

Walker, are small size and body color pattern. The present author has been unable to examine a collection of small males of *A. brevicauda brevicada* and unable to compare the color patterns of live specimens from the upper reaches of Doe Run and *A. brevicauda brevicada*. Until such examination and comparison have been made, preferably on material gathered entirely from Doe Run, subspecific status for Walker's taxon is appropriate. It may be added that through the courtesy of Dr. L. A. Krumholz, University of Louisville, an attempt to examine live material from Doe Run was made, but unfortunately the material did not survive the postal journey.

Asellus brevicauda brevicada Forbes

FIGURES 11, 12, 14

Asellus brevicauda Forbes, 1876, pp. 8-10.

Asellus brevicaudus Mackin and Hubricht, 1938, pp. 631-632.

TYPE MATERIAL.—Lectotype, adult ♂, deposited in the Museum of Comparative Zoology; the reference is the specific name (catalog number 6800): Labels read: "MCZ Illinois: Union Co., July 30, 1876; S. A. Forbes coll. *Asellus brevicauda* Forbes" and "hololectotype."

DESCRIPTION OF LECTOTYPE.—Body: Length, 13.0 mm.

Head (Figure 11A): Eyes large and distinct; posterolateral lobes large, prominent and rounded, and with numerous strong spines.

First antenna (Figure 11B): Flagellum 12-merous and tip reaching to point about two-thirds distally along last segment of peduncle of second antenna; penultimate 2 segments bearing aesthetascs. Flagellum about two-thirds length of peduncle. First segment of peduncle slightly shorter than second; third segment about half length of second. First segment of peduncle about twice as long as wide and bearing distally a circlet of short strong spines; second and third segments respectively about 3 and 2.5 times as long as wide.

Second antenna: Length (8.0 mm) about three-fifths (0.62) that of body. Flagellum 80-merous. Fourth and fifth segments of peduncle respectively about 2.5 and 4.5 times as long as wide, but peduncle otherwise similar to *A. communis*.

First peraeopod (Figure 11C): Dactylus slightly longer than palm with 8 toothlike spines on inner margin and ending in a long terminal claw. Propodus about three-fifths (0.61) as wide as long, and subtra-

pezoidal in shape; palm with a small, low, conical projection near midpoint, a very large toothlike spine proximally, and a submarginal row of spines on inner and outer surfaces.

Second to seventh peraeopoda: Similar in construction to *A. communis*; most noticeable minor difference is occurrence of fewer toothlike spines on inner margin of each dactylus.

First pleopod (Figure 12A): Total length of appendage slightly greater (1.15) than that of second pleopod. Sympod subrectangular, about three-fifths as wide as long; inner margin with 7 hooklike protuberances for coupling. Distal segment also subrectangular, but distinctly curved outward so that the outer lateral margin is deeply concave and the inner lateral margin is convex; proximal width slightly greater than distal width; maximum width slightly less (0.47) than half maximum length; distal margin bearing 11 long plumose spines and 9 shorter simple spines somewhat irregularly arranged; lateral distal angle with a row of short strong spines arranged regularly; inner proximal angle with 2 short simple spines.

Second pleopod (Figures 12B-D): Sympod subrectangular, maximum length over one and a half (1.65) times maximum width; medial and lateral margins more or less straight, and medial margin bearing 4 simple spines beneath attachment of endopodite. Proximal segment of exopod with 7 simple spines on outer margin, inner margin conspicuously sclerotized. Distal segment of exopod subtriangular with 17 long plumose spines marginally and conspicuously sclerotized near inner proximal angle. Endopod narrow and gently curved outward in long axis, total length subequal to that of exopod; a prominent inner basal apophysis and a less prominent outer basal apophysis are present. Cannula short and wide and completely overlapped ventrally by a flattened, expanded, and rounded lateral process. Ventral groove prominent, moderately long and wide. Mesial process large, sclerotized, and expanded so that it wholly occupies the inner lateral margin of the endopod tip; distally its outer face is concave. Caudal process not developed, but dorsal surface of distal tip of endopod with several minute, short spinules.

Uropod (Figure 11D): About half as long (0.48) as telson. Peduncle about as wide as long and bearing distally numerous short to moderately long spines; subtriangular in shape. Exopod as long as peduncle and about twice as long as greatest width; endopod slightly

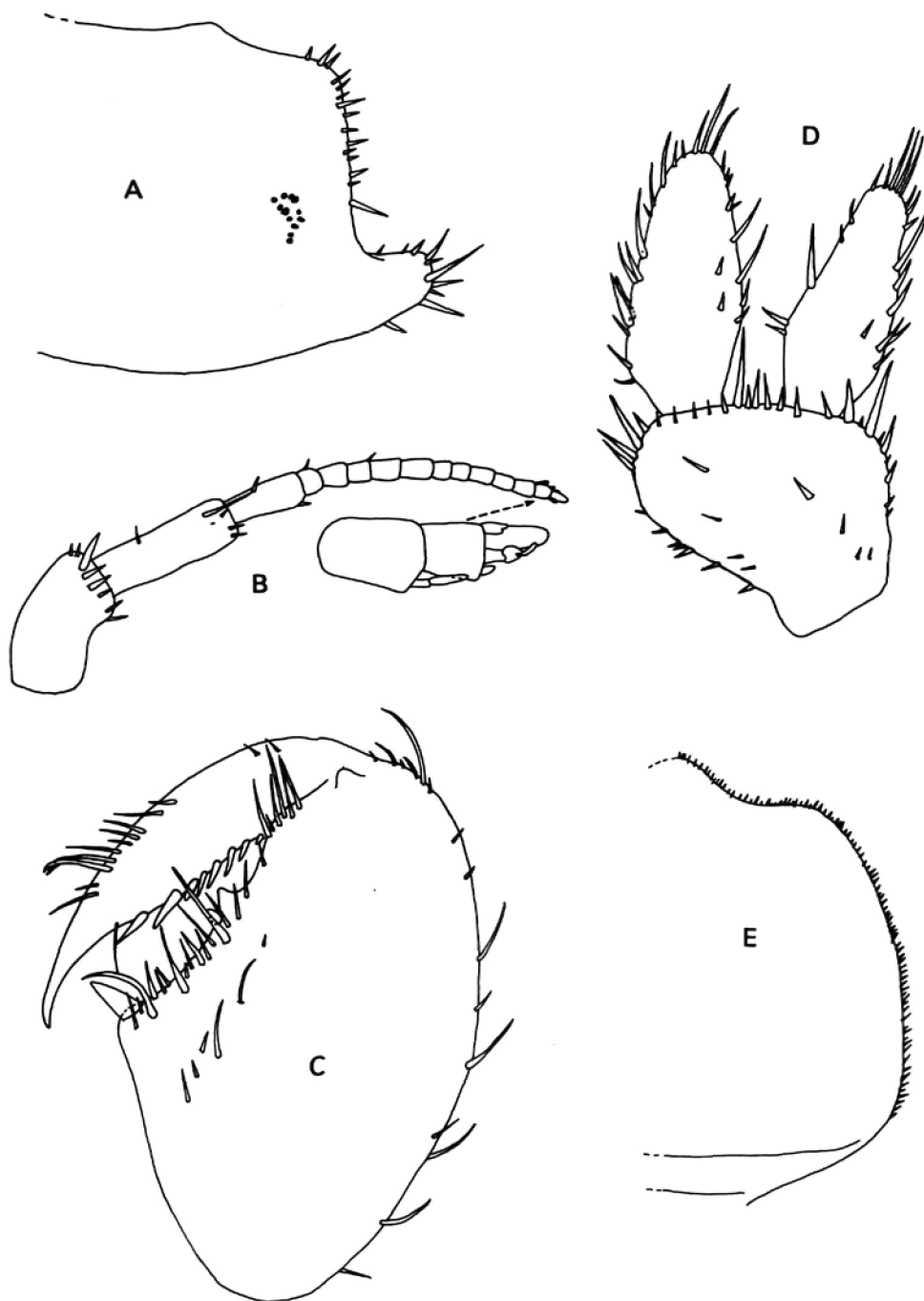


FIGURE 11.—*Asellus brevicauda brevicauda*, lectotype: A, head; B, first antenna; C, dactylus and propodus of first pereopod; D, uropod; E, telson.

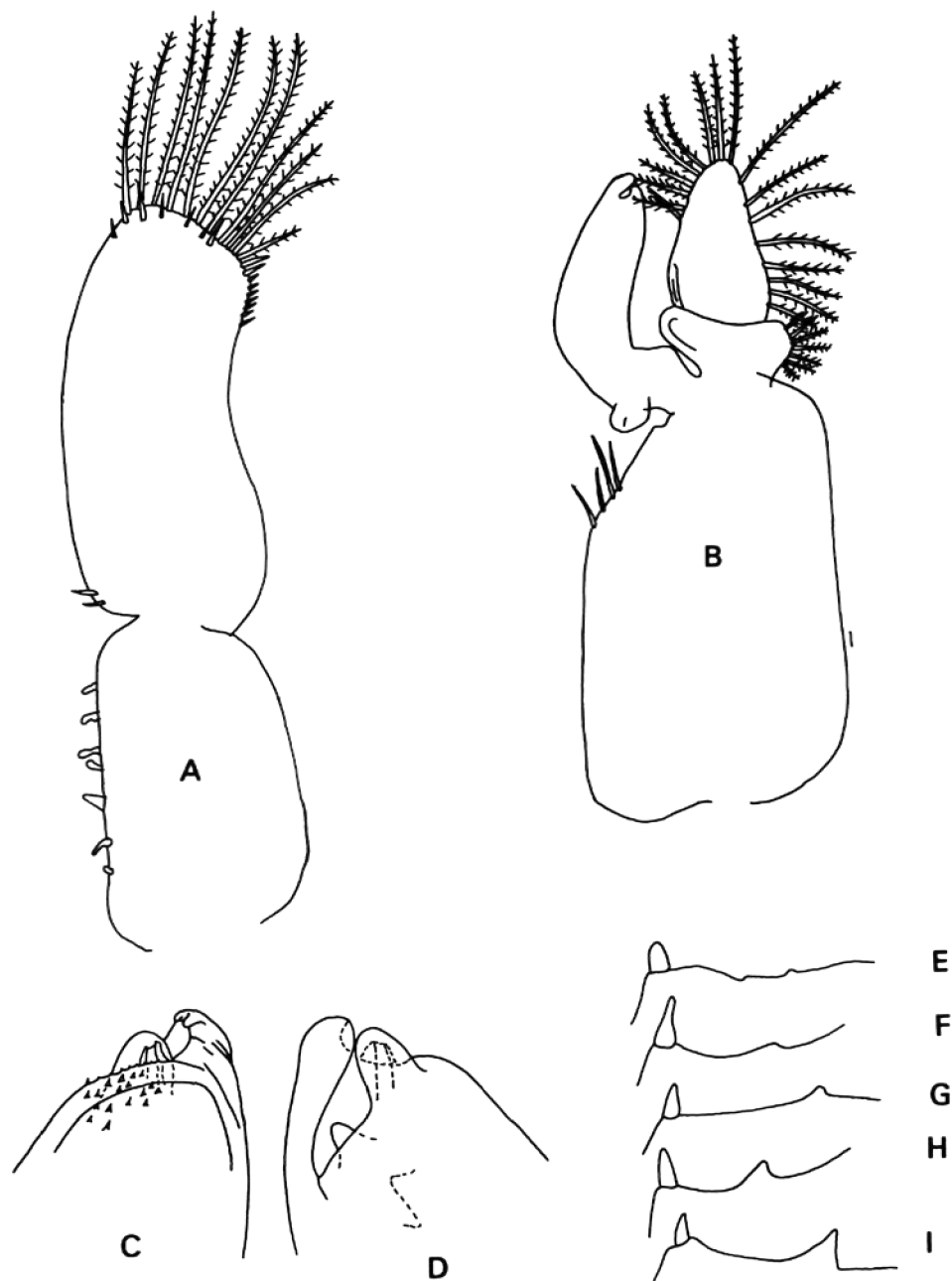


FIGURE 12.—*Asellus brevicauda brevicauda*, A-D, lectotype; E-I, extent of variation in palm shape of male first peraeopod in nontype material: A, first pleopod; B, second pleopod; C, D, respectively dorsal and ventral surfaces of tip of endopodite of second pleopod; E, Goose Creek, Jefferson County, Kentucky; F, Harine, Jefferson County, Missouri; G, Boone County, Missouri; H, near Fountains Gap, Monroe County, Illinois; I, Burkesville, Monroe County, Illinois.

longer than peduncle (1.13) and also about twice as long as greatest width; both exopod and endopod bear numerous strong and relatively short spines.

Telson (Figure 11E): Subcircular, as long as wide; uropodal sinuses prominent.

MATERIAL EXAMINED.—ILLINOIS: Fountain Gap, Monroe County, ∞ ♂♂, coll. L. Hubricht, 26.v.1937 (USNM); Burkesville, Monroe County, ∞ ♂♂, coll. L. Hubricht, 6.xi.1937 (USNM); Bluffside, St. Clair County, ∞ ♂♂, coll. L. Hubricht, 16.i.1938 (USNM); Burkesville, ∞ ♂♂, coll. Burk et al., 24.i.1947 (INHS); Shawnee National Forest, Union County, 1♂, coll. R. L. Lippson, 7.iv.1967.

KENTUCKY: Goose Creek,* Jefferson County, 1♂, coll. G. A. Cole, 4.v.1955.

MISSOURI: Glencoe Creek, St. Louis County, ∞ ♂♂, coll. L. Hubricht, 1.iii.1936 (USNM); Harine, Jefferson County, ∞ ♂♂, coll. L. Hubricht, 21.v.1936 (USNM); Gray Summit, Franklin County, ∞ ♂♂, coll. L. Hubricht, 29.v.1937 (USNM); Antonia, Jefferson County; ∞ ♂♂, coll. L. Hubricht, 6.vi.1937 (USNM); St. Louis, ∞ ♂♂, coll. L. Hubricht, 25.xi.1937 (USNM); Cave brook, Boone County, ∞ ♂♂, coll. C. Boll, 6.x.1956 (NMC).

GEOGRAPHICAL DISTRIBUTION AND ECOLOGY.—The localities detailed above, together with the type locality, are plotted in Figure 13. From some of the localities, *A. brevicauda* has been recorded by Mackin and

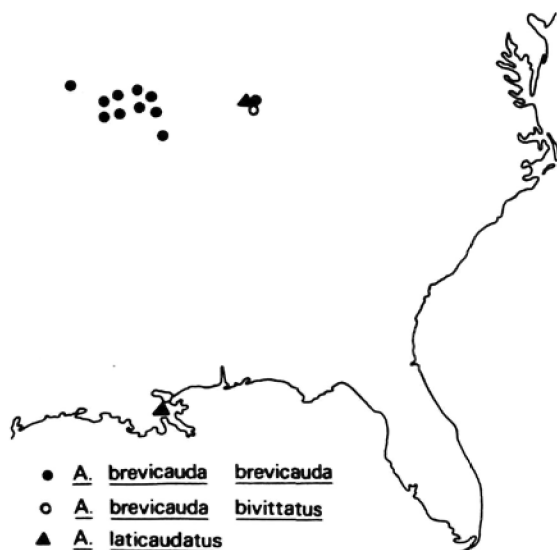


FIGURE 13.—Geographical distribution.

Hubricht (1938); none of their additional records are plotted. This procedure gives greater certainty to and does not detract substantially from the conclusions that may be drawn from Figure 13, since they recorded *A. brevicauda* from only one additional State, Arkansas (1 locality). From Figure 13 it is clear that *A. brevicauda brevicauda* occurs in a large but relatively restricted area of east-central United States, south of Lake Michigan.

According to the data on labels in the collections examined, *A. brevicauda brevicauda* is typically a species associated with springs or spring-fed streams. It has also been collected on a few occasions, however, from cave streams, from which macrohabitat *A. brevicauda* was recorded also by Mackin and Hubricht (1938).

FURTHER DESCRIPTION (♂).—Body: The largest male examined was 17.0 mm long, and the smallest 8.5 mm.

First antenna: Flagellum 11- to 17-merous; flagellum tip reaching to midpoint or slightly beyond the distal margin of the last segment of the peduncle of the second antenna; penultimate 2 or 3 segments bear aesthetascs.

Second antenna: Length 0.53 to 0.76 times that of body. Flagellum 60- to 124-merous.

Mouthparts: See Table 1.

First peraeopod: Nearly always only one thick tooth-like spine is present at proximal end of palm, but occasionally a smaller similar spine is also present. The small, low conical process near the midpoint of the palm, likewise, is almost invariably present; it was absent, however, in one male specimen examined. Dactylus with 8 to 14 teethlike spines on inner margin. Propodus 0.5 to 0.72 times as wide as long, but about two-thirds is the usual value. Figures 12E-I illustrate the range of variation which may occur in the shape of the palm. The typical shape is as shown by the lectotype (Figure 11c).

First pleopod: Total length of appendage 1.03 to 1.24 times as long as second pleopod. Inner margin of sympod with 4 to 7 (usually 6 or 7) coupling hooks. Maximum width of distal segment 0.43 to 0.52 times maximum length; distal margin bearing 5 to 11 long setose spines and 6 to 9 shorter simple spines somewhat irregularly arranged; lateral distal angle with a row of 7 to 11 short strong spines arranged more or less regularly.

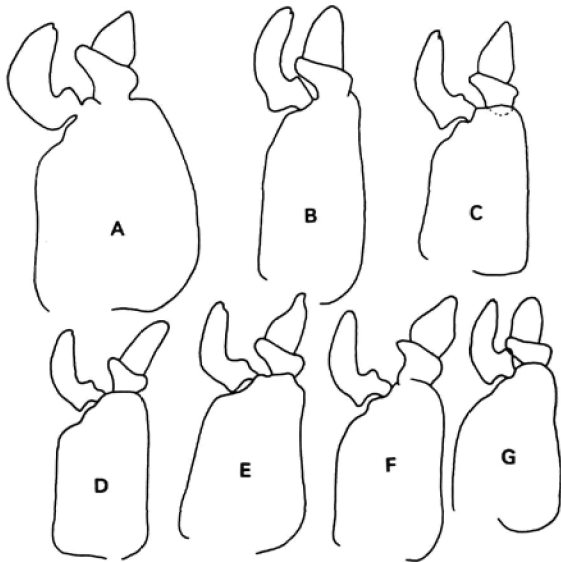


FIGURE 14.—*Asellus brevicauda brevicauda*, extent of variation in shape of sympod, endopod, and exopod of male second pleopod: A, near Fountains Gap, Monroe County, Illinois; B, Burkesville, Monroe County, Illinois; C, Goose Creek, Jefferson County, Kentucky; D, Harine, Jefferson County, Missouri; E, Franklin County, Missouri; F, Antonia, Jefferson County, Missouri; G, St. Louis, Missouri.

Second pleopod: Maximum length of sympod from 1.37 to 2.00 times maximum width; medial and lateral margins of sympod more or less straight to slightly convex. Proximal segment of exopod with 3 to 7 simple spines on outer margin; distal segment with 12 to 17 long setose spines marginally, and subovate to elongate triangular in shape. The morphology of the tip of the endopodite displays very little variation. The greatest variation that occurs in the second pleopod involves the length/width ratio of the sympod, the shape of the distal segment of the exopod, and the relative positions of the distal tips of the exopod and endopod. Figure 14 illustrates the nature of this variation.

Uropod: See Table 2.

Asellus brevicauda bivittatus Walker, new combination.

FIGURE 15

Asellus bivittatus Walker, 1961, pp. 385-390, figs. 1-5.

TYPE MATERIAL.—Walker (1961) gives the following information concerning the deposition and collec-

tion of the types of her taxon: Holotype: adult ♂ 4.3 mm in length, USNM 107465. Paratypes: a series of 100 specimens, USNM 107466. Type locality: Doe Run, Meade County, Kentucky, approximately 3 miles east and 0.4 miles north of Ekron. The type material was collected 24 October 1959.

PARTIAL REDESCRIPTION OF HOLOTYPE.—As previously indicated, Walker's description of her taxon is detailed, the only significant omission being information upon the morphology of the tip of the endopodite of the male second pleopod (her omission of a description of the mouthparts is not significant). A reexamination of the holotype enables the description now to be completed.

Second pleopod (Figure 15): Sympod subrectangular, maximum length 1.34 times maximum width.



FIGURE 15.—*Asellus brevicauda bivittatus*, holotype: dorsal surface of right second pleopod.

Endopod rather wide, about half as wide as long. Dorsal surface of endopod near distal margin lacking minute spines, but otherwise morphology of tip of endopodite closely similar to that of *A. breviceauda breviceauda* (see Figures 12c, d).

MATERIAL EXAMINED.—KENTUCKY: Doe Run, Meade County, ∞ ♂♂, coll. W. L. Minckley, 4.viii.1962; Doe Run, Meade County, 10 ♂♂, coll. L. A. Krumholz, 22.viii.1967.

GEOGRAPHICAL DISTRIBUTION AND ECOLOGY.—The only locality from which *A. breviceauda bivittatus* is known is the type locality (Figure 13). This lies in the southern part of the range of the nominate subspecies. According to Minckley (1961), Doe Run is a large spring-fed creek with an average flow of 50 cubic feet per second. Only the upper 3 miles of the creek are inhabited by *A. breviceauda bivittatus*. Minckley (1963) provides a detailed description of the locality.

SEPARATION OF *A. breviceauda bivittatus* FROM THE NOMINATE SUBSPECIES (♂♂ only).—Comparison of Walker's description of *A. breviceauda bivittatus* with the description of *A. breviceauda breviceauda* given in this paper indicates that the principal differences between the two taxa are that *A. breviceauda bivittatus* is shorter in total length, has fewer segments in the flagella of its first and second antennae and fewer tooth-like spines on the dactylus of its gnathopod, lacks a triangular process near the midpoint on the palm of the propodus of the gnathopod, has a propodus which is only half as wide as long, bears fewer spines on the distal segment of the first pleopod and on the exopod

of the second pleopod, and has a slightly shorter uropod. A consideration of topotypic material of *A. breviceauda bivittatus* negates one of these differences but supports the remainder. The one it negates is that relating to the width/length ratio of the propodus of the gnathopod; this ratio in *A. breviceauda bivittatus* (0.61 to 0.68) is similar to that displayed by *A. breviceauda breviceauda*. The principal differences between the two subspecies, as indicated by the material at my disposal, are shown in Table 3, which includes a further difference not apparent from the comparison of Walker's paper, namely that the distal segment of the first pleopod of *A. breviceauda bivittatus* is broader relative to length than it is in the nominate subspecies. Also the spines on the uropoda of *A. breviceauda bivittatus* are longer relative to the length of the rami than they are in *A. breviceauda breviceauda*.

Asellus intermedius Forbes

FIGURES 16–18, 20

Asellus intermedius Forbes, 1876, pp. 10–11.—Richardson, 1905, pp. 422–423, figs. 474–476.—Van Name, 1936, pp. 456–457, fig. 286.—Ellis, 1961, pp. 80–102, figs. 1–4. *Asellus militaris* Hay, 1878, pp. 90–92.—Mackin, 1940, pp. 17–18.—Van Name, 1942, p. 317.

Although Forbes' original description in 1876 of *A. intermedius* lacked drawings, it did give a rather complete description of the species except for critical details of the morphology of the tip of the endopodite of the second pleopod; about this Forbes wrote only

TABLE 3.—Principal differences between *Asellus breviceauda breviceauda* and *Asellus breviceauda bivittatus* [Males only]

	<i>A. breviceauda breviceauda</i>	<i>A. breviceauda bivittatus</i>
Maximum body length (mm)	17.0	5.5*
Number of segments in flagellum of first antenna	11–17	8–9
Number of segments in flagellum of second antenna	60–124	31–44
Number of toothlike spines on dactylus of gnathopod	6–14	5–6
Triangular process near midpoint of palm of propodus	present ^b	absent
Number of coupling hooks on sympod of first pleopod	4–7	3–4
Width/length ratio of distal segment of first pleopod	0.40–0.50	0.50–0.62
Number of setose spines on distal segment of first pleopod	5–11	4–6
Length/width ratio of sympod of second pleopod	1.37–2.00	1.25–1.60
Number of setose spines on distal segment of exopod of second pleopod	12–17	5–10
Uropod length/telson length ratio	0.48–0.68	0.36–0.44

* Dr. L. A. Krumholz (personal communication, 23 August 1967) reports a maximum length of 7–8 mm.

^b Rarely absent (one specimen noted).

(p. 11), "the outer terminal angle is prolonged into an incurved process, the inner provided with a movable (?) excurved claw." Forbes did not mention deposition of types, but in the redescription by Richardson (1905), which included drawings of the first and second pleopoda, Richardson mentioned she had been sent "types" [sic] from the Museum of Comparative Zoology of Harvard University. Her redescription was based on this material, but unfortunately, like Forbes, she omitted details of the endopodite tip of the second pleopod. Inquiries directed to Dr. H. W. Levi of the Museum of Comparative Zoology revealed that this institution possessed no collection clearly labeled as the type of *A. intermedius*, but it did possess a collection consisting of three male specimens and one female specimen of *Asellus* labeled "*Asellus intermedius* Forbes S.A. Forbes Union Co. Ill."

As the United States National Museum, with which institution Richardson was associated, also does not possess material labeled as the type of *A. intermedius* (T. E. Bowman, personal communication, 9 March 1967), we may reasonably assume that the collection examined by Richardson and referred to as type material was returned to the Museum of Comparative Zoology and is the same collection as that referred to above. Although no date of collection is given, the indication that the material had been collected by Forbes himself, and from an area within which he had collected specimens for the original description ("hill country of southern Illinois"), provides strong circumstantial evidence that the material is syntypic. This material, however, if it is syntypic, is not the only such material in existence. Inquiries to the Illinois Natural History Survey revealed the presence of two collections of *Asellus*, each one labeled "cotypes." One was labeled, "Cotypes *Asellus intermedius* Forbes" and "Callahan Cr. Cobden. Ill. May 30, 1876 S. A. Forbes" and contained five males and six females. The other was labeled, "cotypes *Asellus intermedius* Forbes" and "Stoneft. Cr. Makanda Ill. Jy 30, 1876. S. A. Forbes," and contained 13 males and 38 females; 2 of these males belonged to the taxon *A. brevicauda brevicauda*, whereas the other males belonged to a different taxon. The first of the two collections contained males belonging to a single species only, and since it predates the second collection, it is here regarded as consisting of syntype material and from it a lectotype and paralectotypes have been designated.

Asellus militaris was described without drawings by Hay in 1878. Shortly afterward (1882, p. 241) he

commented that his taxon was the same as *A. communis* and this synonymy was accepted by Richardson (1905) and Van Name (1936). It was not accepted, however, by Mackin (1940) who regarded *A. militaris* as a valid species. Irrespective of the lengthy description given by Hay, his only comment on the morphology of the tip of the endopodite of the second pleopod was, "inner ramus navicular, notched at the distal extremity." It is thus impossible to be certain about the identity of this taxon from the original description alone. No mention is made in Hay's paper of type material, but there is in the collections of the Illinois Natural History Survey a collection of *Asellus* with the label, "Ill. State Lab. Nat. Hist. Abingdon Ill. O.P. Hay 1878 S.A. Forbes." Part of this label is in faded handwriting, namely "Abingdon Ill. O.P. Hay 1878", while the rest is printed. These locality data correspond closely with the locality data given by Hay for his original material (1878, p. 92: "near Abingdon, Knox county, Illinois"), suggesting that the material was that used by Hay in the preparation of his description. Further evidence for this was kindly provided by Dr. J. D. Unzicker, taxonomist at the Illinois Natural History Survey, who wrote (personal communication, 5 June 1967):

I believe that the vial of *A. militaris* Hay, which I sent to you, is the type series for this species because (1) the collecting data correspond with that given in the original description, (2) the vial was in a rack labelled 'check for type material,' and (3) since Hay described this species in a paper published in our Bulletin series the type would ordinarily be deposited in our collection.

The material consisted of several detached peraeopoda and a detached pleon, two ovigerous females, the front half of a male specimen, one male specimen broken into two halves, and one almost complete male specimen. The last specimen was fully dissected and examined by the present author; only the genital pleopoda of the other damaged male were examined. The examinations revealed that the material was conspecific with lectotype material of *A. intermedius* and accordingly *A. militaris* may now be synonymized with this species. The first and second pleopod of the least damaged male are illustrated in Figure 16. The material remains in the collections of the Illinois Natural History Survey where it has no number and is referred to as "INHS (uncataloged)" (J. D. Unzicker, personal communication, 10 August 1967).

TYPE MATERIAL.—Lectotype, adult ♂. Paralectotypes, 4 ♂♂ and 6 ♀♀. All material is deposited in the

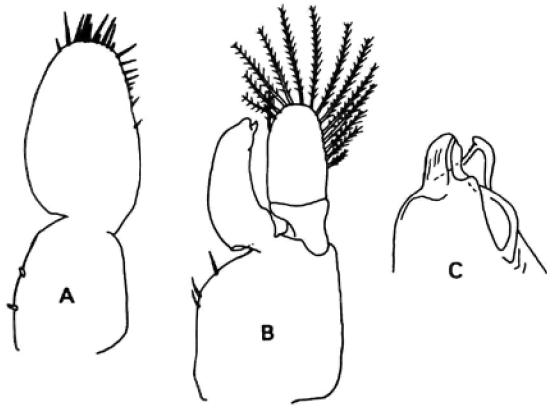


FIGURE 16.—*Asellus intermedius*, least damaged male specimen collected from Abingdon, Illinois, in 1878 by O. P. Hay: A, first pleopod; B, second pleopod; C, ventral surface of tip of endopodite of second pleopod.

Illinois Natural History Survey, Urbana; the material is not numbered, the reference is "INHS (uncataloged)." Data on original label reads: "Callahan Cr. Cobden. Ill. May 30, 1876 S.A. Forbes" and "Cotypes *Asellus intermedius* Forbes."

DESCRIPTION OF LECTOTYPE.—Body: Length, 4.5 mm.

Head: Eyes large and distinct. Anterolateral lobes not prominent.

First antenna: Tip of flagellum broken off, flagellum at least 5-merous and reaching to point one-third distally along last segment of peduncle of second antenna. All segments of peduncle about twice as long as wide; first segment longest, second about three-quarters length of first, and third about three-quarters length of second.

Second antenna: Tip of flagellum broken off, but length of antenna (2.5 mm) at least half (0.55) body length. Flagellum at least 31-merous.

First peraeopod (Figure 17A): Dactylus slightly longer than palm of propodus and with 6 teethlike spines on palmar edge and a long terminal claw. Propodus about 1.5 times as long as wide, almost subtriangular; palm with a large obtuse triangular projection about half width of opposing dactylus situated near midpoint, 1 large toothlike spine at proximal end, and a submarginal row of spines on inner and outer surfaces.

First pleopod (Figure 17B): Total length of appendage 1.10 times as long as second pleopod. Sympod sub-

circular, about as wide as long; inner margin with 3 hooklike protuberances for coupling. Distal segment subovate but distal margin somewhat truncate and distal part of segment distinctly narrower than proximal part; maximum width slightly greater (0.57) than half maximum length; distal margin and adjacent part of outer lateral margin with 9 simple spines of moderate length.

Second pleopod (Figures 17C-E): Sympod subsquare, maximum length equal to maximum width. Proximal segment of exopod with a single spine on outer margin. Distal segment of exopod ovate with 2 short and 11 long setose spines. Endopod subrectangular, rather wide (maximum width about half maximum length), and total length subequal to that of exopod; conspicuous basal apophyses not present. Cannula prominent, wide, as long as wide, and subequal in length to caudal process. Caudal process prominent, sclerotized, and terminated by a sharp point. Mesial process not developed.

Uropod (Figures 18A,B): Slightly shorter (0.77) than telson. Peduncle about twice as long as greatest width. Exopod as long as peduncle, endopod rather longer (1.3); both rami have a number of long fine spines distally, and numerous shorter and stronger spines laterally.

PARTIAL DESCRIPTION OF FEMALE PARALECTOTYPE.—"First" pleopod (Figure 18c): Approximately trapezoidal in shape, almost (2.3) two and a half times as long as maximum width. Distal margin and distal half of outer margin with 7 long and 3 shorter finely plumose spines; a short simple spine occurs near inner proximal angle.

MATERIAL EXAMINED.—ONTARIO: Humber River,* York County, 4♂♂, coll. Ontario P. & D., 12.vi.1946 (NMC); Underwood Creek, Collingwood, 7♂♂, coll. J. B. Sprague, 2.iv.1955 (ROM); Rideau River, 4♂♂, coll. Macoun Field Club, 30.iv.1955 (NMC); Rideau River, 2♂♂, coll. E. L. Bousfield, 7.v.1955 (NMC); stream east of Houghton, 2♂♂, coll. Ontario P. & D., 7.vi.1955 (NMC); Little Otter Creek, 2♂♂, coll. Ontario P. & D., 9.vii.1955 (NMC); Rideau River, 1♂, coll. Macoun Field Club, 12.v.1956 (NMC); Underwood Creek, Collingwood, 5♂♂, coll. J. B. Sprague, 11.viii.1956 (NMC); Frazer Dantle Quarry Pond, Ottawa, 8♂♂, coll. E. L. Bousfield, 29.ix.1956 (NMC); Taylor's Hill Quarry, Ottawa, 4♂♂, coll. E. L. Bousfield, 13.iv.1957 (NMC); Taylor's Hill Quarry, Ottawa, 3♂♂, coll. E. L. Bous-

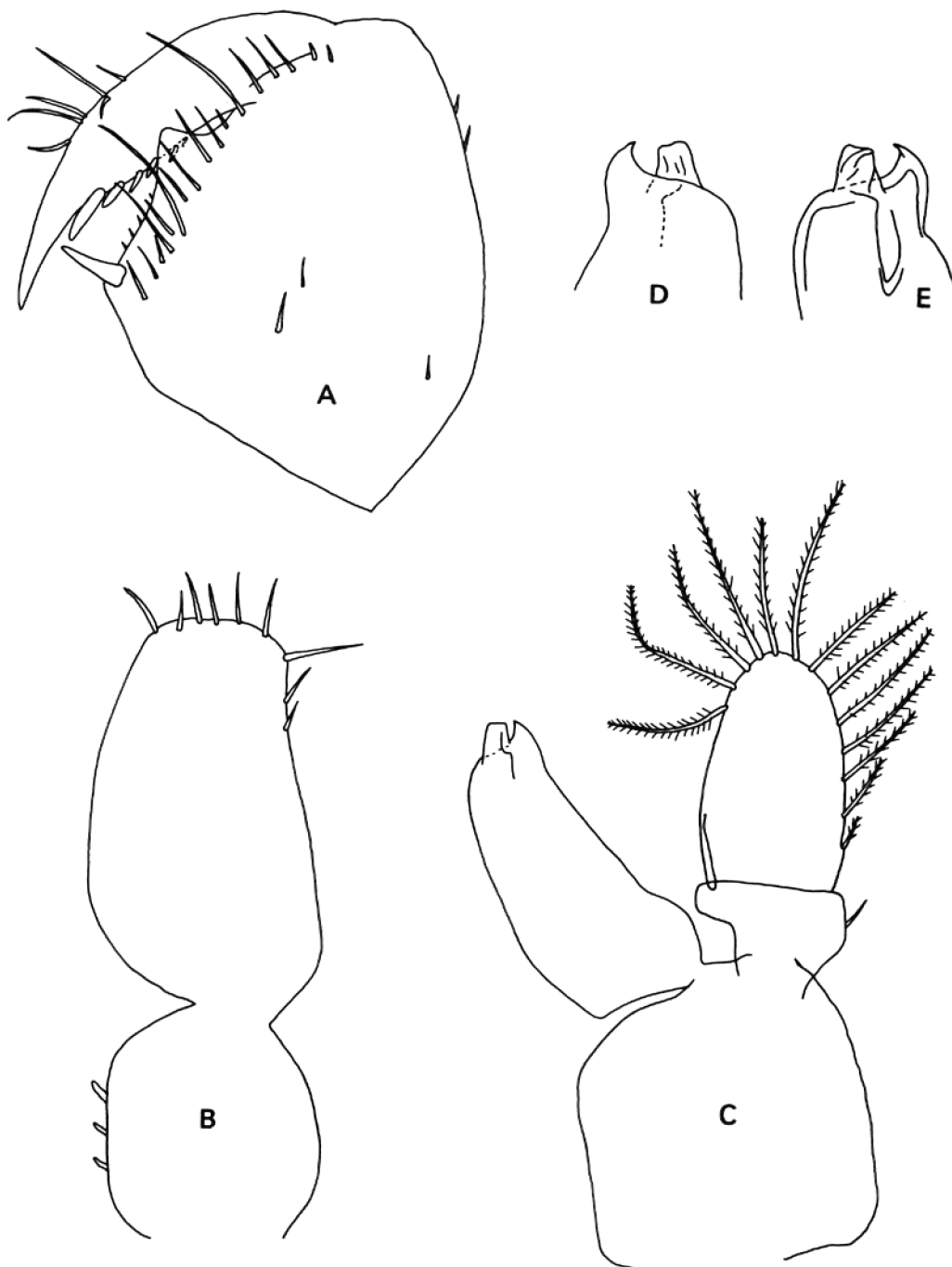


FIGURE 17.—*Asellus intermedius*, lectotype: A, dactylus and palm of first pereopod; B, first pleopod; C, second pleopod; D, E, respectively dorsal and ventral surfaces of tip of endopodite of second pleopod.

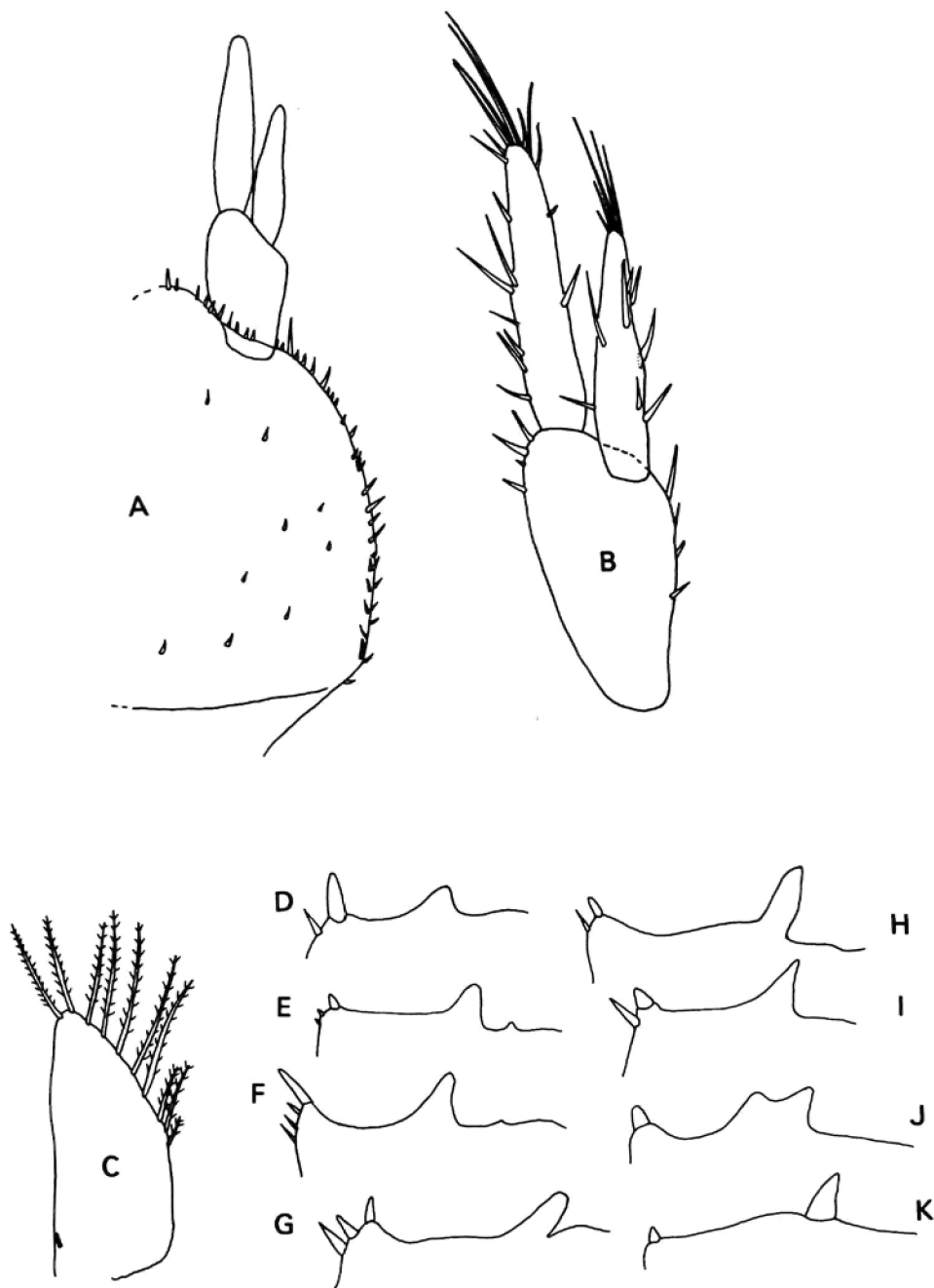


FIGURE 18.—*Asellus intermedius*, A, B, lectotype; C, female paralectotype; D–K, extent of variation in palm shape of male first peraeopod in nontype material: A, uropod and telson; B, uropod; C, "first" pleopod; D, F, I, Ottawa, Ontario; E, Cook County, Illinois; G, Shawnee National Forest, Illinois; H, Swedesburg, Iowa; J, Jefferson County, Kentucky; K, Lake Mendota, Wisconsin.

field, 4.v.1957 (NMC); Cookeville, 5♂♂, coll. D. Barr, 5.iv.1962 (ROM); Cookeville, 14♂♂, 5.iv.1962 (ROM); Ottawa, 5♂♂, coll. E. L. Bousfield, 21.v.1962 (NMC); Cookeville, 14♂♂, coll. D. Barr, 14.vii.1962 (ROM).

ILLINOIS: Golconda, 3♂♂, coll. B. D. Burks, 12.iii.1940 (INHS); Palas Hills, Cook County, ∞♂♂, coll. L. Hubricht, 2.v.1941 (USNM); Lemont, Cook County, ∞♂♂, coll. L. Hubricht, 3.v.1941 (USNM); Galesburg, Knox County, ∞♂♂, coll. L. Hubricht, 4.v.1941 (USNM); Glendale, 1♂, coll. Messrs. Ross and Burks, 18.iv.1942 (INHS); Carbondale, 4♂♂, coll. R. L. Lippson, 6.iv.1967; Hutchin's Creek, Union County, 4♂♂, coll. R. L. Lippson, 7.iv.1965.

INDIANA: Wabash River, New Harmony, 1♂, coll. U.S. Dept. Interior, 29.ix.1965; Wabash River, New Harmony, 1♂, coll. U.S. Dept. Interior, 20.xii.1965.

IOWA: Swedesburg, Henry County, ∞♂♂, coll. L. Hubricht, 24.iv.1942 (USNM).

KENTUCKY: Fish Pond Creek, Jefferson County, 3♂♂, coll. G. A. Cole, 21.iii.1954; Pennsylvania Creek, Jefferson County, 7♂♂, coll. G. A. Cole, 21.iii.1954; Cedar Creek, Jefferson County, 1♂, coll. G. A. Cole, 28.iii.1954; Fern Creek, Jefferson County, 7♂♂, coll. G. A. Cole, 4.iv.1954; Beargrass Creek, Jefferson County, 2♂♂, coll. G. A. Cole, 25.iv.1954; Pennsylvania Run, Jefferson County, 1♂, coll. G. A. Cole, 23.v.1954; Spring, Oldham County, 3♂♂, coll. G. A. Cole, 17.iv.1955 (NMC); Goose Creek,* Jefferson County, 4♂♂, coll. G. A. Cole, 4.v.1955; Acc. 59-173, Jefferson County, 1♂, coll. G. A. Cole, 1957 (NMC).

MICHIGAN: Wolf Lake Hatchery, Van Buren County, 1♂, coll. R. L. Lippson, 25.xi.1965.

MISSOURI: Meramec State Park, Franklin County, ∞♂♂, coll. L. Hubricht, 25.vii.1937 (USNM).

WISCONSIN: Lake Mendota, 32♂♂, coll. H. W. Levi, September 1948 (CMZ); Lake Superior, Ashland, 6♂♂, coll. E. L. Bousfield, 26.vi.1957 (NMC); Lake Mendota, ∞♂♂, coll. H. B. N. Hynes, 15.viii.1962; Milwaukee River, 1♂, coll. U.S. Dept. Interior, 23.viii.1962.

GEOGRAPHICAL DISTRIBUTION AND ECOLOGY.—The localities listed above, together with the type locality, are plotted in Figure 19. From this it can be seen that *A. intermedius* occurs within a large area of east-

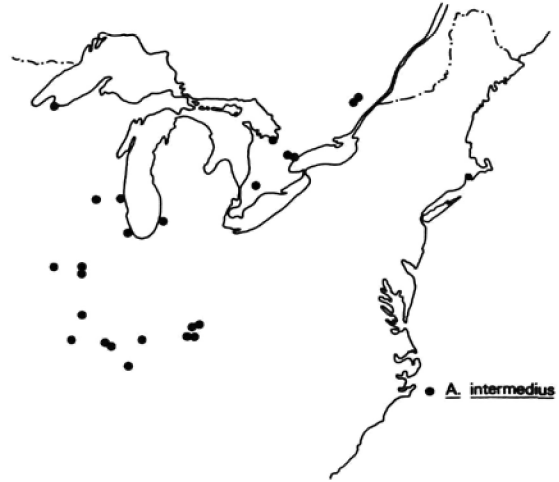


FIGURE 19.—Geographical distribution.

central United States and southern Ontario. Over a part of its range it is sympatric with *A. brevicauda brevicauda*, but its range is more extensive than that of this species and it extends farther northward.

Most of the collections examined, as indicated by the data on labels, had been obtained from creeks, streams, or rivers, so that we may assume that *A. intermedius* is characteristically associated with running waters. Some of the collections, however, were from springs, lakes, ditches, or ponds, and it is clear that *A. intermedius* is by no means restricted to running waters. The ecology of this species has been intensively studied by Ellis (1961); certainly for his correct identification of the species is provided by his drawings of the male genital pleopods (1961, figs. 2-4), which are undoubtedly those of *A. intermedius*.

FURTHER DESCRIPTION (♂).—Body: The largest ♂ examined was 16.0 mm long, and the smallest 4.0 mm.

First antenna: Flagellum 7- to 17-merous; flagellum tip reaching to one-third along or to distal end of the last segment of the peduncle of the second antenna; penultimate 2 to 4 (unusually 3) segments bear aesthetascs.

Second antenna: Length 0.48 to 0.79 times that of body. Flagellum 32- to 93-merous, depending upon size.

Mouthparts: See Table 1.

First peraeopod: Dactylus with 4 to 14 teethlike spines on palmar margin; in general, these spines are

large and few in small specimens, and small and many in large ones. The shape of the palm shown in Figure 17A (lectotype) occurs only in young specimens, and the shapes typically encountered in large adult males are more like those illustrated in Figures 18d-k, which indicate the range of variation that occurs. Thus, the large triangular structure near the midpoint of the palm is always large and quite prominent (often sharply pointed and occasionally toothlike), and the proximal end of the palm is also usually produced outward, this projection bearing a blunt wide tooth (very occasionally 2 such teeth) and beyond this 1 to 4 but usually 2 stout spines.

First pleopod: Total length of appendage 0.88 to 1.22 times as long as second pleopod. Inner margin of sympod with 3 to 5 (usually 3 or 4) coupling hooks. Maximum width of distal segment 0.36 to 0.71 times maximum length; marginal spines few to numerous, but always simple and of moderate length. The typical shape of the distal segment is subovate; only a little variation occurs.

Second pleopod: Maximum length of sympod from 1.0 to 1.2 times maximum width. Proximal segment of exopod with 1 to 6 spines on outer margin; distal segment with 7 to 23 plumose spines on margin. Inner basal angle of endopod obtuse, sharply angled, or produced into a small acutely pointed apophysis. The main features of the morphology of the tip of the

endopod are constant, the principal variation occurring only in the shape and extent of development of the caudal process; this may be rounded, pointed, or have a terminal claw; it is frequently produced at approximately right angles to the main body of the endopod, and may in some cases have pointed basal protuberances, although this is not usually so and is found only in very large specimens. Figure 20 indicates the range of variation in the morphology of the endopod tip. The typical morphology is as illustrated for the lectotype (Figures 17D, E).

Uropod: See Table 2.

Asellus attenuatus Richardson

FIGURES 21, 22

Asellus attenuatus Richardson, 1900, p. 297.—Richardson, 1901, pp. 552-553, figs. 26-28.—Richardson, 1905, pp. 426-428, figs. 482-485.—Van Name, 1936, pp. 461-462, fig. 289.

The name *Asellus attenuatus* was first published as part of an identification key for North American Asellidae, and the only distinguishing characters mentioned were confined to the uropoda and propodus of the first peraeopod (sex unstated) (Richardson, 1900). The description sensu stricto was not published until the following year (Richardson, 1901). This, while more

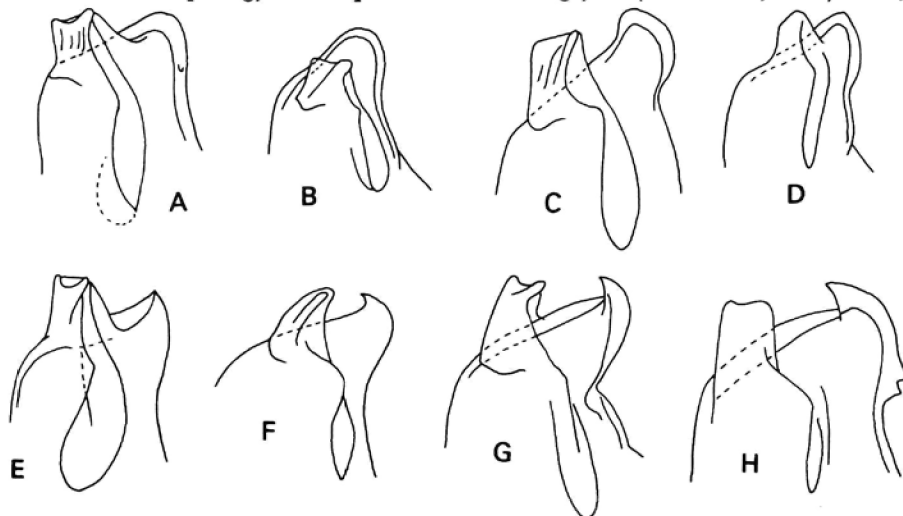


FIGURE 20.—*Asellus intermedius*, extent of variation in morphology of endopod tip of male second pleopod: A, E, Oldham County, Kentucky; B, D, Jefferson County, Kentucky; C, Meramec State Park, Franklin County, Missouri; F, Lake Mendota, Wisconsin; G, Wabash River, Indiana; H, Collingwood, Ontario.

complete and accompanied by some drawings, is insufficiently detailed to enable adequate identification of Richardson's taxon; no mention is made, for example, of the form of any pleopoda. It is not surprising, therefore, that no further material of this species has been identified since the original type collection was made (1899). Some additional descriptive details concerning the female genital pleopoda and the propodus of the male first peraeopod were given by Richardson in 1905, but these details likewise are insufficient to clarify the species identity.

Fortunately, type material of *A. attenuatus* was set aside by Richardson, this being noted in her publications (1901, 1905) as: "Type [sic].—Cat. No. 23910, U.S.N.M." Through the courtesy of Dr. T. E. Bowman, National Museum of Natural History, I have been able to reexamine this material. It was contained in two tubes in a jar labeled "23910 *Asellus attenuatus*." One tube contained 2 specimens (1 ♂, 1 nonovigerous ♀) and the other 100 specimens (9 ♂♂, 90 nonovigerous ♀♀, 1 juvenile). The material in the first tube had obviously been withdrawn from the larger collection at some time, for there is a note that it had been "given to Hubricht in exchange and returned by Hubricht as gift." Several labels were in the second tube, of which the significant one read: "United States National Museum 23910 *Asellus attenuatus* Richardson Washington Ditch, Dismal Swamp, Va. June 9, 1899 Wm. Palmer and Paul Bartsch for the Museum. Type 106 id. H. Richardson Acc. No. 35186." Two microvials were also present in the jar, one containing the damaged posterior half of a specimen and the other a detached peraeopod and maxilliped. All specimens were damaged and no single complete male was present; the least damaged male lacked only uropoda, while all remaining males lacked at least their second antennae. Of the females present only five possessed attached second antennae. The least damaged male has been designated lectotype, the remaining specimens as paralectotypes.

TYPE MATERIAL.—Lectotype, adult ♂. Paralectotypes, 9 ♂♂, 91 nonovigerous ♀♀, 1 juvenile. All material is deposited in the National Museum of Natural History, USNM 23910.

DESCRIPTION OF LECTOTYPE.—Body: Length, 9.5 mm.

Head: Eyes large and distinct; posterolateral lobe not prominent but bearing a single long and robust spine.

First antenna: Flagellum 14-merous and tip reaching to midpoint of last segment of peduncle of second antenna; penultimate 2 segments bear aesthetascs. Flagellum subequal in length to peduncle. First and second segments of peduncle subequal in length; third segment about two-thirds length of second. First segment of peduncle about twice as long as wide; second and third each 4 times as long as wide.

Second antenna: Length (10.5 mm) slightly longer (1.11) than body. Flagellum 82-merous. First, second, and third segments of peduncle stout, about twice as wide as long; fourth segment twice as long as first three combined, 4 times as long as wide; fifth segment about 1.5 times as long as fourth, about 8 times as long as wide.

Mouthparts: See Table 1.

First peraeopod (Figure 21A): Dactylus about 1.5 times longer than palm, with 10 toothlike spines on palmar margin and a distinct terminal claw. Propodus slightly less than twice as long as wide, subovate; palm with a single low blunt triangular projection near midpoint, a very long and strong tooth at proximal end, and numerous short to long submarginal spines.

First pleopod (Figure 21B): Total length of appendage only three-quarters length of second pleopod. The division of the appendage into proximal and distal segments is incomplete so that it appears somewhat dumbbell-shaped; the basal portion has 3 hooklike coupling protuberances on its inner margin, and the subovate distal portion has 11 short, simple (apparently) spines on its distal margin.

Second pleopod (Figures 21C,E): Sympod subovate, maximum length 1.44 times maximum width. Proximal segment of exopod with a single spine on outer margin. Distal segment of exopod with 1 short and simple spine and 17 long plumose spines on margin. Endopod rather narrow, more or less straight in long axis, and about 3.5 times central width; endopod three-fifths total length of exopod, but distinctly shorter (0.72) than distal segment of exopod; inner and outer basal apophyses present but not well developed. Canula long and tubular and extending beyond caudal process. Mesial process long, subequal in length to canula, sclerotized, and ending in a sharp point. Caudal process present but not well developed and more or less rounded in outline with no associated hooks or spines.

Uropod: Missing (see below).

PARTIAL DESCRIPTION OF MALE PARALECTOTYPE.—Uropod (Figure 21F): Same length as telson. Peduncle

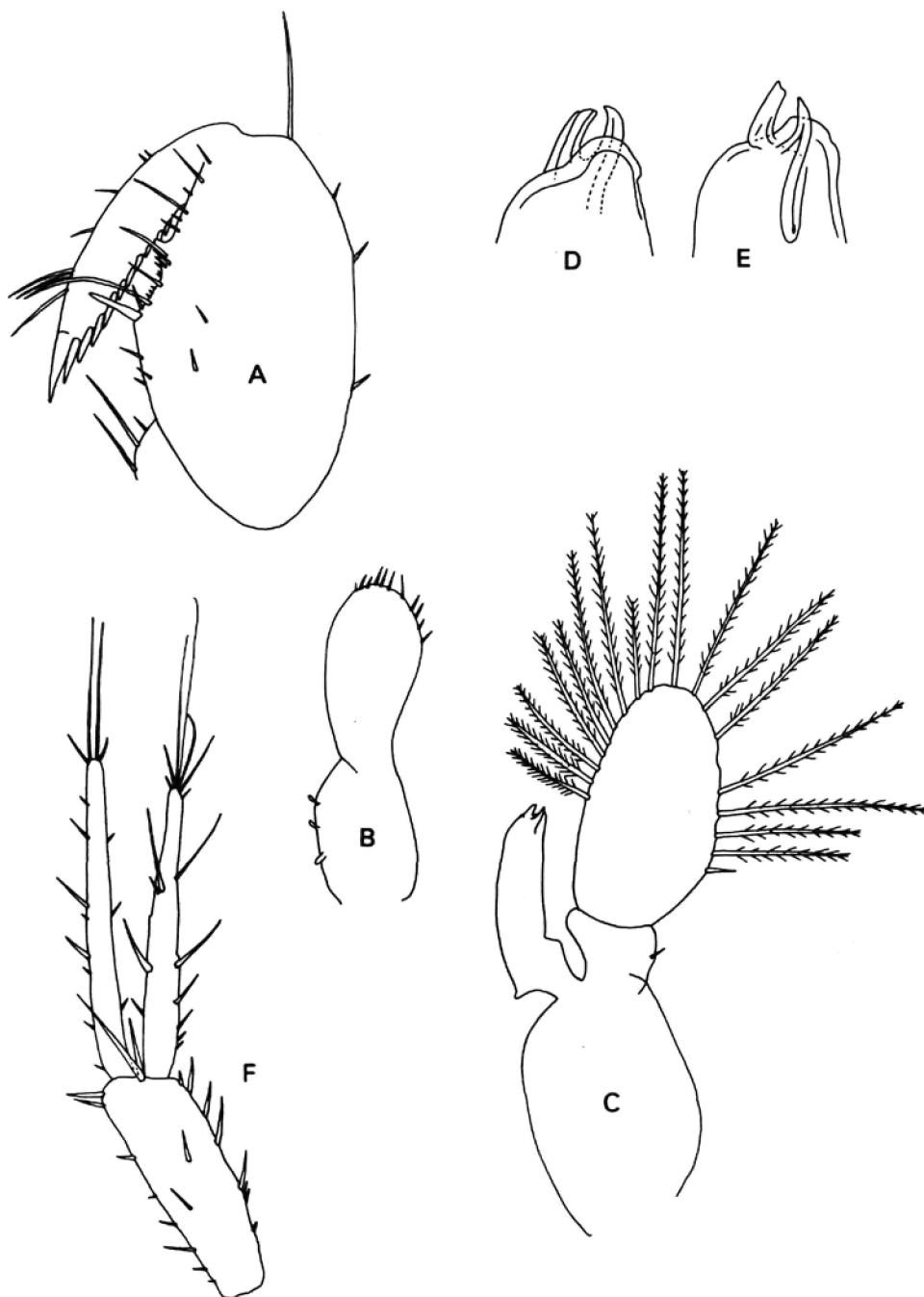


FIGURE 21.—*Asellus attenuatus*, A-C, E, lectotype; D, F, male paralectotype: A, dactylus and propodus of first pereopod; B, first pleopod; C, second pleopod; D, E, respectively dorsal and ventral surfaces of tip of endopodite of second pleopod; F, uropod.

about 3 times as long as greatest width with several marginal spines. Exopod and endopod respectively 1.2 and 1.3 times peduncle length; both rami narrow and with a small group of very long fine spines at distal tip as well as several stout marginal spines.

PARTIAL DESCRIPTION OF FEMALE PARALECTOTYPE.—
Body: Length, 11.0 mm; maximum width, 4.5 mm.

Second antenna: Length (13.0 mm) distinctly greater (1.18) than body length.

First pereopod (Figures 22A,B): Relatively slender and not subchelate. Dactylus about as long as palm of propodus with 12 toothlike spines on margin and a larger terminal spine. Propodus subovate, about twice as long as greatest width. Carpus triangular, small. Merus subtriangular, about as wide as long, with 2 long and strong spines at anterodistal angle. Ischium subrectangular, not quite twice as long as merus, twice as long as wide. Basis subtrapezoidal, about 1.5 times as long as ischium, twice as long as wide.

"First" pleopod (Figure 22c): Shape almost subrectangular, distal width slightly greater than proximal width, length 2.5 times maximum width. Distal

margin with 17 long plumose spines and a single short simple spine at outer distal angle.

DISCUSSION.—The damaged condition of the type material, and especially the presence of only a few specimens with attached second antennae, is rather unfortunate, for it appears that the ratio of the length of the second antennae to the body length constitutes one of the salient characters of this species, as indicated by Richardson's name for it. In the five females with attached second antennae, the ratio—length of second antenna/body length—varied from 0.94 to 1.31.

The paucity of male specimens is also most unfortunate for it precludes the determination of the extent of phenotypic variation in the genital pleopoda and other critical parts of males of this species. At first it was thought that the incomplete division and relatively small size of the first pleopod was perhaps an aberration of the sort known to occur occasionally in single specimens of *Asellus* (cf. Williams, 1962a), but the same configuration was displayed by the first pleopod of a male paralectotype. At all events, study of further material is certainly needed to indicate the extent of

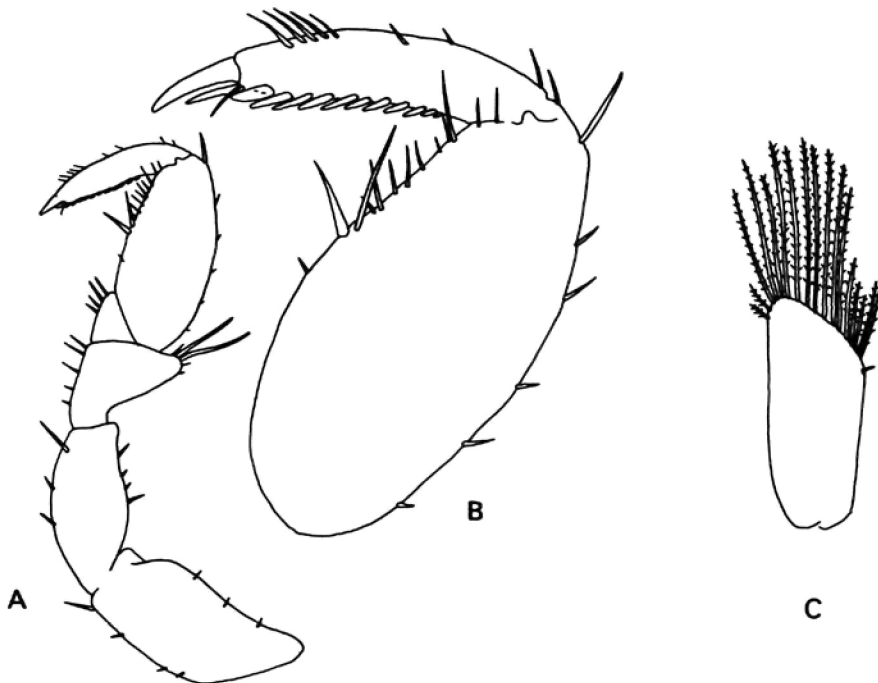


FIGURE 22.—*Asellus attenuatus*, female paralectotype: A, first pereopod; B, dactylus and propodus of first pereopod; C, "first" pleopod.

morphological variation in *A. attenuatus*. It must be recorded that no such material was encountered during the present revision, indicating perhaps that *A. attenuatus* has a restricted range of distribution. The only Dismal Swamp in Virginia known to the writer lies in the extreme southeastern corner of the state just west of Portsmouth (Figure 30).

In the morphology of the tip of the endopod of the second male pleopod, *A. attenuatus* closely approaches *A. racovitzai*, and the taxa may perhaps prove to be no more than subspecifically separate. However, the lack of a well-developed caudal process and the somewhat more elongated nature of the cannula and mesial process, combined with other differences between the taxa, indicate that until further study of material of Richardson's taxon has been made it is appropriate at present to retain specific status for it. The other differences, as indicated by the study of lectotype material, are that in both sexes of *A. attenuatus* the second antennae are longer (almost as long as or longer than the body), and that in males the first pleopod is significantly shorter than the second and is incompletely divided into a proximal portion and a subovate distal portion, and the endopod of the second pleopod is distinctly shorter than the distal segment of the corresponding exopod. Other apparent differences, such as those in the proportions of the antennal segments and the shape and armature of the first male peraeopod and the uropod, are perhaps less significant for these appendages in *Asellus* are known to be rather variable in structure.

Asellus dentadactylus Mackin and Hubricht

FIGURE 23

Asellus dentadactylus Mackin and Hubricht, 1938, pp. 629-630, figs. 3-6, 8.—Van Name, 1940, pp. 127-128, fig. 20.

The original description of *A. dentadactylus* is certainly sufficient to allow identification of this species with considerable confidence, as the morphology of the tip of the endopodite of the male second pleopod is described in some detail and figured. The accuracy of the original description and figures was checked by reexamination of the type material deposited by Mackin and Hubricht in the United States National Museum. This material consisted of specimens distributed within two jars, one containing 24 specimens and labeled both "paratypes" and "cotypes," the other containing 8 specimens and labeled only "co-

types." From the second jar one adult male has been designated the lectotype; the remaining 4 ♂♂ and 3 ovigerous ♀♀ in this jar, and all the specimens in the other jar, have been designated paralectotypes. A label in the second jar reads: "A 2659 April 11, 1936 *Asellus dentadactylus* Mackin and Hubricht Small creek, 1/2 mile S. of Locust Cottage, Jefferson Co., Arkansas Leslie Hubricht coll. Cotype. Cat. No. 74841 USNM." Other labels in both jars gave the same information.

Although Mackin and Hubricht's description supplies the more significant details concerning the morphology of *A. dentadactylus*, their description is incomplete, and at least with regard to the fine structure of the endopodite tip of the male second pleopod several differences are apparent between their drawings and my own based on the lectotype. Furthermore, it is not possible to discern from their drawing (fig. 4) the relationships of the various processes surrounding the cannula, nor indeed to be certain of the position of the cannula itself. Concerning the morphology of the endopodite tip Mackin and Hubricht state only (1938, p. 629), "truncate tip with wide opening." For these reasons, a description of the lectotype is given below. Van Name (1940) simply repeated the descriptive details given by Mackin and Hubricht (1938).

DESCRIPTION OF LECTOTYPE (♂).—Body: Length, 7.5 mm; maximum width, 2.0 mm.

Head: Eyes distinct.

First antenna: Flagellum 10-merous and tip reaching to midpoint of last segment of peduncle of second antenna. Flagellum three-quarters length of peduncle. First segment of peduncle about three-quarters length of second, second about twice as long as third. First segment about twice as long as wide, second and third each about 4 times as long as wide.

Second antenna: Length (6.0 mm) four-fifths body length. Flagellum about 56-merous.

Mouthparts: See Table 1.

First peraeopod (Figure 23A): Dactylus subequal in length to palm, with 9 small denticles on palmar margin and a large terminal claw. Propodus 1.3 times as long as wide, subtriangular; palm with a large acutely pointed triangular projection near midpoint, one toothlike spine and 2 stout spines at proximal end, and numerous short to long submarginal spines.

First pleopod (Figure 23B): Total length of appendage distinctly longer (1.35) than second pleopod. Symпод subrectangular, about 1.5 times as long as

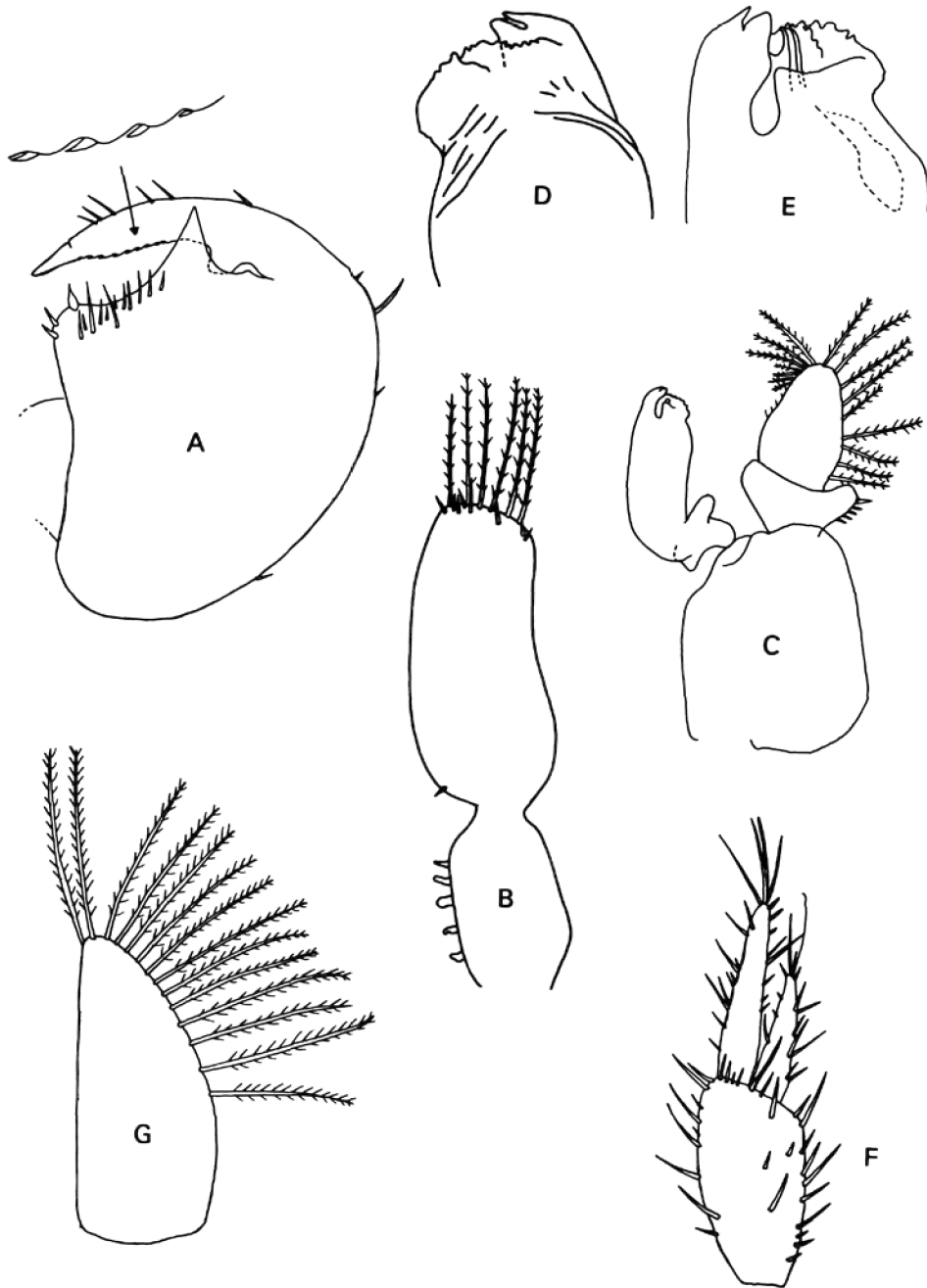


FIGURE 23.—*Asellus dentadactylus*, A–F, lectotype; G, female paralectotype: A, dactylus and propodus of first pereopod; B, first pleopod; C, second pleopod; D, E, respectively dorsal and ventral surfaces of tip of endopodite of second pleopod; F, uropod; G, “first” pleopod.

wide; inner margin with 5 hooklike protuberances for coupling. Distal segment also subrectangular, but gently curved outward so that the outer lateral margin is distinctly concave and the inner lateral margin convex; proximal width slightly greater than distal width; maximum width slightly less (0.46) than half maximum length; distal margin bearing 6 long sparsely setose spines and 8 shorter simple spines somewhat irregularly arranged; inner proximal angle with a short simple spine.

Second pleopod (Figures 23c-e): Sympod subquadrate, maximum length only slightly greater (1.2) than maximum width; medial and lateral margins more or less straight. Proximal segment of exopod cupulate, outer margin with 5 short simple spines. Distal segment of exopodite subovate, about 1.5 times as long as wide, and with 16 long plumose spines on outer and distal margins and several fine short spines on inner margin. Endopod about as long as exopod; prominent inner and outer apophyses occur basally. Cannula short and narrow. Ventral groove short. Mesial process large and well developed, bifid, and extending beyond cannula. Lateral process not prominent. Caudal process wide, not protruding beyond cannula, and irregularly dentate.

Fourth pleopod: Six plumose spines on outer distal margin in addition to those spines occurring along outer proximal margin.

Uropod (Figure 23f): As long as telson. Peduncle about twice as long as greatest width. Exopod two-thirds (0.63) length of peduncle, endopod almost as long (0.91) as peduncle; both rami have a number of long fine spines distally, and numerous shorter and stronger ones laterally.

PARTIAL DESCRIPTION OF FEMALE PARALECTOTYPE.—First peraeopod: General shape and setation similar to that described for a female paralectotype of *A. attenuatus* but propodus has a single moderately long and strong toothlike spine near proximal end of palm. Palmar margin of dactylus with 4 teethlike spines.

"First" pleopod (Figure 23g): Shape subtriangular, but outer margin convex with 14 long plumose spines on distal half.

GEOGRAPHICAL DISTRIBUTION AND ECOLOGY.—No further material of this species was encountered during the present investigation, and I cannot add therefore to the two localities from which the species has hitherto been recorded (Mackin and Hubricht, 1938). The known localities are in Arkansas (type locality

and Louisiana (Natchitoches Parish, 2 miles south of Saline); their positions are indicated in Figure 7.

Concerning the ecology of this species, it can only be said that specimens have been taken from a small creek, and from among dead leaves in a small creek below an artificial pond (Mackin and Hubricht, 1938).

Asellus montanus Mackin and Hubricht

FIGURE 24

Asellus montanus Mackin and Hubricht, 1938, pp. 630–631, figs. 1, 2, 7, 9, 10.—Van Name, 1940, pp. 126–127, fig. 19.

Like *A. dentadactylus* discussed above, the original description of *A. montanus* is certainly sufficient to allow specific identification with considerable confidence; the morphology of the tip of the endopodite of the male second pleopod of this species also is described in some detail and figured. The accuracy of the original description and figures is supported by a re-examination of the type material deposited by Mackin and Hubricht in the United States National Museum. This material consisted of 14 specimens in a jar with the label: "United States National Museum 74842 *Asellus montanus* Creek, Y-city, 4 miles S. of Boles, Scott Co., Ark. L. Hubricht (coll. & don.) April 27, 1936 id. Mackin and Hubricht Acc. No. 145424 Cotypes." The specimens were actually in a tube inside the jar and this tube had its own label which, however, gave the same information as the one in the jar. The 14 specimens consisted of 7 ♂♂, 5 ovigerous ♀♀, and 2 nonovigerous ♀♀. All males were damaged to a greater or lesser extent; the least damaged male was designated the lectotype and all other material was designated paralectotypes.

As was the case for *A. dentadactylus*, although Mackin and Hubricht's description gives the pertinent details concerning the morphology of *A. montanus*, it is incomplete, and with regard to the fine structure of the tip of the endopod of the male second pleopod minor differences are again apparent between their drawing and my own based on the lectotype. For these reasons a description of the lectotype is given below. Van Name (1940) simply repeated the descriptive details given by Mackin and Hubricht (1938).

DESCRIPTION OF LECTOTYPE (♂).—Descriptive details are omitted when these refer to parts of the body that are similar in construction in *A. communis* (neo-

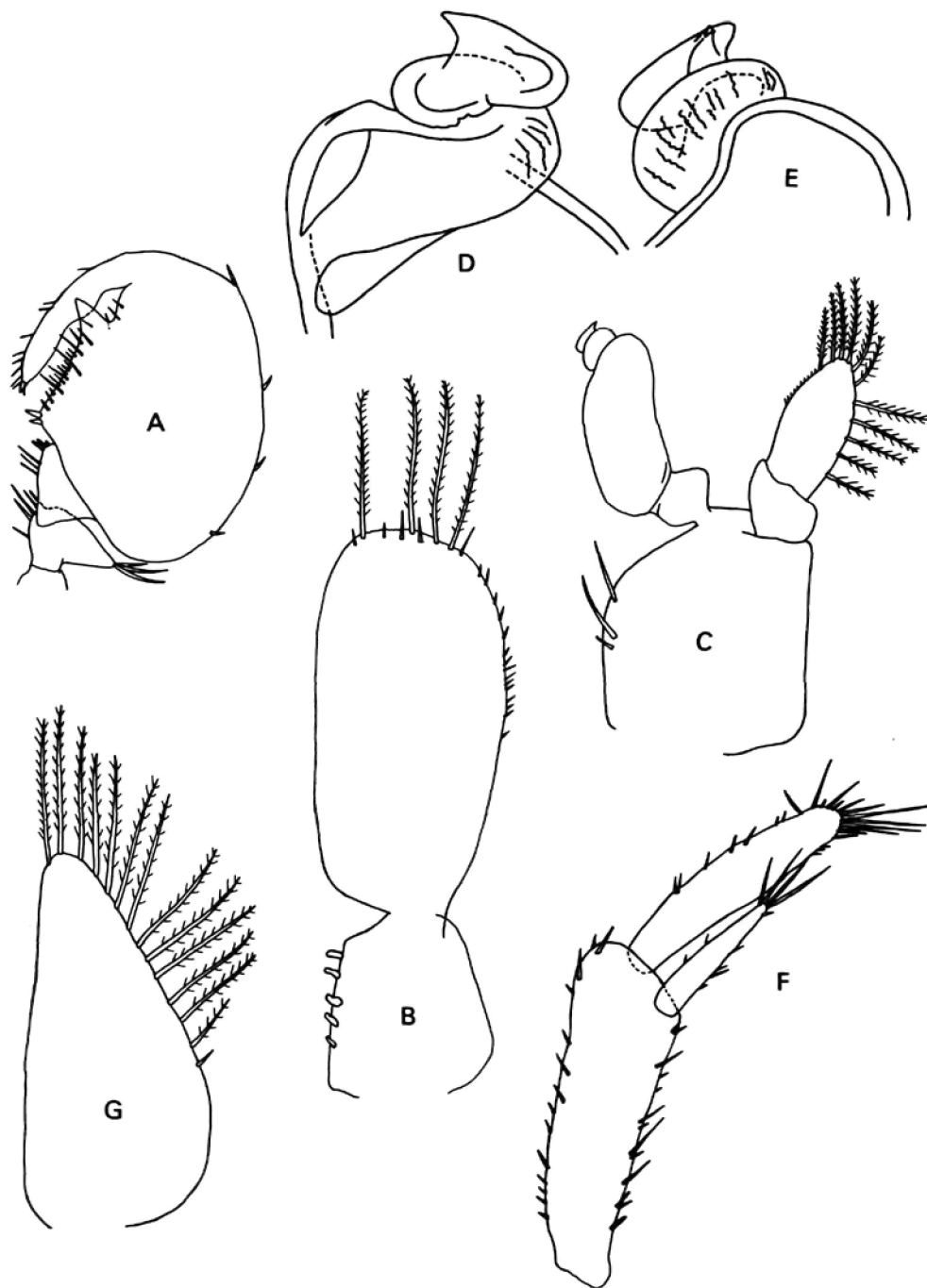


FIGURE 24.—*Asellus montanus*, A–F, lectotype; G, female paralectotype: A, distal segments of first pereopod; B, first pleopod; C, second pleopod; D, E, respectively dorsal and ventral surfaces of tip of endopodite of second pleopod; F, uropod; G, "first" pleopod.

type), or, where indicated, *A. dentadactylus* (lectotype).

Body: Length, 11.5 mm; maximum width, 2.5 mm.

Head: Eyes relatively large and distinct.

First antenna: Flagellum 13-merous. Otherwise similar to *A. dentadactylus*.

Second antenna: Length (9.0 mm) four-fifths body length. Flagellum 94-merous and about twice length of peduncle. Fourth segment of peduncle about 1.5 times as long as first three segments combined, 4 times as long as wide; fifth segment about 1.5 times length of fourth, 6 times as long as wide.

Mouthparts: See Table 1.

First peraeopod (Figure 24A): Dactylus slightly shorter than palm, lacking spines or denticles on palmar margin but with a short and rather blunt terminal claw. Propodus 1.5 times as long as wide, subquadrate; palm with a large acutely pointed triangular projection near midpoint, 2 small but stout toothlike spines at proximal end, and numerous short to long submarginal spines.

Second to seventh peraeopoda: Segments generally more elongated than as described for *A. communis*, and dactyli bear fewer toothlike marginal spines. The proportions of the segments to each other in a given peraeopod are nevertheless similar to those described for *A. communis*.

First pleopod (Figure 24B): Total length of appendage distinctly (1.32) longer than second pleopod. Sympod subquadrate, about as long as wide; inner margin with 5 hooklike protuberances for coupling. Distal segment broadly ovate, widest about two-thirds toward distal margin; maximum width half maximum length; numerous short and simple spines occur on the distal margin and the distal half of the outer margin, and in addition 4 long plumose spines are present on the distal margin.

Second pleopod (Figures 24C-E): Sympod subquadrate, maximum length only slightly greater (1.2) than maximum width; medial and lateral margins more or less straight. Proximal segment of exopod irregularly subtriangular, marginal spines absent. Distal segment of exopod subovate, twice as long as wide, with 11 long plumose spines on outer and distal margins, and a row of very fine short spines on inner margin. Endopod a little longer (1.17) than exopod. The body and associated structures of the endopod are arranged in a spiral fashion; thus, the main body appears to be twisted through 180° so that the terminal

groove, which lies ventrally in other species, here lies dorsally. The terminal processes are subject to even more twisting and appear to coil at least 1.5 times. The actual processes involved in the coiling are difficult to discern, but it appears that the caudal process is not involved (and is not developed) and the lateral one is. The cannula is not visible. Basally, the endopod has an indistinct inner apophysis and a distinct outer right-angled apophysis.

Uropod (Figure 24F): Slightly longer (1.1) than telson. Peduncle about 3 times as long as greatest width. Exopod slender, about half (0.46) length of peduncle; endopod rather spathulate, four-fifths length of peduncle; both rami have a number of long fine spines distally (the endopod more than the exopod), and a few short ones laterally.

PARTIAL DESCRIPTION OF FEMALE PARALECTOTYPE.—First peraeopod: General shape and setation similar to that described for a female paralectotype of *A. attenuatus* but propodus has 2 strong toothlike spines near proximal end of palm, one moderately long and one shorter. Palmar margin of dactylus with 2 toothlike spines.

“First” pleopod (Figure 24G): Triangular, distal two-thirds of outer margin more or less straight and with 1 short simple spine and 13 long plumose spines.

GEOGRAPHICAL DISTRIBUTION AND ECOLOGY.—No further material of this species was encountered during the present study, and I cannot add therefore to the 5 localities from which the species has been recorded (Mackin and Hubricht, 1938). The known localities are in Arkansas (type locality, and near Minturn) and Oklahoma (two localities in Leflore County and one in Latimer County); their positions are indicated in Figure 7. Mackin and Hubricht (1938) record the species from a roadside slough and creeks or streams.

Asellus kenki Bowman

FIGURE 25, 26

Asellus kenki Bowman, 1967, pp. 131–140, figs. 1–44.

Asellus kenki was recently described by Bowman (1967) in what is undoubtedly the best description of a North American epigeic species of *Asellus* that has appeared. I need add nothing to this description and there is certainly no point in reproducing it in entirety here. The species is characterized principally by the shape of the uropoda, the configuration of the first and

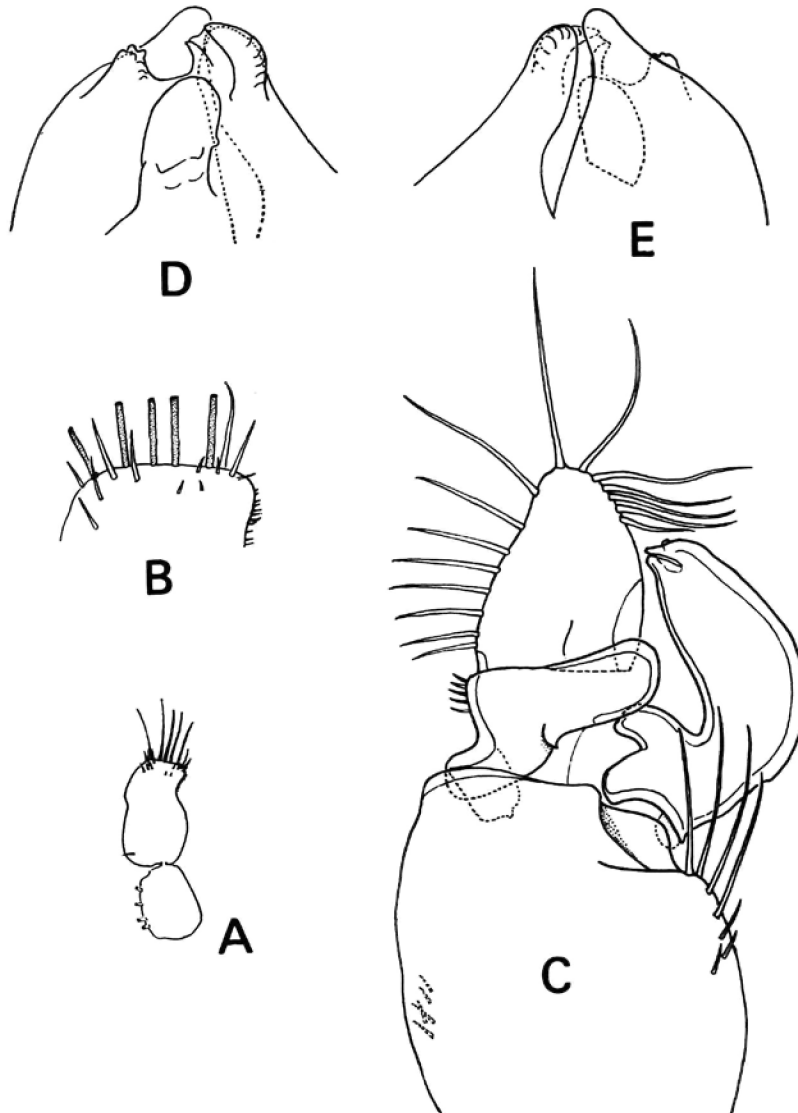


FIGURE 25.—*Asellus kenki*, male: A, first pleopod; B, distal margin of first pleopod; C, second pleopod; D, E, respectively dorsal (= posterior) and ventral (= anterior) surfaces of tip of endopodite of second pleopod. From Bowman (1967) with permission.

second pleopoda in males, and above all by the morphology of the tip of the endopodite of the male second pleopod. For comprehensiveness and convenience, Bowman's description of these features is reproduced here, and they are again illustrated (Figures 25, 26). The figures have been prepared entirely by selection from the drawings given by Bowman.

TYPE MATERIAL AND TYPE LOCALITY.—Holotype:

adult ♂, USNM 119808. Paratypes: numerous other specimens from the type locality, USNM. Type locality: spring-fed pool located 0.91 km SSW of the Nature Center, Rock Creek Park, Washington, D.C.

PARTIAL DESCRIPTION (reproduced from Bowman, 1967).—Body: Moderately small, largest male 14 mm in length, but most mature males considerably shorter; ovigerous females reaching 7-8 mm.