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Two New South African Machilids of the Genus *Machiloides* (Microcoryphia, Insecta)

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Among a small lot of South African machilids received for study from Dr. J. Heeg, now at the University of Natal, at Pietermaritzburg, I found two undescribed species of *Machiloides* Silvestri (Meinertellidae), each of which differs from all other species of *Machiloides* and even from all other machilids in having unique morphological features. My sincere thanks are due to Dr. Heeg for allowing me to describe these unusual species. The types are deposited in the American Museum of Natural History.

I have thought it useful to preface the descriptions with an updated key to East and South African *Machiloides,* including *Machiloides delanyi* Wygodzinsky, 1961, and the species described below. As there are probably many undescribed species of *Machiloides* in South Africa, a determination arrived at with the key should be checked against an adequate description and illustrations.

Key to the Species of *Machiloides* of East and South Africa

1. Eyes as long as, or longer than, wide 2
   Eyes wider than long (figs. 1I, 3A) 3
2. Basal pair of pigment spots on clypeus larger than apical pair; apical segment of labial palp about three times as long as wide; ovipositor surpassing apex of styli IX by two and one-half times length of latter ..... *silvestrii* Womersley

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Apical pair of pigment spots of clypeus larger than basal pair; apical segment of labial palp about four times as long as wide; ovipositor surpassing apex of styli IX by one and one-half times their length ..... *mensarius* Wygodzinsky

3. Ventral surface of legs completely without short, spinelike setae 4
   Ventral surface of some segments of legs with distinct, short, spinelike setae (figs. 1N, 3H) 5
4. Clypeus strongly salient, incised medially; apex of third segment of maxillary palp of male dorsally with a weakly sclerotized, apically directed, conical projection; fourth segment of maxillary palp of both sexes shorter than third; setae of ventral surface of legs elongate, but not very numerous ..... *sjostedti* Wygodzinsky
   Clypeus not strongly salient and not incised medially; third segment of maxillary palp of male subapically with strongly chitinized, horizontally directed process (as shown in figs. 1M, 3G); fourth segment of maxillary palp about as long as third; setae of ventral surface of legs extremely numerous ..... *rudebecki* Wygodzinsky
5. Ventral surface of femur, tibia, and tarsus of legs with very long and strong, distinctly pigmented bristles in addition to any spinelike setae that might be present 6
   Ventral surface of segments of legs with only a few short, hyaline bristles in addition to spinelike setae 8
6. Clypeus with large central pigment spot and with 1+1 distinct spots apically at sides; frons and clypeus of male with numerous short, spinelike setae; mid and hind tibiae each with fewer than 10 spinelike setae ..... *delanyi* Wygodzinsky
   Clypeus lacking large central pigment spot and without 1+1 spots apically at sides; frons and clypeus without spinelike setae; mid and hind tibiae each with more than 10 spinelike setae 7
7. Coxae of legs very faintly pigmented or unpigmented; tarsi not pigmented ..... *dubius* Wygodzinsky
   Coxae of all legs with large and conspicuous basal pigment spot; tarsi faintly but distinctly pigmented ..... *dubius coxatus* Wygodzinsky
8. Short spinelike setae on ventral surface of femur, tibia and all tarsal segments; labial palp subtriangular in female ..... *solitarius* Silvestri
   Short spinelike setae not present on both femur and third tarsal segment 9
9. Maxillary palp and legs both completely unpigmented ..... *obsoletus* Wygodzinsky
   At least maxillary palp with hypodermal pigment 10
10. Males 11
    Females 19
11. Segment IV of maxillary palp dorsally and apically with fleshy or flattened projection beset with short, strongly pigmented, spinelike setae; scapus of antennae with similar spinelike setae 12
    Segment IV of maxillary palp without such projection; scapus of antennae without specialized setae 15
12. Inner surface of segment IV of maxillary palp with very numerous, short, spinelike setae inserted on slight projection ..... *spinipes* Silvestri

Inner surface of segment IV of maxillary palp with distinct projection which bears apically a small group of spinelike setae and on its dorsal surface a brushlike group of very numerous delicate hairs 13

13. Apical projection of segment IV of maxillary palp large, flattened, beset on lower surface with long series of spinelike setae ..... *fontium* Wygodzinsky

Apical projection of segment IV of maxillary palp much shorter, not flattened, spinelike setae arranged differently 14

14. Clypeus without hypodermal pigment; spinelike setae of scapus of antenna slender, few in number; segment III of maxillary palp almost twice as long as wide, distinctly longer than IV, its apex dorsally without specialized structures; legs with hypodermal pigment ..... *lawrencei* Wygodzinsky

Clypeus with hypodermal pigment; spinelike setae of scapus of antennae numerous, very short; segment III of maxillary palp scarcely longer than wide, not distinctly longer than IV; its apex dorsally with short tooth and three short spinelike setae inserted on small projection; hypodermal pigment of legs absent ..... *draconis* Wygodzinsky

15. Segment III of maxillary palp subapically with pigmented hooklike projection (figs. 1M, 3G) 16

Segment III of maxillary palp subapically with small, unpigmented, toothlike process ..... *leonis* Wygodzinsky

16. Fourth segment of maxillary palp dorsally with series of conspicuous peglike spines (fig. 1G, M); scapus and pedicellus each with conspicuous projection (fig. 1A, C) ..... *heegi,* new species

Fourth segment of maxillary palp lacking such spines; scapus and pedicellus simple 17

17. Clypeus with 1+1 apical spots at sides (fig. 3C); clypeus basally with small group of spinelike setae (fig. 3C, D); coxae and femora of forelegs on inner surface with numerous spinelike setae in addition to normal hairs (fig. 3J); articles of antenna uniformly brown, with intermediate jointlets whitish ..... *abditus,* new species

Clypeus with 1+1 lateral spots near base or near middle; clypeus without spinelike setae; forelegs without spinelike setae on inner surface of coxae and femora; flagellum of antennae dark but with numerous articles white 18

18. Hypodermal pigment present between ocelli and on labrum; coxae with distinct pigment spot; first and second tarsal segments normally pigmented ..... *monticola* Wygodzinsky

Region between ocelli, as well as labrum, without pigment; first tarsal segment not pigmented, second with conspicuous pigment spot ..... *calcarius* Wygodzinsky

19. Clypeus lacking pigment except 1+1 spots apically at sides (as shown in fig. 3C); fore coxae and femora on inner surface with numerous spinelike setae in addition to normal hairs (fig. 4C) ..... *abditus,* new species

Clypeus with different pigment pattern; fore coxae and femora lacking spinelike setae on inner surface 20

20. No pigment between ocelli; second segment of tarsi with conspicuous pigment spot; remaining tarsal segments unpigmented ..... *calcarius* Wygodzinsky

Region between ocelli with pigment; pigment pattern of tarsi not as described above, or tarsi without pigment 21

21. Basal portion of clypeus with large, central, elongate, pigment stripe connected to large pigmented area on frons ..... *obscurus* Wygodzinsky
Base of clypeus pigmented differently 22

22. Articles of flagellum of antenna brownish, with apical and basal subarticles white; pigment on penultimate segment of maxillary palp occupying more than half of surface of segment ..... *silvicola* Wygodzinsky
Articles of flagellum of antennae brownish; intermediate jointlets also brownish, or light-colored; pigment of segment VII of maxillary palp reduced or absent 23

23. Hypodermal pigment of legs absent or almost imperceptible 24
Hypodermal pigment of legs present, very distinct 25

24. Basal area of clypeus with central pigment spot (as shown in fig. 1J); scapus distinctly pigmented (fig. 2B); intermediate jointlets of antennae brown like rest of flagellum ..... *heegi,* new species
Basal area of clypeus with sublateral and lateral pigment spots; pigment of scapus very faint; intermediate jointlets of flagellum whitish, contrasting with brown flagellum articles ..... *draconis* Wygodzinsky

25. Coxae and labrum without pigment 26
Coxae and labrum pigmented ..... *spinipes* Silvestri

26. Anterior gonapophyses with about 85 pseudosegments; base of clypeus faintly pigmented along lateral margins; femora pigmented on almost their whole length ..... *lawrencei* Wygodzinsky
Anterior gonapophyses with not more than 50 pseudosegments; base of clypeus with 1+1 large pigment spots; femora pigmented at apex only ..... *mahai* Wygodzinsky

Machiloides heegi, new species

Maximum observed length of body of male 10 mm.; of female, 11.5 mm. General body color whitish; violaceous hypodermal pigment present on head, base of antennae, palps, and mandibles. Pattern formed by scales unknown.

Pigment pattern of head of male as shown in figure 1D, E, I; of female similar but with spot on clypeus longer. Frons of male with laterally compressed, subsemicircular protuberance (fig. 1E, I), the latter beset on anterior surface with a group of long slender hairs.

Shape of eyes as shown in figure 1D, I. Ratio, length/width of eyes, 0.9/1; ratio, line of contact/length, 0.5/1. Ocelli with outer portion very narrow, their width equal to three-fourths of that of eye. Length of antennae at least 20 mm. Scapus and pedicellus with pigment spots as shown in figures 1C, 2B. Flagellum uniformly light brown. Basal segments of antennae of male highly modified, as shown in figures 1A, C. Scapus and pedicellus dorsally each with conspicuous process, that of scapus long and slender, somewhat curved, that of

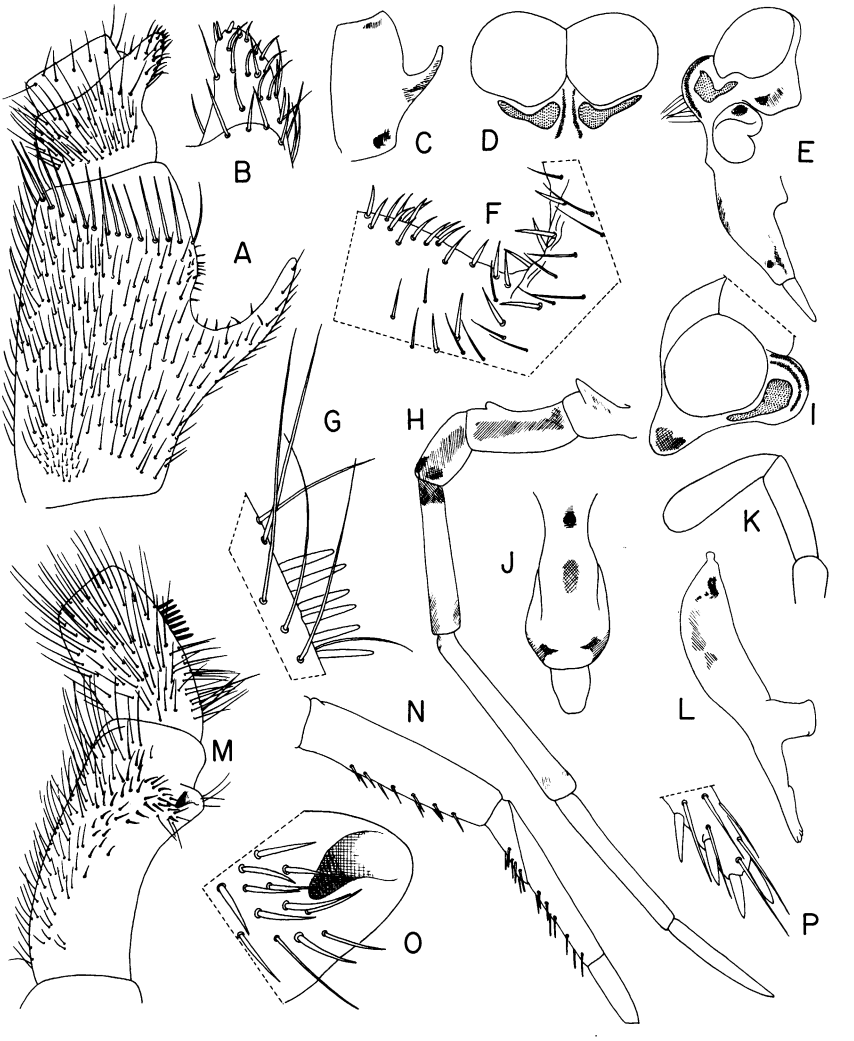

FIG. 1. *Machiloides heegi,* male. A. Scapus and pedicellus. B. Apex of projection of pedicellus. C. Color pattern of scapus. D. Eyes and ocelli, frontal view. E. Head, lateral view. F. Area of insertion of projection of scapus. G. Peglike setae of dorsal surface of fourth segment of maxillary palp. H. Maxillary palp, color pattern. I. Eye and ocellus, with part of head, dorsolateral view. J. Clypeus and labrum, color pattern. K. Labial palp. L. Mandible, with color pattern. M. Third and fourth segments of maxillary palp. N. Tibia and tarsus of hind leg. O. Projection of third segment of maxillary palp. P. Apex of last segment of maxillary palp.

pedicellus shorter and stouter. Dorsal surface of scapus opposite process with several very short, dark, almost spinelike setae (fig. 1F); apex of process of pedicellus with similar setae (fig. 1B). Pigment of mandibles as shown in figure 1L. Shape and pigment of maxillary palps of both sexes as shown in figures 1H, 2A. Length of maxillary palp of female, 5.9 mm., viz., about half as long as body. Last segment distinctly more than half as long as penultimate, in both sexes. Segment IV conspicuously shorter than III, in both sexes. Third segment of maxillary palp of male subapically with slight dorsal protrusion bearing short, heavily sclerotized, inwardly turned, hooklike process (fig. 1M, O); segment on inner surface near process with short, darkly pigmented, spinelike setae; hairs of apical portion of segment very long. Segment IV (fig. 1M) lacking projection, with very long hairs; dorsal surface on basal half with tuftlike group of erect hairs; dorsal surface slightly beyond middle with comblike row of six or seven strongly sclerotized, peglike spines (fig. 1M, G). Apical sensory spines of palp as illustrated (fig. 1P). Shape of labial palps of male and female as illustrated (figs. 1K, 2C); faint pigment spot on apex of second segment ventrally.

Legs not pigmented. Length of hind leg of female 4.5 mm., viz., slightly less than half of body length. Medium-sized, distinctly pigmented, spinelike setae on ventral surface of tibiae and first and second tarsal segments (fig. 1N). Number of spinelike setae: on tibia I, female, 2, male, 3; on tibia II, female, 4–5, male, 4–7; on tibia III, female, 7–9, male, 10–11. Hairs of legs not pigmented and not especially numerous.

Abdominal sterna as usual for genus. Setae of apex of abdominal styli slightly pigmented; apical spine hyaline, about half as long as stylus. Styli II–VII slightly more than half as long as respective sterna.

Ovipositor of primary type, very long and slender, surpassing apex of coxite IX by one and one-half times length of latter. Anterior gonapophyses with 60–63 pseudosegments, their chaetotaxy as illustrated (fig. 2D, E, G). Distal segments without minute sensory setae and rods (fig. 2G). Apical portion of posterior gonapophyses as shown in figure 1H. Penis as usual for the genus.

Material Examined: Cape Province: Amatola Mountains, Hogsback, April, 1959, 5000–6000 feet, under bark in forest, (M. S. Thompson), male holotype, female allotype, two male paratypes.

This species is one of the most unusual of the Microcoryphia. I do not know of any other species in which the male has such a highly modified antennal base, although in some other South African species of *Machiloides* specialized setae occur on the scapus of the male. It is very likely that the modified antennae of *M. heegi* are used by the male to

grasp the female prior to, or during, fertilization. *Machiloides heegi* is named for Dr. J. Heeg, who has furnished me this material, in recognition of his work in the physiology of the Microcoryphia and Thysanura. The species possibly belongs to the *dubius*-group (see Wygodzinsky, 1955); the secondary sexual characters of the male are sufficient to distinguish *heegi* from all other species of *Machiloides.*

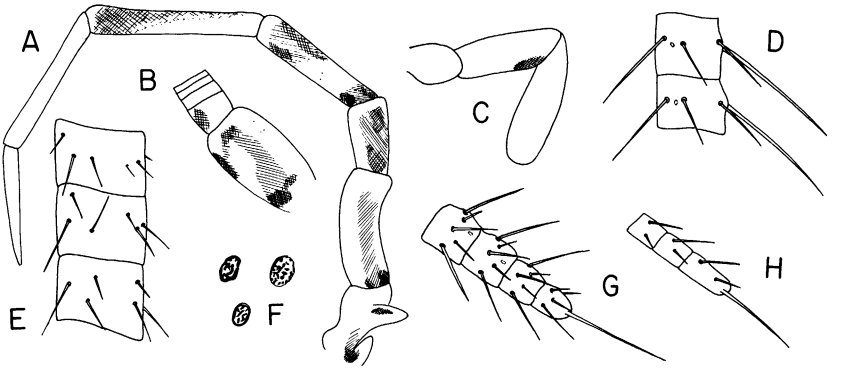

FIG. 2. *Machiloides heegi,* female. A. Maxillary palp, color pattern. B. Base of antenna, color pattern. C. Labial palp. D. Pseudosegments of center of anterior gonapophysis. E. Pseudosegment of basal portion of anterior gonapophysis. F. Sensilla as found on apical portion of anterior gonapophysis. G. Apical pseudosegments of anterior gonapophysis. H. Apical pseudosegments of posterior gonapophysis.

Machiloides abditus, new species

Maximum observed body length of male, 8 mm.; of female, 9 mm. General body color yellowish white; violaceous hypodermal pigment present on head, base of antennae, maxillary palps, mandibles, and legs. Pattern formed by scales unknown.

Pigment pattern of head of male as shown in figure 3A–C; of female, similar. Frons of male with not very conspicuous rounded protuberance beset with a few scattered, dark, spinelike setae; similar spinelike setae and some hairs forming small patch on center of basal half of clypeus (fig. 3C, D).

Shape of eyes as shown in figure 3A, B. Ratio, length/width of eyes, 0.9/1; ratio, line of contact/length, 0.55/1. Ocelli with outer portion very narrow, their width equal to three-fourths of that of eye. Maximum observed length of antennae (female), 32 mm., viz., more than three

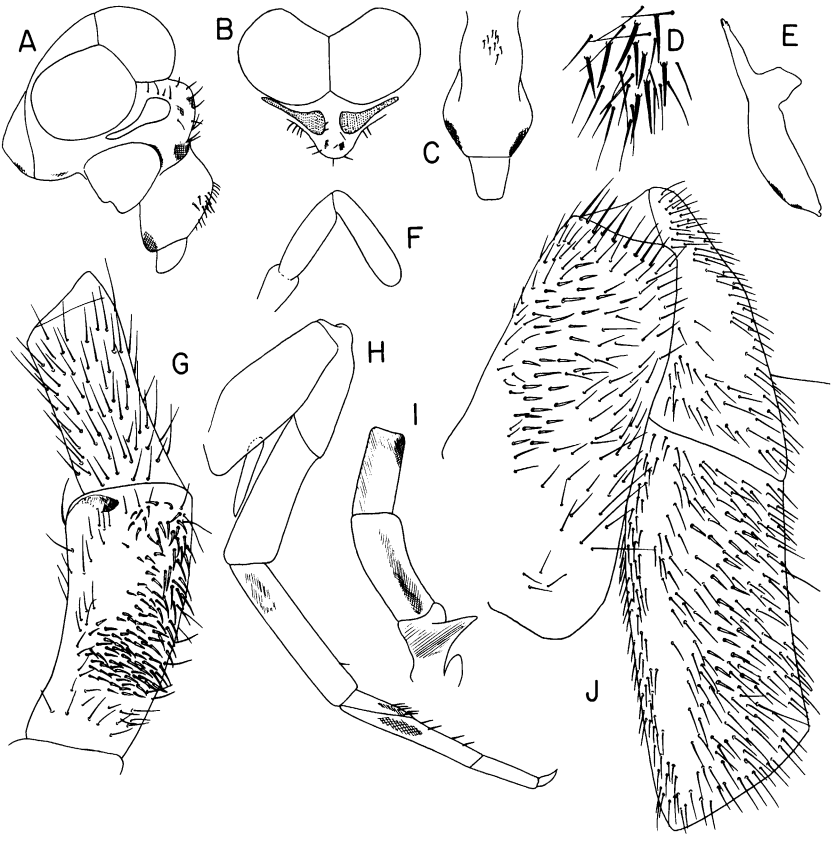

FIG. 3. *Machiloides abditus,* male. A. Head, dorsolateral view. B. Eyes and ocelli, frontal view. C. Clypeus and labrum. D. Group of setae of center of clypeus. E. Mandible. F. Labial palp. G. Third and fourth segments of maxillary palp. H. Hind leg, with color pattern and spinelike setae. I. Color pattern of preserved segments of maxillary palp. J. Coxa, trochanter and femur of foreleg, inner surface.

times length of body. Pigment pattern of scapus as shown in figure 4F; pedicellus also with some pigment. Articles of flagellum uniformly light brown, intermediate jointlets whitish. Pedicellus of male without specialized setae. Pigment of mandibles as shown in figure 3E. Pigment of basal segment of maxillary palp of male (remaining not preserved) as shown in figure 3I. Maxillary palp of female as shown in figure 4A, its length 7.3 mm., viz., distinctly more than half as long as body. Large projection of second segment of palp of both sexes more

pointed than usual (figs. 3I, 4A). Apical segment of palp of female slightly more than half as long as penultimate. Third segment of maxillary palp of male with heavily sclerotized, inwardly turned, hook-shaped process (fig. 3G); inner surface of segment near process with numerous short, darkly pigmented, dorsally directed, spinelike setae. Segment IV lacking projections or specialized setae. Shape of labial palps of male and female as shown in figures 3F, 4B.

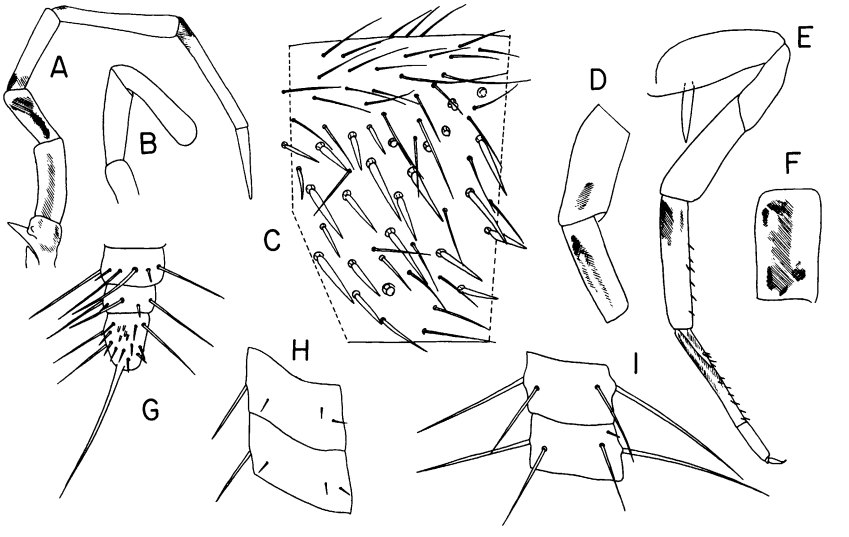

FIG. 4. *Machiloides abditus,* female. A. Maxillary palp, color pattern. B. Labial palp. C. Detail of fore coxa, inner surface. D. Femur and tibia of foreleg, color pattern. E. Hind leg, with color pattern and spinelike setae. F. Color pattern of scapus. G. Apical pseudosegments of anterior gonapophysis. H. Pseudosegments of basal portions of anterior gonapophysis. I. Pseudosegments of central portion of anterior gonapophysis.

Legs as shown in figures 3H, 4D, E. Length of hind leg of female, 7.7 mm., viz., distinctly more than half as long as body. Pigment present on tibia and on two basal tarsal segments; forelegs with faint pigment spot also on apex of femur (fig. 4D). Inner surface of coxae and femora of forelegs with numerous hyaline, spinelike setae interspersed among normal setae (figs. 3J, 4C); in female, 80 on coxa and 20 on femur; in male somewhat fewer, possibly owing to smaller size of body of specimen examined. Medium-sized, distinctly pigmented, spinelike setae on ventral surface of tibiae and first and second tarsal segments of all legs (figs. 3H, 4I). Number of spinelike setae: on tibia I,

female, 1, male, 0–1; on tibia II, female, 3–4, male, 1; on tibia III, female, 6–7, male, 1. Hairs of legs not pigmented and not numerous.

Abdominal sterna as usual for the genus. Setae and apical spine of styli hyaline. Apical spine half as long as styli on abdominal segments I–VIII, about one-third as long as stylus on segment IX. Ratio of length of stylus to length of coxite: segments II–VII, male, 0.55/1, female, 0.7/1; segment VII, male, 0.8/1, female, 0.95/1; segment IX, male, 0.75/1, female, 0.8/1.

Ovipositor of primary type, surpassing apex of styli IX by slightly more than length of latter. Anterior gonapophyses with 82–83 pseudosegments, their chaetotaxy as shown in figure 4G–I. Apical segment with minute sensory setae and rods. Penis as usual for genus.

MATERIAL EXAMINED: Cape Province: Kingwilliamstown, Pirie Forest, in cave, September, 1954 (J. Skead), male holotype, female allotype.

This species belongs to the *dubius*-group. It differs from all related species by details of its pigmentation and chaetotaxy and, more importantly, by the presence of numerous spinelike setae on the inner surface of the fore coxae and femora, in both sexes. This condition is unique in the genus *Machiloides,* nor has it been reported in any other species of the order Microcoryphia.

The two specimens here examined were found in a cave, but there are no characters that indicate any adaptation of the species to life in caves. The unusually long antennae of the female may simply suggest that the specimen led a somewhat more sheltered life than free-living specimens in which the antennae are prevented from attaining their full growth potential by numerous small accidents.

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