

## A NEW *MACHAEROTHRIX* HAUPT FROM SRI LANKA WITH NOTES ON THE GENUS (HYMENOPTERA: POMPILIDAE: PEPSINAE: AGENIELLINI)

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**Abstract.**—A new taxon of *Machaerothrix* Haupt, *M. johni* Wahis, is described and illustrated from both sexes; descriptive notes are included for a melanistic form of *M. johni* restricted to the Sinharaja Rain Forest. A provisional key to the known species is provided. An English translation of the description of *M. ussuriensis* Lelej is given.

**Key Words:** Hymenoptera, Pompilidae (Ageniellini), *Machaerothrix*, Sri Lanka, new taxon

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Hermann Haupt (1938) described a new genus *Machaerothrix* based on the female of a new species *M. coactifrons* Haupt from Shanghai [Kioungsi]. The genus is easily recognized by the scattered, long, lanceolate setae on the upper front, vertex, pronotum, scutum and scutellum (Figs. 8–10). These modified setae are variable in length but are longer than other setae on the head and thorax. Haupt placed the genus in the tribe Calicurgini, subfamily Claveliinae. He noted that he had a second undescribed species from Canton [Guangzhou] collected by Mell that had yellow bands anteriorly on the gaster like those of a wasp, i.e., vespid.

Yasumatsu (1939) described the female *M. tsushimensis* from Tsushima Island, Japan with transverse pale yellow bands on the gastral terga. He gave a key to the two known species and added to or corrected Haupt's generic diagnosis.

Twenty years later Haupt (1959) returned to *Machaerothrix* (misspelled *Machaerotrix*), and transferred the genus to the Macromerinae (currently Ageniellini in Pepsinae). He also described *M. decorata* from Canton from the females collected by Mell

that he mentioned but did not describe in 1938. He included a key to *M. coactifrons* and *M. decorata*. Apparently he was unaware of *M. tsushimensis* Yasumatsu and it is possible that *M. decorata* is a synonym of *M. tsushimensis*. The unique type of *M. tsushimensis* is not currently available for study because many of Yasumatsu's specimens are scattered in small boxes in the collection in Kyushu University (O. Tadauchi, in litt., to RW).

More recently Lelej (1986) described both sexes of another species *M. ussuriensis* from the region of Primorskij krai, Russian Far East and gave some precise characters to distinguish the female from that of *M. coactifrons*.

Tsuneki (1988) described a male collected in Mindanao, Philippines as *Meragenia quadridentata*. The unique type is in the National Museum of Natural History, Smithsonian Institution, Washington, DC (USNM). It was studied by M. C. Day, The Natural History Museum, London (BMNH), and RW who recognized it as a male of *Machaerothrix*, **new combination**.

Males of *Machaerothrix* do not have



modified setae on the head and thorax as in the females and are therefore more difficult to characterize. Shimizu (1996) separated *Machaerothrix* males from those of *Auplopus* Spinola in a key to the genera of Japanese Pompilidae by the coarsely and strongly sculptured, reticulate-rugose integument of the propodeum compared with the densely, minutely punctate propodeum, at most with fine transverse rugae, of *Auplopus*; and in *Machaerothrix* cross-vein cu-a is very oblique to vein 1 A (Figs. 4, 5) instead of perpendicular to it. We note that in addition the mandible is strongly elbowed in male *Machaerothrix* (Fig. 14) so that the lower margin is noticeably angulate near its middle (Fig. 16; also Tsuneki 1988: Fig. 35) rather than evenly curved as in *Auplopus*. We presume that the modified mandibles may enable the male to grasp more firmly the female's neck during mating. The long slender antennae (Figs. 14, 15) and quadridentate or bidentate apical margin of the male clypeus are also diagnostic for the genus (Figs. 1–3).

To date species of *Machaerothrix* have been described from China, Japan, Russia Far East and the Philippines. Its occurrence in Sri Lanka is now known from the series of ten females and seven males of a new species collected at Anniewatte, Kandy by K. V. Krombein, B. B. and J. Norden in 1997. The collectors were surprised at the bright yellow markings of the females and called them "yellow stripers" because of this unusual feature in Pepsinae. The females were collected, one each day except as noted, on 20, two on 22, two on 23 February and on 4, 5, 7, 17 and 23 March. The seven males, not recognized as *Machaerothrix* until studied in Washington, were collected, one each day except as noted, on 23 and 28 February and during March, two on 5 and three on 7. The majority of specimens of both sexes showed no wear and had probably emerged very recently.

The distribution of *Machaerothrix* is even wider than noted above because RW found additional species in The Natural

History Museum, London from India, Nepal, Laos, Malaysia and Borneo (Sabah). These will be described subsequently by RW in a revision of *Machaerothrix*.

Natural history.—Our knowledge is very scanty. Krombein and the Nordens collected both sexes of their "yellow stripers" flying near or crawling rapidly on the walls of their rented home in the Anniewatte suburb of Kandy near the Peradeniya Botanical Garden. Neither nesting nor mating behavior was observed, but presumably nests were made in the soil of grassy lawns and flower beds adjacent to the house. Females were attracted to one corner of the house where a downspout, narrowly separated from the wall, drained water from the gutters to the ground. Prey capture was not observed but was likely to have been jumping spiders (Salticidae) sheltering in the narrow space between the downspout and wall; there were no large orb-weaver spiders on the walls or beneath the eaves.

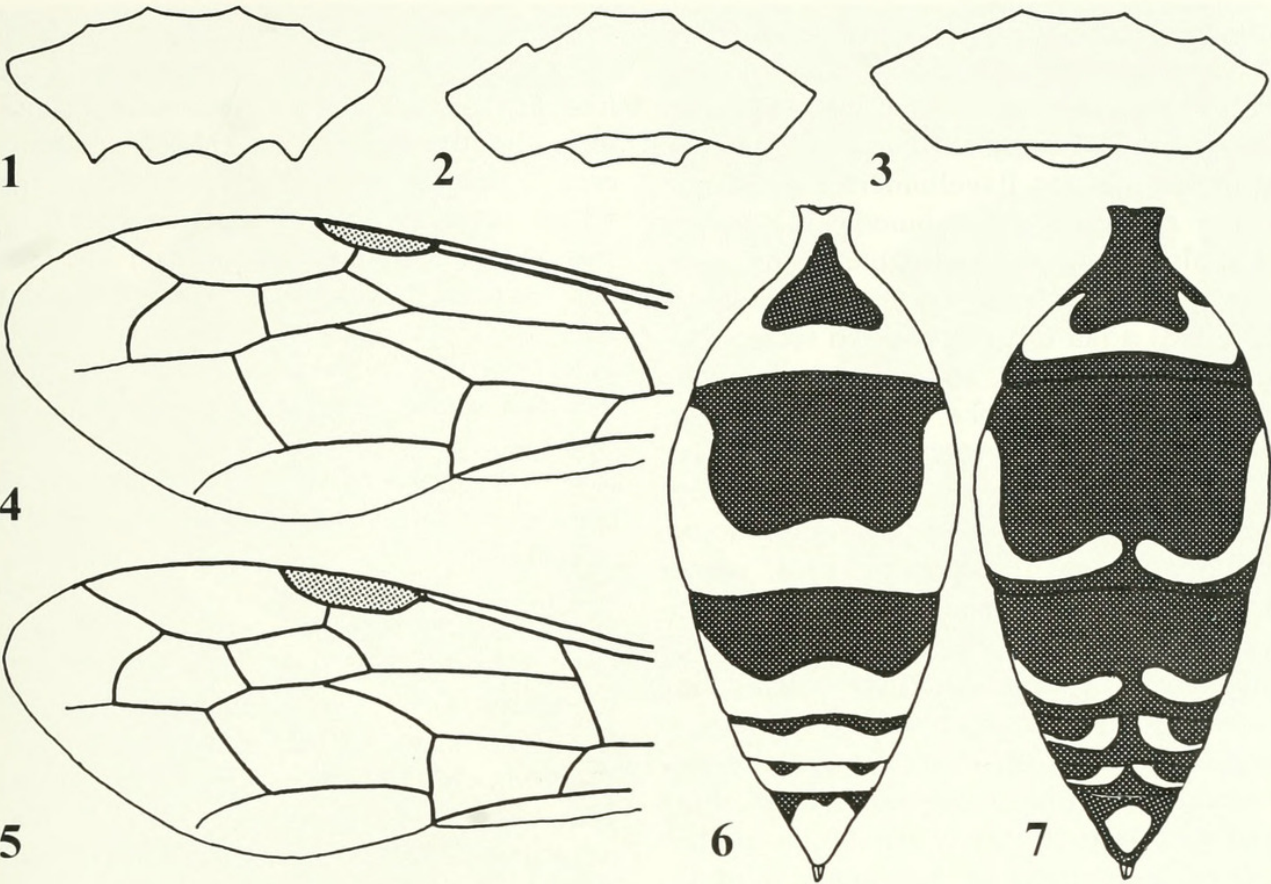
Nest-building was observed first in *M. ussuriensis*. A. S. Lelej (personal communication to KVK) said that T. Romankova, collector of the type series, observed this species excavating nests in the soil along a pathway in the forest in Primorskij krai, Russia Far East (Lelej 1986).

Shimizu (in Evans and Shimizu 1996) observed more complex behavior in the Japanese *M. tsushimensis* Yasumatsu. Shimizu found females nesting in a lump of clay in cracks in a wooden shrine. Several females nested together and showed evidence of a dominance hierarchy. Shimizu observed females carrying salticid spiders to the nest site as well as carrying water from a distance.

### *Machaerothrix johnei* Wahis, new species (Figs. 2, 4, 6–19)

This species is the only known representative of *Machaerothrix* in Sri Lanka. It has been collected at localities receiving from 1,900 to 5,000 mm of rain annually. The description that follows is based on the typical form.





Figs. 1–7. *Machaerothrix* species. 1–3, Male clypeus. 1, *M. quadridentata*. 2, *M. johni*. 3, *M. ussuriensis*. 4–5, Apical 2/3 forewing. 4, *M. johni* female. 5, *M. quadridentata* male. 6–7, Color pattern gastral terga, *M. johni* female. 6, Normal form. 7, Melanistic form.

A melanistic, geographically isolated form is known from two females and a male found only in the Sinharaja rainforest. Descriptive notes for this melanistic form follow the description of the typical form (cf Figs. 6, 7).

Female.—Body length 7–8 mm, forewing length 6–7 mm. Black, matt, with following pale yellow: clypeus except orange apical margin, mandible except brown apex, labrum, mouth parts, labial and maxillary palpi, pronotal collar and sides, posterolateral margin of propodeum, a large band on each gastral tergum (Fig. 6) and apical half of gastral sterna 1–5; the following yellowish orange: scape, pedicel, flagellomere 1, flagellomeres 2–10 beneath (brown dorsally), tegula and wings basally, small round spot on mesopleuron below, and legs except brown mid and hind tarsi.

Face and thorax except metapostnotum with short, appressed golden pubescence

(Fig. 10) which is so dense that basal dark coloration and cuticular structure cannot be seen; similar dense, silvery pubescence on malar space, gena and occiput (Fig. 9); pale, erect, long, scattered setae on gena, thorax, base and sides of gastral tergum 1 as well as gastral sterna 1–5, those of apical segment longer and darker; also some pale, shorter setae on mandible, coxae and femora beneath; clypeus with a triangular sub-basal area bearing about 20 long, brownish setae directed anterad (Fig. 9); wings pale, transparent, slightly fuscous apically, veins pale brown, stigma yellowish; front along inner orbits, vertex, pronotum, scutum posteriorly and scutellum with long, lanceolate black setae (Figs. 8–10) characteristic of *Machaerothrix* females.

Head wider than high, slightly curved on vertex; eyes reniform, about a quarter as wide as greatest interocular distance; ocelli on vertex forming an obtuse triangle, di-



ameter of anterior ocellus half distance between posterior ocelli; postocellar line subequal to ocellocular line; viewed from above head strongly narrowed behind eyes; antennae slender, flagellomere 1 as long as scape and pedicel combined,  $1.2\times$  longer than flagellomere 2; mandible strong, inner margin with subapical tooth; labial brush (Fig. 13) a fan of subappressed setae; clypeus (Fig. 11) large, convex, apical margin rounded; malar space as wide as basal width of flagellomere 1; gena viewed laterally (Fig. 9), slightly narrower than eye width (10:13); lateral aspect of pronotum and propodeum regularly rounded; pronotum viewed from above with sides converging anteriorly, posterior margin slightly angulate in middle; scutellum half as long as scutum, metanotum two-thirds as long as scutellum (ratio of 30:16:10); metapostnotum very narrow, strap-like, black, shiny and weakly transversely striate; tarsal claw with a strong inner tooth at apical third, orbicula very small with comb of thin, long setae (Fig. 12); forewing venation (Fig. 4); hindwing with distinct antefurcal nervellus; transverse furrow of gastral sternum 2 deep and very distinct.

Male.—Body length 6–7 mm, forewing length 5–6 mm. Body black except gastral tergum 6 with a pair of small, indistinct, pale yellow spots posteriorly in middle, and tergum 7 entirely pale yellow, terga 1 and 2 rarely with some indistinct reddish marks on sides and apex; femora, tibiae and tarsi except apices reddish, as are scape, pedicel and flagellomere 1, other flagellomeres brownish on basal half and black on apical half including ventral surface also; pubescence on upper part of front slightly golden but silvery on other parts of body; wings hyaline with pale brown venation and dark brown to black stigma; long white setae on head posteriorly, on thorax, laterally on gastral segments, on coxae and on femora beneath; head less narrowed posteriorly behind eyes than in female; gena larger, almost equal to eye in lateral aspect (Fig. 15); ocelli arranged in a right angled triangle on

vertex, postocellar line equal to ocellocular line; antennae elongate, flagellomere 1 as long as the scape and pedicel combined and only slightly shorter than other flagellomeres; apical margin of clypeus (Fig. 16) with a strong lateral tooth above middle of mandible, median part depressed and appearing to be the labrum, its margin sinuate; subgenital plate (Fig. 17) short, subtriangular apically, its basal part widened laterally and setose; ventral aspect of genitalia (Fig. 18), gonostyli very long, strongly setose, in lateral view (Fig. 19) with a basal spiniform process; sagittae curved apically.

Holotype.—♀, Sri Lanka, Kan[dy] Dist[rikt], Anniewatte, Kandy,  $7^{\circ}18'N$ ,  $80^{\circ}38'E$ , 9–28 February 1997, K. V. Krombein, J. W. Norden, B. B. Norden (USNM).

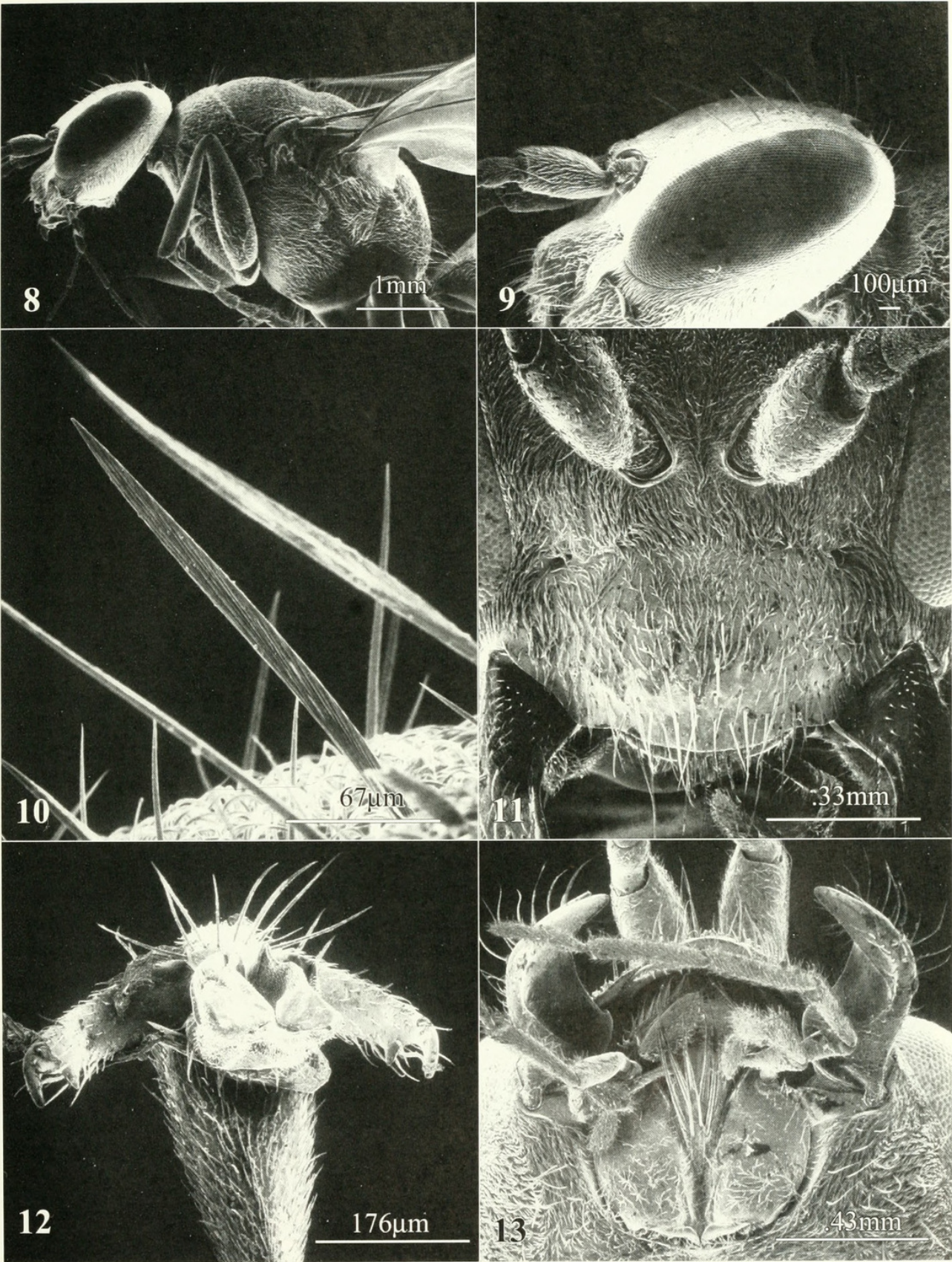
Paratypes.—3 ♀, ♂, same data as type; 5 ♂, 5 ♀, same locality and collectors but 1–31 March 1997; 1 ♀, Kandy Dist., Udawattakele, 27–28 October 1972, P. B. Karunaratne (USNM); 1 ♀, Kandy Dist., 5 mi NW Mahiyangana, Hasalaka Irrigation Bungalow, 30.iii–9.iv.1971, Malaise trap, P. & P. Spangler (USNM); 1 ♂, 1 ♀, Bad[ulla] Dist., Ella, 26.xi.1976, G. F. Hevel, R. E. Dietz IV, P. B. & S. Karunaratne, D. W. Balasooriya (RW); 1 ♂, Rat[napura] Dist., Uggalkaltota, 23–26.vi.1978, K. V. Krombein, P. B. Karunaratne, T. Wijesinhe, L. Jayawickrema, N. Karunaratne (USNM); 1 ♂, Col[ombo] Dist., Labugama Reservoir Jungle, 13–14.x.1973, K. V. Krombein, P. B. Karunaratne, P. Fernando, J. Fernandino (USNM); 1 ♂, Ceylan, 1910 (Paris). A pair of paratypes (USNM) are in the Institute of Biology and Pedology, Vladivostok, as an exchange. An additional pair from Anniewatte, not part of the type series, was sacrificed by coating for SEM study.

Etymology.—The species is named in honor of John W. Norden, then aged 13 years, who collected the first “yellow stripper” at Anniewatte on 20 February 1997.

Melanistic Form of  
*Machaerothrix johnei* Wahis  
(Fig. 7)

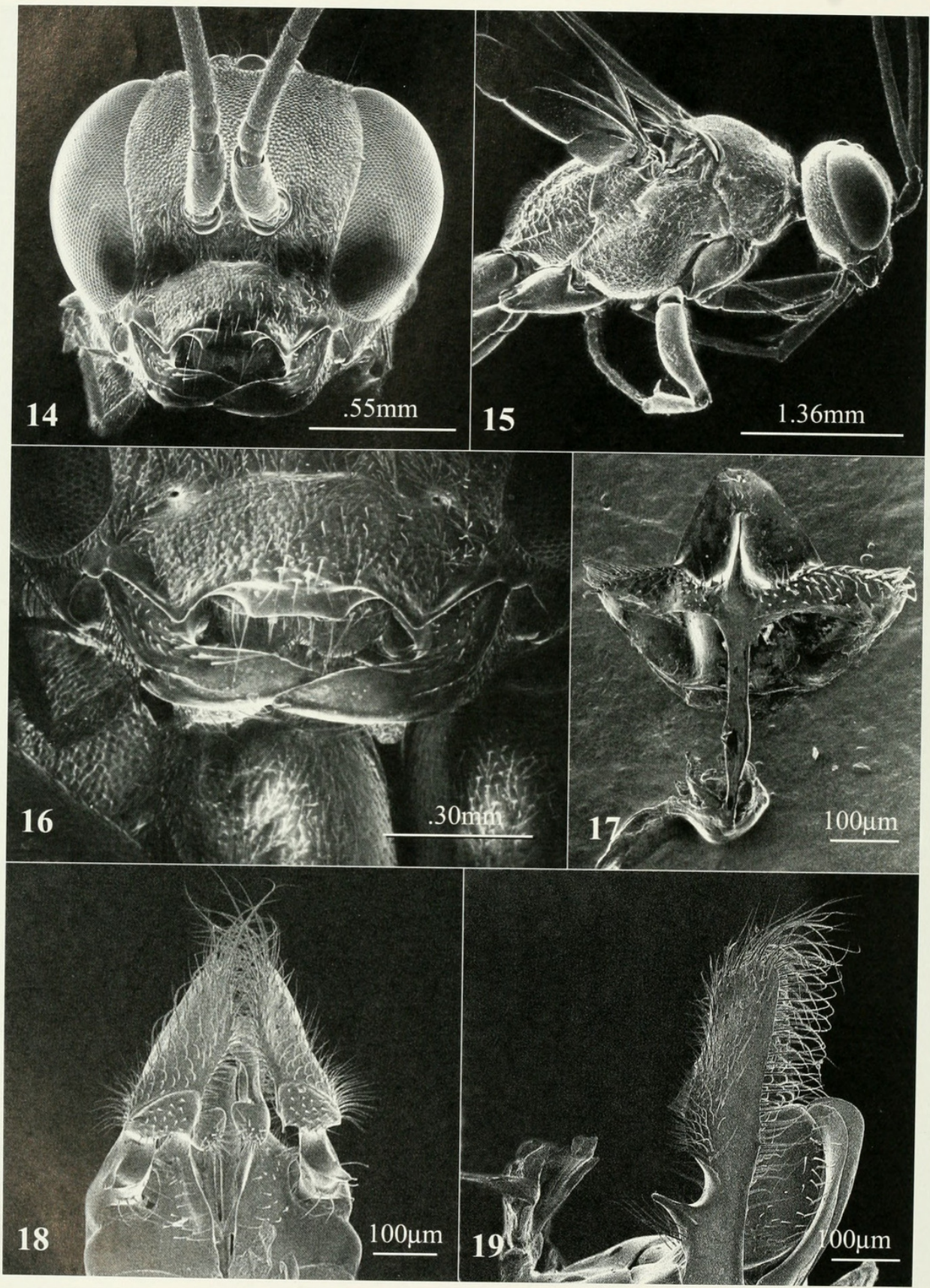
The normal and melanic forms are separated by the color pattern and vestiture as





Figs. 8–13. *Machaerothrix johni*, female. 8, Head and thorax lateral view, note modified lanceolate setae on front of head and thoracic dorsum (wire mount and glue near lower right). 9, Oblique lateral view of head. 10, Several lanceolate setae on front of head, note short, dense, curly appressed setae obscuring surface sculpture. 11, Clypeus and scape. 12, Tarsal claw. 13, Head, ventral view, note labial brush.





Figs. 14–19. *Machaerothrix johni*, male. 14, Head, frontal view. 15, Head and thorax, lateral view. 16, Clypeus and mandibles. 17, Subgenital plate. 18, 19, Genitalia. 18, Ventral view. 19, Lateral view.



Table 1. Distinctive characters of the two Ceylonese forms of *Machaerothrix johni* females.

Normal form	Melanistic form
Clypeus entirely yellow	Clypeus yellow only on basal half
Legs including coxae light reddish orange	Legs entirely dark
Lateral pronotum beneath and posteriorly; tegulae and posterior propodeal angles yellowish orange	Lateral pronotum beneath and posteriorly with yellow spots; tegulae and posterior propodeal angles black
Scape, pedicel and basal third of flagellum light red	Scape black, rest of antenna brown
Appressed pubescence of front and thorax golden	Appressed pubescence of front coppery, that of thorax silvery
Erect slender setae of thorax golden	Erect slender setae of thorax silvery

noted in Table 1. Two females from the Sinharaja rainforest have reduced yellow markings especially on the abdomen (Fig. 7) as detailed in the following description. A male from Kanneliya, Sinharaja rainforest, where one of the melanic females was collected, falls within the range of color pattern found in males of *M. johni* but pale markings on T 6–7 are brighter yellow. These three specimens are labeled as the melanic form and are kept in a separate tray in the USNM collection. Additional specimens from Sinharaja are needed to ascertain the degree of variation.

Female.—Body length 9 mm, forewing length 8 mm. Black, matt, the following pale yellow: mandible except apex, basal half of clypeus, small spot below anteriorly on side of pronotum and pronotal lobe, gastral terga 1–5 with narrow apical bands slightly interrupted on midline of 2–5 and spot on apex of 6 (Fig. 7), sterna 2 and 3 with posterolateral spot, and 3–5 with larger posterolateral spot that extends as a narrow stripe on apical fourth of segment; fore tibia and fore and mid tarsi brown; scape dark brown, pedicel and flagellomeres light brown, somewhat paler beneath.

Body including gaster with dense, subap-

pressed silvery pubescence, stronger on head posterad and thorax where it conceals integument; wing venation pale brown with yellowish stigma.

Male.—Body length 8.0 mm, forewing length 7.0 mm. The single male from Kanneliya assigned here agrees in most details with those of typical *M. johni* except for brighter yellow markings on gastral terga 6 and 7.

Specimens examined.—1 ♀, Sri Lanka, Gal[le] Dist[RICT], Kanneliya Section, Sinharaja Jungle, 2–5.x.1980, K. V. Krombein, P. B. Karunaratne, T. Wijesinhe, L. Jayawickrema, V. Gunawardane, collected at black light (USNM); 1 ♂, same locality as preceding but 9–14.vi.1975, D. H. Messersmith, G. L. Williams, P. B. Karunaratne (USNM); 1 ♀, Sri Lanka, Rat[napura] Dist[RICT], Sinharaja Jungle, 9.ix.1979, P. B. Karunaratne, T. Wijesinhe, L. Jayawickrema, R. Subasinhe (USNM).

KEY TO THE KNOWN SPECIES OF  
*MACHAEROTHRIX*

Note: we have not seen the holotype female of *M. tsushimensis* Yasumatsu.

- 1. Female ..... 2
- Male ..... 6
- 2. Thorax completely (or except prothorax), propodeum and gaster black; legs and antennae entirely or almost black ..... 3
- At least the gaster and sometimes thorax and propodeum with abundant bright yellow markings; rarely the legs and/or antennae light red ..... 4
- 3. Sides of thorax strongly punctate, granulose, matt; stigma yellowish; second submarginal cell above longer than third; entirely black without any yellowish white spot ..... *M. coactifrons* Haupt
- Thorax smooth, shiny, meso- and metapleuron very sparsely punctate; stigma dark brown; second submarginal cell above as long as third; preapical spot on clypeus, collar and pronotal lobe yellowish white ..... *M. ussuriensis* Lelej
- 4. Legs dark, coxae for most part, trochanters and femora black; basal half of clypeus yellow; gastral terga 1–5 with narrow yellow posterior bands, those on 2–5 narrowly separated at midline (Fig. 7) ... *M. johni* Wahis, melanistic form
- Legs including coxae light red; clypeus yellow except orange apically; gastral terga 1–5 with



- broad yellow apical bands extending anterad on sides (Fig. 6) ..... 5
5. Thorax almost entirely black, pale yellow only on pronotal lobes and tegulae .....  
 ..... *M. johni* Wahis, normal form
- Pronotum in part, sides of rest of thorax and propodeum yellowish orange .....  
 ..... *M. decorata* Haupt
6. Apical margin of clypeus quadridentate, not depressed in middle (Fig. 1); second submarginal cell above longer than third, receiving first recurrent vein near basal third (Fig. 5); gastral tergum 7 entirely black .....  
 ..... *M. quadridentata* (Tsuneki)
- Apical margin of clypeus depressed in middle, smooth and shiny; second submarginal cell above as long as third, receiving first recurrent vein in middle (Fig. 4); gastral tergum 7 black or with a pale subapical spot ..... 7
7. Depressed median area of clypeal apex relatively large and angulate laterally (Fig. 2); propodeum with dense granulate punctation and a few weak, lateral rugae; gastral tergum 7 with a pale subapical spot ..... *M. johni* Wahis, n.sp.
- Depressed median area of clypeal apex narrower, rounded, not angulate laterally (Fig. 3); propodeum strongly rugose; gastral tergum 7 black ..... *M. ussuriensis* Lelej

TRANSLATION OF ORIGINAL DESCRIPTION OF  
*MACHAEROTHRIX USSURIENSIS* LELEJ, 1986

**Female.**—Body and forewing length 7–8 mm. Inner eye margin concave, distance between eyes at top  $0.9\times$  distance between them at middle; eye width at upper margin of antennal socket  $0.2\times$  face width. Ocelli medial, diameter of anterior ocellus equal to distance between it and posterior ocellus; postocellar line  $0.7\times$  ocellocular line; clypeus convex with arcuate anterior margin to lateral angles. Mandible with one preapical tooth on inner margin. Relative lengths of antennal segments 1–4 are 2:1:3:2; segment 3  $4.5\times$  its maximal width. Radial cell anterad to stigma  $1.6\text{--}1.7\times$  as long as stigma; ratio of abscissae 1–4 of radial cell is 0.6:3:3:2.5; nervulus diagonal, postfurcal for half its length; metapostnotum narrow, abruptly perpendicular to metanotum. Gaster segment 1 definitely petiolate basally.

Propodeum rugose. Thorax dorsally and gastral terga smooth, shiny. Gaster tergum 6 with smooth, shiny medial part and sparse

weak punctures. Front with reddish-brown pubescence; upper part with long flattened setae. Pronotum with black erect hairs, propodeum with thinner gray hairs. Gaster ventrally with erect short black setae. Body, antennae and legs black. Collar and pronotum laterally with large yellow spots, clypeus with small yellow spot.

**Male.**—Body length 7.0–7.5 mm, forewing length 6.0–6.5 mm. Distance between eyes at top  $0.9\times$  distance between them at middle; eye width at upper level of antennal socket  $0.3\times$  width of face. Postocellar line  $0.8\times$  ocellocular line. Clypeus with convex anterior margin. Relative lengths of antennal segments 1–4 are 2:1:3.8:3.3; ratio of abscissae 1–4 of radial cell 0.5:1.7:2.2:2.6; radial cell anterad to stigma  $1.4\times$  as long as stigma; nervulus diagonal, slightly postfurcal. Metapostnotum narrow, approximately  $2\times$  shorter than postnotum. Gaster segment 1 weakly divergent posterad to sides,  $1.4\times$  as long as segment 2. Gaster sternum 6 (Fig. 5). Hypopygium short, its apex slightly protruded from posterior margin of sternum 6 (Figs. 6, 7).

Head and thorax dorsally with dense small punctures. Propodeum with irregular strong rugae. Mesopleuron and metapleuron with irregular, weaker rugae than on propodeum. Upper front, vertex and pronotum with erect black setae which are gray, long and thin on propodeum. Body, antennae and legs black, fore- and midtibiae and tarsi brown.

**Distribution.**—Russian Far East, Primorskij krai.

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