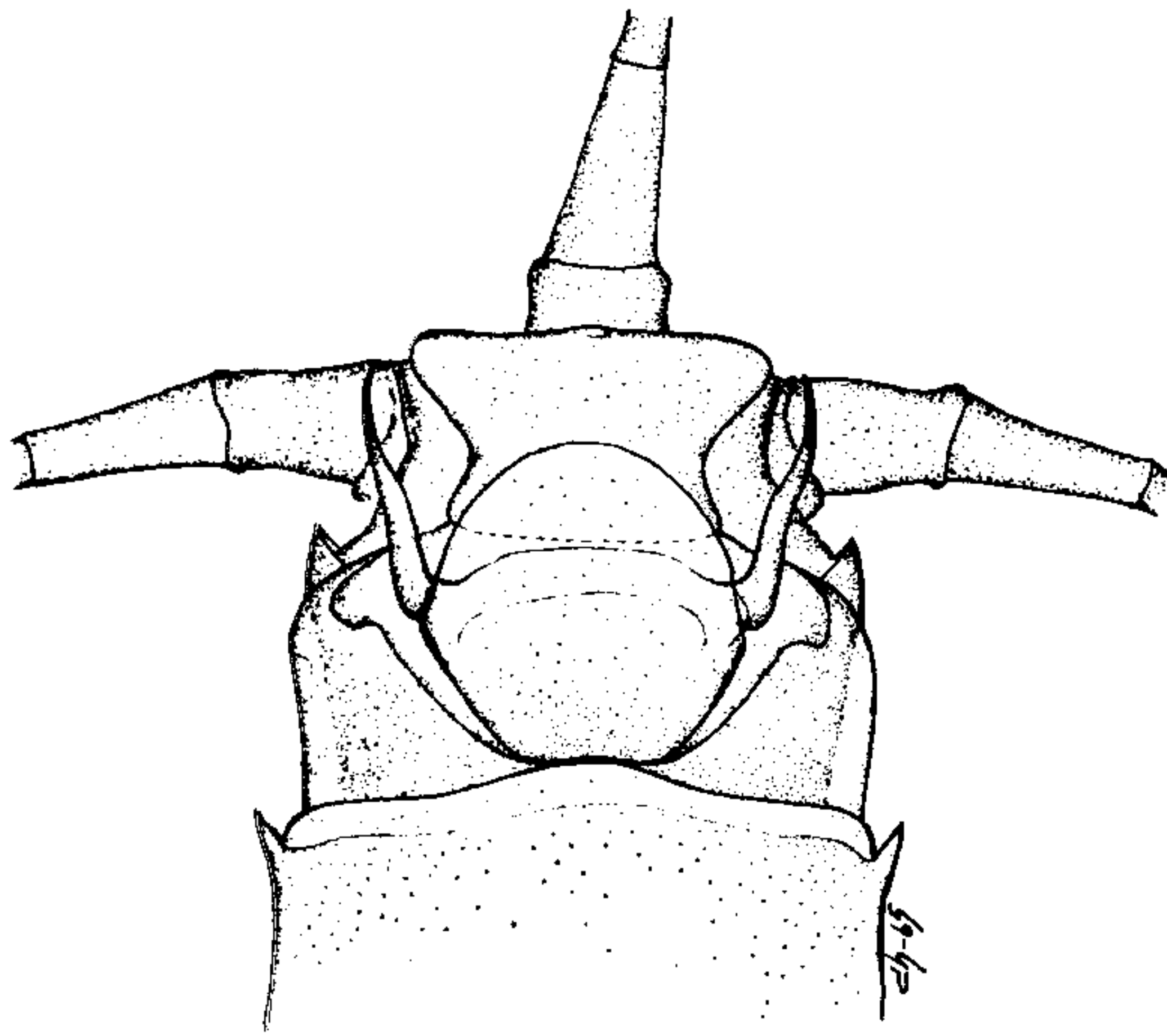


Fig. 1. *C. horaria* (L.). Male genitalia. A specimen captured with a mercury lamp in Kakkerta near Turku, August 3, 1965; length of body 3.9 mm. — Orig.

in order to show that they differ from those of the nominate race. His figure is quite a good one but that with which he compares it (SCHOENEMUND 1930: Fig. 110) is misleading. I have seen specimens of *C. horaria* from England (identified by Dr. MACAN) as well as from Sweden (material of BENGSSON) but have not been able to detect any differences in this respect. I also checked numerous specimens from different parts of Finland in regard to the femoral black spots. It then became evident that the spots are present almost without exception. For example, in 1964 I caught 72 males and 12 females with a mercury lamp in Vammala on the river Kokemäki and only in four males were the black spots mentioned above lacking. Thus the creation of a geographic race for the Finnish population of *C. horaria* is not justified on the grounds proposed by ARO (1928) and TIENSUU (1939), at least.

In the following, information about the colouration and some morphological features of the species in Finnish populations are discussed.

Imago male (in liquid; fresh).

Length: body 2.5–4.1 mm, wing 2.6–4.0 mm, tail 10.0–14.0 mm, (material ca. one hundred specimens).

Head and pronotum blackish, mesonotum brownish; intensity of colouration varies moderately within a single population. Sides of pronotum light. Ground colour of abdomen white with grey markings; intensity and size of markings vary greatly inside the population. In the extreme case tergites 1–6 are totally grey as well as half of the 7th, and further there are also faint grey dots on both sides of sternites 1–6. On the other hand, in the same population very pale specimens may be found, having only very faint grey dots on both sides of tergites 1–6, the sternites being totally white. Two last femora with a black spot on the upper edge. The colouration, especially the intensity, of these spots varies within the population; they range from black to faint grey but are absent only in very few cases.

Male genitalia weakly chitinized, pale almost throughout, so that only the gonopods are faintly brownish. Therefore their shape is difficult to discern, although they are very characteristic (Fig. 1). First two joints of antennae brownish, flagellum white. Tail white.

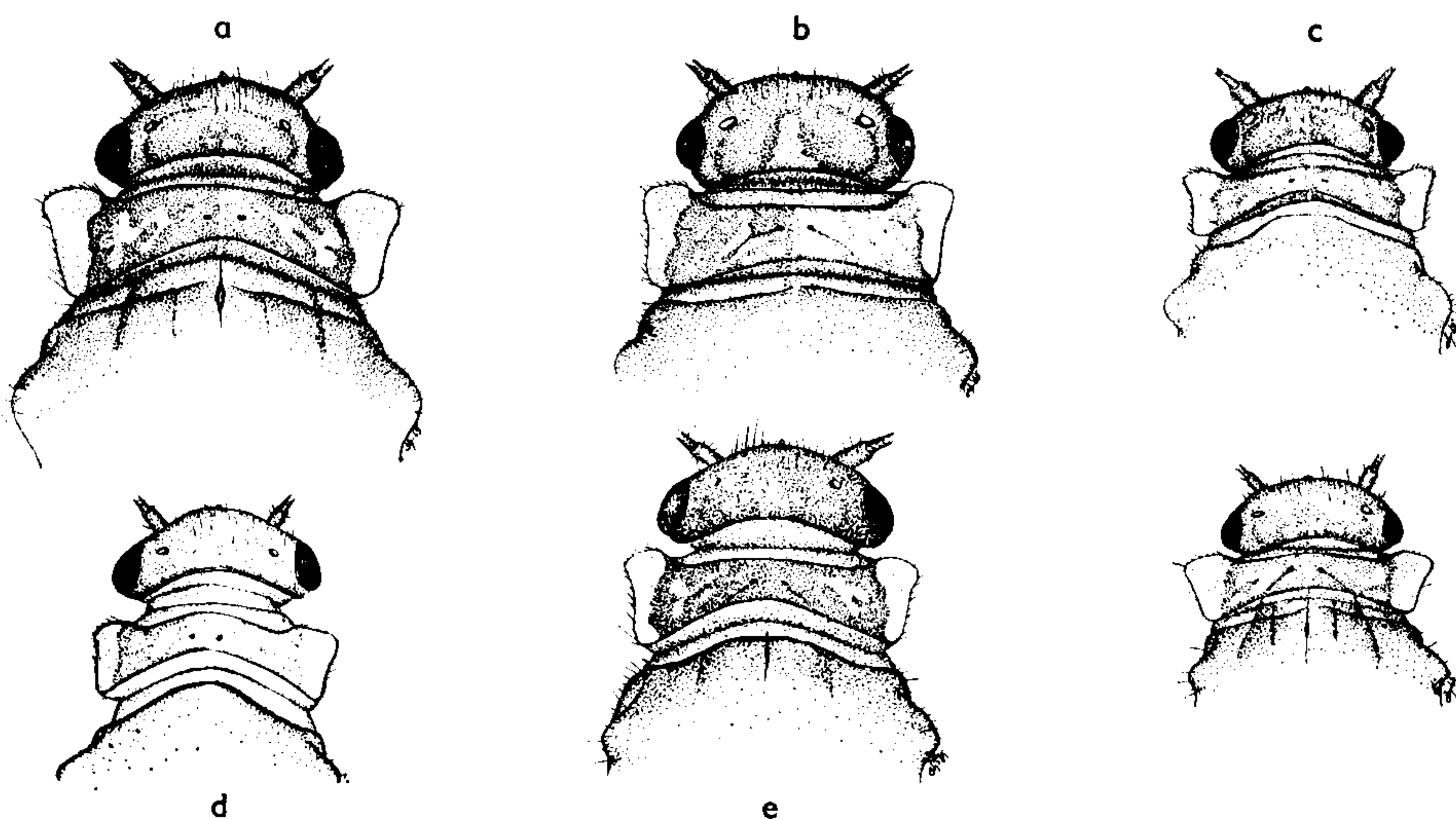


Fig. 2. *C. hovaria* (L.). Pronotum of nymph. — a. Ultimate stage of ♀, Lake Gyltöträsk, Korppoo, June 14, 1965; length of body 6.6 mm. — b. Ultimate stage of ♀, Lake Käringsviken, Nauvo, June 14, 1965; length of body 5.6 mm. — c. Penultimate stage of ♂, Lake Krokträsk, Nauvo, June 13, 1965; length of body 4.1 mm. — d. Halfgrown stage of ♀, the river Paimionjoki, Paimio, July 5, 1965; length of body 5.0 mm. — e. Ultimate stage of ♀, Lapinlahti, Kuopio, July 17, 1965; length of body 5.6 mm. — f. Ultimate stage of ♂, Lake Haukivesi, Sääminki, July 19, 1965; length of body 4.2 mm. — Orig.

Imago female (in liquid; fresh).

Length: body 3.8–5.9 mm, wing 3.6–4.9 mm, tail 1.9–2.8 mm, (material ca. 25 specimens).

Colouration much as in the male and apparently more stable, but in the abdomen there is some variation. For example, the first two tergites may be white and there is grey only on the next four tergites. The sternites are almost always white. The black femoral spot can also be seen on the upper tip of the first femora.

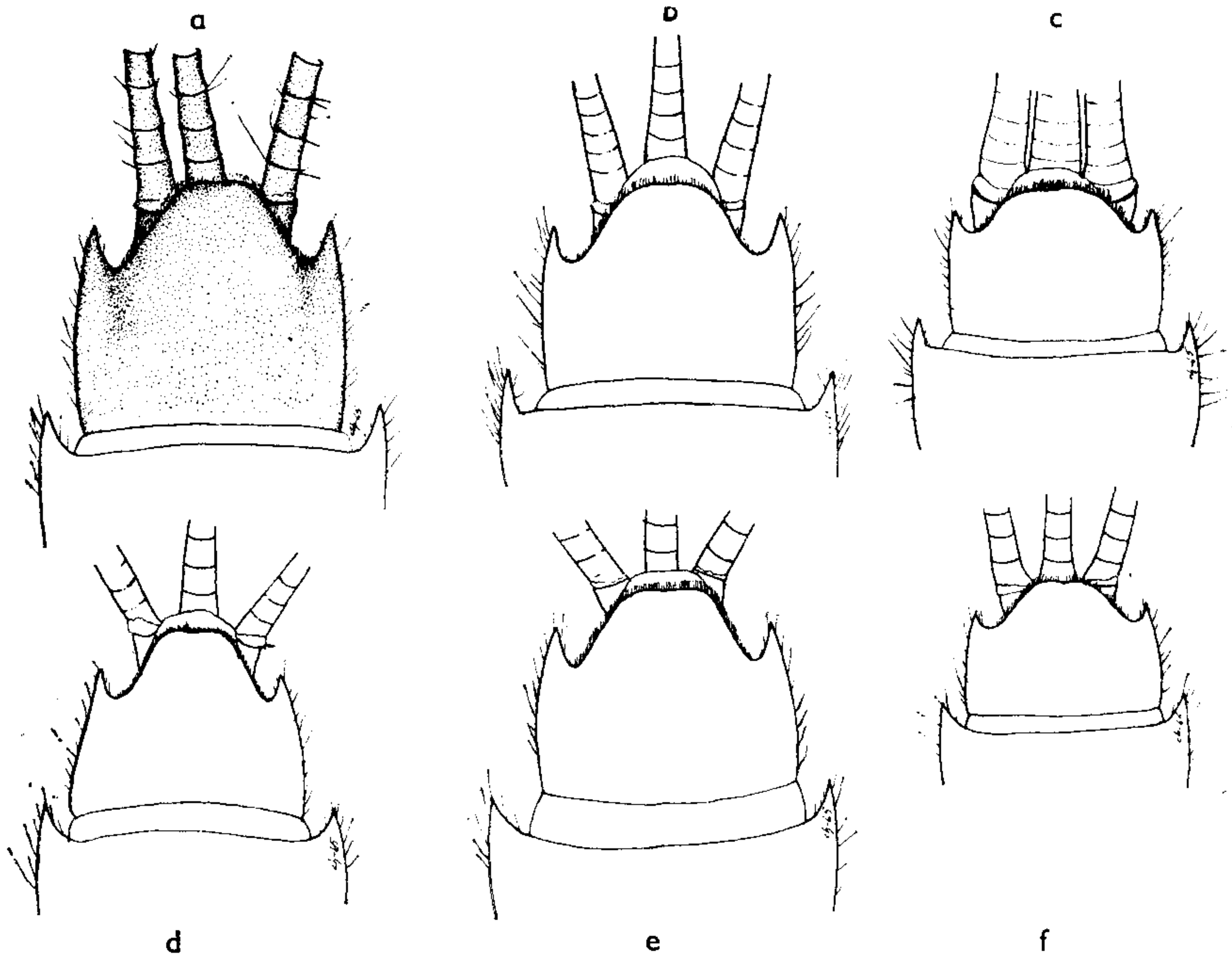


Fig. 3 *C. horaria*. (L.) Last sternite of nymph. For explanation, see Fig. 2. -- Orig.

Nymph (in liquid; fresh).

The colouration varies according to the stage of maturity and the kind of environment. In the mature nymph, however, there is a basic colour pattern which is the same even in the earlier stages, although more obscure. Head brown, pronotum greyish brown with a tiny black spot on both sides of the median line and with irregular paler areas also. Mesonotum greyish brown with irregular paler spots and a black spot on each side of the median line; the last-mentioned can often be seen in imagos also. Gill-covers brownish grey. The last four tergites of the abdomen greyish brown, often gradually darkening towards the end of the abdomen. Usually there are whitish spots on each side of the median line at the distal end of each tergite. A black spot on the upper edge of each femora. There is a black band in the middle of both the tibiae and tarsi. Their width is

variable, sometimes extending the whole length of the corresponding joint. The intensity of their colouration is also variable. Tail white with narrow and slightly darker articulation. First joint of antennae grey.

Shape of pronotum and last abdominal sternite very characteristic. Sides of pronotum start to diverge outwards near middle as the front curves down to meet the diverging sides (Fig. 2 a – f).

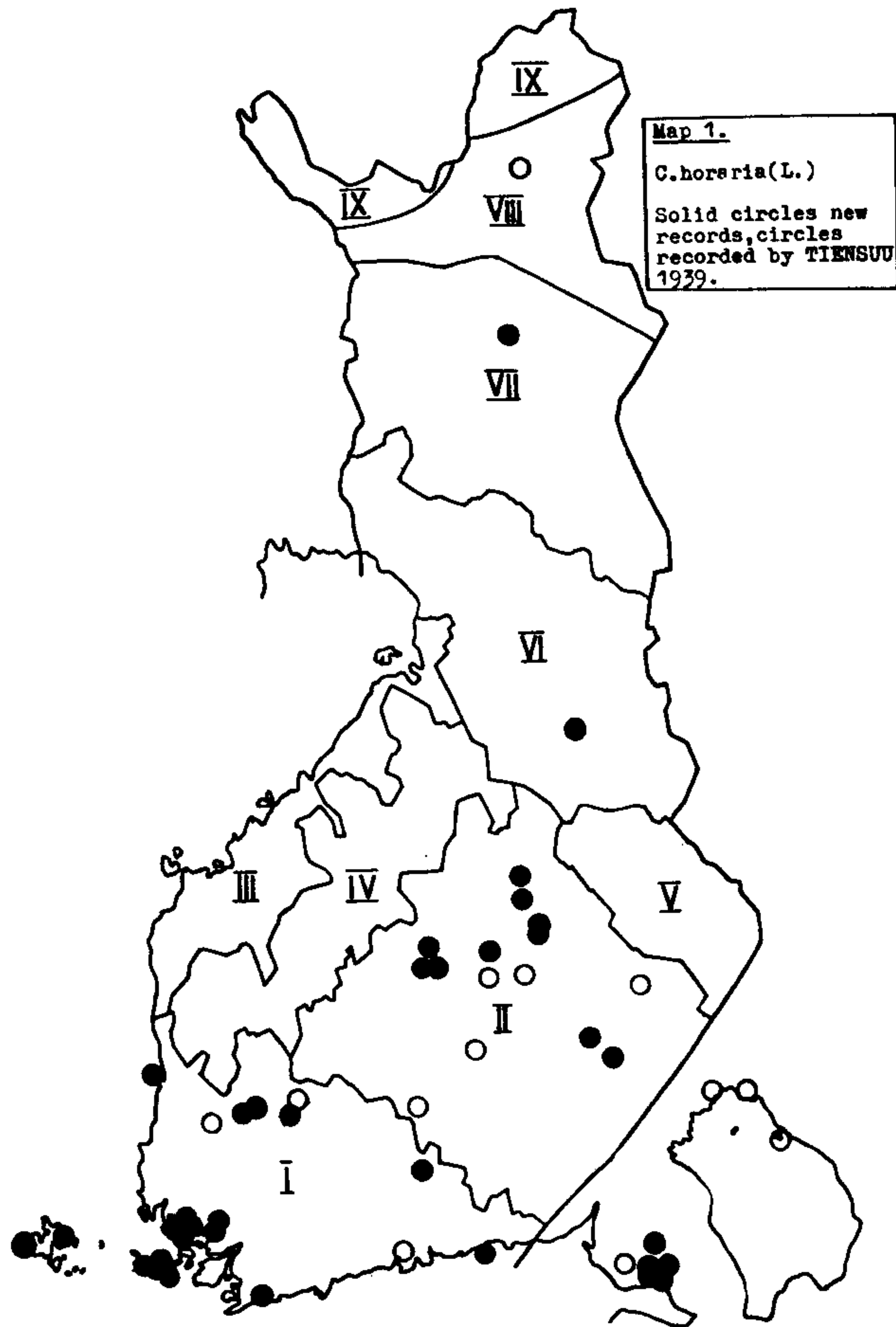
The distal end of the last abdominal sternite broadly truncate and usually with a slight notch in the middle (Fig. 3 a – f).

Numerous hairs covering the nymph all over are characteristic of this species. Thus the nymph is almost totally covered with little particles attached to the hairs.

The species is distributed all over the southern and central parts of Finland and it has also been recorded once from Finnish Lapland (Map 1). Its nymphs are commonly found under stones as well as in mud and among the vegetation in lakes, streams and rivers. The species seems to tolerate quite a high salinity. For example, I found its nymphs in remarkable numbers in the Turku archipelago in Lake Vesterholma, with a salinity of 4.1 ‰ (in the summer of 1965). According to the literature, found all over Europe.

The swarming time is rather long; according to ARO (1928), from late May to September. The species is strongly attracted by light — especially by a mercury lamp — as are all the other *Caenis* species.

New records: — I. Eckerö, Skag, June 25, 1949 (leg. NORDMAN), 2 ♂♂ and ♀ imagos; brook of Björbybäck, Sund, June 11, 1904 (leg. M. WEURLANDER), one nymph; Korppoo, Lake Gyltöträsk, June 14, 1965, nymphs; Nauvo, Lake Käringsviken, June 8, 1964 (leg. P. BAGGE) and June 14, 1965, nymphs; Nauvo, Lake Krokträsk, June 16, 1964 (leg. P. BAGGE), nymphs; Nauvo, Lake Vesterholma, June 13, 1965, nymphs; Turku, Kakskerta, August 3, 1965, numerous imagos with a mercury lamp; Turku, the river Aurajoki Halistenkoski, May 11 and June 5, 1965, nymphs; Raisio, the river Raisionjoki, June 18, 1965, nymphs; Naantali, Kalevanniemi: from brackish water (4.8 ‰), July 13, 1965 (leg. E. LEPPÄKOSKI), one nymph with a bottom sampler from a depth of 120 cm; Paimio, the river Paimionjoki Askala, August 28, 1964, one male; Tarvasjoki, Juva, July 5, 1965 (leg. S. KÄNNÖ), nymphs; Tammisaari, Knipan (leg. unknown), one nymph; Tammisaari (leg. HELLÉN), 6 ♂♂; Kotka; from brackish water (K. KEYNÄS, pers. comm.), nymphs; Reposaaari, July 19, 1953 (leg. V. LAURO), 2 ♀♀; Vammala, the river Kokemäki, July 27, 1964, numerous imagos with a mercury lamp, and June 29, 1965, several imagos from spiders' webs; Karkku, Heinoo, June 25, 1906 (leg. J. E. ARO), one male; Pirkkala, Lake Pyhäjärvi, June 25, 1965, nymphs; Nastola, Salojoki, July 27, 1965 (leg. R. TERIAHO), some ♂♂ and ♀♀ imagos. — II. Äänekoski, Häränkulku, Lake Keitele, July 1, 1964 (leg. A. PIETILÄINEN & E. LEPPÄKOSKI), a nymph; Konginkangas, Listo, Lake Keitele, June 28 – 29, 1964 (leg. A. PIETILÄINEN & E. LEPPÄKOSKI), nymphs from a depth of 120 – 160 cm; Konginkangas, Lake Jouhtjärvi, June 19 – 21, 1894 (leg. A. LUTHER), a nymph; Suolahti, Sumiainen, June 21, 1897 (leg. A. LUTHER), a nymph; Kuopio, Röynänlahti, July 7, 1964 (leg. A. PIETILÄINEN), nymphs; Kuopio, Sorsasalo, July 28, 1902 (leg. J. E. ARO), one ♂ subimago; Maaninka, Lake Onkivesi, July 16, 1964 (leg. A. PIETILÄINEN), nymphs from a depth of 150 cm; Lapinlahti, Lake Onkivesi,



Map 1. Hitherto known records of *Caenis horaria* (L.) in Finland.

July 17, 1964 (leg. A. PIETILÄINEN), nymphs; Suonenjoki, Lake Iisvesi, June 30, 1930 (leg. unknown), one male; Sääminki, Mertajärvi Pääskylähti, June 9, 1898 (leg. J. L. LYDECKEN), a nymph; Sääminki, Oravi, Lake Haukivesi, July 18 – 20, imagos as well as nymphs. — VI. Ristijärvi, July 23, 1935 (leg. unknown), several ♂♂ & ♀♀ imagos as well as subimagos. — VII. Sodankylä, Lake Sompiojärvi, summer 1959 and 1960 (leg. M. HIRVENOJA), numerous stages of metamorphosis. — Unpublished records from Southern Karelia (now a part of USSR): Terijoki (leg. HELLÉN), one ♂ imago and subimago; Uusikirkko, the river Vammeljoki, Lake Kanneljärvi, and Lake Kuujärvi, April 22 – August 10, 1898 (leg. A. J. SILFVENIUS), five samples with different stages of metamorphosis; Kivennapa, Lake Kouhijärvi, June 7, 1898 (leg. J. A. SILFVENIUS), two nymphs; Muolaa, Lake Punnusjärvi, August 1, 1898 (leg. J. A. SILFVENIUS), two nymphs and one cast skin; Sortavala, June 30 – August 27, 1898 (leg. A. J. SILFVENIUS), four samples from different places with imagos and subimagos.

C. rivulorum EATON 1884.

C. dimidiata var. *rivulorum* EATON 1884. Revis. Monogr., p. 143 – 144.

C. rivulorum, EATON 1888. Revis. Monogr., p. 340 (correction: for var. *rivulorum* read *Caenis rivulorum* sp. nov.).

C. dimidiata var. *rivulorum*, PETERSEN 1910. Danmarks Fauna 8, p. 90.

C. nivea BENGTTSSON 1917. Ent. Tidskr. 38: 2, p. 181 – 182. n.syn.

— TIENSUU 1939. Ann. Ent. Fenn. 5: 2, p. 123 – 124, Figs. 17 and 18.

C. rivulorum, KIMMINS 1954. Freshw. Biol. Ass. Sc. Publ. 15, p. 39. Fig. 12R. — Key to imagos.

C. rivulorum, MACAN 1955. Ent. Gaz. 6, p. 138 – 140, Figs. 5 and 7. — Key to nymphs.

When BENGTTSSON (1917) described *C. nivea*, he was well aware of the existence of *C. rivulorum*. However, EATON (1884) had not given any figures of the male genitalia and BENGTTSSON was not able to identify his specimens with *C. rivulorum*, for their colouration did not perfectly agree with the original description of EATON. I have checked the paratype material of BENGTTSSON (9 specimens) together with over a hundred other Swedish specimens of *C. nivea* from BENGTTSSON's collection. The paratypes are from Undersåker, Jämtland, captured by O. RINGDAHL in August 1916. The material has been compared by me with the British material of *C. rivulorum* identified by Dr. MACAN. As a result of this study, there is no doubt that *C. nivea* is a synonym of *C. rivulorum*.

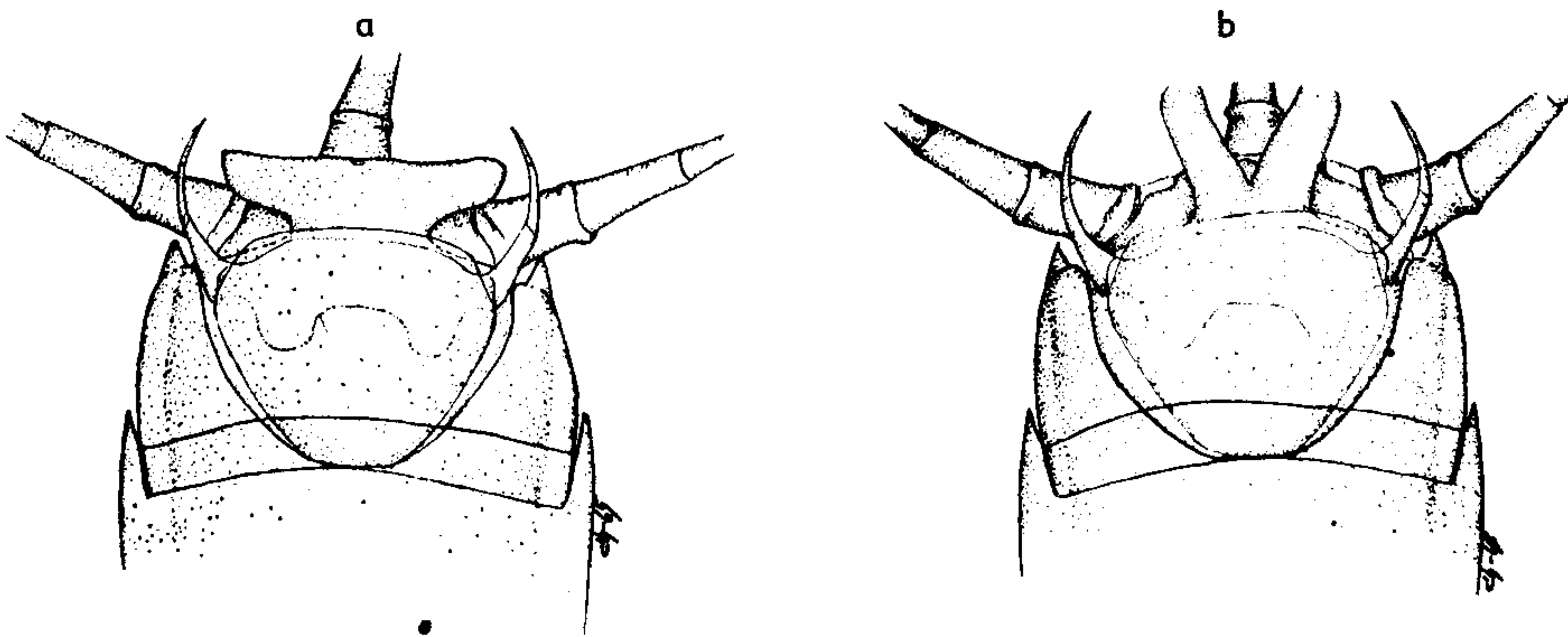


Fig. 4. *C. rivulorum* EATON. Genitalia of two paratype ♂♂ of *C. nivea* BENGTS. captured in Undersåker, Jämtland, in August, 1916, by O. RINGDAHL. — a. A specimen showing the normal shape of the penis; length of body 2.3 mm. — b. Another specimen with a V-shaped penis (see Fig. 12 R by KIMMINS 1954), probably caused by the influence of the preserving fluid; length of body 2.5 mm. — Orig.

I have not obtained material for descriptions of the colouration of Finnish populations. Therefore, I give information only concerning the characteristic morphological features.

Imago male.

Our smallest species; length of body and of wing about 2.0 – 2.5 mm.

BENGTSSON (1917) stated that there are no pleural processes on the abdomen but, according to my studies, they are present although very weak and short.

Male genitalia weakly chitinized, throughout pale. Thus their shape is difficult to see, as in *C. horaria*. Among the specimens having the normal type of penis there are some with a V-shaped one in the collection of Bengtsson (Figs. 4a and b).

Nymph.

Sides of pronotum rounded. Front corner slightly bulging forward. The few hairs on the pronotum are concentrated on the tip of the bulge mentioned above



Fig. 5. *C. rivulorum* EATON. Pronotum of nymph. — a & b. Ultimate stages of ♂♂, Lake Keitele, Konginkangas, June 25, 1964; length of body 2.9 and 3.0 mm, respectively. — Orig.

(Fig. 5a – b). Last abdominal sternite broadly truncate, straight (Fig. 6 a – b). There are a few hairs on the nymph, which thus looks very clean (no particles cover the body).

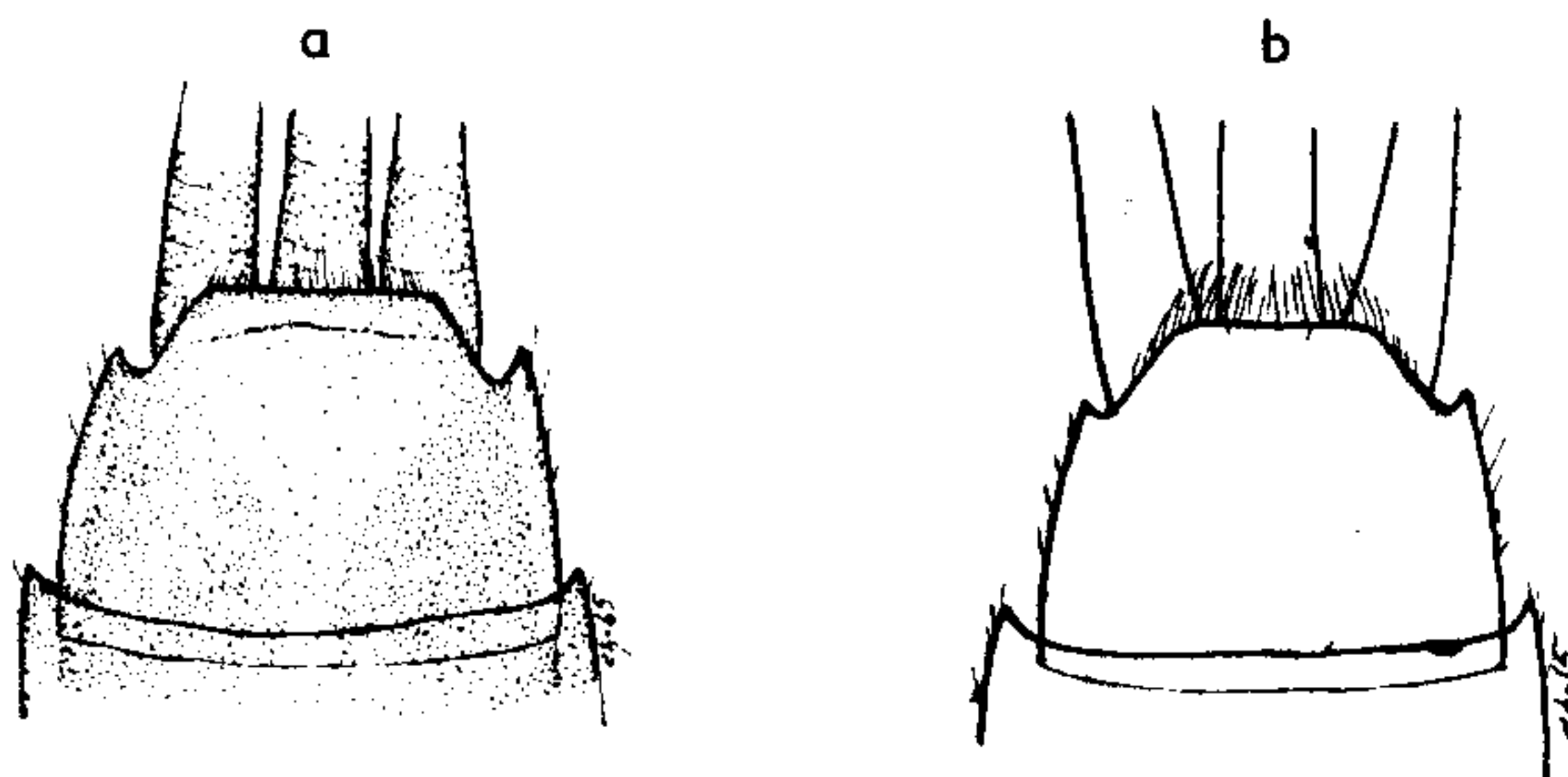
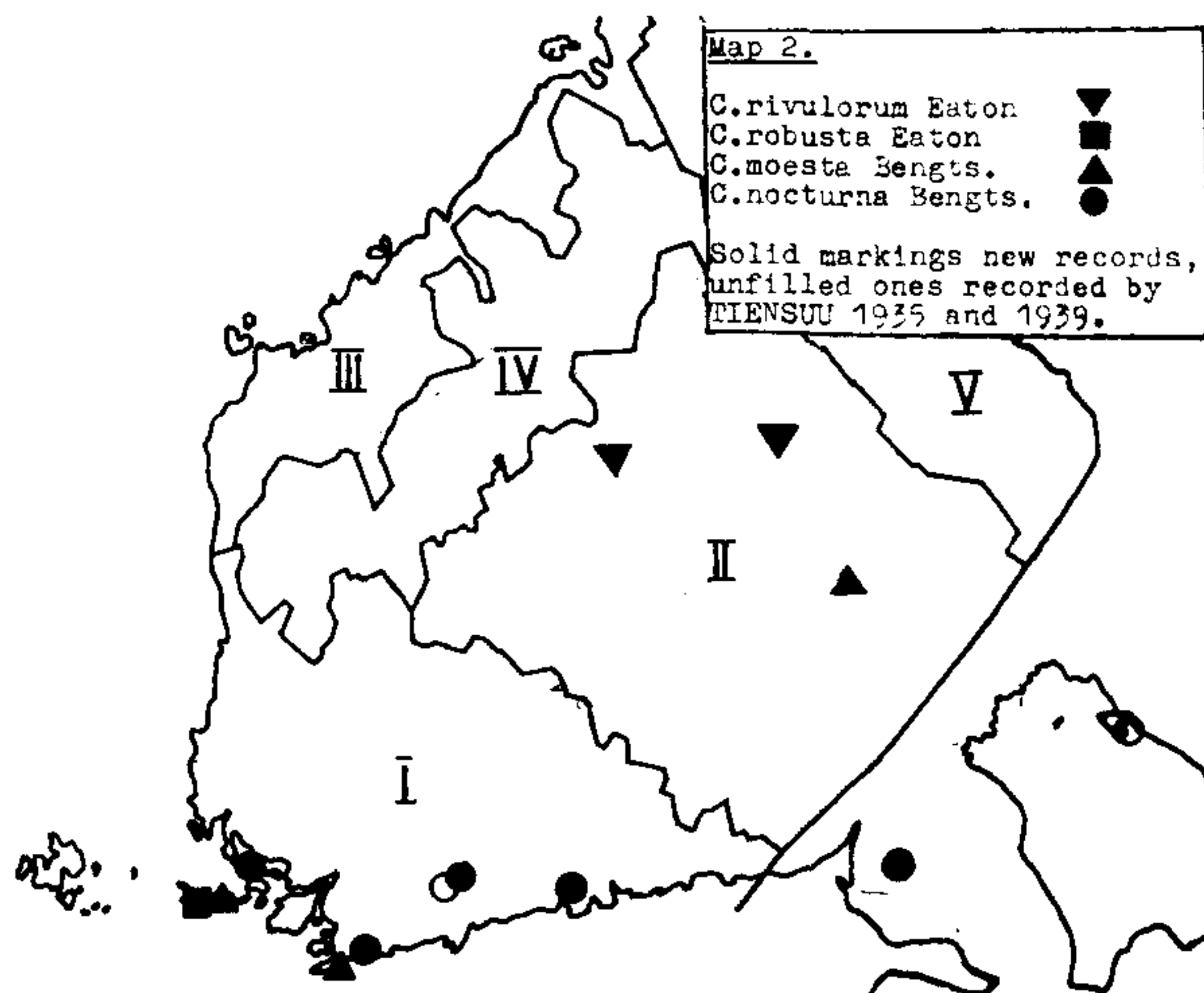


Fig. 6. *C. rivulorum* EATON, Last sternite of nymph. For explanation, see Fig. 5. — Orig.

The species is new to the Finnish fauna. I found three nymphs among the bottom fauna material collected by Mr. A. PIETILÄINEN and Mr. E. LEPPÄKOSKI in Listo, Lake Keitele, Konginkangas, on June 25, 1964. The nymphs were caught with a bottom sampler from a depth of 10 – 40 cm on a stony bottom.



Map 2. Hitherto known records of *Caenis* species (excluding *C. horaria*) in Finland.

Further I have found several ♂♂ subimagos (dried) in the collection of the Entomological Museum of Helsinki collected by A. VESTERLUND in Kuopio.

The species has also been recorded in England (terra typica), Sweden (BENGTS-SON 1917: *C. nivea*), Denmark (PETERSEN 1910: *C. dimidiata* var. *rivulorum*), France (DEGRANGE 1957), and USSR (TIENSUU 1939: *C. nivea*; surroundings of Lake Ladoga).

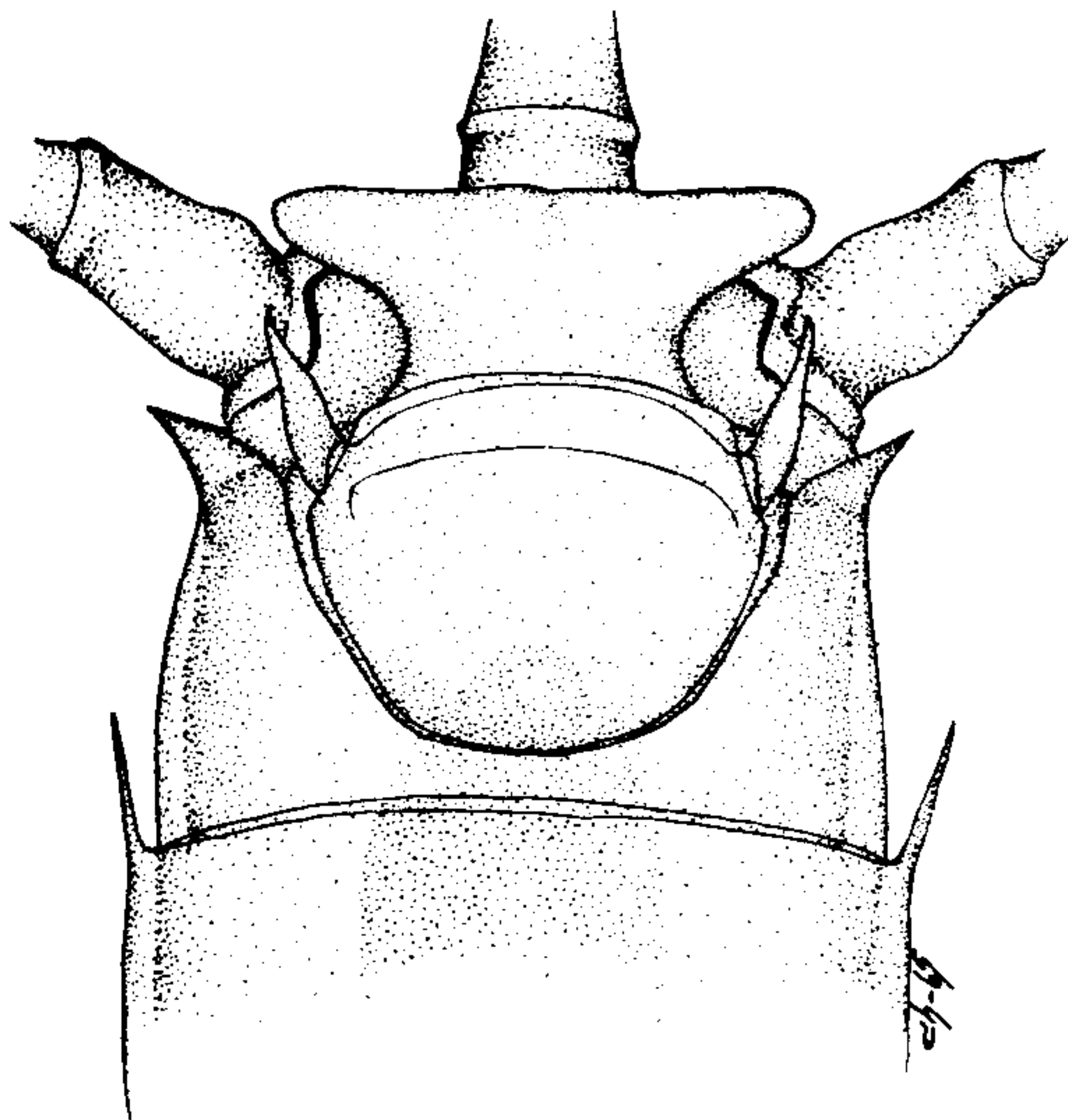


Fig. 7. *C. robusta* EATON, Genitalia of paratype ♂ of *C. incus* BENGTS. captured at Oppmannasjö, Skåne, on June 28, 1906, by BENGTS-SON; length of body 4.7 mm. — Orig.

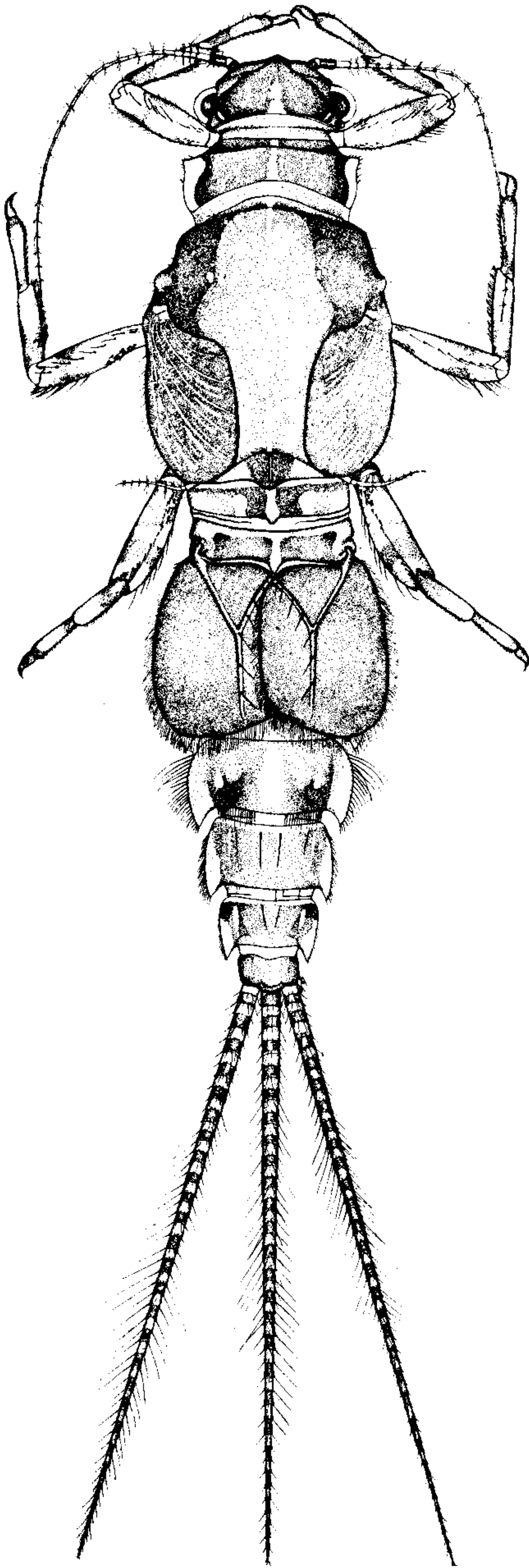
C. robusta EATON 1884.

Fig. 8. *C. robusta* EATON, A nymph from Lake Gyltöträsk, Korppoo, on June 14, 1965; length of body 6.5 mm. — Orig.

C. robusta EATON 1884. Revis. Monogr., P. 145 – 146.

C. incus BENGTTSSON 1912. Ent. Tidskr. 33: 1 – 2, p. 107 – 108.

C. incus BENGTTSSON 1917. Ibid. 38: 2, p. 181 (description of nymph).

C. robusta, KIMMINS 1954. Freshw. Biol. Ass. Sc. Publ. 15, p. 39, Fig. 12 R. — Key to imagos.

C. robusta MACAN 1955. Ent. Gaz. 6, p. 131 and 133, Figs. 2 and 3. — Key to nymphs.

I have had the paratype material of *C. incus* at my disposal. It consists of 49 ♂♂ and 21 ♀♀ and was collected by BENGTTSSON on 23. VI. 1906 in Arkelstorp Lake Oppmannasjö, Skåne. There are also nymphal cast skins in BENGTTSSON's collection. For comparison I have received some British specimens of *C. robusta* identified by Dr. MACAN. Besides, I have collected numerous nymphs from Lake Gyltöträsk, Korppoo, and reared them in an aquarium. Thus I was convinced that *C. incus* was synonymous with *C. robusta*. Later I became aware that DEGRANGE had independently come to the same conclusion already in 1957, so that I agree with him completely.

Imago male.

Our largest species; length of body and of wing about 4 – 5 mm.

Male genitalia weakly chitinized, their shape often difficult to see (Fig. 7).

Nymph (in liquid; fresh).

Basic colour pattern very characteristic. Head brownish; pronotum, mesonotum, and gill-covers brownish grey. Sides of pronotum light. Light central line on head, pronotum, and mesonotum; it may sometimes be shorter at its caudal end. Light dots

on mesonotum. Three of them on curved line in front of mesonotum on both sides of median line and further one light dot laterally of the three first dots and one caudally of them. Legs white with grey band at distal end of femur, a similar one at proximal end of tibia as well as at both proximal and distal ends of tarsi. First two joints of antennae grey, flagellum white. Tail with darker articulation (Fig. 8).

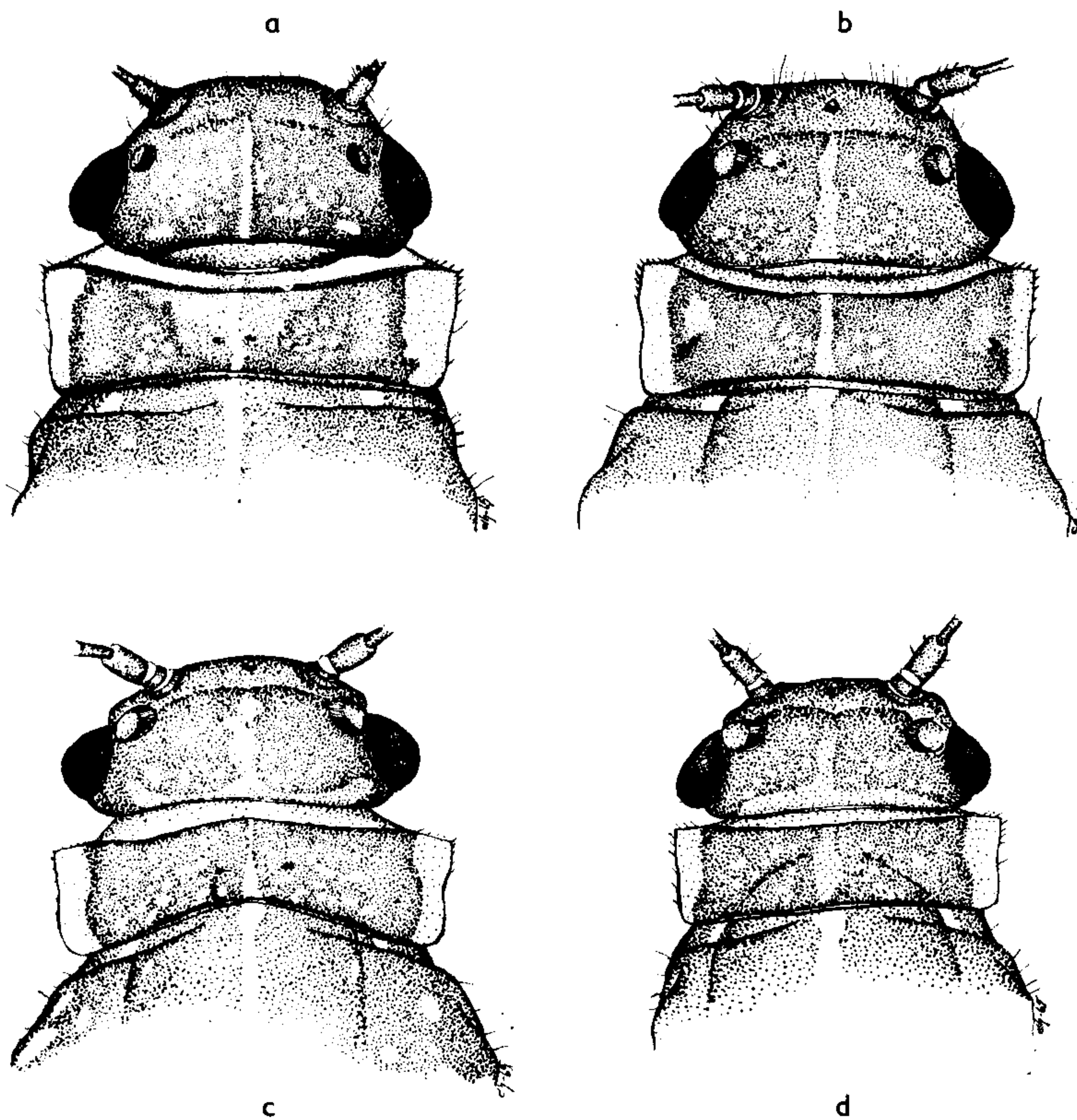


Fig. 9. *C. robusta* EATON. Pronotum of nymph. — a, b, & c. Ultimate stages of ♀♀; length of body 6.5, 7.0, and 6.3 mm, respectively. — d. Ultimate stage of ♂; length of body 6.0 mm. — All specimens from Lake Gyltöträsk, Korppoo, June 14, 1965. — Orig.

Side of pronotum pointed as in *C. horaria* but it does not diverge outwards near the middle so strongly as in *C. horaria*, at least, and the anterior margin is always straight (Fig. 9 a–d). Last sternite also much as in *C. horaria* but its margin always evenly curved (Fig. 10 a–d).

Lake Gyltöträsk, Korppoo, is the only known locality for this species in Finland, and thus *C. robusta* is published here as new to the Finnish fauna. Lake Gyltöträsk has quite recently become isolated from the Baltic Sea and it still has a salinity of 1.1 ‰ (summer 1965). I originally found this species among

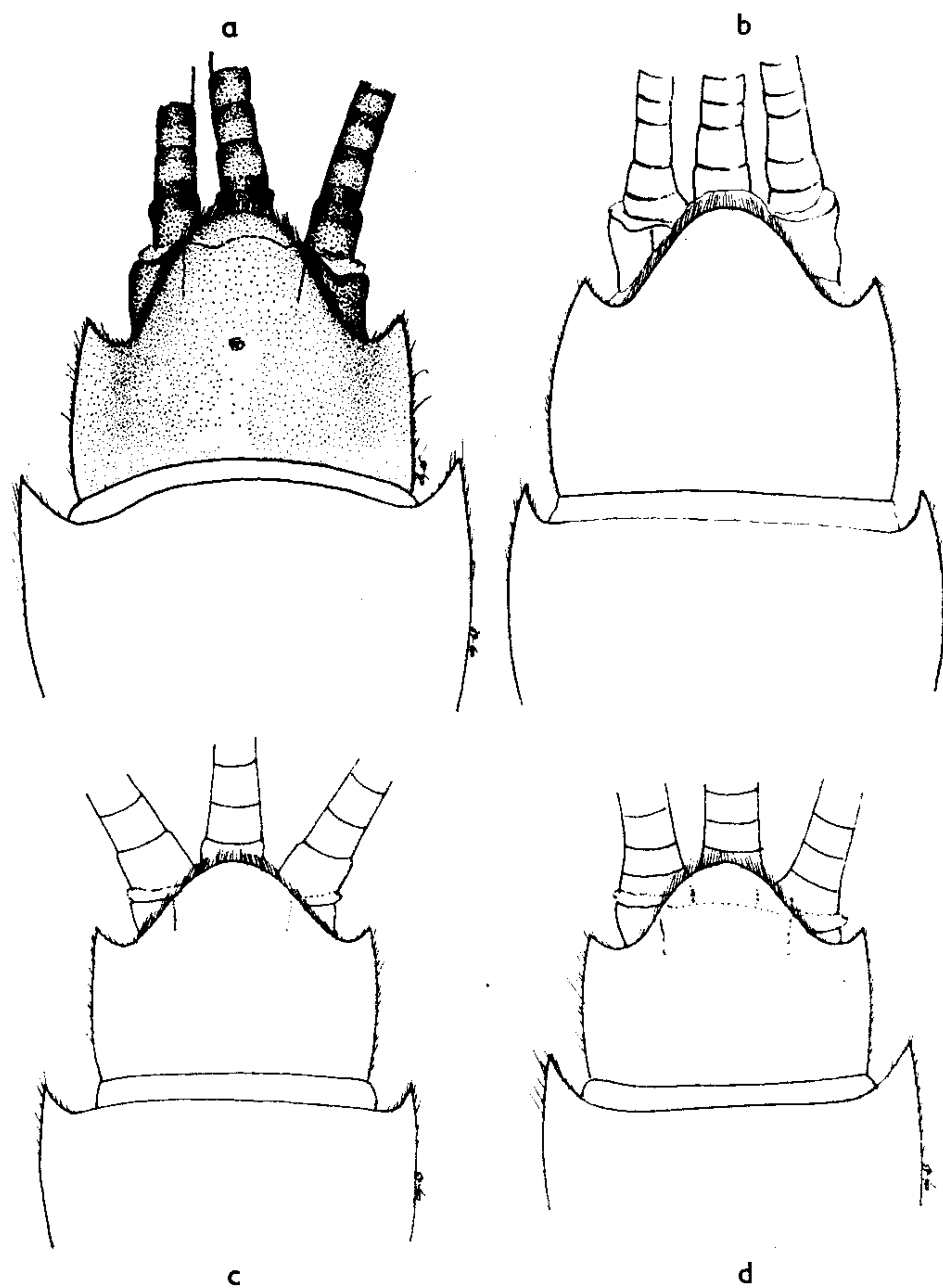


Fig. 10. *C. robusta* EATON. Last sternite of nymph. For explanation see Fig. 9. — Orig.

the material collected by students during the ecological hydrobiology classes at the Marine Biological Station of the University of Turku on the island of Lohm. In the summer of 1965 I also visited the lake mentioned above and found nymphs of this species in considerable numbers among the vegetation.

The species is also known from Holland (terra typica), Sweden (BENGTSSON 1912: *C. incus*), Denmark (BERG 1948 & JENSEN 1956), Czechoslovakia (LANDA 1954: *C. incus*), England (MACAN 1954), France (DEGRANGE 1957), and Germany (MÜLLER-LIEBENAU 1958). According to MÜLLER-LIEBENAU (1957) the species is also known from Yugoslavia and USSR (Oka, Murom).

C. moesta BENGTSSON 1917.

C. halterata, EATON 1884. Revis. Monogr., p. 144 – 145 (in part; Plate 15, Fig. 26a and Plate 42, Fig. 1A, non *C. halterata* FABR.)

C. halterata, PETERSEN 1910. Danmarks Fauna 8, p. 89, Fig. 79a, non *C. halterata* FABR.

C. moesta BENGTSOON 1917. Ent. Tidskr. 38: 2, p. 182 - 183.

→→, SCHOENEMUND 1930. Die Tierwelt Deutschlands 19, p. 61 (imago) and p. 101 (nymph).

→→, KIMMINS 1954. Freshw. Biol. Ass. Sc. Publ. 15, p. 39, Fig. 12M. — Key to imagos.

→→, MACAN 1955. Ent. Gaz. 6, p. 133 - 136, Figs. 4 and 5. — Key to nymphs.

Imago male.

Medium-sized species; length of body and of wing about 4 mm.

Male genitalia quite strongly chitinized. Forceps and styliiger plate brownish as also the triangular marking on the proximal end of the ninth sternite. Penis white (Fig. 11).

Nymph (in liquid; fresh).

Colouration varies notably but some kind of basic pattern can be seen. Front of head usually blackish brown and neck brown. Often there is a light, rather broad median line on the neck and, on both sides of it, irregularly starlike black marking sometimes. Light spots on both sides of median line of pronotum; a smaller dark spot on median line of pronotum; a smaller dark spot, which sometimes flares out and covers the light ones totally, is often associated with

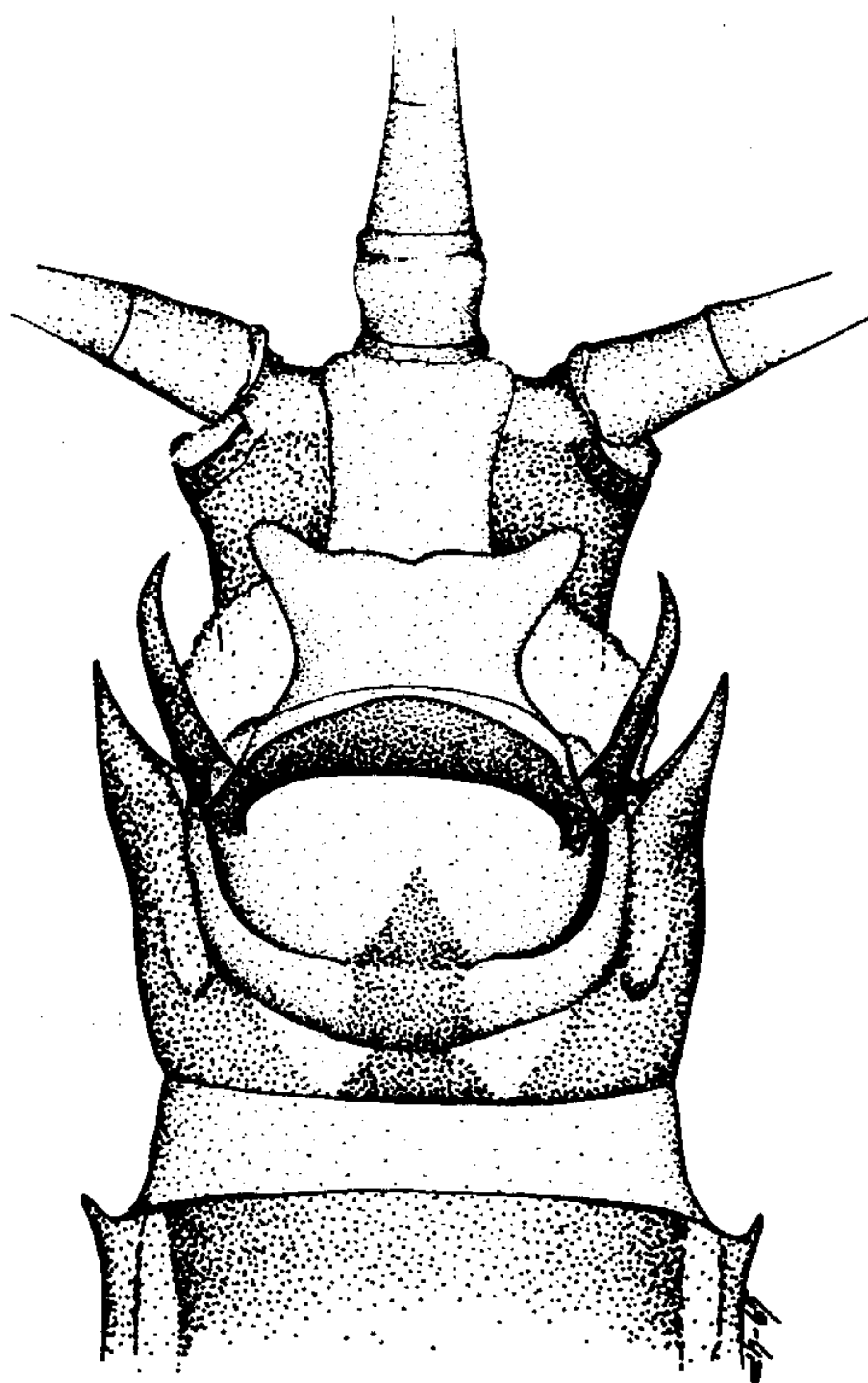


Fig. 11. *C. moesta* BENGTS. Male genitalia of a British specimen identified by Dr. MACAN; length of body 4.5 mm (abdomen strongly telescoped). — Orig.

them. More laterally of these there are somewhat larger spots which may vary considerably in shape; they may also be connected with darker markings. Sides of pronotum light. Mesonotum brown. In front of it relatively long and narrow light markings, converging caudally. Caudally to mesonotum often another pair of similar light markings. In front corner of mesonotum often light spots and the median caudal end of it is light in many cases. Very narrow light stripe on

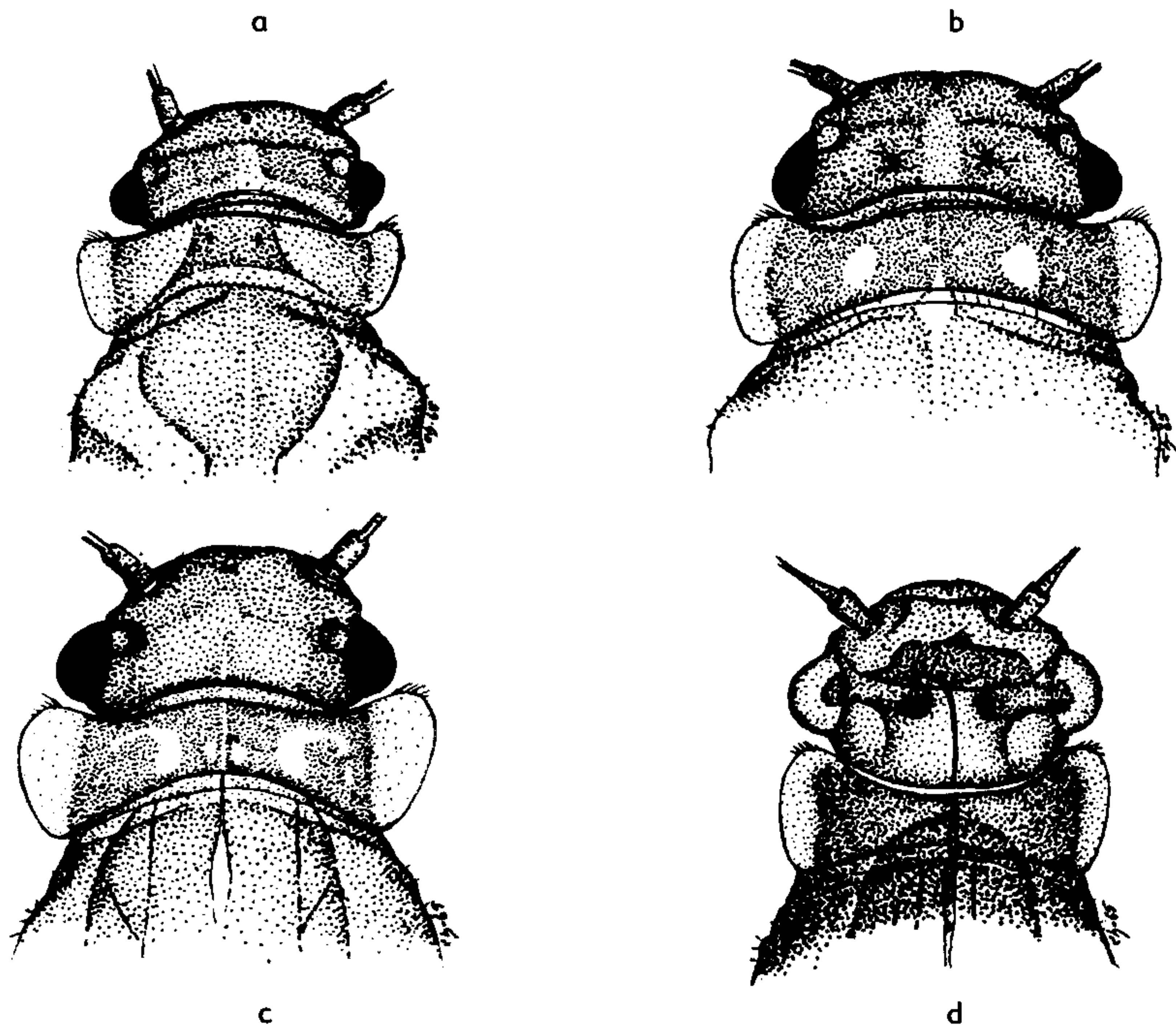


Fig. 12. *C. moesta* BENGTS. Pronotum of nymph. — a. Ultimate stage of ♂; length of body 4.0 mm. — b & c. Ultimate stages of ♀♀; length of body 5.7 and 5.1 mm, respectively. — d. Ultimate stage of ♂; length of body 4.1 mm. — The first three from Lake Käringsviken. Nauvo, June 14, 1965, and the last from Lake Haukivesi, Sääminki, July 17, 1965. — Orig.

median line of pronotum and mesonotum. Gill-covers brown. There is a narrow dark stripe on both sides of the median line on the last few abdominal tergites and, laterally to them, dark quadrangular markings. The markings on each side of the median line may also be fused. Legs white; on upper side of femora black elongate triangular marking which may gradually fade. Tibia with dark band at proximal end. Tarsus with some marking at proximal and often also at distal end.

Sides of pronotum rounded, and its front corners often bulging forward. Thus the pronotum is usually wider in front than at the rear (Fig. 12 a - d).

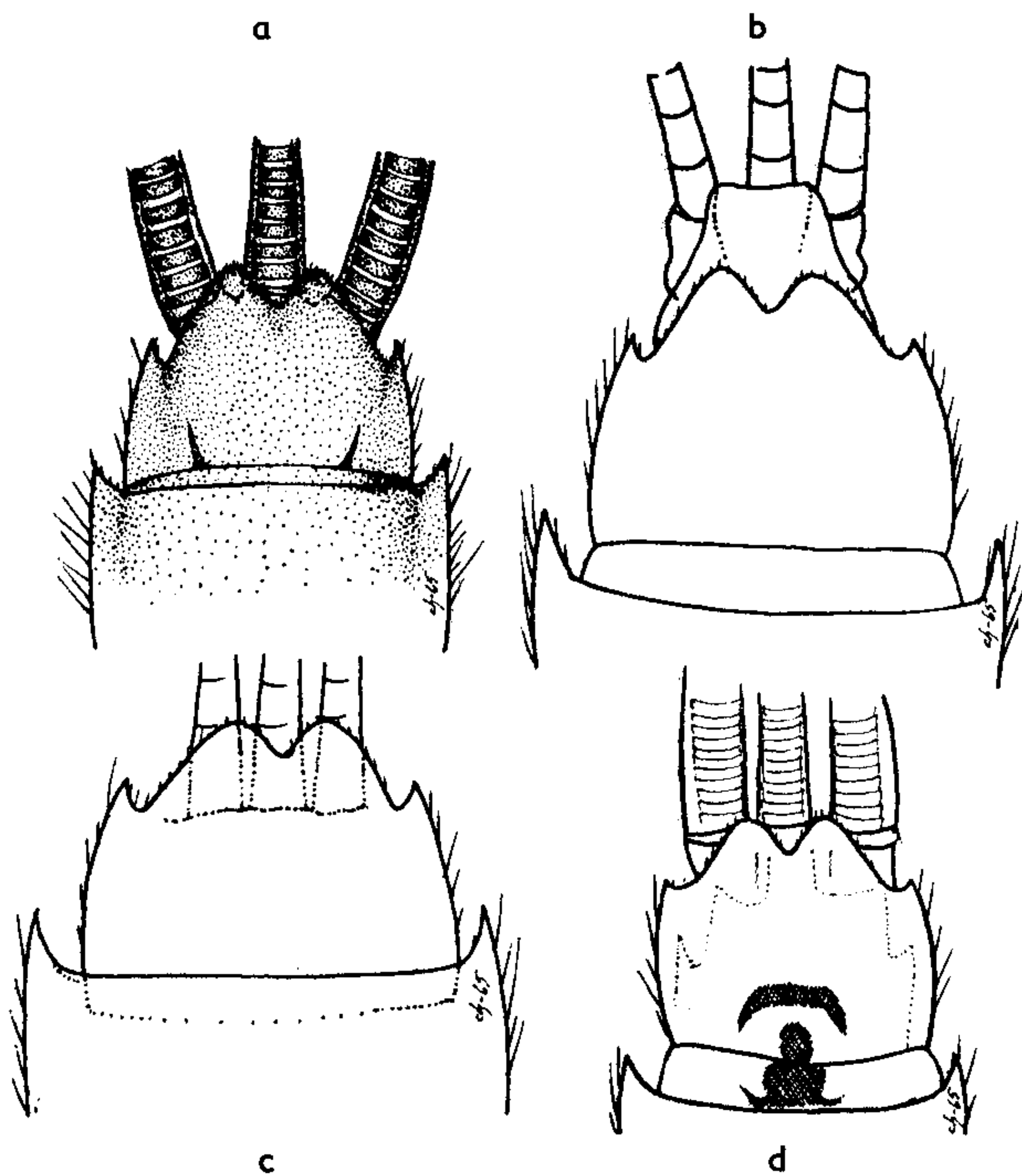


Fig. 13. *C. moesta* BENGTS. Last sternite of nymph. For explanation see Fig. 12. — Orig.

Last abdominal sternite with a rather deep V-shaped incisor at distal end (Fig. 13 a - d). Sides of fore femora typically sinuated (Fig. 14 a - d).

The species is new to the Finnish fauna. It was originally found and identified by BAGGE among the material collected by students during the ecological hydro-

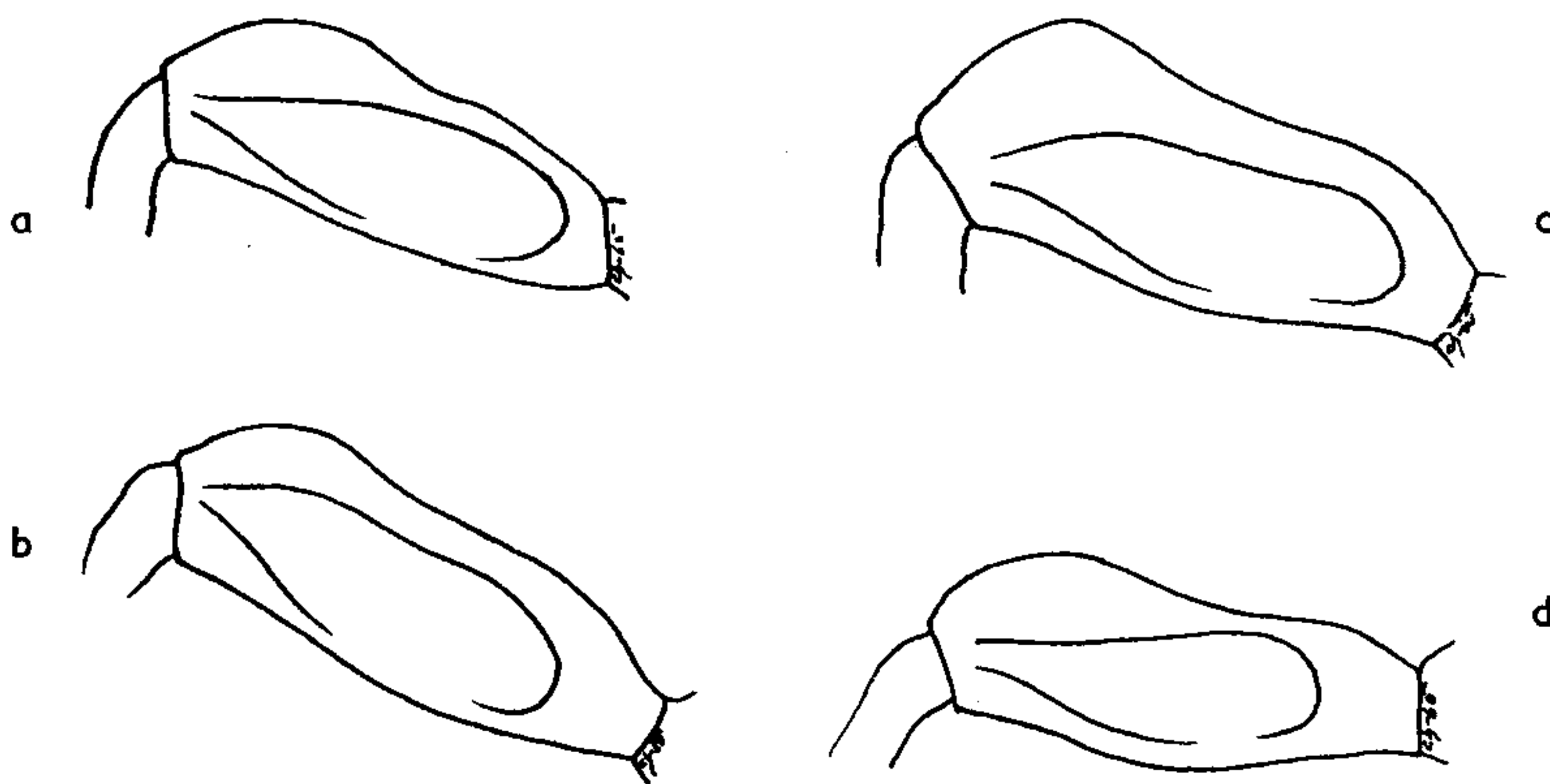


Fig. 14. *C. moesta* BENGTS. First femur of nymph seen from below. For explanation see Fig. 12. — Orig.

biology classes in Lohm. Later it has been found in many lakes in Korppoo and Nauvo. Last summer I also visited one of these lakes, Lake Käringsviken in Nauvo, and found there numerous nymphs which I also reared in the aquarium. The salinity of Lake Käringsviken was 2.3 ‰. Further I have found nymphs and imagos of this species in Lake Haukivesi, Sääminki, July 19, 1965. Its nymphs have also been found in brackish water at Pohjanpitäjä, Lappohja (leg. L. KOLI; M. HIRVENOJA pers. comm.). The species is also known in Sweden (terra typica), Denmark (PETERSEN 1910: *C. halterata*), Norway (BREKKE 1938), England (several authors), and Germany (SCHOENEMUND 1930).

C. nocturna BENGTTSSON 1917.

C. nocturna BENGTTSSON 1917. Ent. Tidskr. 38: 2, p. 185 – 187.

C. undosa TIENSUU 1939. Ann. Ent. Fenn. 5: 2, p. 122 – 123, Fig. 16. n. syn.

I have checked both the paratype material of BENGTTSSON and the type material of TIENSUU. Thus the synonymy of these species is indisputable. In his first paper, TIENSUU (1935) quite rightly identified this species as *C. nocturna*, but later he (1939) described it as a new species and gave a figure of the male genitalia. Because of some misunderstanding, BENGTTSSON stated that it was not one of his species, although he was well acquainted with the excellent figure of TIENSUU (1939).

It is possible that *C. tumida* BENGTTSSON 1912 is also synonymous with this species. If so, this would be the valid name for it. However, I do not venture to

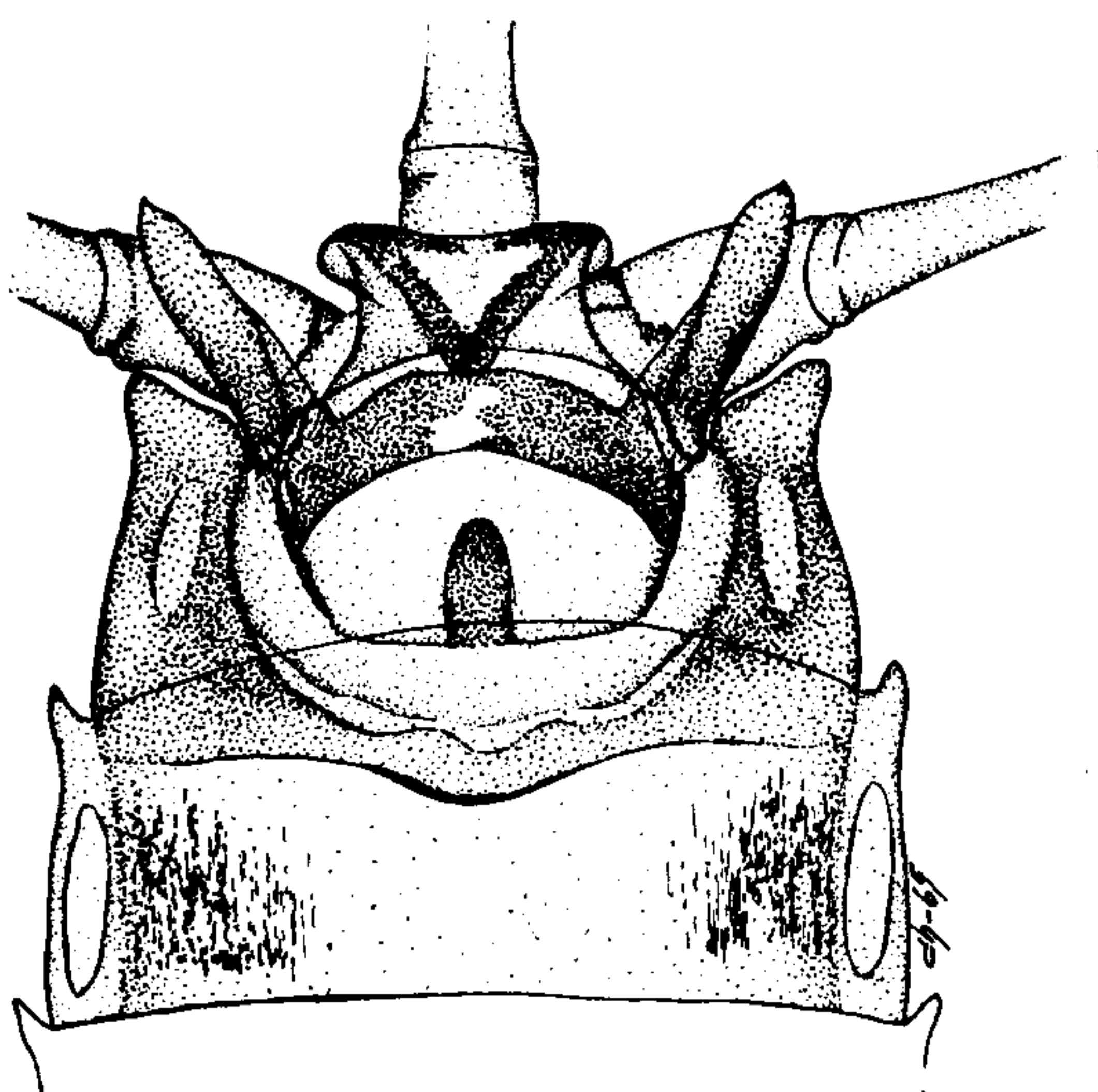


Fig. 15. *C. nocturna* BENGTS. Male genitalia of a specimen captured with a mercury lamp in Ruissalo, Turku, on August 24, 1965; length of body 4.0 mm. — Orig.

make such an assumption because only two females of the paratype material of BENGTSOON have been at my disposal. This problem can only be finally solved through comparison of the male specimen of the type material of *C. tumida* with males of *C. nocturna*.

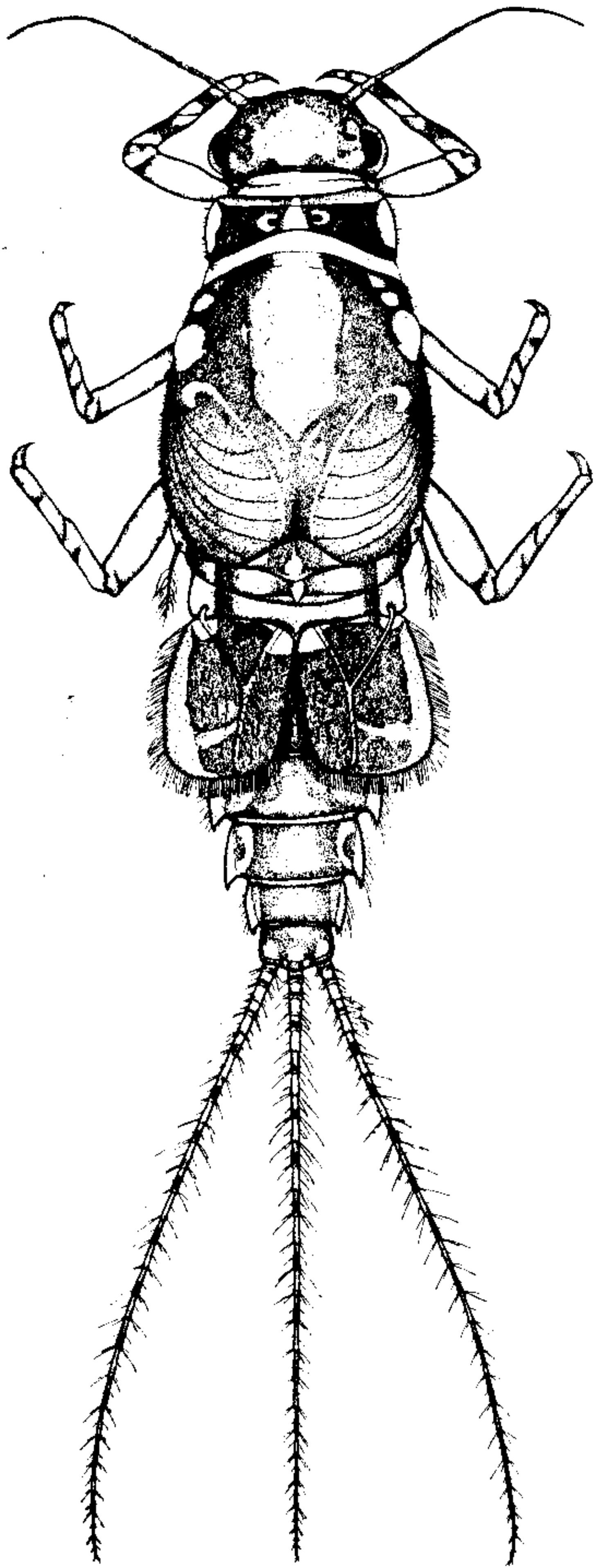


Fig. 16. *C. nocturna* BENGTS. A nymph from Näätälahti, Kuopio, August 19, 1964; length of body 4.7 mm. — Orig.

Imago male.

Medium-sized species; length of body and of the wing 4 mm.

Male genitalia strongly chitinized. Forceps, styliger plate, and oval marking at the proximal end of the ninth sternite blackish. There is also a blackish marking on the penis, resembling a fruit of maple. However, the intensity of this colouration is variable (Fig. 15).

The female and the nymph of this species have not yet been described. I have examined three nymphs from Näätälahti, Kuopio. They were among the bottom fauna material collected by Mr. A. PIETILÄINEN, and I at first took them to represent the nymph of *C. nocturna*. Independently, KEYNÄS (pers. comm.) placed nymphs of the same species from Lake Hiidenvesi, Lohja, in *C. undosa*. I here give some figures of the nymph of this species (Figs. 16–18). A more detailed description of the nymph and the female will be published by KEYNÄS.

New records: — I. Turku, Ruissalo, August 24, 1965, one ♂ with a mercury lamp; Tammissaari (leg. HELLÉN), 4 ♂♂; Karjalohja (coll. SAHLBERG), 1 ♂; Lohja, Lake Hiidenvesi, August 18, 1963 (leg. K. KEYNÄS) numerous imagos; Porvoo (leg. E. & P. SUOMALAINEN), several ♂♂. — Southern Karelia: Muolaa, Äyräpää, July 29, 1921 (leg. J. E. ARO), 2 ♂♂ subimagos.

The species is also known from Sweden (terra typica), and USSR (TIENSUU 1935: *C. undosa*, surroundings of Lake Ladoga).

The swarming time seems to be rather late; from late July till late August. In BENGTSOON's collection there are two samples of *C. nocturna*, dated July 29, 1906, and August 3, 1930. TIENSUU (1939) also mentioned very late dates as follows: 22. VIII., 13. VIII., and 7. VIII.

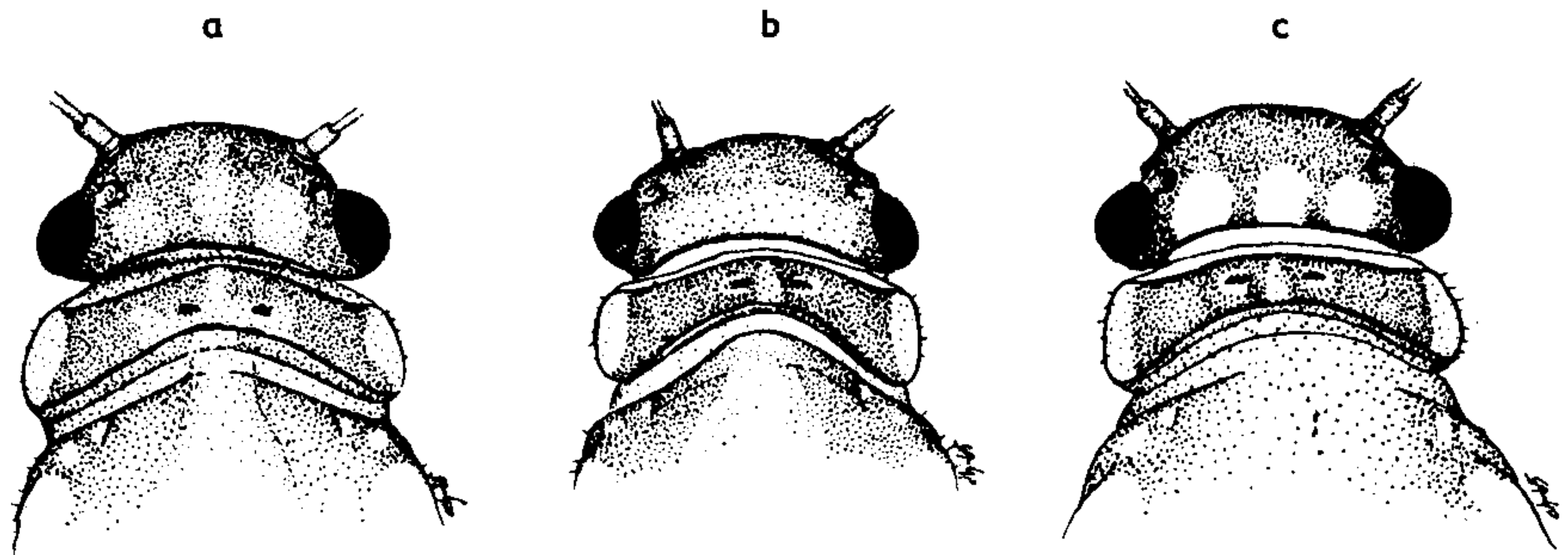


Fig. 17. *C. nocturna* BENGTS. Pronotum of nymph. — a, b, & c. All ultimate stages of ♀♀ from Näätälahti, Kuopio, August 19, 1964; length of body 5.0, 4.7, and 5.0 mm, respectively. Orig.

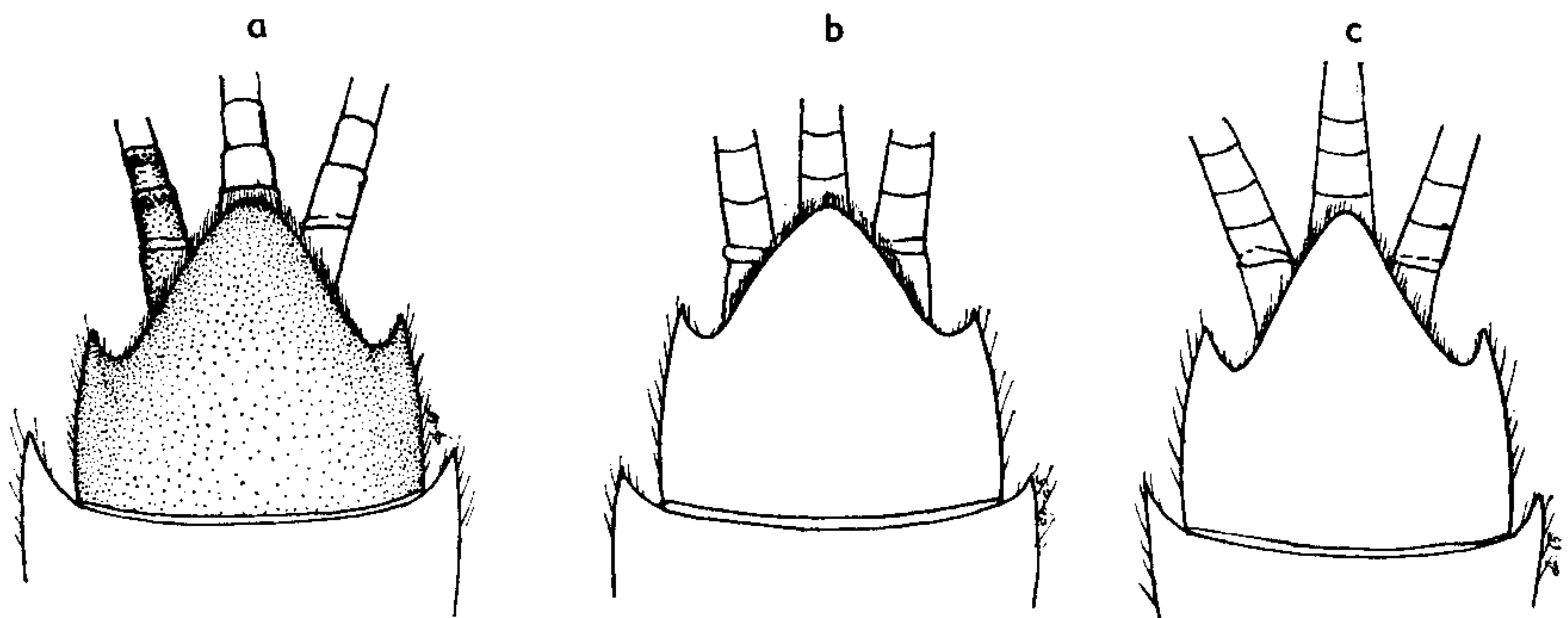


Fig. 18. *C. nocturna* BENGTS. Last sternite of nymph. For explanation see Fig. 17. — Orig.

Summary.

1. The revised list of the Finnish species of the genus *Caenis* is:

<i>C. horaria</i> (LINNÉ) 1758	= <i>C. horaria fennica</i> ARO 1928 n.syn.
<i>C. rivulorum</i> EATON 1884	= <i>C. nivea</i> BENGTSOON 1917 n.syn.
<i>C. robusta</i> EATON 1884	
<i>C. moesta</i> BENGTSOON 1917	
<i>C. nocturna</i> BENGTSOON 1917	= <i>C. undosa</i> TIENSUU 1939 n.syn.

2. Three species are recorded as new to the Finnish fauna, viz. *C. rivulorum* EATON, *C. robusta* EATON, and *C. moesta* BENGTS.

3. Figures of the undescribed nymph of *C. nocturna* BENGTS. are given.

4. A series of figures is given in order to show the taxonomic value of the shape of the last abdominal sternite in the nymphal stage. This character has not previously been discussed.

A corresponding series of figures showing the shape of the pronotum is also given. The significance of this character has not previously been correctly interpreted and the inaccurate figures published have caused many errors.

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References: ARO, J. E. 1928. Suomen päiväkörennoiset. Otavan Hyönteiskirjasia No. 3, 68 pp. Helsinki. — BAGGE, P. 1965. Observations on some mayfly and stonefly nymphs (Ephemeroptera and Plecoptera) in Utsjoki, Finnish Lapland. Ann. Ent. Fenn. 31, p. 102 – 108. — BENGTTSSON, S. 1912. Neue Ephemeriden aus Schweden. Ent. Tidskr. 33, p. 107 – 117. — 1917. Weitere Beiträge zur Kenntnis der Nordischen Eintagsfliegen. Ibid. 38, p. 174 – 194. BERG, K. 1948. Biological Studies on the River Susaa. Folia limnol. Scand. No. 4. — BRINCK, P. 1957. Reproductive system and mating in Ephemeroptera. Opusc. Ent. 22, p. 1 – 28. — BREKKE, R. 1938. The Norwegian Mayflies (Ephemeroptera). Norsk Ent. Tidskr. 5, p. 55 – 73. — DEGRANGE, C. 1957. Note de synonymie: *Caenis incus* Bengtsson, 1912 = *Caenis robusta* Eaton 1881 (Ephemeroptera). Trav. Lab. Hydrobiol. Pisc. Grenoble 48–49, p. 33 – 36. — 1957. Deux *Caenis* nouveaux pour la faune française: *C. robusta* Etn. et *C. rivulorum* Etn. (Ephem.). Bull. Soc. Ent. France 62, p. 75 – 77. — EATON, A. E. 1883–1888. A revisional monograph of recent Ephemeridae or Mayflies. Trans. Linn. Soc. London. Ser. 2, Vol. 3. Zoology. 352 pp., 65 pls (Issued in six parts between December 1883 and February 1888). — HIRVENOJA, M. 1964. Studien über die Wasserinsekten in Riihimäki (Südfinnland). IV. Ephemeroptera, Odonata, Hemiptera, Lepidoptera und Coleoptera. Ann. Ent. Fenn. 30, p. 65 – 93. — JENSEN, C. F. 1956. Ephemeroptera (Døgnfluer). En faunistisk biologisk undersøgelse av Skern Å. II. Flora og Fauna 62, p. 53 – 75. — KIMMINS, D. E. 1954. *Caenis robusta* Eaton, a species of Ephemeroptera new to Britain. Ent. Mon. Mag. 89, p. 117 – 118. — MÜLLER-LIEBENAU, I. 1958. *Caenis robusta* Eaton, eine für Deutschland neue Ephemeropteren-Art. Gewässer und Abgewässer 22, p. 59 – 65. — PETERSEN, E. 1910. Guldsmede, Døgnfluer, Slørvinger og Copeognather (Pseudoneuropterer). Danmarks Fauna Vol. 8. (part Ephemerida, p. 64 – 105, 33 figs.) — SCHOENEMUND, E. 1930. Eintagsfliegen oder Ephemeroptera. Die Tierwelt Deutschlands 19. Teil. 106 pp. Jena. — TIENSUU, L. 1935. On the Ephemeroptera-fauna of Laatokan Karjala (Karelia Ladogensis). Ann. Ent. Fenn. 1, p. 3 – 23. — 1939. A survey of the distribution of Mayflies (Ephemerida) in Finland. Ibid. 5, p. 97 – 124.