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Tanytarsus minutipalpus, spec. nov. from the saline lakes in the Rift Valley, East Africa

(Insecta, Diptera, Chironomidae)

Torbjørn Ekrem & Arthur D. Harrison

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Tanytarsus minutipalpus, spec. nov., from the saline lakes in the Rift Valley in East Africa is described and figured in all stages. The males and pupae fit well in the *Tanytarsus mendax* species group if the lack of digitus is ignored, and the larva show some characteristics that could be diagnostic for this group. The immatures of *T. minutipalpus* were collected in lakes with a conductivity of 19,000 to at least 40,000 $\mu\text{S}/\text{cm}$. The adults often occur in mass numbers around the saline Rift Valley lakes, and can have a potential of becoming a nuisance problem.

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Introduction

Tanytarsus v. d. Wulp, 1874 is one of the most species-rich genera of the family Chironomidae, with at least 85 species described from the Holarctic region (Cranston et al. 1989). Reiss and Fittkau (1971) placed the European *Tanytarsus* species into species-groups based solely on adult male characters. Their suggestions were adopted by Cranston et al. (1989) in the key to the adult males of Holarctic Chironominae, but the *holochlorus*-group was renamed the *mendax*-group as *Tanytarsus holochlorus* sensu Reiss and Fittkau proved to be a synonym of *T. mendax* Kieffer. Sasa and Kikuchi (1995) erected species-groups for the Japanese, and Glover (1973) for the Australian *Tanytarsus* species. Neither Sasa and Kikuchi nor Glover adopted the ideas of Reiss and Fittkau (1971), and their species groups do not correspond to the groups suggested for the European *Tanytarsus* species. Describing six new species from Ghana, West Africa, Ekrem (1999) found it difficult to place African *Tanytarsus* species in the European species groups. The new species described here, however, possesses most of the diagnostic characters of the *mendax*- group.

Material and methods

The terminology follows Sæther (1980) with the additions and corrections given by Sæther (1990). The term “shoulders” is used for the posteriomarginal lobes of the male anal tergite. The term “LS” (Pinder & Reiss 1986) is used for the lateral lamelliform setae of the pupal abdomen. The mounting procedure is according to Sæther (1969). Measurements are taken according to Schlee (1966) with the additions given by Ekrem (1999).

The different stages were associated by rearing in the strongly saline water of the small Lake Chitu, Ethiopia.

Tanytarsus minutipalpus, spec. nov.

Tanytarsus sp. (Milbrink 1977).

Tanytarsus horni Goetghebuer sensu Vareschi & Jacobs (1984), Vareschi & Vareschi (1984), Harrison (1987), Tudorancea & Harrison (1988), Tudorancea et al. (1989).

Tanytarsus sp. A (Verschuren 1997).

Types. Holotype: 1♂, Tanzania, Lake Manyara at Hotel, 30.I.1987, leg. E. G. Burmeister. – Paratypes: 2♂♂, 8♀♀, as holotype; 3♂♂, Kenya, Bogoria, S Lake Baringo, 6.III.1983, leg. E. J. Fittkau; 4♂♂, 2♀♀, 6 pupal exuviae. 1 larva, Ethiopia, Lake Chitu, III.1983, leg. A. D. Harrison; 1♂, Kenya, Lake Bogoria, 1.IX.1985, leg. A. D. Harrison; 1♂, Kenya, Lake Elmenteita, 31.VIII.1985, leg. A. D. Harrison; 1♂, Kenya, Lake Nakuru, light trap by hotel, 2.IX.1985, leg. A. D. Harrison; 1 pharate pupa (♀), Ethiopia, Lake Shala, north shore, 17.I.1985, leg. A. D. Harrison; 4 larvae, Ethiopia, Lake Shala, north-east shore, Ekman grab at 15 m, 17.I.1985, leg. A. D. Harrison.

1♂ and 1♀ paratype deposited at Museum of Zoology, University of Bergen, Bergen, Norway (ZMBN). All other types and additional alcohol material from the type localities at Zoologische Staatssammlung München (ZSM), Munich, Germany.

Diagnostic characters. The new species differs from other *Tanytarsus* species by the following combination of characters: male with wing almost bare, carrying only a few setae on apical $\frac{1}{4}$; maxillary palps with 5 extremely short palpomeres (Fig. 1B); hypopygium: median setae on anal tergite absent; anal point with spines between well developed anal crests; superior volsella well developed with dorsolateral microtrichiae, digitus missing; median volsella with numerous lamellae. The maxillary palp with only 4 extraordinary short palpomeres (Fig. 2B) separates the female from other described *Tanytarsus* females. Pupa with long, slender and bare thoracic horn; long cephalic tubercles with almost equally long frontal setae; pedicel sheath tubercle well developed; hook row almost as wide as tergite II; spinepatch of tergite III on posterior part of tergite, with long spines directed posteriorly; spine patches on tergites IV and V elongate, spine patch on T VI circular; LS setae on segment VIII only. Larva with pedicel of Lauterborn organs about as long as antennal segment three; well sclerotized premento-hypopharyngeal complex; SII, chaetae, chaetulae and spinulae all simple; premandible with six teeth, the outermost stiliform; dorsal teeth of the mandible well developed with basal most tooth extending beyond ventral, inner teeth; spine on mola present.

Description

Male imago (n = 6).

Total length 4.0–4.7 mm. Wing length 1.91–2.07 mm. Total length/wing length 2.03–2.25.

Coloration. Cleared specimens with head light brown, darker brown pedicel, apodemes and eyes; thorax (Fig. 1C) with dark brown patches anteriorly on scutum, laterally under parapsidal suture, on median anepisternum II, on epimeron II, basally on scutellum, basally on post- and antepnotum and on preepisternum; legs light brown; abdominal tergites II–VI with posterior, transverse, dark band and longitudinal median band, tergite VI with an additional anterior transverse band. Tergite VII with a broad transverse anterior stripe, tergite VIII usually with 2 large medially connected pigment patches. Colour intensity fading towards apex of abdomen.

Head (Fig. 1B). Antennae normally developed with AR 1.35–1.58. Thirteenth flagellomere 612–670 μm long. Longest antennal seta about 600 μm long. Distance between eyes 227–270 μm . Large cephalic tubercles, about 40–57 μm long with laced apices. Temporal bristles 15–17; including 4–5 inner verticals, 4–6 outer verticals and 6–7 postorbitals. Clypeus semicircular, 61–83 μm long with 16–29 setae. Tentorium 154–166 μm long, 36–54 μm wide at sieve plate. Stipes 97–140 μm long, 14–22 μm wide. Cibarial pump with one pair of 2–3 ventrolateral sensorial setae, cibarial pump 61–68 μm wide. Lengths of palp segments (in μm): 18–25, 22–29, 29–47, 40–50, 68–79.

Thorax (Fig. 1C). Dorsocentrals 10–14, acrostichals 15–22, prealars 1–2, scutellars 7–12. Halteres with 5–7 setae.

Wing (Fig. 1A). VR 1.04–1.10. Brachiolum with 1 seta, Sc bare, R with 7–18 setae, R₁ with 0–4, R₄₊₅ with 1–3, M₁₊₂ with 8–21 setae. Rest of veins bare. Cell m bare, r₄₊₅ with 40–58 setae, m₁₊₂ with 3–11 setae including on false vein, m₃₊₄, cu and an all bare.

Legs. Spur on front tibia 46–50 μm long including scale. Spurs of middle tibia 32–36 μm long including 14–18 μm long comb and 29–32 μm long including 14–18 μm long comb; of hind tibia 38–47 μm long including 14–18 μm long comb and 36–40 μm long including 14–18 μm long comb. Middle tibiae with 6–15 sensilla chaeticae.

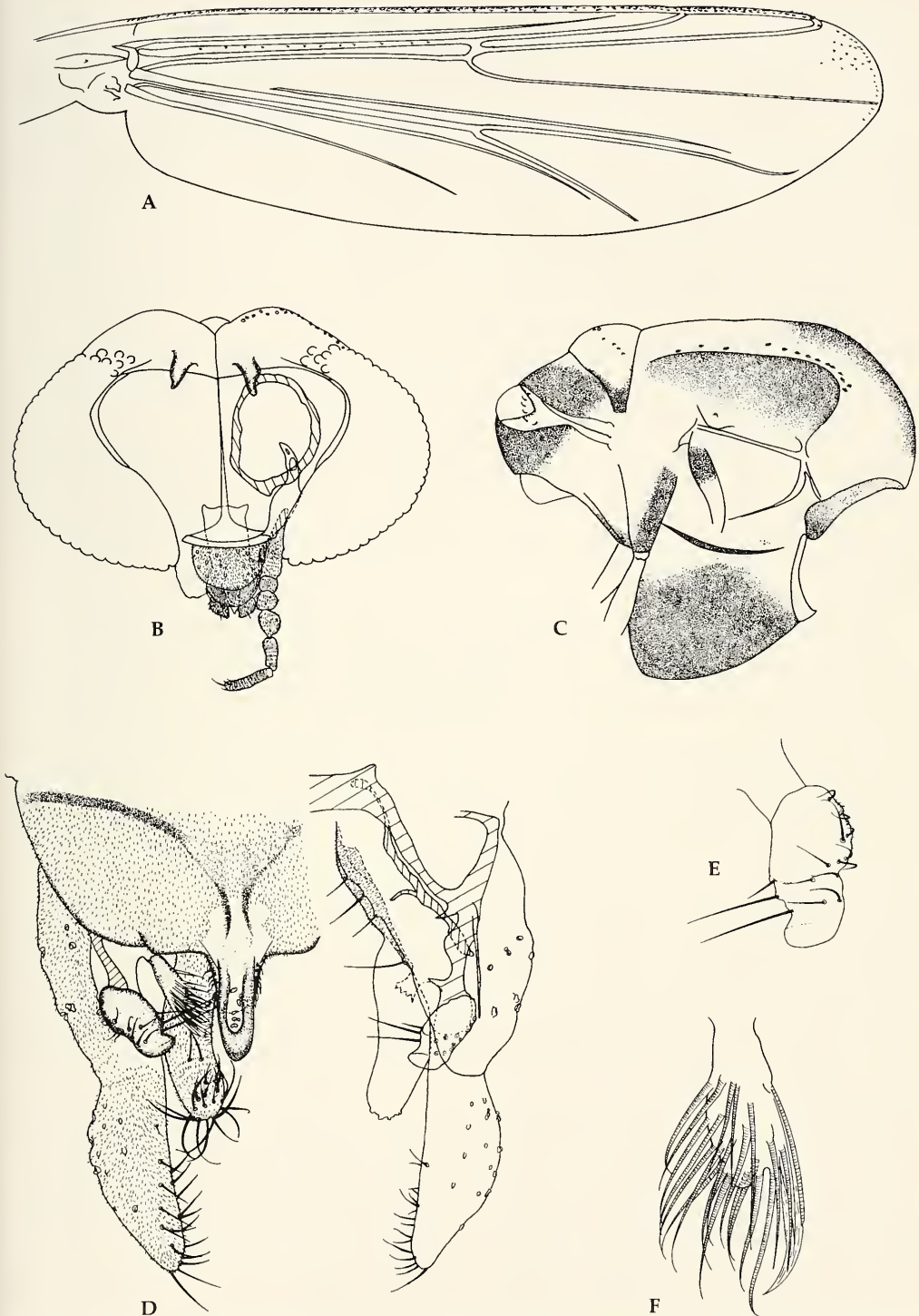


Fig. 1. *Tanytarsus minutipalpus*, spec. nov. ♂. A. Wing. B. Head. C. Thorax. D. Hypopygium, dorsal and ventral view. E. Superior volsella. F. Median volsella.

Lengths (in μm) and proportions of legs:

	fe	ti	ta ₁	ta ₂	ta ₃	ta ₄	ta ₅
p ₁	648-731	486- 536	922-1058	479-514	382-425	270-288	133-162
p ₂	745-806	724- 788	371- 439	227-252	187-212	133-151	101-108
p ₃	774-857	961-1015	594- 673	360-396	338-356	198-205	122-158
	LR	BV	SV	BR			
p ₁	1.90-2.05	1.60-1.81	1.16-1.27	3.3-4.9			
p ₂	0.51-0.57	2.76-2.91	3.50-3.73	4.9-6.0			
p ₃	0.62-0.68	2.25-2.36	2.75-2.92	4.3-5.7			

Hypopygium (Fig. 1D). Tergite IX 136-152 μm long, median setae lacking, but 14-18 apical setae are present; apical margin with shoulders; lateral teeth not visible; microtrichiae absent in an area around base of anal point. Anal point 61-86 μm long, 23-32 μm wide at base and 9-11 μm wide at apex. Anal point with 4-6 spines between well developed anal crests. Broad anal tergite bands curved anally, almost reaching anal point, with median elongations almost connecting the tergite bands. Transverse sternapodeme 57-89 μm long, phallapodeme 125-149 μm long. Gonocoxite 182-124 μm long, gonostylus 154-182 μm long. Superior volsella tapered towards a median elongated apex; bearing 5-6 small dorsal setae; 4-5 small lateral setae and 3 median setae, the apical 2 much stronger than the basal one; dorsolateral microtrichiae present (Figs 1D, E); digitus absent. Median volsella (Fig. 1F) 36-50 μm long with 4-6, 25-32 μm long, subulate lamellae. Inferior volsella relatively straight, 143-121 μm long, with strong apical setae directed both orally and anally. HR 1.09-1.21, HV 2.28-2.84.

Female imago (n = 8).

Total length 3.28-3.64 mm. Wing length 1.91-2.02 mm. Total length/wing length 1.69-1.87.

Coloration. Similar to male, but with smaller patches on the abdominal tergites.

Head. Antennae (Fig. 2A) with 4 flagellomeres; pedicel 50-72 μm long; lengths of flagellomeres (in μm): 97-115, 61-65, 61-72, 162-191. AR 0.68-0.77. Flagellomeres 1-3 with 1 antennal spur, flagellomere 4 with numerous spurs. Distance between eyes 216-252 μm . Cephalic tubercles pyramid shaped, 32-54 μm long. Temporal bristles 12-14; including 3-4 inner verticals, 3-5 outer verticals and 4-6 postorbitals. Clypeus semicircular, 68-101 μm long, with 34-51 setae. Tentorium 130-144 μm long, 29-36 μm wide at sieve plate. Stipes about 104-115 μm long, 14 μm wide. Cibarial pump 58-79 μm wide, with one pair of 4-5 ventrolateral sensorial setae. Maxillary palp (Fig. 2B) with 4 palpomeres; lengths (in μm): 18-25, 22-25, 40-42, 54-76.

Thorax. Dorsocentrals 11-16, humerals 2-6, acrostichals 16-27, prealars 1-2, scutellars 7-11. Halteres with 6-10 setae.

Wing. VR 1.06-1.13. Brachiolum with 1 seta, Sc bare, R with 16-26 setae, R₁ with 15-24, R₄₊₅ with 16-22, M₁₊₂ with 20-35, M₃₊₄ with 9-27, Cu with 0-21, Cu₁ with 3-13, PCu with 0-6 setae, An bare. Cell m bare, r₄₊₅ with about 80-190 setae, m₁₊₂ with 80-190 including on false vein, m₃₊₄ with 3-42, cu with 0-3 setae, an bare.

Legs. Spur on front tibia 36-47 μm long including scale. Spurs of middle tibia 27-32 μm long including 11-18 μm long comb and 18-32 μm long including 11-18 μm long comb; of hind tibia 25-36 μm long including 14-18 μm long comb and 25-32 μm long including 11-18 μm long comb. Middle tibiae with 30-44 sensilla chaeticae.

Lengths (in μm) and proportions of legs:

	fe	ti	ta ₁	ta ₂	ta ₃	ta ₄	ta ₅
p ₁	558-623	461-486	799-835	324-342	241-256	162-198	97-119
p ₂	688-760	709-738	353-385	187-205	144-166	162-198	79- 97
p ₃	745-788	950-983	547-565	281-313	263-306	144-169	108-115
	LR	BV	SV	BR			
p ₁	1.67-1.77	2.09-2.24	1.27-1.38	2.1-2.4 (n=4)			
p ₂	0.49-0.54	3.09-3.42	3.66-4.13	1.6-2.8 (n=5)			
p ₃	0.55-0.58	2.58-2.81	3.01-3.21	1.9-2.3 (n=4)			

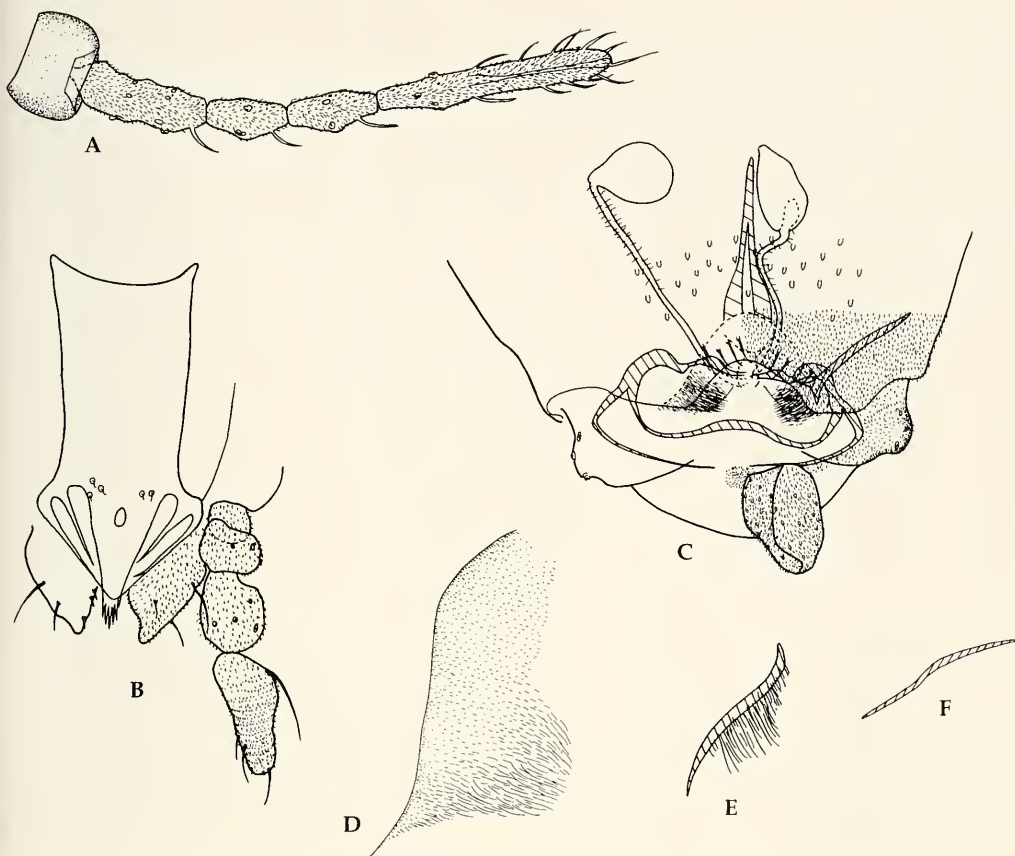


Fig. 2. *Tanytarsus minutipalpus*, spec. nov. ♀. **A.** Antenna. **B.** Cibarial pump and maxillary organs. **C.** Genitalia, ventral view. **D.** Ventrolateral lobe of gonapophysis VIII. **E.** Dorsomesian lobe of gonapophysis VIII. **F.** Apodeme lobe of gonapophysis IX.

Genitalia (Figs 2C-F). Tergite IX apically rounded; floor under vagina well developed, bearing 3-7 lateral setae; seminal capsules 65-83 μm long, with lateral neck; notum 58-72 μm long, notum + rami 115-158 μm long; gonocoxite apodemes somewhat concave with forked posterior apex. Lobe of gonapophysis VIII (Fig. 2D) with long, straight, medioposteriorly directed microtrichiae; dorsomesal lobe of gonapophysis VIII (Fig. 2E) slightly S-shaped with long median microtrichiae; apodeme lobe of gonapophysis IX (Fig. 2F) straight; coxosternapodeme with 1 small and 1 large anteriorly directed lobe; gonocoxite IX laterally extruding with about 3-7 setae; postgenital plate circular; cerci 86-101 μm long.

Pupa (n = 6).

Total length 3.7-4.6 mm. Coloration light brown [The exuviae were transparent, almost glassy before mounting, and therefore difficult to handle. Only the below described features were visible in a Leica Diaplan light microscope with phase contrast].

Cephalothorax (Figs 3A,B). Length of frontal setae 76-94 μm , cephalic tubercles large, conical (Fig. 3A), 79-108 μm long. Pedicel sheath tubercle (Fig. 3B) prominent, approximately. 18-25 μm long. Thoracic horn (Fig. 3B) bare, evenly tapered, 580-850 μm long, 29-36 μm wide. Three equally long precorneals, 76-108 μm , placed in a row; anteprepronotals 2: 1 small, dorsal 36-47 μm long, 1 large, ventral 90-94 μm long; 2 pairs of dorsocentrals with 1 thin and 1 thick seta in each pair, thin setae about 60 μm long, thick setae about 75 μm long.

Abdomen (Figs 3C,D). Anterior, transverse band and two triangular posterior patches of shagreen on tergite (T) II; pedes spurii A and B absent; hook row 234-425 μm long, almost the width of TII; spines



Fig. 3. *Tanytarsus minutipalpus*, spec. nov. Pupa. A. Frontal apotome. B. Thoracic horn. C. Spines of abdominal tergites. D. Posterolateral comb of segment VIII.

of T III 40-65 μm long, in separate, laterally curved longitudinal rows on posterior half of tergite; spines of T IV 14-50 μm long with short spines in separate, elongate patches, often with long spines placed posteriorly of these patches (Fig. 3C); spines of T V 11-14 μm long in small, anterior, oval patches; spines of T VI 7-11 μm long in small, anterior, circular patches; segments V-VII with normal, 36-54 μm long L setae, segment VIII with 5 about 160 μm long LS setae of which the third seta is placed more medially than the other four; anal lobe with 2 dorsal lamelliform setae, anal fringe with 41-50, 259-270 μm long lamelliform setae; posterior lateral comb of segment VIII (Fig. 3D) 58-79 μm wide with 7-9 apical teeth.

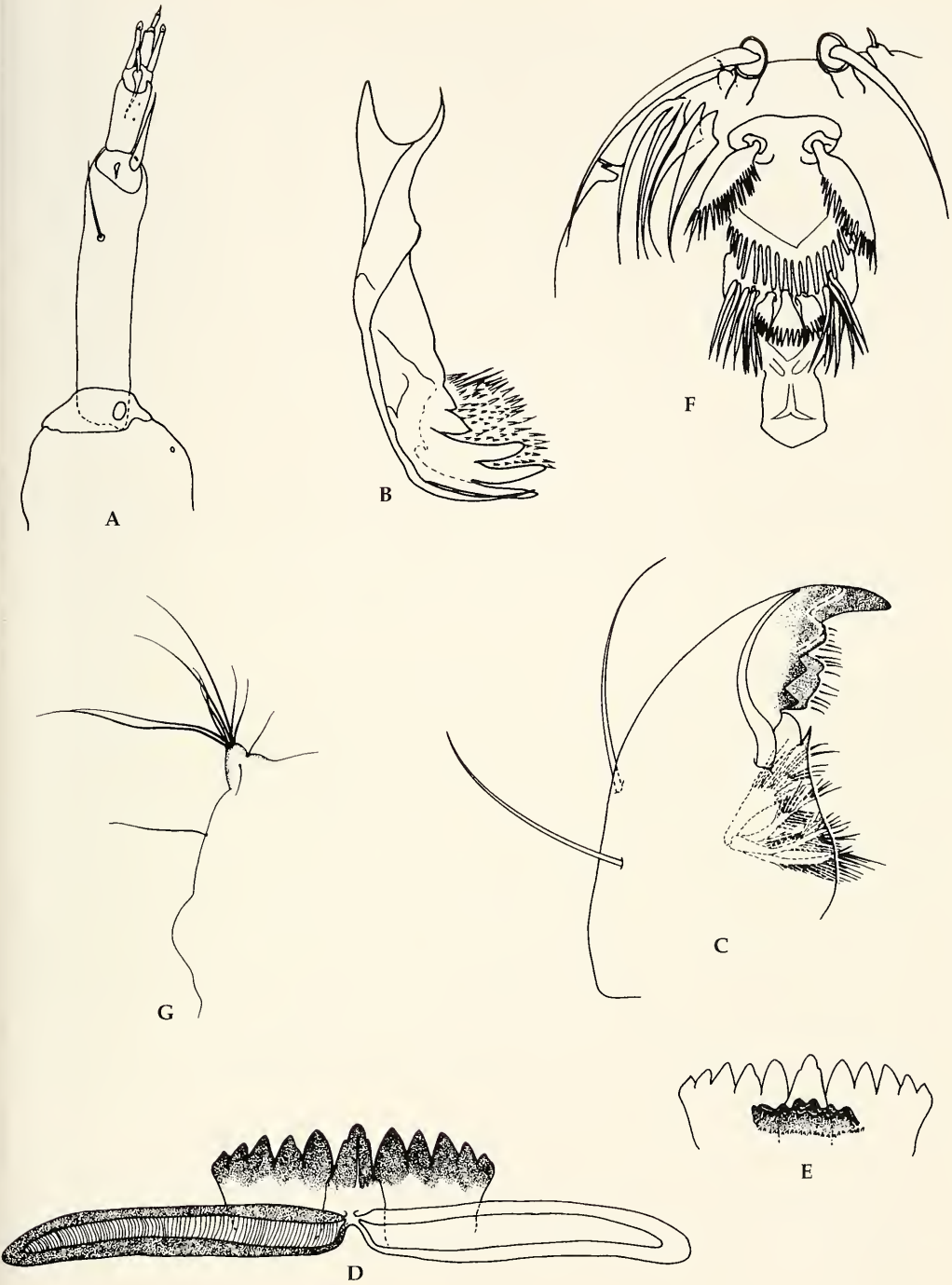


Fig. 4. *Tanytarsus minutipalpus*, spec. nov. Larva. **A.** Antenna. **B.** Premandible. **C.** Mandible. **D.** Mentum with ventromental plates. **E.** Mentum with premento-hypopharyngeal complex. **F.** Labral region. **G.** Anal region.

Larva (n = 5).

Total length 4.9-6.7 mm. Length of head capsule 353-378 μm .

Head. Antenna (Fig. 4A) with five segments. Length of segments (in μm) 95-107, 25-32, 11-18, 7-8, 5-6. AR 1.62-1.90. Antennal pedestal 34-39 μm long; basal antennal segment 20 μm wide; distance from base of basal antennal segment to ring organ 2-3 μm ; distance from base to antennal seta 68-75 μm ; blade 20-34 μm long; accessory blade 16-23 μm long. Apical style of second antennal segment 5-7 μm long. Lauterborn organs 18-25 μm long, barely longer than third antennal segment. Premandible (Fig. 4B) 66-68 μm long, with six teeth, the outermost being stiliform, other teeth more or less spatulate; premandible brush well developed. Mandible (Fig. 4C) 134-159 μm long with 3 ventral inner teeth, and 2 dorsal inner teeth, basal most being large and rectangular; dorsal apical tooth present, about half length of ventral apical tooth; two outer mandibular setae present; seta subdentalis thick, about 36 μm long and curved; mola with one spine; seta interna well developed. Mentum (Figs 4D,E) 91-102 μm wide with 11 teeth; median tooth with lateral notches; ventromental plates, 123-134 μm wide; premento-hypopharyngeal complex well sclerotized, consisting of 3 toothed lamellae (Fig. 4E). Labrum (Fig. 4F) with S I plumose, 20-27 μm long; S III simple, 40-57 μm long on 14-20 μm long pedestal; S IVA and B simple; spinulae and chaetae simple; chaetulae basales foliate, chaetulae laterales falciform; labral lamella comblike with broad teeth; pecten epipharyngis consisting of 3 plumose scales; ungula and basal sclerite both well developed. Maxilla two segmented, about 10 μm long.

Body. Anterior and posterior parapods with simple claws; posterolateral setae on segments IV-VIII, transparent; procercus (Fig. 4G) 27-40 μm long, 23-34 μm wide; 8 anal setae 114-272 μm long; procercus with one dorsal and one lateral seta in addition to anal setae; 2 anal tubules, about 40 μm long; one strong seta between procercus and anal tubules.

Discussion

Based on the adult male morphology, *Tanytarsus minutipalpus*, spec. nov. keys either to the *T. mendax*- or the *T. lugens*-species group (Cranston et al. 1989). The shape of the anal point, median volsella and superior volsella of the male is very similar to *T. horni* in the *T. mendax*-group, but *T. minutipalpus* lacks the digitus, a feature diagnostic for the *T. lugens*-group (compare Reiss & Fittkau 1971, figs 33-42). In Pinder and Reiss (1986) the pupa keys out to the *T. mendax*-group mainly because of its large cephalic tubercles. No diagnostic characters are present for larvae of the *T. mendax*-group, but according to Hofmann (1971) a mandible with two dorsal teeth and an additional tooth on the dorsal surface is characteristic for larvae of the *T. lugens*-group. Thus, the larva of *T. minutipalpus* in this respect shows affinity with the *T. lugens*-group. Dejoux (1968) described the larva of *T. nigrocinctus* Freeman, which was synonymised with *T. horni* by Reiss and Fittkau (1971), and Verschuren (1997) included photographs of this species in his work on subfossil chironomids from Kenya. Comparing the photos and drawings of *T. minutipalpus* with those of *T. horni* reveals similarities such as short Lauterborn organs and only simple spinulae and chaetae on labrum. These larval characters could be diagnostic for the *T. mendax*-group, but a revision of the two species groups is necessary to determine this with certainty. We tentatively choose to place the new species in the *T. mendax* species group.

T. minutipalpus, spec. nov. is a halobiont species, specially adapted to the extreme conditions in the soda lakes of the Rift Valley (Tab. 1). In some of these metasaline lakes like Elmenteita, Bogoria and Chitu, it is probably the only chironomid species present (Verschuren 1997).

Tab. 1. Lakes inhabited by *T. minutipalpus*, spec. nov.

Country	Lake	Conductivity ($\mu\text{S}/\text{cm}$)	Reference
Ethiopia	Chitu	40,000	Verschuren (1997)
Ethiopia	Shala	21,000	Tudorancea & Harrison (1988)
Kenya	Elmenteita	$\geq 38,000$	Verschuren (1997)
Kenya	Baringo	$\leq 1,200$	Källquist (1987)
Kenya	Bogoria	$\geq 35,700$	Verschuren (1997)
Kenya	Nakuru	$\geq 19,000$	Verschuren (1997)
Tanzania	Manyara	94,000	Talling & Talling (1965)

In addition to the records presented in Tab. 1, the species is found as a subfossil in the lakes Sonachi and Oloidien in Kenya. Apparently, *T. minutipalpus* dominated the chironomid community of Lake Sonachi from the late 1940s to the mid- 1960s and Lake Oloidien in the 1870s and early 1880s (Verschuren 1997). The specimens collected at Lake Manyara were caught in 1987, more than 20 years after the analyses done by Talling & Talling (1965) for water conductivity. Since large water level and salinity fluctuations seems to be common in many of the lakes in the Rift Valley, it is probable that the conductivity was lower than 94,000 $\mu\text{S}/\text{cm}$ when the specimens were collected. Nevertheless, it is possible that *T. minutipalpus* handles water with a conductivity of more than 40,000 $\mu\text{S}/\text{cm}$ as recorded by Verschuren (1997) for Lake Chitu. Adults of the new species were collected close to the non-saline Lake Baringo ($\leq 1,200 \mu\text{S}/\text{cm}$) in 1983. According to Verschuren (1997, pers. comm.) it is not likely that the immature stages live in water with conductivity much below 19,000 $\mu\text{S}/\text{cm}$. Around Lake Baringo there are several saline springs (Källquist 1987), and it could well be that the immatures of the adults caught at Lake Baringo live in saline pools close to the lake, and not in the lake itself.

T. minutipalpus is known to have mass occurrences at Lake Bogoria, Lake Elmenteita and Lake Manyara, and is a potential nuisance species.

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