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FROM THE HAWAIIAN ISLANDS
(INSECTA: ARCHAEOGNATHA: MACHILIDAE)

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BERNICE P. BISHOP MUSEUM

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**A NEW *NEOMACHILIS* SPECIES
FROM THE HAWAIIAN ISLANDS
(INSECTA: ARCHAEOGNATHA: MACHILIDAE)**

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ABSTRACT. The genus *Neomachilis* is redescribed and subdivided into the subgenera *Neomachilis* s.str. and *Nesochilis* n.subg. The species *Machilis heteropus* and *Machilis perkinsi* from the Hawaiian Islands are placed in *Neomachilis* (*Nesochilis*) with the type species *N. insularis*, n. sp. The description of *N. perkinsi* from Kauai is supplemented, *Neomachilis* (*Nesochilis*) *insularis*, n. sp. from Oahu is subdivided into 3 subspecies: *N. i. insularis*, *N. i. setulifera*, n. ssp. and *N. i. asetulifera*, n. ssp. The description of *Neomachilis* (*N.*) *halophila* from the American mainland is supplemented. The distribution of the genus and the relationships between the species are briefly discussed.

INTRODUCTION

Silvestri in 1904 described 2 species of Machilidae from the Hawaiian Islands: *Machilis heteropus* based on material from Kauai, Oahu, Lanai, Maui and Hawaii, and *Machilis perkinsi*, based on material from Kauai. In 1948 Zimmerman transferred the 2 species, without stating reasons, to the genus *Machiloides* (family Meinertellidae). Thus, the affiliation of the 2 species to genus and family remained unclear. In connection with the description of some species of Archaeognatha from the USA and Mexico by the author, the question of the taxonomic position of the Hawaiian species arose.

Examination of the material of Machilidae from the Bishop Museum, Honolulu, revealed that all specimens belonged to the genus *Neomachilis* Silvestri, 1911 and to a new subgenus (*Nesochilis*). The genotypic and hitherto only species of this genus, *N. halophila* Silvestri, 1911, is restricted to the Pacific coast of California. Apart from the 2 species described by Silvestri from the Hawaiian Is, at least 1 further species exists there, the description of which is presented here. The strong and markedly differing sexual dimorphism in 2 of the Hawaiian species leads one to believe that further collecting will produce even more species.

ABBREVIATIONS

- BMNH = The Natural History Museum, London [formerly British Museum (Natural History)].
BPBM = Bernice P. Bishop Museum, Honolulu, Hawaii.
CASC = California Academy of Sciences, San Francisco.
IEA = Istituto di Entomologia Agraria, Portici/Napoli, Italy.
LACM = Los Angeles County Museum of Natural History, Los Angeles, California.

SYSTEMATICS

Neomachilis Silvestri

Neomachilis Silvestri, 1911: 341. Type species: *N. halophilus* Silvestri, 1911: 342.

Redescription of genus

Medium-sized animals (adult ca. 8–15 mm); flagellum of antenna without scales; body, head, scapus, pedicellus and other appendages at least partially scaled, pattern formed by scales unknown; hypodermal pigment weakly developed, detectable mainly on head, maxillary palps, labium, and tarsi.

Head: Eyes somewhat wider than long; width of eyes: width of head = 0.7–0.8; lateral ocelli sublateral to eyes, subrectangular; frons weakly to obviously protruded.

Antennae: Longer or somewhat shorter than body; scales on scapus and pedicellus present; flagellum without scales and rosette-like sense organs, sensory rods present.

Mandible: Obviously 4-toothed apically.

Maxillary palps: Processus triangularis on article 1 generally strikingly small and only slightly projecting; form of the palps and differentiation of the setae little to strongly sexually dimorphic.

Labium: Submentum laterally obviously protruded against mentum; articles 2 and 3 of palps weakly to strongly sexually dimorphic, slightly to obviously broadened apically; sensory cones on article 3 with small lateral setae, base not ringed.

Legs: II and III with coxal stylets; ventral side of all legs with scattered very long pointed setae, generally also with spinelike setae.

Urosternites: II–IX with stylets, I–VII each with 1 pair of coxal vesicles; sternite I rounded caudad; median angle of sternites II–VII ranging from less than 90° to well over 90° length of terminal spines of stylets II–VIII generally about 1/3 stylet length; coxites without spinelike setae, I–VII with fields of scattered setae.

Penis and parameres: Penis shorter than coxites IX, aperture apical, without specialized setae; parameres IX somewhat longer to obviously shorter than penis; parameres VIII and IX with at least 6 articles.

Ovipositor: Exceeding the ends of stylets IX, slender, of primary type, with more than 50 articles; gonapophyses with longer setae only on the distal 1/3–1/2, terminal spine VIII and IX longer than the 2–3 distal articles; distal articles with up to 6 small sensory rods; articles of the distal part each with 4–10 setae.

Caudal appendages: With hyaline spinelike setae, without hairlike scales; cercus with 2 terminal spines, 1 of these can be very small.

Discussion. The genus was hitherto represented only by the species *N. halophila*. The examination of a paratype specimen of this species and of specimens from the Hawaiian Is, which belong to this genus made a redescription of the genus necessary. The genus can be separated from the other genera of Machilidae by the following characters: Flagellum of antenna without scales; lateral ocelli subrectangular and sublateral to the eyes; mandible with 4 teeth; processus triangularis on article 1 of the maxillary palp small; distal article of the labial palp not or weakly broadened apically; legs II and III with coxal stylets; urosternites I–VII each with 1 pair of coxal vesicles; median angle of urosternites II–VII ranging from less than 90° to more than 90°; penis shorter than coxites IX, with apical aperture, without specialized setae; articulated parameres on coxites VIII and IX; ovipositor of primary type, long, with more than 50 articles, macrochaetae only present on the distal 1/3–1/2.

Within the genus the diversity of sexual dimorphic characters on maxillary palps, labial palps and legs I is remarkably high. The male maxillary palp of *N. perkinsi* is one of the most remarkable structures within the recent Archaeognatha.

The colonization of the purely volcanic Hawaiian Islands by Machilidae probably proceeded from the North American continent. This supposition is supported by the fact that

the only known continental species of *Neomachilis* is halophilic and apparently restricted to the Pacific coast of North America. Taking into account the resistance of the eggs and their long period of development, a propagation by water currents (e.g., by driftwood) seems the most probable way (see Sturm & Bach 1988: 282, 283).

By the addition of the taxa described here from the Hawaiian Islands, the genus now comprises 4 species. Because of certain differences between the continental and the island species, they are placed in 2 subgenera (see also under *Neomachilis* sp. below).

Neomachilis (Neomachilis) Silvestri, s. str.

Diagnosis

Dorsal portion of frons obviously protruded; antennae shorter than body or about as long; scapus at most 2.4 x as long as wide; article 7 of ♂ maxillary palp apically rounded with many setulae on inner face; article 2 of labial palp in ♀ distally or medially slightly clubbed; in the ♂ outer border strongly convex with some very long fine setae and many medium sized erect stout setae; one of the apical spines of cercus of normal size, the other from very small to nearly the same length.

The subgenus currently includes only the species *N. (N.) halophila*, which is recorded from the Pacific coast of the U.S. (see complementary description below and under *Neomachilis* sp. below).

Neomachilis (N.) halophila Silvestri

Figs. 1–22

Neomachilis (N.) halophila Silvestri, 1911: 342.

Complementary description

Scales light to black; color pattern varying, hypodermal pigment in all specimens from IEA strongly bleached; in other ♀ on some parts of head and appendages obvious, in ♂ relatively weak.

Head (Figs. 1, 2, 12): Width of eyes: width of head = 0.75–0.80; eyes in front view somewhat wider than long (length: width = 0.75–0.90); line of contact: length of eyes ca. 0.40–0.65; lateral ocelli sublateral to the eyes, subrectangular, ratio inner distance: width of both eyes = 0.30–0.35; frons dorsally distinctly protruded, scaled; labrum with some long straight setae.

Antennae (Figs. 3, 14): Flagellum uniformly light brown (only jointlets between chains lighter); scapus ca. 2 x as long as broad (up to 2.4 x); pedicellus fairly cylindrical, ratio width: length = 1.0–1.4.

Maxillary palps (Figs. 4, 15, 16): All articles scaled; without specialized setae; ratio of lengths of articles 7: 6: 5: 4 = 0.60–0.80: 1.00: 1.10–1.30: 0.85–1.00 (♀) / 1.20 (♂); articles 5–7 with hyaline spines: 9/12/4 respectively (♀); in ♂ number and length of hyaline spines on articles 5–7 reduced: 4/5–6/1, and on ventral side of all articles (on article 5 in reduced number) many short strong nearly vertically erected setae and some ciliar ones present, apex of article 7 rounded.

Labium (Figs. 5, 6, 17, 18): Submentum laterally rounded; sensory cones on article 3 laterally with some small straight setae, base not ringed; article 2 of ♀ palp distally or medially slightly clubbed; article 2 of ♂ laterally distinctly protruded, margin of protrusion with many short, strong erect setae and some ciliar ones.

Legs (Figs. 19, 20): Length of stylets = 0.6–0.8 x femur length; femur I ca. 1.2 x broader than femora II and III, all tarsomeres ventrally with hyaline(?) spinelike setae, transitional setae and some very long pointed setae.

Urosternites: Median angle of sternites increasing from II to VII (II+III ca. 80°, IV+V ca. 90°, VI–VII ca. 95°–130°; coxites with some scattered setae, without spinelike setae; apical spines of stylets longer than 1/4 stylet length, surrounded by some strong setae which can reach 3/4 length of apical spine; length

coxite: length stylet: length of terminal spine for II = 1.50–1.80: 1.00: 0.30–0.45, ratio for V = 2.1–2.5: 1.0: 0.4–0.6, ratio for VIII = 1.3(1.4): 1.0: 0.4, ratio for IX = 1.70–1.80 (♀) / 1.40 (♂): 1.00: 0.25–0.30.

Ovipositor (Fig. 7–10): Long and slender, surpassing stylets IX, with more than 50 articles, of primary type, longer setae restricted to the distal 1/3; some of the macrochaetae nearly vertically projecting or oriented proximad; terminal spines longer than at least 2 terminal articles; gonapophyses VIII with 2–6 medium sized to long setae on the 10 distal articles and 0–6 sensory rods per article; gonapophyses IX with up to 2 long setae per article.

Penis and parameres (Figs. 21, 22): Length of penis about 3/4 of length of coxite IX, aperture apical, specialized setae absent; parameres on abdominal segments VIII+IX present, with tubular setae, VIII with 1+7 articles, IX with 1+8 and about as long as penis.

Caudal appendages (Fig. 11): With hyaline spinelike setae; apex of cercus with a large straight terminal spine and a small lateral one.

Material examined: 5 paratypes ♀, 8.5–11.0 mm in alcohol: 1 ♀ 11 mm mounted in Euparal, USA, Calif., Monterey, spiaggia (beach), F. Silvestri leg., IX.1908 (IEA). ♀ 7 mm, Calif., San Francisco, Golden Gate Park, 26.VI.1964, P. Rubtsoff leg. (CASC). 2 ♀ 11 mm + ♂ 9 mm Calif., San Francisco, Baker Beach, on bark of *Eucalyptus* trees, 25.IX.1992, H. Sturm leg. (CASC). ♂ 7.5 mm Calif. Monterey Co., Point Lobos near beach; 20.II.1971, A.J. Ferreira leg. (CASC). ♀ 8.5 mm, Calif., Marin Co., near Olema, 28.III.1960, D.Q. Cavagnaro leg. (CASC). 3 ♀ 8–10 mm, Calif., Ventura Co., Pt. Mugu Naval Air Station, 6–20.IX.1981, C.D. Nagano & J.N. Hogue leg. (LACM).

Etymology. Since *Machilis* is a feminine noun, the name *Neomachilis* also has to be feminine; hence the usage of *N. halophila*.

Discussion. The only species of the subgenus can be separated from the other known species of the genus by the special chaetotaxy and form of article 2 of the male labial palp and by the other differential subgeneric characters. The species “is common under rocks and in crevices in the high intertidal zone on California beaches” (Benedetti 1973 after W. Evans pers. comm.). Perhaps further collecting on the Pacific coast of North America and Mexico will make necessary the description of more species of the subgenus. For example, 2 of the specimens mentioned above (♀ Golden Gate Park, ♀ Olema) are lacking the spinelike setae on the tarsomeres, which are present on the paratypes. At least in the San Francisco area ♂♂ are distinctly rarer than ♀♀.

Nesochilis Sturm, n. subg.

Type species: *Neomachilis (Nesochilis) insularis*, n.sp.

Diagnosis

Frons slightly and uniformly protruded; Antennae longer than body; scapus more than 2.4 x as long as broad; article 7 of maxillary palp ♂ more or less pointed, without setulae; article 2 of labial palp ♀ not clubbed, article 2 of ♂ without strong protrusion on the outer border; gonapophyses VIII ♀ on the 10 distal articles with 1–10 medium sized or long bristles per article and 2–6 short and stout ones; cercus with 2 terminal spines of nearly equal size (Fig. 64).

The subgenus comprises 3 species, which are restricted to the Hawaiian Is (*Neomachilis (Nesochilis) heteropus* (Silvestri, 1904), **n. comb.**; *Neomachilis (Nesochilis) perkinsi* (Silvestri, 1904), **n. comb.**; see redescription in this article; *Neomachilis (Nesochilis) insularis*, **n. sp.** with 3 subspecies—see descriptions below). It is the only taxon of Archacognatha recorded from this area.

Etymology: *Neso-* derives from the Greek *nesos* = island + *-chilis* from *Machilis*. The name

alludes to the fact that all known species of the subgenus are restricted to the Hawaiian Islands.

Neomachilis (Nesochilis) heteropus (Silvestri), **n. comb.**

Machilis heteropus Silvestri, 1904: 295, 296.

Machiloidea heteropus (Silvestri, 1904): Zimmerman 1948: 32.

The specimens determined by Silvestri as "*Machilis heteropus*" come from very different localities (Kauai, Oahu, Lanai, Maui, Hawaii). It is probable that they belong to different species. Unfortunately, the ♂ type specimen of this species could not be found in either IEA or BMNH. The 4 ♀ ♀ from Silvestri's "*M. heteropus*" material (IEA), which I was able to examine, were in a bad condition or non-adults and did not allow a detailed comparison. In the BMNH the following material is deposited under "*Machilis heteropus*": HAWAII, Olaa, 2000 ft., XI.1896, ♀ ca. 8.5 mm, 2 immature specimens ca. 5 mm, "cotypi"; OAHU, Waianae Mts, 2 ♂, ca. 9.0 and 9.5 mm, IV.1892, Perkins. On the basis of the present knowledge the ♀ from Olaa can only be determined as *Neomachilis (Nesochilis)* sp. The ♂ ♂ from the Waianae Mts do not possess the special form of tibia I nor the characteristic field of very short setae on this article and can not be treated as this species

The species *N. heteropus* can be easily recognized by a well limited field of very short setae on the extremely broadened tibia I of males. A comparable sensory field on tibia cannot be found in any other species of Machiloidea.

Silvestri (1904) mentions the following localities for this (??) species: KAUAI, Koholuamano, 1895, Perkins; OAHU, Waianae Mts Nuuanu Valley, Perkins, IV.1892; LANAI, 2000 ft., Perkins, I.1894; MAUI, Haleakala, 5000 ft., Perkins, V.1896; HAWAII, Olaa, 2000 ft.

Neomachilis (Nesochilis) perkinsi (Silvestri), **n. comb.**

Figs. 23–34

Machilis perkinsi Silvestri, 1904: 294, 295.

Machiloidea perkinsi (Silvestri, 1904): Zimmerman, 1948: 32.

Redescription

Only the more important differential characters are mentioned here in relation to the other species, especially to *N.i. insularis*. Hypodermal pigment apparently largely bleached.

Head (Figs. 23, 24): Width of eyes: width of head = 0.7–0.8; width of lateral ocellus: distance of median borders of lateral ocelli = 0.4–0.6.

Antennae (Fig. 25): Length of scapus: width = 2.4–3.0; flagellum not annulated by pigment.

Maxillary palps (Fig. 26–30): Processus triangularis on article 1 very small; length of articles 7: 6: 5: 4 = 0.7–0.8: 1.0: 0.8–0.9: 0.7–0.8; number of spines on articles 7/6/5 = 14–15/14/4–5 (♂); 12–16/7–8/– (♀); form of articles and differentiation of setae without special features in ♀, in ♂ extremely specialized: all articles in lateral view distinctly broader than in the ♀, especially 6+7; 5+7 on the median side with many short to medium-sized curved setae, 6 also with longer setae which are inclined to the central part of article, forming various tufts; median side of article 2 with a patch of setae of various lengths and orientations; ventral border with a band of setulalike setae; setae of the outer side without special features.

Labium (Figs. 31, 32): Article 3 of palp not or weakly broadened, in the ♂ distinctly longer than in the ♀ and with some long erect setae.

Legs (Figs. 33, 34): Article 2 of tarsus I with spinelike setae and transitional setae, II and III without spinelike setae; tibiae and tarsi without setulae.

Urosternites: Length terminal spine: length stylet: length of coxite for II = 0.4–0.5 : 1.0: 1.2–1.4; for V

= 0.5–0.7: 1.0: 2.0–2.2; for VIII = 0.6: 1.0: 1.2–1.3 (♀) / 1.7–1.8 (♂); for IX = 0.3–0.4: 1.0: 1.3–1.4 (♂) / 1.7 (♀).

Ovipositor (Figs. 35–38): Distal 1/2 with longer setae; gonapophyses VIII apart from the macrochaetae with up to 7 sensory rods per article on the distal articles.

Material Examined: ♂ 10.5 mm lectoparatype, ♀ 10.5 mm, ♂ pre-adult; HAWAII, KAUAI, Alakai Swamp; 8.VII.1937, E.C. Zimmerman leg. (BPBM); ♂ 15 mm “type”, KAUAI, Mt Waimea, 4000 ft., Perkins leg., 1894 (BMNH).

Discussion. Due to the extremely sexually dimorphic differentiation of the maxillary palps, this species cannot be confused with other species. The original description of Silvestri is based on a ♂ (body length 15 mm, length of antenna 20 mm; Hawaii, Kauai, Mt Waimea, 4000 ft; 1894, Perkins leg.). Unfortunately the type could not be found in IEA. A ♂ from the same locality designated as “Typus” is deposited in the BMNH but it is not mounted and probably not the specimen figured in the original description of Silvestri (1904). Nearly all characteristics of the BMNH specimen, especially those of maxillary and labial palps, correspond very well with the redescription given here. Only the lateral ocelli are broader (ratio width of lateral ocellus: distance of median borders of lateral ocelli ca. 0.8), a characteristic which cannot constitute a new species. The ♀ is described here for the first time. For the determination of the ♀ the lack of spinelike setae on tarsi II and III, the ratios of article length on the maxillary palps and the higher number of short setae on the distal articles of gonapophyses VIII can be used. The similarity of the ♀ with those of other species of the subgenus is another indication that the descriptions of new species of this genus must be based on both sexes.

Neomachilis (Nesochilis) insularis Sturm, n. sp.

Figs. 39–62, 68

Diagnosis

Adult animals of medium size (9–13 mm); pattern formed by scales unknown; ground color of body yellowish; hypodermal pigment faintly developed and often indistinctly limited. For the determination of ratios, 5 specimens were measured.

Head (Figs. 39, 63): Frons slightly and uniformly protruded, scaled; clypeus with some longer setae; above eyes and near bases of antennae with patches of hypodermal pigment; eyes of medium size (width of eyes: width of head = 0.70–0.75), wider than long (length: width = 0.75–0.85), in fixed animals uniformly black, line of contact about 1/2 length of eyes; lateral ocelli light brown, not always distinctly limited, longish oval to subrectangular, sublateral to eyes, distance between inner borders clearly more than width of 1 ocellus.

Antennae (Figs. 41–43): Unbroken longer than body (up to 18 mm); scapus long (length: width = 2.1–2.6); pedicellus distinctly longer than wide; flagellum without scales, distal half annulated reddish-brown and pale, chains with up to 20 articles, without rosettelike sense organs, some articles with sensory rods.

Maxillary palps (Figs. 44, 64–69): Pigment weakly developed and indistinctly limited; processus triangularis on article 1 relatively small; length of articles 7: 6: 5: 4 = 0.9–1.0: 1.0: 1.1–1.2: 0.9–1.2: 0.7–0.9; number of hyaline spines on articles 7/6/5 = 19–23/11–16/3–4; in ♀ without specialized setae; in ♂ articles 4+5 distinctly clubbed distally, with more and longer tactile hairs, dorsal (outer) 1/2 of both articles with many setulae and some long bristles, ventral 1/2 (inner side) densely scaled (Fig. 57).

Labium (Figs. 45, 46): Mentum distolaterad obviously protruded; article 3 of palp slightly to distinctly (♂) broadened.

Legs (Figs. 47–50): Length of coxal stylets ca. 0.65–0.90 x length of femur; hypodermal pigment faintly developed; tarsomeres 1/2/3 with spinelike setae ventrally: 2–9/13–21/4–8 (♂); 2–5/8–12/1–4 (♀); Tibia I ♂ with many setulae, which spread also to tarsus 2 (Fig. 48).

Urosteronites (Figs. 51–55): Terminal spines of stylets hyaline, on V–VIII at least 1/2 as long as stylets; length terminal spines: length stylet: length coxite for II = 0.3–0.4: 1.0: 1.2–1.3 (♂)/ 1.5–1.8 (♀), for V = 0.5–0.7: 1.0: 1.7–2.0 (♂)/ 2.0–2.6 (♀); for VIII = 0.5–0.6: 1.0: 1.3–1.7; for IX = 0.3–0.4: 1.0: 1.1–1.2 (♂)/ 1.3–1.4 (♀).

Penis and parameres (Figs. 56, 57): Parameres VIII and IX each with 1+7–9 articles, glands and grooved setae well developed; penis somewhat shorter than parameres IX or of equal length, aperture apical, without specialized setae.

Ovipositor (Figs. 58–62): Of primary type, long and slender, generally exceeding terminal spines of stylets IX, with ca. 60 articles, terminal spines distinctly longer than the 2–3 distal articles; distal half of gonapophyses VIII with cross-rows of 5–6 setae per article, at least 1 seta distinctly longer, macrochaetae restricted to the distal 1/3–1/2.

Caudal appendages (Fig. 60): Cerci up to 5 mm long, apex with 2 terminal spines of fairly equal size, with hyaline to yellowish spinelike setae and tactile setae, hairlike scales absent.

Material examined: Type ♂ 10.5 mm, allotype ♀ 10 mm, paratypes 2 ♀, 1 ♂; 3 immatures; HAWAII, OAHU, Mt Tantalus, 400 m, at night on bark; 5.XI.1963, J.C.Harrel & D.M.Tsuda leg. (BPBM).

Etymology: Refers to the fact that the species—in contrast to the genotypic species—is restricted to islands.

Discussion. *N. insularis* can be separated from *N. heteropus*, e.g., by the tibiae I of ♂♂, which are not distinctly broadened and do not possess a sensory field of specialized setae, by the short penis reaching at most the length of parameres IX. Because of the strongly different characters of ♂ maxillary palps, it can not be confused with *N. perkinsi*. It can be separated from *N. halophila* by the subgeneric characters.

Specimens from 2 other localities which are undoubtedly closely related to the nominate form show differences in some characters of the ♂ maxillary palp. They are described here as new subspecies:

Nesomachilis (Nesochilis) insularis setulifera Sturm, n. ssp.

Figs. 64–66

Diagnosis

Articles 3–5 of ♂ maxillary palp distinctly more thickened than in ♀; greater part of the median side of articles 3–6 covered by mostly distally directed setulae; maxillary palps of ♀ without setulae and with fewer tactile setae.

Material examined: Type ♂ 10.5 mm, allotype ♀ 12 mm, OAHU, Waianae Kai Valley, 650 m, in rotting *Hibiscus arnottianus*; 13.VII.1974, F.G.Howarth leg. (BPBM).

Etymology: The subspecies name refers to the abundance of setulae (*setula*, Latin = little seta, +*ferre*, Latin = to bear) on articles 4–7 of the ♂ maxillary palps.

Neomachilis (Nesochilis) insularis asetulifera Sturm, n. ssp.

Fig. 67

Diagnosis

The ♂ of this subspecies lacks setulae or setula-like setae on maxillary palps and on legs I. Considering that the penis and parameres are fully developed, it is very probable that the sexual dimorphic characters on maxillary palps and legs I have also reached their full differentiation.

Material examined: Type ♂ 8 mm, allotype ♀ 13 mm; MOLOKAI, Waiakuilani Gulch, 1100 m; 25.I.1973, W.C. Gagné leg. (BPBM).

Etymology: The name refers to the lack of setulae on the maxillary palps and the legs I of ♂ (see above).

Discussion on the subspecies

In the current state of Archaeognatha taxonomy it seems appropriate to give these distinctive populations the rank of subspecies. Further examination based on more extensive material is required before this classification can be substantiated or revised.

Neomachilis sp.

The specimen examined is placed in the genus *Neomachilis* on the basis of the following characteristics: flagellum of antenna without scales; mandible obviously 4-toothed; coxal stylets on legs II+III present; median angle of abdominal sternites II–VII ranging from less than 90° to well over 90°; abdominal coxites I–VII each with 1 pair of coxal vesicles; penis shorter than coxites IX, with apical aperture.

However, the specimen differs from all the known species of the genus in the following characteristics: distance of median margins of lateral ocelli relatively small (= 0.14 x width of head); processus triangularis on article 1 of maxillary palp big and pointed, articles 2–4 with ciliar setae ventrally; scapus of antenna short and broad (ratio length: width = 1.4–1.5); terminal spines of abdominal stylets shorter than 1/4 stylet length.

The species is not described in detail for the following reasons: lateral ocelli strongly bleached, their form not clearly visible; perhaps the specimen has not developed all its sexual characteristics (body length 6 mm !); the corresponding ♀ has not yet been found.

This specimen implies that at least a second species of *Neomachilis*, which must be placed in a separate subgenus, exists on the American mainland.

Material examined: ♂ 6 mm; USA., CALIF., Imperial Co., Ocotillo Wells, Highway 78 nr., 50 ft., 12.II.1983, B. Hebart leg. (LACM).

Other material examined

The following specimens clearly belong to this subgenus. They could not be referred to the known species or described as new species as adult specimens of ♂♂ and ♀♀ from the same locality are not available. In particular in this genus, the description of new taxa must include the sexually dimorphic characters. 2 ♀ 10 + 6.5 mm, HAWAIIAN IS., KAUAI, Mts Waimea, 3000 ft; V.1894, Perkins leg., Silvestri det. (as *M. heteropus*); 4 ♀ 5.5–9.0 mm, same data except Mts Koele, I.1894; 3 ♀ 11–12 mm, Alakai Swamp, Halepaakai, 1385 m, 5.VII.1985, S.L. Montgomery leg.; 2 ♀ 7.2 and 13 mm, OAHU, Waianae Mts, Honouliuli For. Res., Kaluoa Gulch, at light; 10.X.1976, F.G. Howarth leg.; ♂ 11.5 mm, OAHU, Tantalus, 29.X.1960, T.Maa leg.; 1 ♀ 9.5 mm, 2 ♂ immatures, OAHU, Waianae Kai, 600 m, on *Cibotium*; 13.I.1974, W.C. Gagné leg.

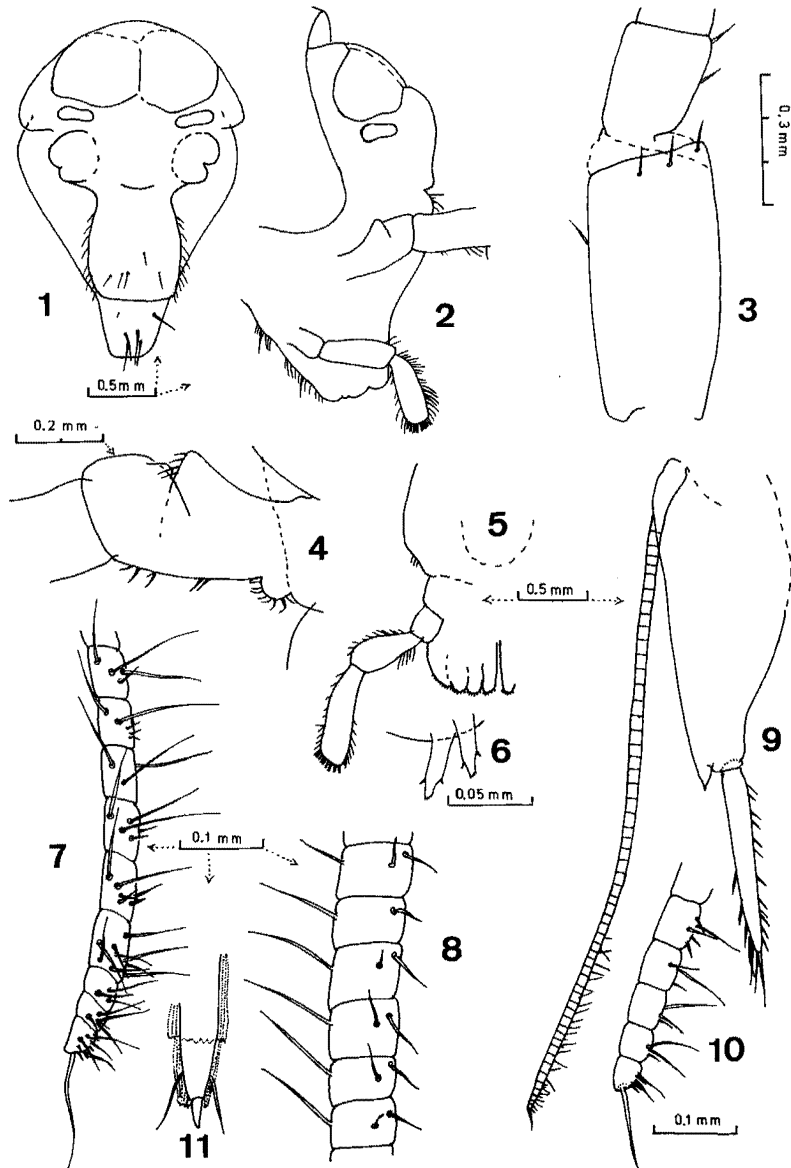
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My thanks are due to Dr. G.M. Nishida from the Bishop Museum Honolulu for the loan of 6 specimens of "*Machilis*" *heteropus*, determined by Silvestri, and of 25 other specimens of Machilidae, which were collected in the years 1937–1985 on the Hawaiian Is; to Prof. Tremblay from the Istituto di Entomologia Agraria, Portici/Napoli for the loan of 5 paratypes (♀) from Silvestri's material of *N. halophila*; to Dr. S. Lewis from the Natural History Museum for the loan of 5 "cotypi" (♂♀) of "*Machilis*" *heteropus* and the "type" of "*M.*"

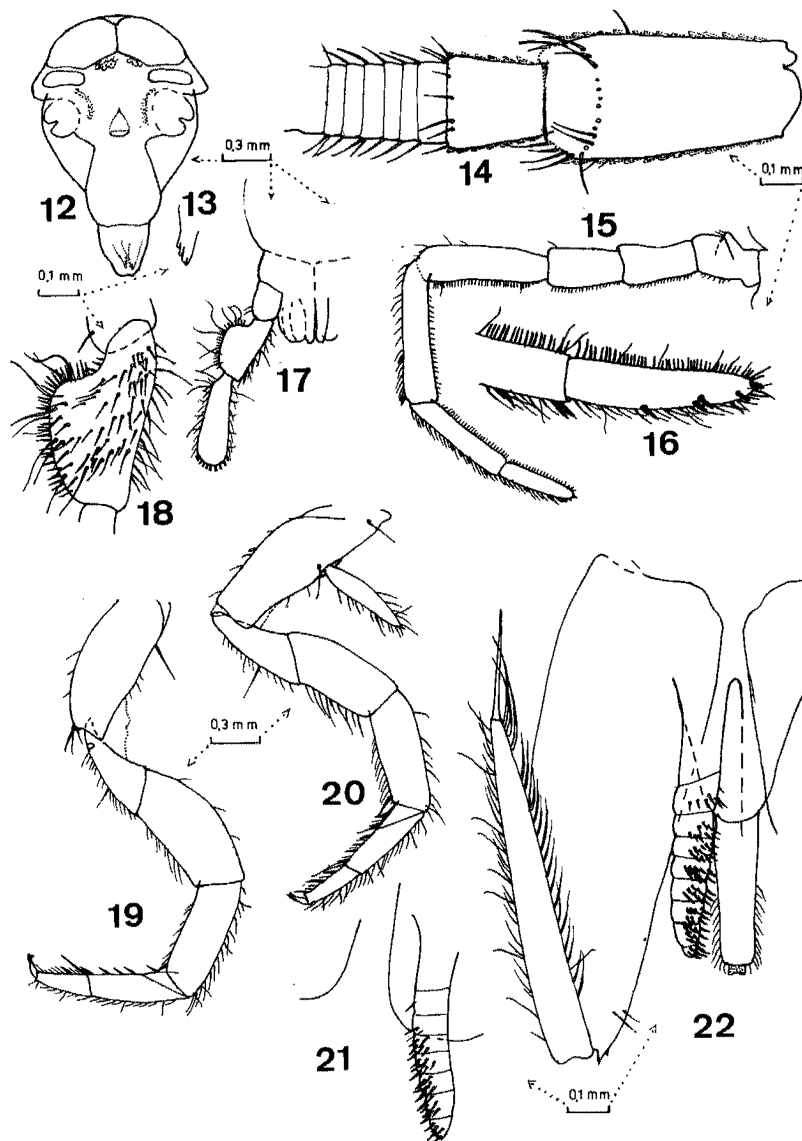
perkinsi; to Dr. V.F. Lee of the California Academy of Sciences and to Dr. C. Hogue from the Los Angeles County Museum for the loan of 5 *Neomachilis* specimens (4♀, 1♂) from California. To K. Bond (Cork) I am indebted for the revision of the English version of the manuscript.

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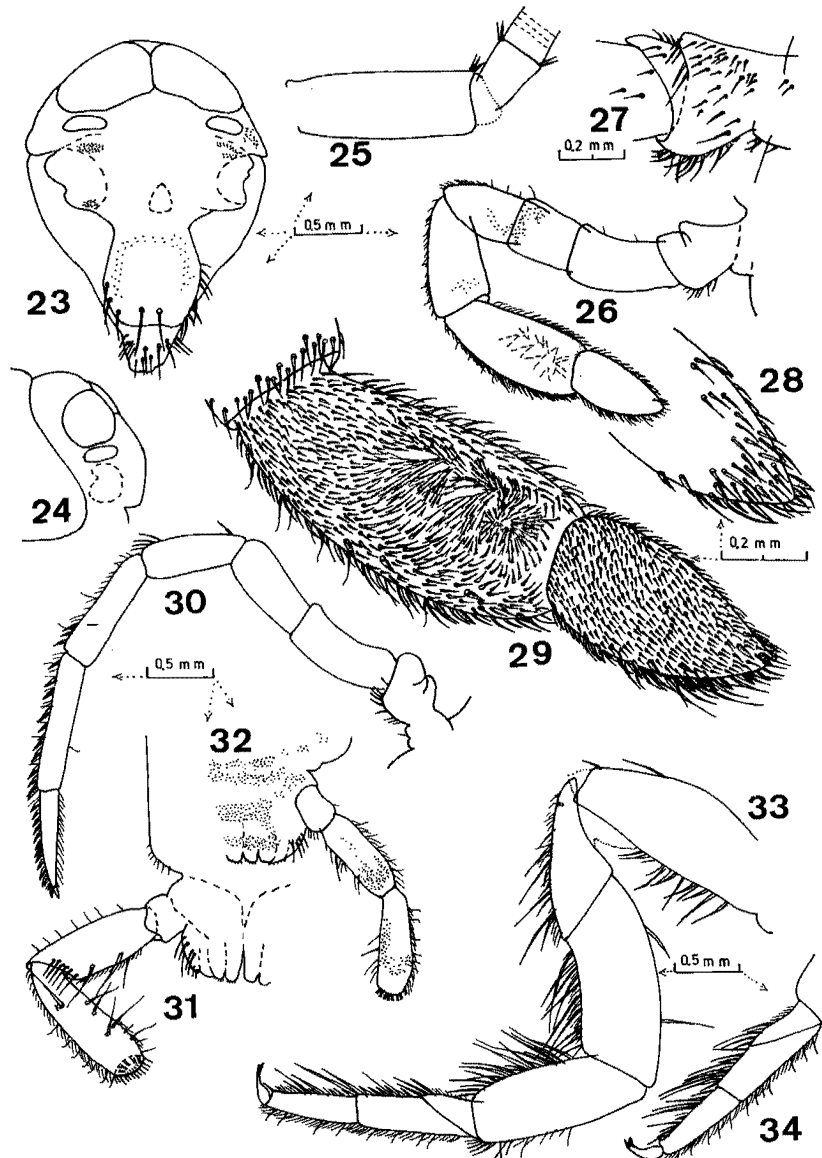
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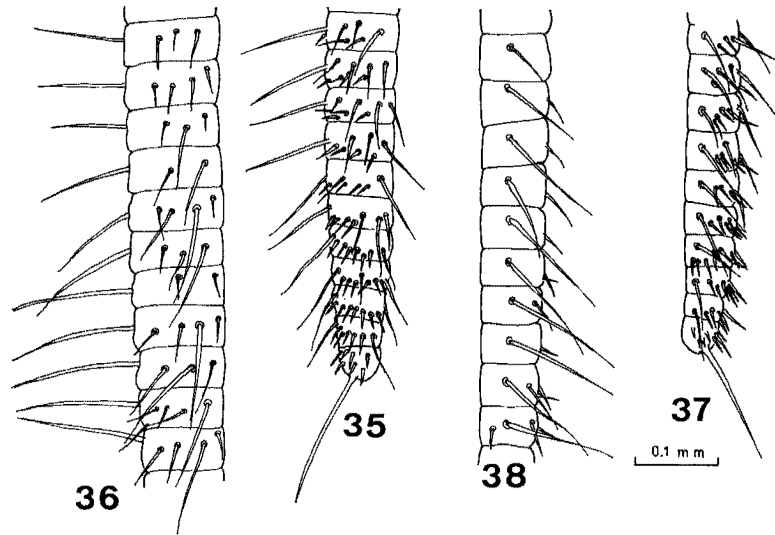
Figs. 1-11. (1-10) *Neomachilis halophila* Silvestri, paratype ♀ 10.5 mm. (1) head, frontal view; (2) head, lateral view; (3) antenna, scapus and pedicellus; (4) maxillary palp, basal portion, lateral view; (5) labial palp with part of labium; (6) sensory cones of labial palp 3, ventral view; (7-8) gonapophysis VIII, ventral view; (7) distal part; (8) articles 14-19 from apex; (9) coxite IX with gonapophysis; (10) gonapophysis IX, distal portion, ventral view; (11) cf. *N. halophila*, ♀ 8.5 mm, apex of cercus with terminal spines.



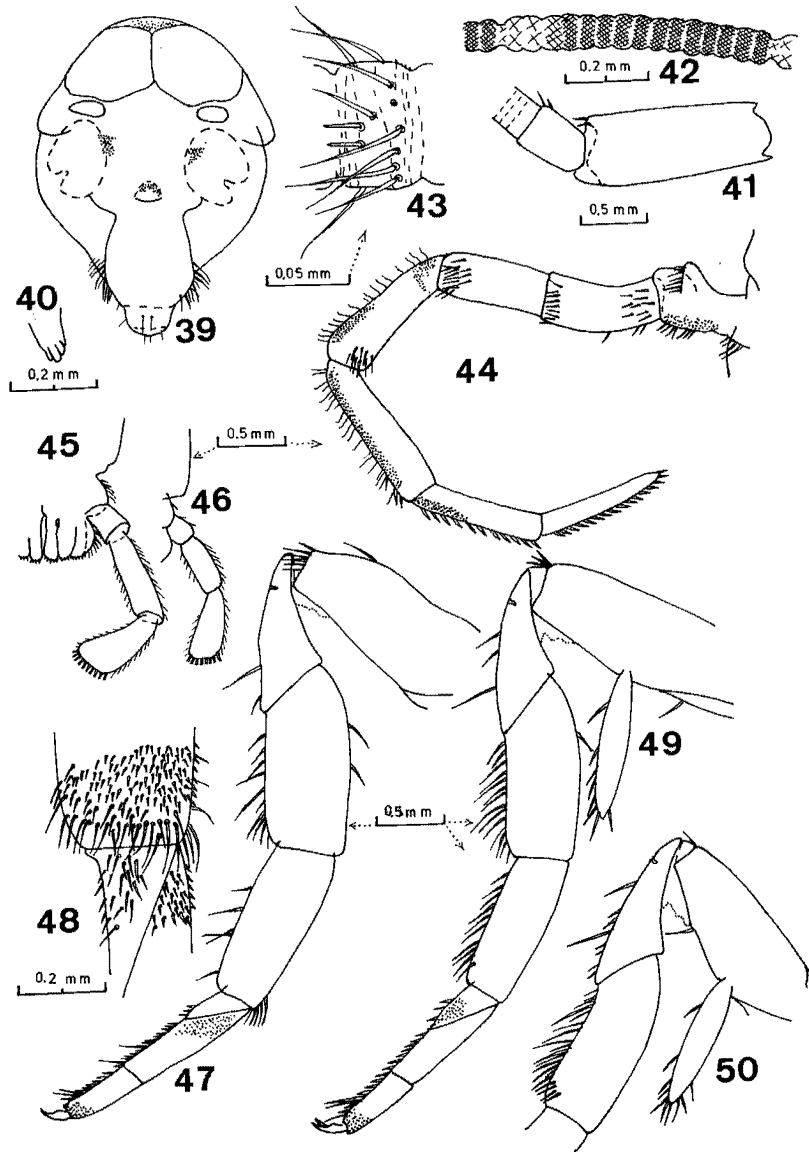
Figs. 12-22. *Neomachilis halophila* Silvestri, ♂ 7.5 mm: (12) head, frontal view; (13) apex of mandibula; (14) antenna, scapus and pedicellus; (15+16) maxillary palp, lateral view; (15) articles 1-7; (16) articles 6+7; (17) labial palp with part of labium, ventral view; (18) article 2 of labial palp, ventral view; (19) leg I; (20) leg II; (21) paramere VIII, ventral view; (22) coxite IX with penis and paramere IX, ventral view.



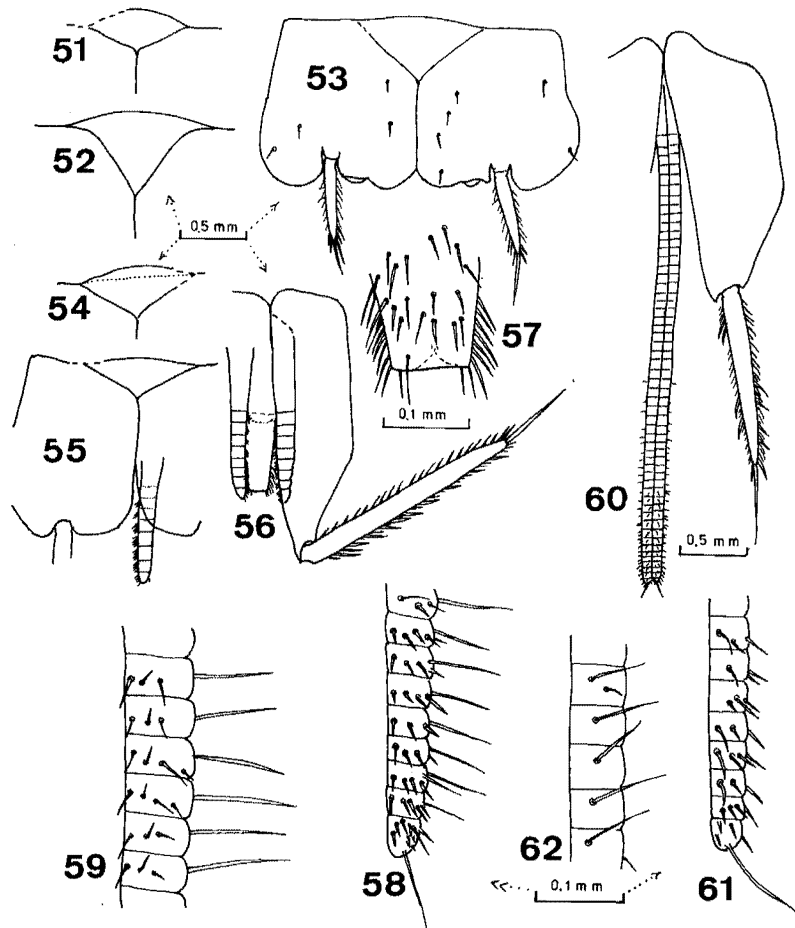
Figs. 23–34. *Neomachilis perkinsi* (Silvestri) ♂ 10.5 mm, ♀ 10.5 mm: (23) head ♂ frontal view; (24) head ♀, dorsal portion, lateral view; (25) antenna ♂, basal portion; (26–29) maxillary palp ♂, lateral view; (26) inner side; (27) article 1; (28) apex of article 7, outer side; (29) articles 6+7, inner side; (30) maxillary palp ♀, lateral view; (31–32) labial palp with part of labium, ventral view; (31) ♂; (32) ♀; (33) leg I ♂; (34) tarsomeres leg II ♂.



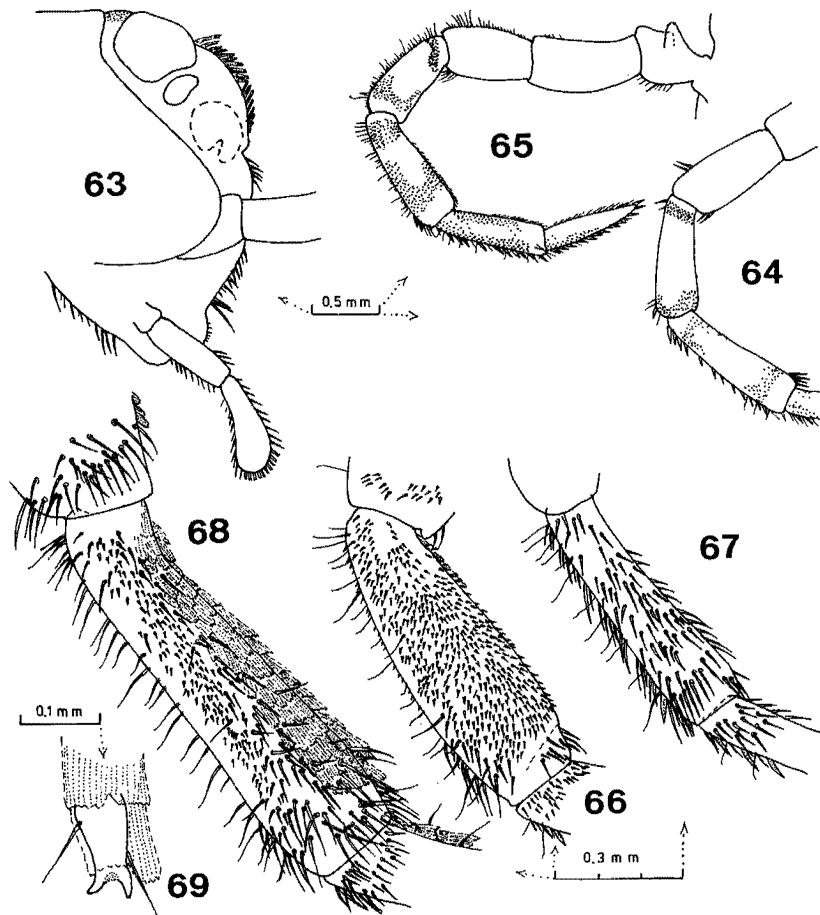
Figs. 35-38. *Neomachilis perkinsi* (Silvestri) ♀ 10.5 mm, gonapophyses: (35) distal part VIII; (36) articles 25-35 from distal; (37) distal part IX; (38) articles 17-26 from distal.



Figs. 39-50. *Neomachilis i. insularis*, n.sp., ♂ 10.5 mm, ♀ 10.5 mm. (39) head ♂, frontal view; (40) apex mandible ♂, frontal view; (41-43) antenna ♂; (41) basal portion; (42) distal chain of flagellum; (43) article of distal chain, S = sensory rod; (44) maxillary palp ♂ lateral view; (45-46) labial palp, ventral view; (45) ♂; (46) ♀; (47) leg I ♂; (48) transition tibia-tarsus I ♂ with setulae; (49) leg II ♂; (50) leg III ♂, basal portion.



Figs. 51–62. *Neomachilis i. insularis*, n.sp., ♂ 10.5 mm, ♀ 10.5 mm. (51) sternite I ♂, ventral view; (52) sternite III ♂; (53) urosternite V ♂; (54) sternite VI ♂; (55) urosternite VIII with paramere; (56) coxite IX with penis and parameres IX, ventral view; (57) apex of penis, ventral view; (58–59) gonapophysis VIII ♀, ventral view; (58) distal portion; (59) articles 19–24 from distal; (60) gonapophyses IX ♀ with coxite IX, ventral view; (61–62) gonapophysis IX ♀, ventral view; (61) distal portion; (62) articles 16–20 from distal.



Figs. 63–69. *Neomachilis insularis*: (63–66) *N.i. setulifera*, n. ssp., ♀ 12 mm, ♂ 10.5 mm; (63) head ♀, lateral view; (64–66) maxillary palp, lateral view, outer side; (64) articles 3–5 ♀; (65) ♂; (66) article 5 ♂ with setulae; (67) *N.i. asetulifera*, n. ssp. ♂ 8 mm, maxillary palp article 5, lateral view; (68) *N.i. insularis* ♂ 11 mm, maxillary palp article 5, lateral view; (69) *N.i. asetulifera*, n. ssp. ♀, apex of cercus with terminal spines.