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Results of the Zoological Explorations of Dr. E. Kaszab in Mongolia. 202. Thysanura and Microcoryphia (Insecta)

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The orders Thysanura and Microcoryphia had not been reported from Mongolia (Mongolian Peoples' Republic) until Dr. Z. Kaszab, of the Hungarian Natural History Museum, Budapest, collected considerable numbers of these insects between 1964 and 1968. The present work is based upon this material. This paper is the 202nd of a series of contributions published by various authors in different journals under the collective title "Ergebnisse der zoologischen Forschungen von Dr. Z. Kaszab in der Mongolei."

The locality data for the different species are adapted from lists provided by Dr. Kaszab, and include relevant ecological information. The transliteration of names of Mongolian localities is as supplied by the collector, and agrees with that found in other papers of this series. In many cases, the spelling is different from that found in English language works. In order to obviate the difficulties that might arise from said differences, the name of each aymag (a political subdivision of Mongolia, roughly equal to a province) is followed, in brackets, by its name as spelled in the National Geographic Atlas of the World. Certain Mongolian terms found in the locality records have not been translated, as they are part of the respective names, even though denoting

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geographic features; these terms are: *davaa*, mountain pass; *gol*, river; *nuur*, lake; *ul*, mountain or mountain range.

All illustrations were made by the author.

The holotypes, allotypes, and most paratypes and other specimens are preserved in the Hungarian Natural History Museum; some paratypes of all species have been retained by the American Museum of Natural History. I am much obliged to Dr. Kaszab for giving me the opportunity to study these interesting specimens, and for allowing me to keep duplicate specimens.

ORDER THYSANURA

***Ctenolepisma kaszabi*, new species**

Figures 1, 2

Maximum body length of male 9 mm.; of female, 11 mm. General shape of body as shown in figure 1A. Thorax slightly wider than abdomen, and somewhat more than half as long as the latter.

General body color whitish; faint violaceous hypodermal pigment on head, antennae (not distinctly annulated), mouthparts, dorsal and ventral body surface, on tibiae and on borders of femora and coxae, and on styli. Cerci and caudal filament suffused with pigment, annulations faint. Head with conspicuously pigmented Y-shaped suture (fig. 1A). Ovipositor more strongly sclerotized than rest of body, brownish. Scales dark on dorsal, light colored on ventral surface of body.

Macrochaetae of the usual type (fig. 1C, J). Scales of varied shapes, always with very numerous parallel longitudinal rays not surpassing border of scale.

Arrangement of macrochaetae on frons as shown in figure 1C. Antennae about as long as body. Mandibles strongly sclerotized apically (fig. 1D). Maxillary palp as shown in figure 1B; last segment as long as penultimate. Labial palp of female and male as shown in figure 1F, G; last segment slightly wider than long, with five sensory papillae arranged in a single row.

Lateral margin of thorax not forming a continuous outline (fig. 1C). Pronotum with five to six, mesonotum and metanotum with seven to eight lateral bristle-combs on each side, each composed of from two to five macrochaetae (fig. 1L). Bristle-combs of hind margin of thoracic nota situated very close to posterolateral angles (fig. 1L). Shape of thoracic sterna as shown in figure 1H, I, K. Prosternum with 3+3 bristle-combs each composed of 9-16 macrochaetae; mesosternum with 2-3+2-3 bristle-combs each composed of 8-13 macrochaetae; metasternum with 2-3+2-3 bristle-combs each composed of 11-16 macro-

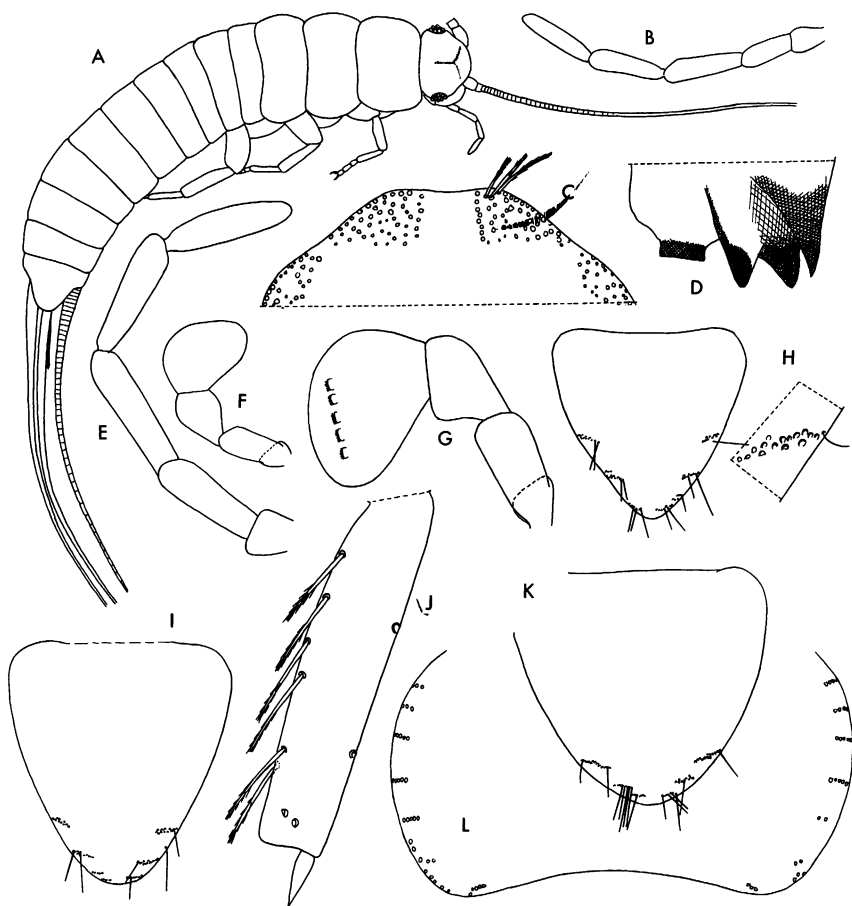


FIG. 1. *Ctenolepisma kaszabi*. A. General aspect. B. Maxillary palp, female. C. Frons, with insertions of macrochaetae. D. Apex of mandible. E. Maxillary palp, male. F. Labial palp, female. G. Labial palp, male, with sensory papillae. H. Prosternum, with one bristle-comb magnified. I. Mesosternum. J. Hind tibia of male, with scheme of macrochaetae. K. Metasternum. L. Metanotum, with insertions of macrochaetae.

chaetae. On all sterna, number of macrochaetae decrease from anterior to posterior bristle-combs; distance between posterior bristle-combs subequal to their width.

Legs short; macrochaetae of tibiae as shown in figure 1J.

Abdomen very slightly tapering toward behind (fig. 1A). Tergum I with 1+1, II-VI with 3+3, VII and VIII with 2+2 bristle-combs; IX

without, X with 1+1 bristle-combs. Number of macrochaetae in infra-lateral bristle-combs 8–11, in lateral ones 5–8 and in sublateral ones 4–6; number of macrochaetae increasing toward posterior segments. Posterior portion of tergum X subsemicircular (fig. 2E), from slightly rounded to almost truncate apically.

Abdominal sterna I–VI with one median, II–VIII with 1+1 sublateral bristle-combs; the median ones composed of 8–11, the sublateral ones of 11–15 macrochaetae. Styli only on coxites IX, short (fig. 2A, C). Genital region of male as shown in figure 2C. Coxite IX of female as shown in figure 2A. Ovipositor relatively stout, surpassing apex of styli by slightly more than the length of the latter. Anterior gonapophyses with approximately 21 articles, setae present from the tenth on. Chaetotaxy of apical articles of anterior gonapophyses as shown in figure 1D. Posterior gonapophyses fused to each other except apically (fig. 2A); their apical article with numerous minute sensory rods (fig. 2B).

Cerci and caudal filament approximately as long as abdomen.

MATERIAL EXAMINED: South Gobi: between somon Sevrej and Dund gol (formerly somon Gurban-tes), 35 kilometers southwest of Sevrej, 1350 meters, under rocks and on ground in sandy desert, June 18, 1967, No. 809, one male, holotype, one female, allotype, 10 males and eight females, paratypes, two juveniles. Bajanchongor [Bayan Hongor]: Cagan bogd ul, 12 kilometers northwest of frontier post Caganbulag, 1750 meters, on road to Echin gol oasis, on mountain slopes above dry river bed, under rocks and on ground, June 26, 1967, No. 852, one male, one female, paratypes, one incomplete specimen.

DISCUSSION: *Ctenolepisma kaszabi* is named for its collector, in recognition of his most valuable contribution to the knowledge of the insect fauna of Mongolia. Its meristic characters place the new species in a group formed by *C. michaelsoni* Escherich and similar species. *Ctenolepisma kaszabi* can easily be distinguished from these and all other species of the genus by the extreme lateral position of the bristle-combs of the hind margin of the thoracic nota.

The genus *Ctenolepisma* possesses many species, mostly in the Palearctic and Ethiopian Regions. The cladistic relationships of the various species and species groups have not been worked out; it is therefore impossible to make any meaningful statement on the systematic and zoogeographical relationships of the Mongolian species.

Ctenolepisma sp.

MATERIAL EXAMINED: Bajanchongor [Bayan Hongor]: Cagan bogd

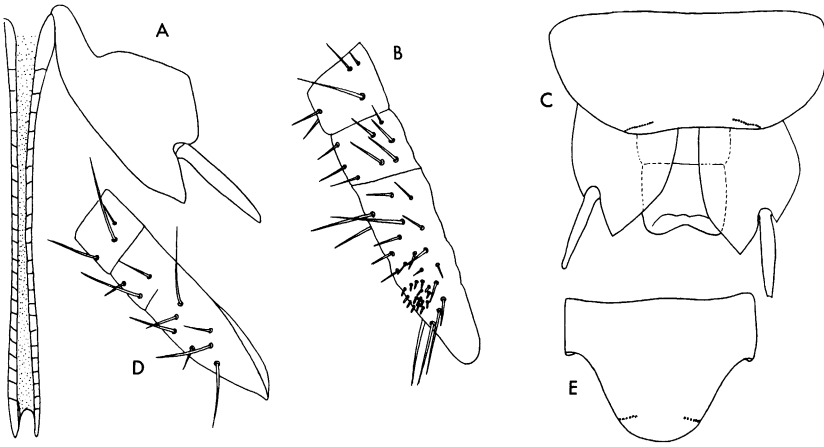


FIG. 2. *Ctenolepisma kaszabi*. A. Coxite IX of female, with posterior gonapophyses. B. Apical articles of posterior gonapophysis. C. Genital area of male. D. Apical articles of anterior gonapophysis of female. E. Tenth abdominal tergum.

ul, frontier post Caganbulag, 1550 meters, under stones and on ground, June 24–25, 1967, No. 845, four males and one female.

These specimens are immature (6–7 mm. long). They agree with *C. kaszabi* in their chaetotaxy and most other characters, but the apical segment of the labial palp is not wider than long, and the ovipositor surpasses the styli IX by slightly over twice the length of the styli. The gonapophyses are composed of slightly over 30 articles.

ORDER MICROCORYPHIA

MACHILANUS SILVESTRI

Four species of *Machilanus* were known from Szechwan (China), Indian Tibet, and Afghanistan; four additional species are here described from Mongolia. Three of the Mongolian species are distinguished by the possession of only 1+1 exsertile vesicles on their abdominal sterna, in both sexes; all other species of this genus have 2+2 vesicles on segments II–V. The Mongolian species agree with typical species of *Machilanus* in so many other characters, such as the shape of the ocelli and especially the highly apomorphic characters of the forelegs of the male and the structure of the genital appendages, that it seems advisable to include all species in the same genus. This judgment is further reinforced by the amazing condition found in a fourth Mongolian species

in which males have 1 + 1 and females 2 + 2 vesicles on segments II–V. The necessary redefinition of the genus will be given in a forthcoming paper containing more new data on species of *Machilanus*.

Ovipositors of primary and secondary type are already known to occur in the genus, and both conditions are found in Mongolian species. The ovipositor of one Mongolian species, *confaratus*, however, does not quite fit either category and can best be defined as of modified primary type, unique in the order.

Species in many genera of Microcoryphia are known to have two color forms; the checkered is the more common, with a longitudinally striped one being generally found in a smaller number of specimens. The existence of these two basic color forms can now be reported in a Mongolian species of *Machilanus* (fig. 9A, B), for the first time in this genus.

KEY TO THE MONGOLIAN SPECIES OF *Machilanus*

1. Males 2
 Females 5
2. Line of contact of eyes shorter than one-third length of eyes (fig. 6A);
 setulae present on undersurface of segments II–VII of maxillary palp
 (fig. 6B) *intergerivus*
 Line of contact of eyes longer than one-third length of eyes (figs. 3A; 7A;
 9C, D); setulae restricted to undersurface of segments V–VII of maxillary
 palp (figs. 3D; 7B; 9K) 3
3. Labial palp without setulae (fig. 9K); styli of ninth abdominal segment
 with numerous conspicuous ciliate setae (fig. 11D, J) *ciliatus*
 Labial palp with setulae at least on apical segment (figs. 3M; 7H); styli
 of ninth abdominal segment lacking conspicuous ciliate setae (fig. 8D)
 4
4. Large number of setulae uniformly distributed on undersurfaces of segments
 V–VII of maxillary palp (fig. 3D); only apical segment of labial palp
 with setulae (fig. 3M) *bifarius*
 Setulae of undersurface of segments V–VII of maxillary palp very sparse,
 except dense group at base of segment V (fig. 7B, F); apical and penul-
 timate segments of labial palp with setulae (fig. 7H) *confaratus*
5. Abdominal segments II–V with 2 + 2 exsertile vesicles (fig. 11A); ovipositor
 very short, not distinctly surpassing apex of coxites IX (fig. 11F); apical
 segments of gonapophyses beset with fossorial spines (fig. 11E, F, H, I)
 *ciliatus*
 Ovipositor longer, distinctly surpassing apex of styli IX (fig. 5A); gona-
 pophyses without fossorial spines (figs. 5E, J; 8H, I) 6
6. Distal spine of apical segment of gonapophyses transformed into a heavily
 sclerotized, stout fossorial rod (fig. 8H, I) *confaratus*
 Distal spine of apical segment of gonapophyses bristle-like, not heavily
 sclerotized (fig. 5E, J) 7
7. Hypodermal pigment conspicuous in most specimens (fig. 6C, F, K); line

of contact of eyes shorter than one-third length of eyes (fig. 6A)	<i>intergerivius</i>
Hypodermal pigment absent; line of contact of eyes longer than one-third length of eyes (fig. 3A)	<i>bifarius</i>

***Machilanus bifarius*, new species**

Figures 3-5

Maximum observed body length of male, 9 mm.; of female, 11 mm. General body color whitish, hypodermal pigment absent, except for a faint spot on vertex (fig. 3B). Pattern formed by scales unknown.

Frons of male with four large setae arranged as shown in figure 3C, in addition to numerous short hairs. Shape of eyes as shown in figure 3A, B. Ratio, length to width of eyes, 0.9; ratio, line of contact to length of eyes, 0.42. Ocelli (fig. 3A, B) pink, narrowly margined with white, subelliptical, twice as wide as long, their distance equal to twice their width. Maximum length of antennae 7 mm., viz., distinctly shorter than body. Antennae of male thicker than those of female. Flagellum uniformly light brown. Scapus of male two-thirds as wide as long. Segments of middle of antenna of male (fig. 3G) with bristles and short sensory setae arranged in from two to four transversal rows; sensillae of apical portion of antennae as shown in figure 3E, H, I, J. Antennae of female with one or two transversal rows of simple setae; short sensory setae absent. Apical preserved articles divided into from five to seven subarticles. Shape of maxillary palp of female as shown in figure 3L, of male as shown in figure 3D; last segment more than half as long as penultimate, in both sexes. Apical segment of maxillary palp of male somewhat pointed apically; undersurface of segments II and III with a few long setae; undersurface of segments V-VII with relatively slender adpressed setulae. Apical sensory spines of maxillary palp hyaline, very faintly pigmented at apex, not diminishing in size toward apex of seventh segment of male (fig. 3F). Shape and chaetotaxy of labial palp of female and male as illustrated (fig. 3K, M); surface of apical segment in male with setulae similar to those of maxillary palp.

Legs not pigmented. Femur of foreleg of male widened but without a projection on undersurface (fig. 4A). Spinelike setae occupying almost entire extension of undersurface of femur, these setae semihyaline, their apical third or half darkened. Ramose sensillae of fore femur as shown in figure 4B; sensory field three and one-half times as long as wide, and two-thirds as long and approximately one-third as wide as femur. Fore tibiae of male stout, slightly concave ventrally, apical spinelike setae very long. Femur and tibia of foreleg of female as shown in figure 4D.

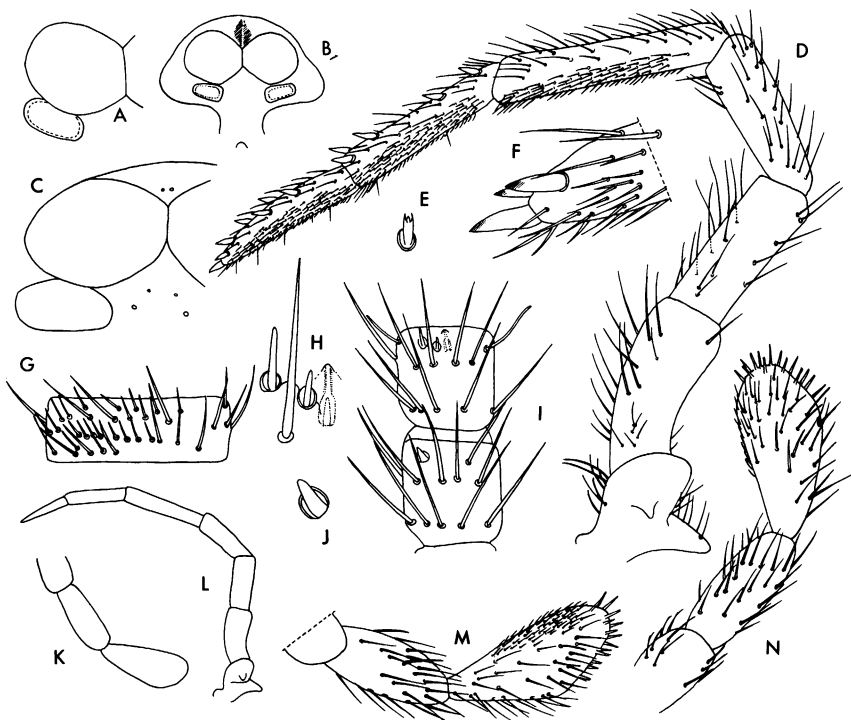


FIG. 3. *Machilanus bifarius*. A. Eye and ocellus, lateral view. B. Upper portion of head, front view. C. Scheme of distribution of large setae of frons and vertex. D. Maxillary palp of male. E. Sensillum of article of flagellum of antenna. F. Apex of distal segment of maxillary palp of male. G. Subarticle of middle of antennal flagellum of male. H. Setae and sensilla of flagellum. I. Subarticles of flagellum. J. Sensillum of flagellum. K. Labial palp, female. L. Maxillary palp, female. M. Labial palp of male, dorsal aspect. N. Labial palp of male, ventral view.

Femora of all legs with relatively long spinelike setae. Number of spine-like setae on tibiae: tibia I, female, 4–5, male, 7–10; tibia II, female, 8–10, male, 4–7; tibia III, female, 13–18, male, 9–14; setae on tibia III arranged in three to four irregular rows (fig. 4C).

Abdominal segments I–VII with 1+1 vesicles. Posterior angle of sternite V approximately 110 degrees (fig. 4K). Shape of sternum VIII of male as shown in figure 4H. Inner posterior lobes of coxites VII of female forming a projection of continuous outline (fig. 4I). Sternites and coxites glabrous, posterior coxites occasionally with one or two spinelike setae (fig. 4G, H, I). Ratio stylus to coxite, on segments II–

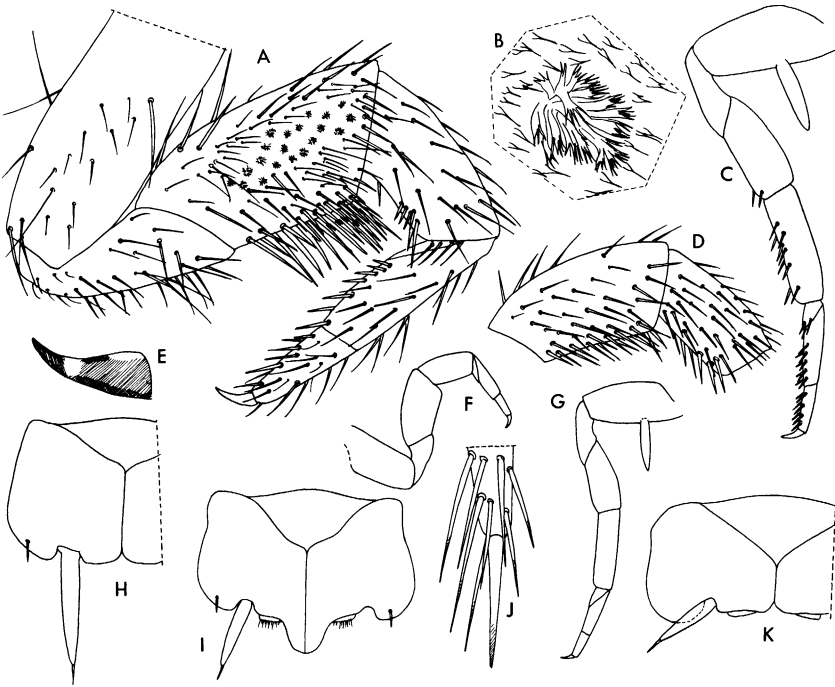


FIG. 4. *Machilanus bifarius*. A. Foreleg of male, external surface. B. Ramose sensillum of sensory field of fore femur of male. C. Hind leg of male, with scheme of spinelike setae. D. Femur and tibia of foreleg of female. E. Claw, with pigment scheme. F. Foreleg, female. G. Hind leg, female. H. Abdominal sternum VIII, male. I. Abdominal sternum VII, female. J. Apex of stylus IX. K. Abdominal sternum V, male.

VII=0.55–0.6, on segment VIII, female, 0.95, male, 0.8; on segment IX, female, 0.75, male, 1. Apical spine of styli as shown in figure 4J, slightly pigmented distally. Styli of ninth segment of male with normal setae (fig. 5H).

Ovipositor of primary type, slender, elongate, surpassing apex of styli IX by about one-half the length of these styli. Anterior gonapophyses with approximately 70 articles, their chaetotaxy illustrated in figure 5C–E; basal 10 segments glabrous. Distal articles with minute sensory setae; distal spine as long as three apical articles combined. Posterior gonapophyses with basal 35 articles glabrous; chaetotaxy of distal portion of gonapophysis as shown in figure 5J. Genital appendages of male (fig. 5G) attaining level of apex of coxites IX; parameres not quite at-

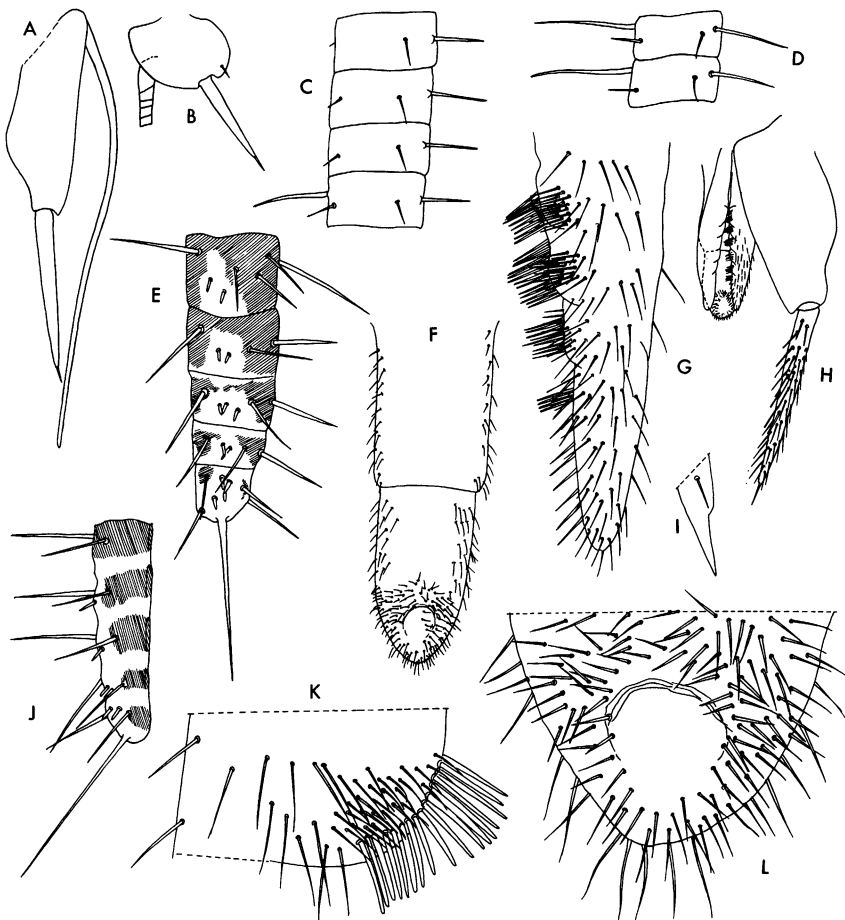


FIG. 5. *Machilanus bifarius*. A. Coxite IX of female, with gonapophysis. B. Coxite VIII of female, with base of gonapophysis. C. Anterior gonapophysis, ninth to twelfth article. D. Anterior gonapophysis, fortieth and forty-first article. E. Apical articles of anterior gonapophysis. F. Penis. G. Paramere, apical half. H. Genital segment of male. I. Apex of cercus. J. Apical articles of posterior gonapophysis of female. K. Detail of article of paramere, dorsal view. L. Apex of penis.

taining apex of penis. Basal portion of penis as long as apical one. Genital opening subcircular (fig. 5F, H, L). Parameres (fig. 5G, H, K) with I+6 articles, the apical one as long as the three foregoing combined.

MATERIAL EXAMINED: Bagan-Ölgij [Bayan Ölögey]: on the Chavcalyn gol, 20 kilometers west-southwest of Böch-mörön gol, 1750 meters, under rocks and on arid slope, July 4, 1968, No. 1060, one male, holotype, one female, allotype, eight males and seven females, paratypes; right hand bank of the Chovd gol, near Ölgij, 1750 meters, under rocks and on ground on very bare slope, June 30, 1968, No. 1048, three males and one female, paratypes. Uvs [Ubsa]: southern shore of Örög nuur, 1500 meters, swept from moist shore vegetation, June 28, 1968, No. 1035, 10 males, paratypes; 3 kilometers west-northwest of southwestern corner of Örög nuur, 1590 meters, under rocks and on ground in very rocky, almost vegetationless desert, June 29, 1968, No. 1039, one male paratype, four juvenile females; 3 kilometers west-northwest of southwestern corner of Örög nuur, 1590 meters, singly under stones and on ground in very rocky, almost vegetationless desert, July 7, 1968, No. 1064, two males, paratypes. Chovd [Hobdo]: Kobdo, approximately 5 kilometers southwest of the town, 1500 meters, under rocks and among roots of *Caragana*, July 10, 1966, No. 666, six males and one female, paratypes. Gobi Altaj [Gobi Altay]: between Schargyn Gobi and Beger nuur, about 20 kilometers east of somon Chaliun, Chuural cācrān, 1700 meters, mountainpass on eastern border of Char Azraga ul, under stones, June 24–25, 1966, No. 571, one male and one female, paratypes; northwestern corner of the Chasagt chajrchan ul, 2 kilometers northwest of somon Bičigt, 1900 meters, mountain steppe under stones, July 14–15, 1966, No. 687, four males and two females, paratypes.

DISCUSSION: *Machilanus bifarius* differs from all described species of the genus by the presence of not more than 1 + 1 exsertile vesicles on any abdominal sternum. *Machilanus bifarius* is also distinguished by the primary ovipositor of the female; this condition has formerly only been reported for one other species, *Machilanus tuxeni* Wygodzinsky, from Afghanistan. There is, however, no reason to assume a close relationship between these two species.

***Machilanus intergerivus*, new species**

Figure 6

Maximum observed body length of male 10.5 mm.; of female, 10 mm. General body color whitish, with hypodermal pigment on head capsule, mandibles, maxillae, labium, thorax, abdomen, and legs. Pattern formed by scales unknown.

Frons with a few irregularly arranged larger setae. Shape of eyes and ocelli as shown in figure 6A. Ratio, length to width of eyes, 0.75; ratio, line of contact to length of eyes, 0.28. Ocelli pink, narrowly margined

with white, large, subelliptical, twice as wide as long, their distance equal to one and one-half times their width. Maximum length of antennae 9 mm., viz., only slightly shorter than body. Antennae of male thicker than those of female. Scapus and pedicellus without hypodermal pigment; flagellum brown, with articles alternating darker and lighter though not conspicuously. Scapus of male twice as long as wide. Segments of middle of antennae of male with bristles and short sensory setae arranged in from two to four transversal rows; sensillae of apical portion of antennae as in *bifarius*. Apical articles divided into five subarticles. Shape and pigmentation of maxillary palp of female as shown in figure 6C, shape of palp of male as shown in figure 6B, its pigmentation similar to that of female but slightly less intensive and extensive. Last segment of maxillary palp about as long as penultimate in both sexes. Apical segment of palp of male subcylindrical, only very slightly narrowed apically; undersurface of segments II–VII with relatively short adpressed setulae (fig. 6B, D, E); segment II with a few, but not very conspicuous, longer setae. Apical sensory spines of maxillary palp hyaline, not diminishing in size towards apex of seventh segment of male (fig. 6E). Labium with diffuse pigment; palpi lacking pigment. Shape of labial palpi as shown in figure, 6G, I; labial palpi of male without setulae.

Legs with diffuse pigment on coxae and, in many specimens, with a small spot on femur (fig. 6F, J, K). Femur of foreleg of male widened but without a projection on undersurface (fig. 6H). Spinelike setae occupying almost entire extension of undersurface of femur, but short and stout setae only on apical third; these setae hyaline, their apical third slightly darkened. Sensory field (fig. 6H) from five to six times as long as wide, only slightly more than half as long and about one-fifth as wide as femur. Fore tibia of male stout, slightly concave ventrally, apical spinelike setae very long (fig. 6H). Shape of forelegs and hind legs of female and male as shown in figure 6F, J–L. Femora of all legs in both sexes with relatively long spinelike setae, those of apex of segment somewhat stouter. Number of spinelike setae on tibiae: tibia I, female, 1–2, male, 1–3; tibia II, female 9–10, male 9–10; tibia III, female, 8–10, male 11–16; setae of hind tibiae arranged in three or four irregular rows (fig. 6N). Spinelike setae of tibiae and tarsi darkened on apical half or third.

Abdominal segments I–VII with 1+1 vesicles. Posterior angle of sternite V approximately 100 degrees (fig. 6O). Shape of sternum VIII of male as shown in figure 6Q. Inner posterior lobes of coxites VII of female (fig. 6P) protruding, not completely fused, their extreme apices



FIG. 6. *Machilanus intergerivus*. A. Eye and ocellus, lateral view. B. Maxillary palp of male, pigment not shown. C. Maxillary palp of female, with pigment pattern. D. Setulae of maxillary palp of male, high magnification. E. Apex of distal segment of maxillary palp of male. F. Foreleg of female, with pigment pattern. G. Labial palp, male. H. Femur and tibia of foreleg of male, external surface. I. Labial palp, female. J. Foreleg of male, with pigment pattern. K. Hind leg, female, with pigment pattern. L. Hind leg, male. M. Coxite IX of male, with paramere. N. Hind tibia of male, with spinelike setae. O. Abdominal sternum V, male. P. Abdominal sternum VII, female. Q. Abdominal sternum VIII, male.

free. Sternites and coxites glabrous, posterior coxites in most cases with one or two spiniform setae. Ratio stylus to coxite, on segments II–VII, 0.55–0.6, on segment VIII, female, 0.85, male 0.75; segment IX, female, 0.75, male, 1.0. Apical spine of styli as in *bifarius* but not pigmented; most of the setae of styli pigmented. Styli of ninth segment of male only with normal setae.

Ovipositor of primary type, slender, elongate, surpassing apex of styli IX by not more than one-third the length of the latter. Anterior gonapophyses with from 55–60 articles, their chaetotaxy as in *bifarius*. Posterior gonapophyses with the basal 30 articles glabrous; chaetotaxy of distal articles as in *bifarius*. Genital appendages of male attaining level of apex of coxites IX; parameres attaining apex of penis. General structure of penis and parameres as in *bifarius*. Genital opening subcircular. Parameres with I+6 or I+7 articles, the apical one as long as the three preceding combined.

MATERIAL EXAMINED: Central Gobi [Middle Gobi]: Delgerchangaj ul, 6 kilometers south of somon Delgerchangaj, 1650–1700 meters, on steep, almost vegetationless hills, in pitfall traps, June 11 to July 10, 1967, No. 786, one male, holotype, one female, allotype, 15 males and 25 females, paratypes, two juveniles.

Uvs [Ubsa]: southern shore of Örög nuur, 1500 meters, swept from moist shore vegetation, June 28, 1968, No. 1035, one male, paratype.

Chovd [Hobdo]: Kobdo, about 5 kilometers southwest of the town, 1500 meters, under rocks and among roots of *Caragana*, July 10, 1966, No. 666, one male, paratype.

DISCUSSION: *Machilanus intergerivus*, also a species with not more than 1+1 vesicles on any abdominal segment, differs from all known species of *Machilanus* including those described in the present paper by the extremely short line of contact of the eyes. In other respects, the female of *intergerivus* is rather similar to that of *bifarius*, but can in most cases be distinguished by the presence of hypodermal pigment on its head, body, and appendages; such pigment is not found in *bifarius*. The male of *intergerivus* differs from that of *bifarius* and the other species described below by the presence of setulae on segments II–VII of the maxillary palp; they are restricted to segments V–VII in the remaining species.

***Machilanus confaratus*, new species**

Figures 7, 8

Maximum observed body length of male, 10 mm.; of female, 11 mm. General body color whitish, terga and abdominal sterna with

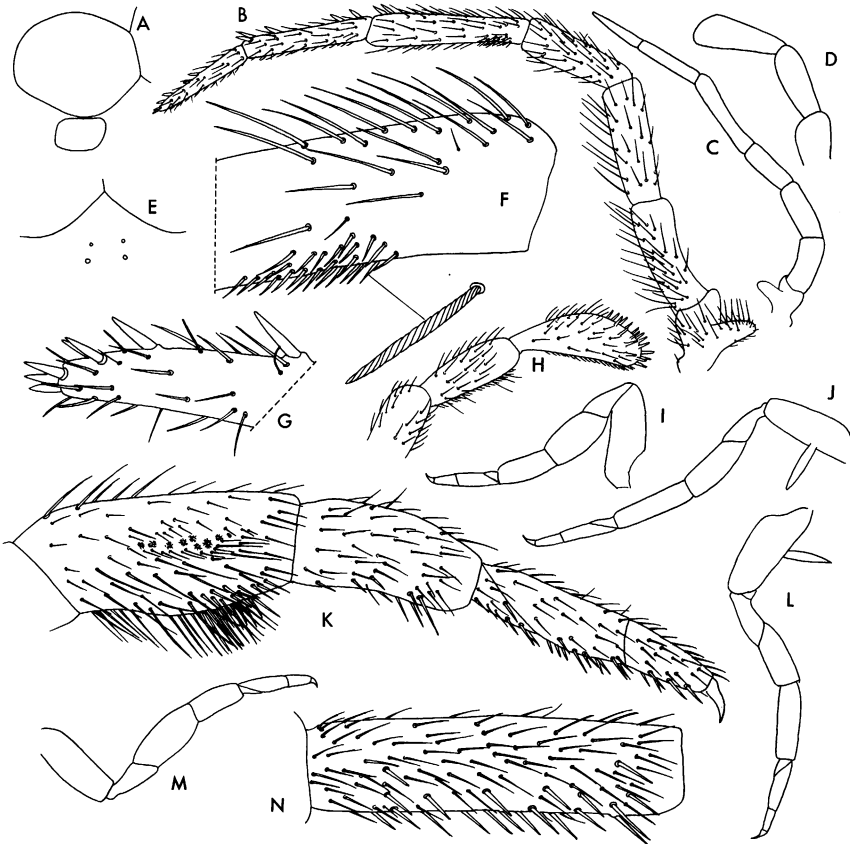


FIG. 7. *Machilanus confaratus*. A. Eye and ocellus, lateral view. B. Maxillary palp, male. C. Maxillary palp, female. D. Labial palp, female. E. Distribution of large setae of frons. F. Base of fifth article of maxillary palp of male, with one setula highly magnified. G. Apex of distal article of maxillary palp of male. H. Labial palp, male. I. Foreleg, female. J. Hind leg, male. K. Portion of foreleg of male, external surface. L. Hind leg, female. M. Foreleg, male. N. Tibia of hind leg of male.

distinct violaceous hypodermal pigment. Pattern formed by scales unknown.

Frons with four large setae arranged as shown in figure 7E. Shape of eyes as shown in figure 7A. Ratio length to width of eyes, 0.8; ratio line of contact to length of eyes, 0.55. Ocelli small, almost twice as wide as long (1.7), their distance equal to 1.3 times their width.

Maximum length of antennae 8 mm., viz., distinctly shorter than body. Antennae of male thicker than those of female. Flagellum uniformly dark brown. Scapus of male twice as long as wide. Segments of middle of antennae of male with bristles and short sensory setae arranged in two or three irregular transversal rows, as in *M. bifarius*. Antennae of female lacking short sensory setae. Apical preserved articles of antennae divided into five subarticles. Shape of maxillary palp of female as shown in figure 7C; of male as shown in figure 7B; last segment four-fifths as long as penultimate in both sexes. Apical segment of maxillary palp of male pointed apically; chaetotaxy of palp of male as shown in figure 7B, F, G; not very numerous long setae on undersurface of segments II and III, and sparse setulae on undersurface of segments V–VII, with a group of more closely spaced setulae sub-basally on segment V. Sensory spines of maxillary palp of male hyaline, faintly pigmented apically, only slightly shorter toward apex of last segment. Shape of labial palp of female as shown in figure 7D. Labial palp of male as shown in figure 7H; setulae present on inner surfaces of distal and penultimate segment.

Legs with very faint pigment at base of coxae, otherwise unpigmented. Fore femur of male less strongly widened than usual for the genus (fig. 7K), slightly projecting ventrally near middle. Spine-like setae most numerous at area of projection, faintly pigmented throughout. Sensory field less than half as long as femur, extremely narrow, composed of one irregular row of ramose sensillae. Fore tibia of male slightly concave ventrally, apical spinelike seta distinctly longer than the remaining setae. General shape of fore legs and hind legs of both sexes as shown in figure 7I–M. Femora of all legs with 2–4 distinct relatively short spinelike setae. Number of spinelike setae of tibiae: tibia I, female, 6–7, male, 8–10; tibia II, female, 10–14, male, 10–11; tibia III, female, 13–15, male, 13–16. Setae on tibia III arranged in 3–4 irregular rows (fig. 7N).

Abdominal segments I–VII with 1+1 vesicles. Posterior angle of sternite V 110 degrees (fig. 8A). Shape of sternum VIII of male as shown in figure 8C. Inner posterior lobes of coxites VII of female form a projection of almost continuous outline (fig. 8B). Coxites of all sterna with 4–9 very slender spinelike setae on external lobes posteriorly; inner portion of coxites each with 1–3 setae; coxites VIII and IX also with a few spinelike setae (fig. 8D–F). Ratio stylus to coxite, on segments II–VII, 0.65–0.7; on segment VIII, female, 0.8, male, 0.85; on segment IX, female 0.7, male 1.0. Apical spine of styli hyaline. Styli of ninth segment of male with normal setae (fig. 8D).

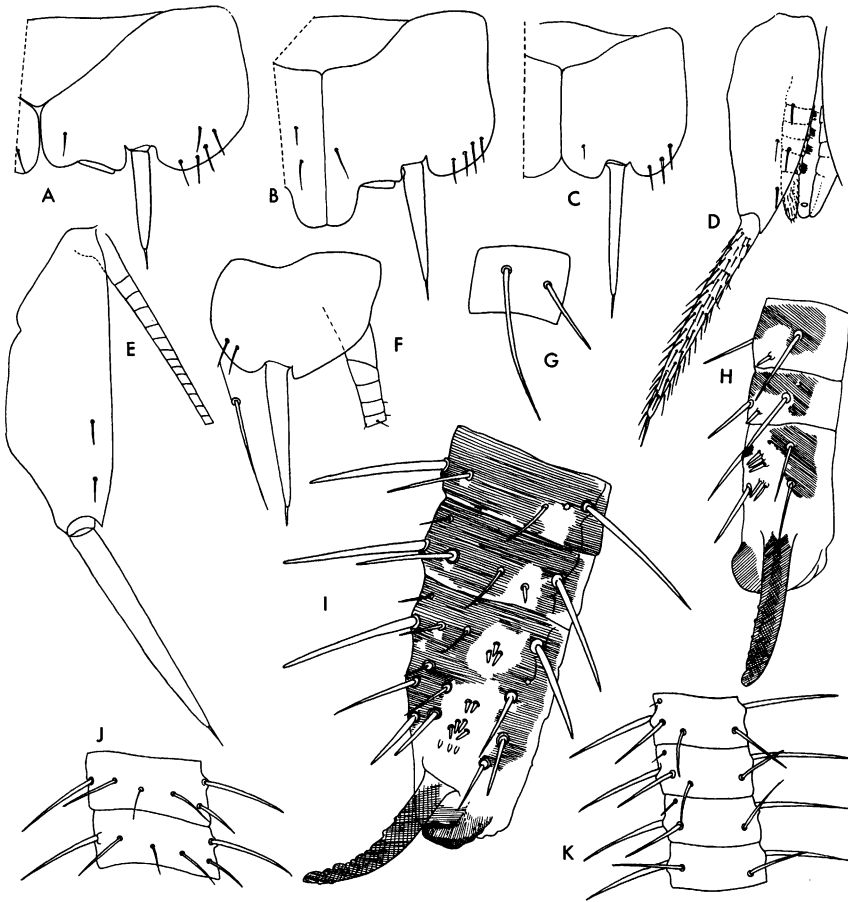


FIG. 8. *Machilanus confaratus*. A. Abdominal sternum V, female. B. Abdominal sternum VII, female. C. Abdominal sternum VIII, male. D. Genital segment of male. E. Coxite IX of female, with base of gonapophysis. F. Coxite VIII of female, one spinelike seta with high magnification. G. Fifteenth article of posterior gonapophysis of female. H. Apical articles of posterior gonapophysis. I. Apical articles of anterior gonapophysis. J. Fifteenth article of anterior gonapophysis. K. Forty-ninth to fifty-second articles of anterior gonapophysis.

Ovipositor of primary type, but apex and apical spine of gonapophyses modified. Ovipositor surpassing apex of styli IX by about the length of the latter. Anterior gonapophyses with 64-68 articles, their chaetotaxy as illustrated in figure 8I-K; only the two or three basal articles glabrous. Apex of last segment strongly sclerotized, with con-

cavity bordered by reinforced edge; apical spine transformed into heavily sclerotized curved rod, its concave surface irregularly beaded (fig. 8I). Basal 15 articles of posterior gonapophyses glabrous, the remaining with one or two strong spines (fig. 8G); apical segments as shown in figure 8H. Genital appendages of male (fig. 8D) attaining level of apex of coxite IX. Genital opening subcircular. Parameres with I+5 articles, the apical one as long as the two preceding combined.

MATERIAL EXAMINED: South Gobi: Eastern border of Zöölön ul, 58 kilometers west-southwest of somon Bajandalaj, on road to somon Sevrej, 1500 meters, dry river bed, under stones, June 16, 1967, No. 806, one male, holotype, one female, allotype; 10 kilometers southwest of somon Sevrej, 1600 meters, foothills of Sevrej ul, very dry, high desert, under stones, June 17, 1967, No. 809, one male and one female, paratypes; eastern border of Zöölön ul, 34 kilometers west-southwest of somon Bajandalaj, 1600 meters, very dry, rocky mountain region, under rocks, June 15, 1967, No. 804, one male and one female, paratypes; Gurban Sajchan ul, 30 kilometers south of somon Bulgan, 1700 meters, under rocks, on ground, and under dry dung, June 19, 1964, No. 153, one male, paratype.

DISCUSSION: The most striking character of *Machilanus confaratus* is the transformation of the apical spine of the last segment of the gonapophyses of the female. No comparable condition has been reported for any other species of *Machilanus*, or even for any other machilid. The male is easily recognized by the dense group of setulae close to the base of the fifth segment of the maxillary palp.

***Machilanus ciliatus*, new species**

Figures 9-11

Maximum observed body length of male, 8 mm.; of female, 11 mm. General body color yellowish white. Hypodermal pigment on head capsule and very faintly on abdomen. Pattern formed by scales approximately as shown in figure 9A, less frequently as shown in figure 9B.

Frons with four large setae arranged as in *bifarius*. Eyes (fig. 9C, D) grayish, speckled with dark pigment (fig. 9E). Ratio, length to width of eyes, 1.1-1.2; ratio, line of contact to length of eyes, 0.65. Ocelli pink, comparatively small, slightly less than twice as wide as long, their distance somewhat larger than twice their width (2.5). Maximum length of antennae, 7 mm., viz., distinctly shorter than body. Antennae of male thicker than those of female, (fig. 9E, H). Flagellum uniformly dark brown. Scapus of male twice as long as wide. Articles of middle

of antennae of male with bristles and short sensory setae arranged in from two to four transversal rows; sensillae of apical portion of flagellum as in *bifarius*. Antennae of female with one or two transversal rows of simple bristles; sensory setae absent. Apical articles of flagellum divided into 7–9 subarticles. Shape of maxillary palp of female as shown in figure 9L, of male as shown in figure 9K; last segment almost as long as penultimate in both sexes. Apical segment of maxillary palp of male subcylindrical, narrowed only at extreme apex; under-surface of segments V–VII with very numerous adpressed setulae (fig. 9I, K, M); undersurface of segments II–V with suberect, long setae not quite as long as diameter of segment, these setae most numerous on segments II and III. Apical sensory spines of maxillary palp (fig. 9M) hyaline, faintly pigmented apically, slightly diminishing in size at apex of seventh segment of male. Shape of labial palp of female and male as illustrated (fig. 9G, J); apical segment of palp of male more strongly widened than in female. Chaetotaxy of labial palp of male as illustrated; setulae absent.

Legs not pigmented. Femur of foreleg of male (fig. 10A) widened, projecting somewhat apically below. Spinelike setae most densely clustered at projection, these setae pigmented throughout. Sensory field of fore femur approximately twice as long as wide, and one-half as long and slightly less than one-half as wide as femur. Fore tibia of male (fig. 10A) stout, faintly emarginated ventrally, apical spine-like seta very long; basal segment of fore tarsus (fig. 10A, C) with exceptionally long spinelike seta. Femur, tibia, and base of tarsus of foreleg of female as shown in figure 10B. Femora of all legs with relatively long spinelike setae. Number of spinelike setae on tibiae: tibia I, female, 4–5, male, 7; tibia II, female, 8–15, male, 9–13; tibia III, female, 13–15, male, 12–14. Spinelike setae of hind tibiae arranged in three or four irregular rows (fig. 10G).

Abdominal segments I–VII of male (fig. 11C) with 1+1 vesicles; in female, I, VI and VII with 1+1, II–V with 2+2 vesicles (fig. 11A). Posterior angle of fifth sternite 100–110 degrees. Shape of sternum VIII of male as shown in figure 11C. Inner posterior lobes of coxites VII of female tongue-shaped, distinctly separated (fig. 11G). Sternites and coxites glabrous, lacking bristles or spinelike setae. Ratio stylus to coxite, on segments II–VII, 0.55–0.65; on segment VIII, female, 0.8, male, 0.7–0.75; segment IX, female, 0.7–0.75, male, 0.95. Apical spine of styli as shown in figure 11D, J, hyaline. Styli of ninth segment of male on posterior surface with a large number of conspicuous ciliate setae (fig. 11D, J).

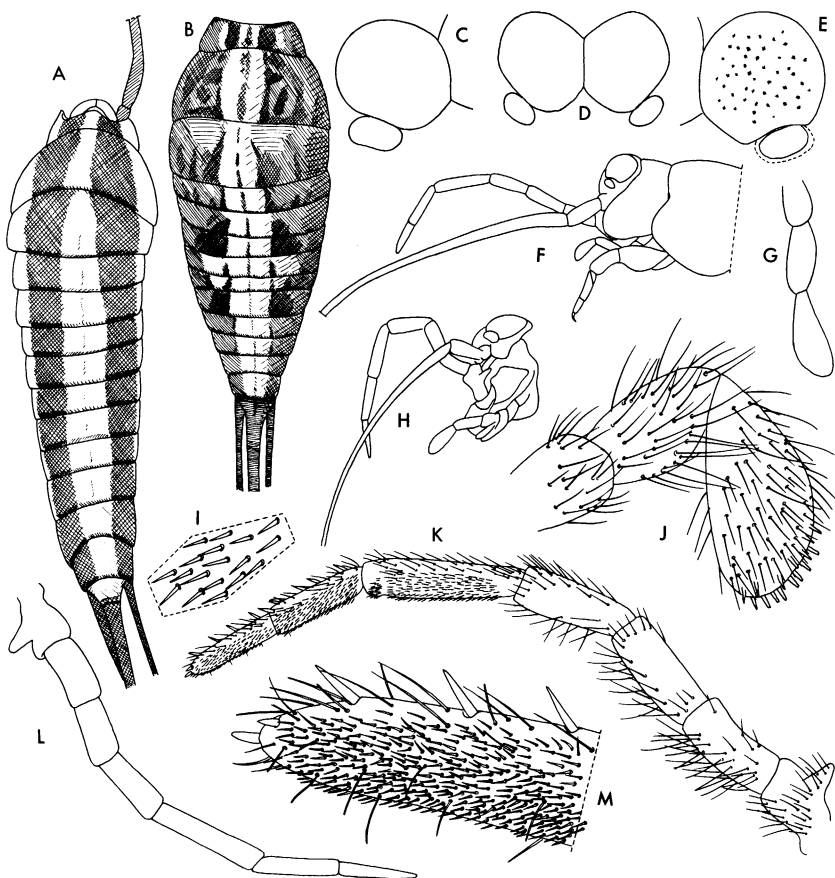


FIG. 9. *Machilanus ciliatus*. A. Less frequent color pattern. B. Common color pattern. C. Eye and ocellus, lateral view. D. Eyes and ocelli, front view. E. Color pattern of eye. F. Anterior portion of body, male. G. Labial palp, female. H. Anterior portion of body, female (magnification as in fig. 9F). I. Setulae of maxillary palp of male, high magnification. J. Labial palp, male. K. Maxillary palp, male. L. Maxillary palp, female. M. Apex of distal segment of maxillary palp of male.

Ovipositor of secondary type, stout, slightly surpassing apex of coxites IX (fig. 11F). Anterior gonapophyses with 20–22 articles, their pigmentation and chaetotaxy as shown in figure 11E, H. Fossorial spines and all other spines pigmented (pigment of spines not illustrated). Terminal four or five segments each with one or two fossorial spines; apical articles with a small group of minute sensory rods. Posterior

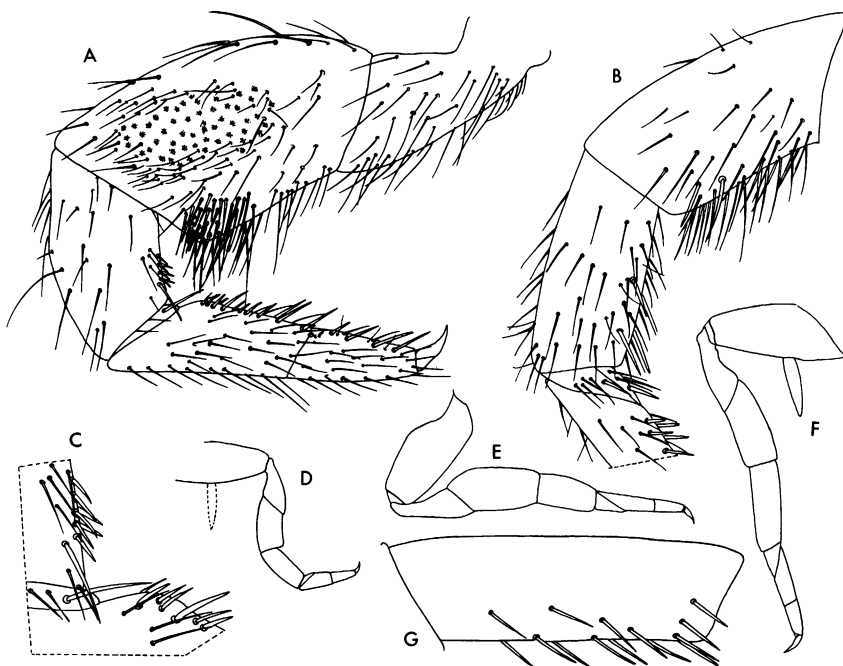


FIG. 10. *Machilanus ciliatus*. A. Foreleg of male, external view. B. Portion of foreleg of female. C. Under surface of apex of fore tibia and base of fore tarsus of male. D. Hind leg, male. E. Foreleg, female. F. Hind leg, female. G. Hind tibia of male, with spinelike setae.

gonapophyses as shown in figure 11F, I; terminal three or four articles with one, or, in most cases, two large fossorial spines; simple, small spines similar to fossorial spines on four or five of the preceding articles. Long setae of outer margin of posterior gonapophyses on all articles but a few basal ones. Genital appendages of male (fig. 11D) attaining level of apex of coxite IX; parameres reaching level of apex of penis. Basal portion of penis as long as apical one; genital opening subcircular. Parameres with I+5 articles, the apical one as long as the two foregoing combined.

MATERIAL EXAMINED: Uvs [Ubsa]: On Chöndlön gol, 32 kilometers northwest of Ulaangom, 1200 meters, in pitfall traps, June 27 to July 7, 1968, No. 1028, one male, holotype, one female, allotype, 25 males and 12 females, paratypes, 54 juveniles; near Changilcagijn gol, 6 kilometers southwest of somon Baruunturuun, 1350 meters, June 24, 1968, No.

1009, one female, paratype, two juveniles; 54 kilometers west of somon Öndörchangaj, foothills of the Chanchöchij ul, 1640 meters, desert steppe, on ground and under stones, July 10, 1968, No. 1089, one female, paratype; somon Öndörchangaj, 1900 meters, on banks of stream near village, July 11, 1968, No. 1090, one male, paratype; 3 kilometers northeast of Öndörchangaj, Chanchöchij ul, 2200 meters, alpine zone, on ground and under stones, July 11, 1968, No. 1092, one immature male. Chovd [Hobdo]: Kobdo, about 5 kilometers south of town, 1500 meters, under stones and among roots of *Caragana*, July 10, 1966, No. 666, three males and three females, paratypes. Gobi Altaj [Gobi Altay]: northwest corner of Chasagt chajrchan ul, 2 kilometers northwest of somon Bičigt, 1900 meters, mountain steppe, under stones, July 14–15, 1966, No. 687, one female, paratype; Chasagt chajrchan ul, about 20 kilometers south of somon Žargalan, 2400 meters, high mountain steppe, under stones, July 15–16, 1966, No. 694, one female, paratype. Chövsgöl [Höbsögöl]: 3 kilometers southwest of somon Burenchaan, 1650 meters, wide, rocky mountain valley, pitfall traps, June 21 to July 16, 1968, No. 993, 236 mostly juvenile females; 8 kilometers north of somon Burenchaan, on the Delger Mörön River, 1450 meters, rocky mountain slopes, on ground and under stones, July 16, 1968, No. 1114, three males, two females, paratypes; 4 kilometers north of Mörön, 1500 meters, dry mountain steppe, night collecting with light, on ground, July 19, 1968, No. 1128, one immature female; 6 kilometers northwest of somon Tosoncegel, 1480 meters, stony slopes with pine trees, pitfall traps, June 18 to July 20, 1968, No. 980, nine females, paratypes. Archangaj [North Hangay]: Changaj Mountains, 8 kilometers west of somon Urdtamir, 1620 meters, dry mountain steppe, pitfall traps, June 19 to July 21, 1966, No. 538, 11 females, paratypes, 25 immature females; Changaj Mountains, Zezerleg, 1650 meters, mountain steppe, under stones, July 21, 1966, No. 720, one female, paratype; Changaj Mountains, 8 kilometers west of somon Urdtamir, 1620–1750 meters, mountain steppe, under stones, July 21–22, 1966, No. 723, two females, paratypes. Bajanchongor [Bajan Hongor]: Changaj Mountains, Ulaan čolon, 18 kilometers south of Egijn davaa, 2300 meters, high mountain steppe, pitfall traps, June 21 to July 18, 1966, No. 552, 27 immature females. Bulgan [Bulagan]: 7 kilometers northwest of somon Chanzargalant, 1350 meters, at border of coniferous forest and on bare mountain slope, pitfall traps, June 16 to July 22, 1968, No. 970, two males and five females, paratypes, three juveniles. Central: 26 kilometers east of somon Lun, 1180 meters, under rocks on *Artemisia* steppe, July 4, 1964, No. 261, one female; Ulan-Baator, Bogdo ul, 12

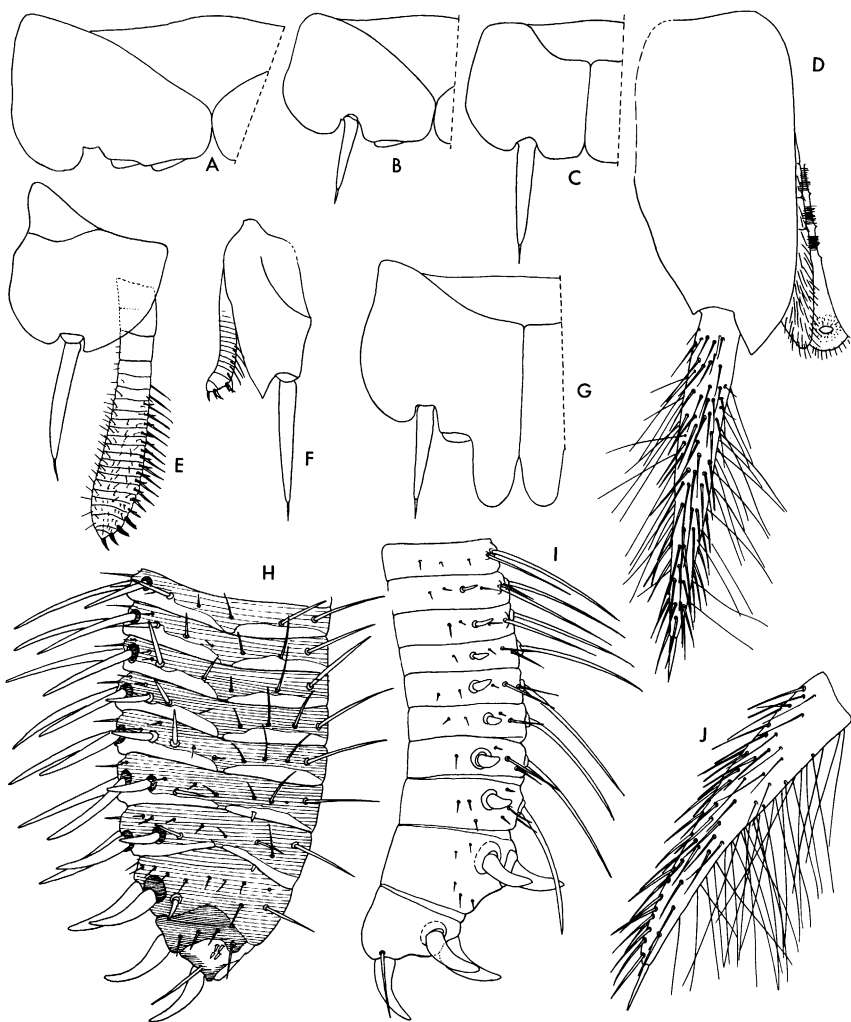


FIG. 11. *Machilanus ciliatus*. A. Abdominal sternum V, female. B. Abdominal sternum V, male. C. Abdominal sternum VIII, male. D. Coxite IX of male, with stylus and genital appendages. E. Coxite VIII of female, with anterior gonapophysis. F. Coxite IX of female, with posterior gonapophysis. G. Abdominal sternum VII of female. H. Apical articles of anterior gonapophysis of female; pigment of spines not shown. I. Apical segments of posterior gonapophysis; pigment of spines not shown. J. Stylus of ninth coxite of male, side view.

kilometers southeast of center of city, 1500 meters, coniferous forest, pitfall trap, June 12 to July 6, 1964, No. 271, 10 juveniles; Ulan-Baator, Bogdo ul, 12 kilometers southeast of center of city, 1500 meters, mountain steppe with southern exposure, pitfall traps, July 22 to August 27, 1965, No. 297a, one female; 25 kilometers east of somon Lun, 1200 meters, dry mountain steppe, night collecting with light, on ground, July 25, 1968, No. 1184, one female, paratype; camp on Kerulen River, 45 kilometers east of somon Bajandelger, 1400 meters, mountain steppe with southern exposure, pitfall traps, July 26 to August 21, 1965, No. 304, 15 females, paratypes; southeast of somon Bajanzogt, 1600 meters, mountain steppe on southerly exposed slope, pitfall traps, June 11 to July 27, 1966, No. 520b, one female, paratype; Cagan Dirschinchodag, valley of the Tola River, left bank, about 24 kilometers from somon Tariat, 1180 meters, bare, rocky mountain slopes, under stones, July 24, 1966, No. 740, one female, paratype; 11 kilometers south of Zosijn davaa, about 90 kilometers south of Ulan-Baator, 1650 meters, mountain steppe, stony slope, pitfall traps, June 7 to July 15, 1967, No. 768, 13 females, paratypes, 25 immature females and specimens of undetermined sex; 12 kilometers south of somon Bajanbaraat, 1380 meters, sandy and rocky slope, pitfall traps; June 8 to July 14, 1967, No. 774, 19 females, paratypes, 51 juvenile specimens. South Gobi: Gurban Sajchan ul, 30 kilometers south of somon Bulgan, 1700 meters, under stones, on ground and under dry dung, June 19, 1964, No. 153, two immature females. Chentej [Hentej]: somon Tumunzogt, 160 kilometers east-northeast of Öndörchaan, 1000 meters, mountain steppe, under stones, July 31, 1965, No. 337, one female, paratype; 7 kilometers northeast of somon Möron, 1200 meters, dry mountain steppe, pitfall traps, July 28 to August 21, 1965, No. 323, four females, paratypes, one additional female; 7 kilometers northeast of somon Möron, 1200 meters, dry mountain steppe, under stones, August 22, 1965, No. 462, six females, paratypes. Suchebaator [Sühe Baatar]: on Bajan gol, 85 kilometers northeast of somon Dariganga, 1100 meters, humid valley bordered by basaltic slopes, under stones, August 8, 1965, No. 376, one female, paratype.

DISCUSSION: This is the most wide-ranging of the known Mongolian species of *Machilanus*; it is also the only one for which available evidence indicates the existence of parthenogenetic as well as bisexual populations. These two facts may be related; many insect species occupying an area significantly larger than that settled by closely related species have been found to include parthenogenetic populations.

Machilanus ciliatus differs from all other described species of *Machilanus*

and all other machilids by the amazing sexual dimorphism in the number of exsertile vesicles. Ovipositors of secondary type, like that of *ciliatus*, are also found in three other described species of *Machilanus*, viz., *hutchinsoni* Silvestri (Indian Tibet), *bitschi* Wygodzinsky (Afghanistan), and *hummeli* Silvestri (Szechwan), but in all of these species the ovipositor surpasses considerably the apex of the coxites IX. The tongue-like inner posterior lobes of the seventh coxite of the female of *ciliatus* are also unique. The male of *M. ciliatus* differs from that of all other species of the genus by the striking ciliate setae of the styli of the ninth abdominal segment.

