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NEW SPECIES AND NEW RECORDS OF THE GENUS
ELAPHOIDEA (CRUSTACEA: COPEPODA: HARPACTICOIDA)
FROM THE UNITED STATES

Janet W. Reid and Teruo Ishida

Abstract. — We list the first record of *Elaphoidella wilsonae* from New Mexico and new records of *Elaphoidella bidens* from Maryland, Tennessee, Virginia and the District of Columbia. Two new species of harpacticoid copepods from the eastern United States, *Elaphoidella carterae* from Virginia and *Elaphoidella amabilis* from Maryland differ from congeners in the shapes of the caudal ramus and caudal setae and the spine formulas of the swimming legs. We provide keys to the known species of *Elaphoidella* from North America.

Collections of harpacticoid copepods from springs and streams in the District of Columbia, Maryland, New Mexico and Virginia included several species, two previously undescribed, belonging to the harpacticoid copepod genus *Elaphoidella*. We list the new records of the previously known species and describe the new ones. The description of each species was authored by its collector. We furnish identification keys and a table of distinguishing characters of both sexes of the known North American species. For taxonomic examination, specimens were drawn with the aid of drawing tubes before dissection in lactic acid and after dissection in polyvinyl lactophenol with a little chlorazol black E added, or in gum-chloral medium. Lengths were measured from the anterior tip of the rostrum to the end of the caudal ramus. Specimens were deposited in the National Museum of Natural History, Smithsonian Institution (USNM).

Hamond (1987) returned several generic and subgeneric taxa including *Elaphoidella* to the synonymy of the genus *Canthocamptus* Westwood, 1836 s. l. pending eventual revision of the family Canthocamptidae. However, we have employed the more familiar genus name without wishing to imply

recognition at the generic level of this poorly defined group of species.

Order Harpacticoida G. O. Sars, 1903

Family Canthocamptidae G. O. Sars, 1906;

Monard, 1928; Lang, 1948

Genus *Elaphoidella* Chappuis, 1929

Elaphoidella wilsonae Hunt, 1979

Elaphoidella wilsonae Hunt, 1979:248-253, figs. 1-21.

Material examined. — 1 ♀, in 70% ethanol, Guadalupe River, Jemez National Forest, about 40 km NE of San Ysidro, New Mexico, about 35°45'N 106°50'W, elevation about 2100 m, damp moss by streamside, 26 May 1991, col. E. Warner (USNM 251152).

Remarks. — The specimen from New Mexico agrees in all respects with the description of females from the type population (Hunt 1979).

Distribution and habitat. — The Guadalupe River is a third-order stream in the drainage basin of the Rio Grande. This species was formerly known only from alkaline spring-fed ponds in Garfield and Rio Blanco Counties, Colorado, in the basins of the Colorado and Green Rivers respectively. The find reported herein extends its known dis-

tribution some 400 km to the south and newly includes the Rio Grande drainage basin.

Elaphoidella bidens (Schmeil, 1893)

Synonymy.—Given by Lang (1948) and Apostolov (1985).

Material examined.—♀, ethanol-preserved, Lonaconing Creek, south of Rawlins, Allegany County, Maryland, about 39°31'N 78°54'38"W, 2 Feb 1988, col. M. C. Swift (USNM 242082). 2 ♀, ethanol-preserved, Piney Creek, Garrett County, Maryland, about 39°42'21"N 78°57'45"W, 6 Apr 1988, col. M. C. Swift (USNM 242084). 3 ♀, Mountain Lake, Giles County, Virginia, 37°21'22"N 80°32'11"W, elevation 1181 m, sandy bottom at small swimming beach on south shore, 25 May 1990, together with *E. carterae*, col. J. W. Reid (USNM 250448). 3 ♀ on 2 slides, and 4 ♀, 1 copepodid, ethanol-preserved, near-bank sediments of Rock Creek, District of Columbia, just east of Maryland border, about 38°59'00"N 77°03'10"W, 5 Oct 1990, col. T. Ishida (USNM 251796).

Remarks.—*Elaphoidella bidens* is a usually parthenogenetic species recorded from nearly every continent. The taxonomy of the two subspecies, *E. bidens* s. s. and *E. bidens coronata* (G. O. Sars, 1904), recorded from North America was discussed by Wilson (1956, 1975) and Wilson & Yeatman (1959). More recently Apostolov (1985), citing morphological variations including the *coronata*-form present in topotypic populations of *E. bidens*, returned several subspecies to the nominate species taxon.

North American records of *E. bidens coronata* reviewed by Wilson (1975) include Florida, Georgia, Louisiana, Minnesota, North Carolina, Ohio, Pennsylvania, and Virginia. These records include a report by Carter (1944) from the region of Mountain Lake. Subsequent records of *E. bidens* s. l. from North America include Coahuila, Mexico by Reid (1988) and New York by Strayer [1988 (1989)]. H. C. Yeatman col-

lected an ovigerous female *E. bidens* from a small lake at Sewanee, Tennessee on 8 April 1973; this is a new record for that state (H. C. Yeatman, pers. comm.). The new records herein, including the first reports from the District of Columbia, Maryland and Tennessee, are well within the known range of this species in North America.

Elaphoidella carterae Reid, new species
Figs. 1, 2

Material examined.—Holotype ♀, dissected and mounted on slide in polyvinyl lactophenol (USNM 251767), and paratype ♀, in 70% ethanol (USNM 251768), from Mountain Lake, Giles County, Virginia, 37°21'22"N 80°32'11"W, elevation 1181 m, sandy bottom at small swimming beach on south shore, 25 May 1990, col. J. W. Reid.

Female.—Habitus (Fig. 1a) cylindrical. Length of holotype 0.76 mm, of paratype 0.62 mm. Cephalosome (Fig. 1a, b) with elongate ovoid nuchal organ. Hyaline fringes of posterior margins of all somites smooth. All somites with scattered long hairs and all somites except cephalosome with transverse rows of tiny hairs, surface of all somites also finely punctate as in area within dotted line (indicated by arrow) on lateral surface of pediger 2 (Fig. 1a). Genital segment (Fig. 1a, c) with remnant of division visible laterally beneath integument (indicated by dotted line in Fig. 1a); ornamented with short transverse row of small spines lateral to genital field; genital field reaching midlength of segment. Two urosomites posterior to genital segment (Fig. 1a, c) each with one row of small spines on ventral and lateral margin. Anal somite (Fig. 1a, c–e) with two spines near posteroventral margin above each caudal ramus; anal operculum smooth, slightly convex. Caudal ramus (Fig. 1a, c–e) about 1.2 times longer than broad, ovate, with dorsal, terminally hooked longitudinal keel extending about $\frac{2}{3}$ length of ramus, and small subdistal medial lobe. Ramus with basally biarticulate dorsal seta inserted lateral to end of keel, two lateral se-

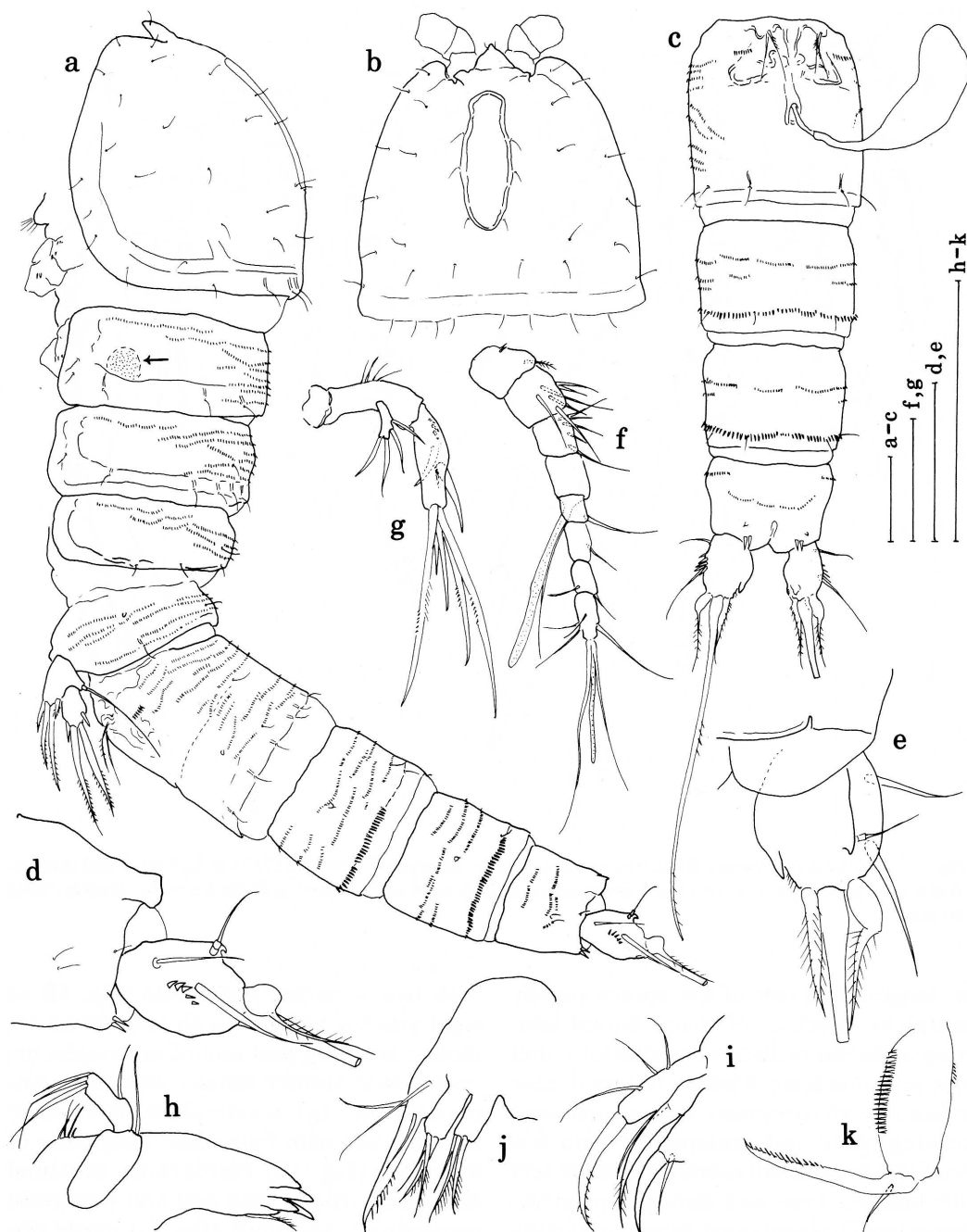


Fig. 1. *Elaphoidella carterae* Reid, new species, female, holotype (USNM 251767): a, Habitus, left lateral (arrow indicates detail of somitic punctations); b, Cephalosoma, dorsal; c, Urosome, ventral; d, Anal somite and caudal ramus, left lateral; e, Part of anal somite and right caudal ramus, dorsal (somewhat compressed in permanent mount); f, Antennule; g, Antenna; h, Mandible; i, Maxillule (part); j, Maxilla; k, Maxilliped. Scales = 50 μ m.

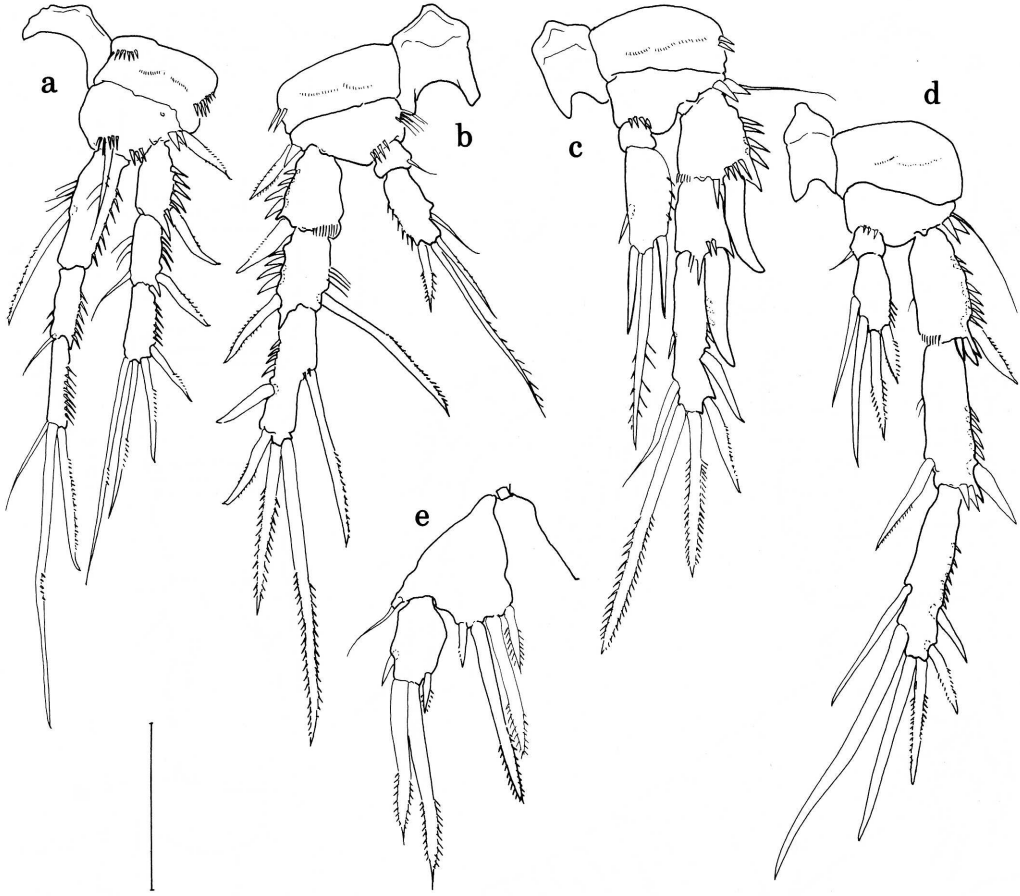


Fig. 2. *Elaphoidella carterae* Reid, new species, female, holotype (USNM 251767): a, Left leg 1 and coupler; b, Right leg 2 and coupler; c, Left leg 3 and coupler; d, Left leg 4 and coupler; e, Right leg 5 and coupler. Scale = 50 μ m.

tae, longitudinal row of five spines slightly ventral to insertion of distal lateral seta, group of fine hairs distal to medial lobe, and three terminal setae. Median terminal setae broken in both specimens, lacking proximal breaking plane and ornamented with few spiniform setules; lateralmost terminal seta with bulbous base and slender tip; medialmost terminal seta stout, tapering, slightly shorter than lateralmost terminal seta; both medialmost and lateralmost terminal setae ornamented with fine hairs. Holotype bearing long ovoid spermatophore (Fig. 1c).

Rostrum (Fig. 1a, b) short, subtriangular,

with two sensillae. Antennule (Fig. 1f) of eight articles, article 4 with long broad esthetasc reaching past end of antennule, article 8 with shorter slender esthetasc. Antenna (Fig. 1g) biarticulate, exopodite uniaarticulate with four setae. Exopodite of mandible (Fig. 1h) biarticulate, proximal and distal articles with one and four setae respectively. Maxillule (Fig. 1i) partly obscured in mount, basis with three visible setae and long terminal claw. Maxilla (Fig. 1j) also with three setae on basis. Maxilliped (Fig. 1h) prehensile, with basis broken but lacking seta present on some congeners.

Legs 1–4 (Fig. 2a–d) each with triarticulate exopodite; endopodite of leg 1 triarticulate, longer than exopodite; endopodites of legs 2–4 each biarticulate. Formula for major armament as follows:

Leg 1	basis 1-1	exp 0-1; 1-1; 0,2,2 enp 1-0; 1-0; 1,2,0
Leg 2	basis 0-1	exp 0-1; 1-1; 1,2,2 enp 1-0; 1,2,1
Leg 3	basis 0-1	exp 0-1; 0-1; 2,2,2 enp 0-0; 1,2,1
Leg 4	basis 0-1	exp 0-1; 1-1; 2,2,2 enp 1-0; 2,1,1

Major lateral spines of leg 3 exopodite articles 1 and 2 very large, curved posteriorly. More distal setae of exopodites of legs 2–4 and endopodites of legs 3 and 4 unusually stout, almost spiniform. Couplers of all legs without ornament.

Leg 5 (Fig. 2e), medial expansion of basoendopodite reaching less than $\frac{1}{2}$ length of exopodite. Basoendopodite and exopodite each with four setae of which lateral and medialmost setae are very short and two medial setae longer, all setae stout, spiniform.

No variation was observed between the two specimens.

Male.—Unknown.

Etymology.—Dr. Marjorie Estelle Carter collected copepods from Mountain Lake and its environs for nearly two decades, but published only two articles, one posthumously, from those studies (Carter 1944, Carter & Bradford 1972). Her collection, which apparently included numerous undescribed species, no longer survives (H. H. Hobbs, Jr., pers. comm. to JWR). It is a pleasure to pay tribute to Dr. Carter's contributions to knowledge of American harpacticoid copepods by naming this species for her.

Comparisons.—The form of the caudal ramus, especially the medial protrusion, and the terminal caudal setae resemble those of no known member of the *Elaphoidella*-group. The major setation of legs 1–4 also

Table 1.—Number of major setae and spines on proximal: distal articles of endopodites of legs 2–4 (females) and legs 2 and 4 (males) and on basoendopodites: exopodites of leg 5 of species of *Elaphoidella* recorded from North America. (Males of *E. californica*, *E. carterae*, and *E. kodiakensis* are unknown.)

Species	Leg 2	Leg 3	Leg 4	Leg 5
Females				
<i>amabilis</i>	1:3	0:3	0:3	4:3
<i>shawangunkensis</i>	1:3	0:5	0:3	4:3
<i>carterae</i>	1:4	0:4	1:4	4:4
<i>subgracilis</i>	1:4	1:5	1:4	4:4
<i>californica</i>	1:5	1:5	1:4	4:5
<i>bidens</i> , <i>kodiakensis</i> , <i>reedi</i> , <i>wilsonae</i>	1:5	1:6	1:4	4:5
Males				
<i>shawangunkensis</i>	1:3	—	0:3	0:3
<i>subgracilis</i>	1:3	—	?	0:4
<i>amabilis</i>	1:3	—	0:3	0:4
<i>reedi</i> , <i>wilsonae</i>	1:4	—	0:3	0:4
<i>bidens</i>	1:4	—	2 ^a	0:4

^a The leg 4 endopodite of the male of *E. bidens* is uniarticulate.

differs from known North American species (Table 1).

Elaphoidella amabilis Ishida, new species

Material examined.—Holotype ♀, dissected and mounted on slide (USNM 251799). Allotype ♂, dissected and mounted on slide (USNM 251800). Paratypes: 2 ♀ and 1 ♂, mounted whole together on slide (USNM 251798), and 2 ♀, in 70% ethanol (USNM 251797). All from perennial spring, southeast corner of Maryland Maintenance Facility, Rock Creek Stream Valley Park, Montgomery County, Maryland, approximately 100 m west of boundary with Washington, D.C., 38°59'16"N 77°03'18"W, 5 Oct 1990, col. T. Ishida. Mounted specimens in gum-chloral medium.

Female.—Habitus (Fig. 3a) cylindrical. Length of holotype 0.57 mm, of mounted paratypes 0.55 and 0.56 mm. Hyaline fringes of posterior margins of all somites smooth. Surface of all somites rather smooth, faintly

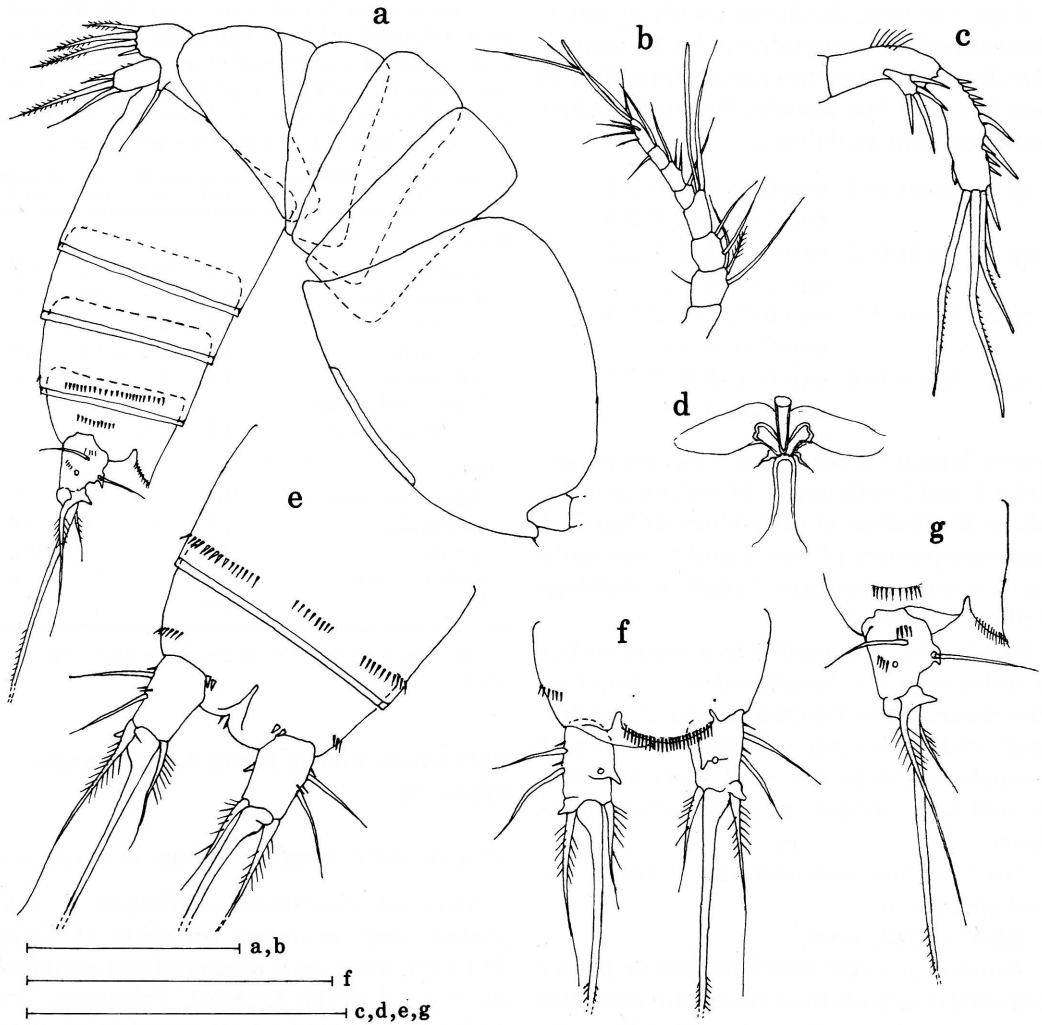


Fig. 3. *Elaphoidella amabilis* Ishida, new species, female, b–f, holotype (USNM 251799), a, g, paratype (USMM 251798): a, Habitus (somewhat compressed in permanent mount), left lateral; b, Antennule; c, Antenna; d, Genital field; e, Penultimate urosomite, anal somite, and caudal rami, ventral; f, Anal somite and caudal rami, dorsal; g, Anal somite and caudal ramus, left lateral. Scales = 100 μ m.

punctate. Posterior end of seminal receptacle (Fig. 3d) reaching $\frac{2}{3}$ length of genital segment. Penultimate urosomite (Fig. 3a, e) with rows of small spines on lateral and ventral margin. Anal somite (Fig. 3e–g) with transverse row of lateral spines on each side, and with two spines near posteroventral margin above each caudal ramus; anal operculum convex, with marginal comb. Caudal ramus (Fig. 3e–g) about 1.5 times longer

than broad, rectangular, with dorsal, terminally hooked longitudinal keel extending about $\frac{2}{3}$ length of ramus. Caudal ramus with basally biarticulate dorsal seta inserted lateral to end of keel, two lateral setae, each with transverse row of four spines at base, and three terminal setae. Median terminal seta lacking proximal breaking plane, basally expanded with ventral knob at insertion, remaining part of seta slender, about

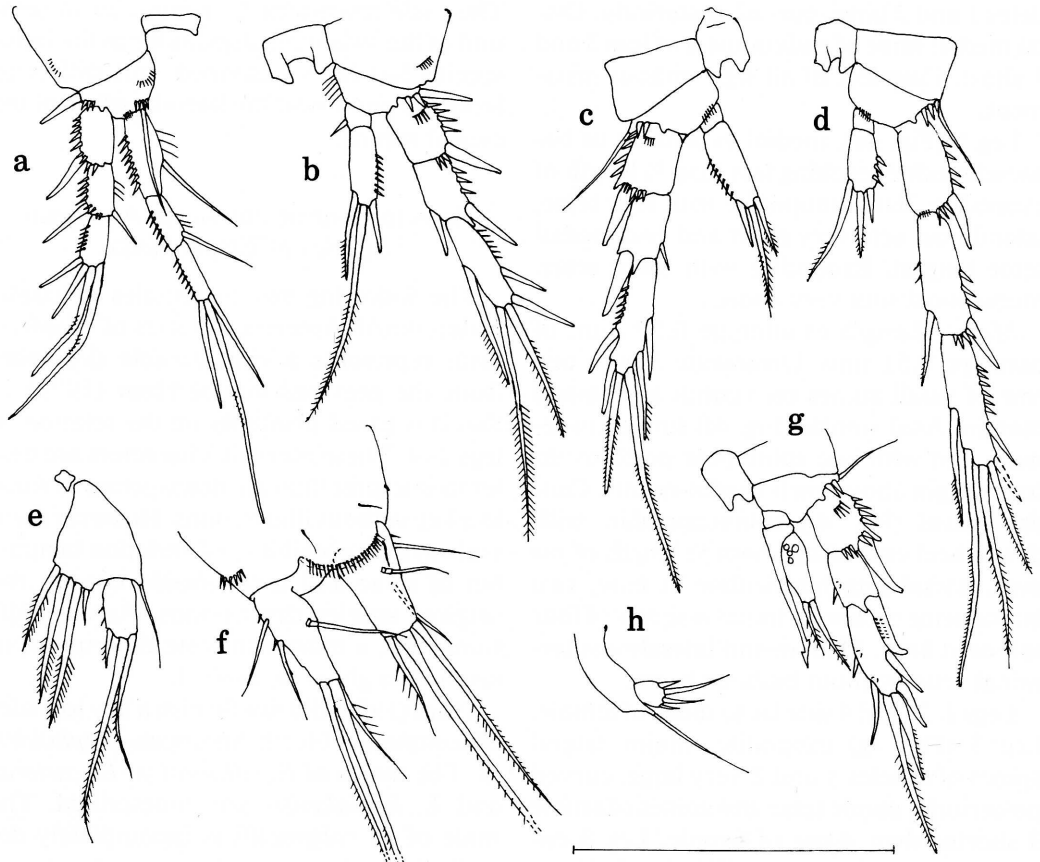


Fig. 4. *Elaphoidella amabilis* Ishida, new species, female, holotype (USNM 251799): a, Right leg 1 and coupler; b, Left leg 2 and coupler; c, Right leg 3 and coupler; d, Left leg 4 and coupler; e, Left leg 5 and coupler. Male, allotype (USNM 251800): f, Anal somite and caudal rami, dorsolateral; g, Left leg 3 and coupler; h, Right leg 5. Scale = 100 μ m.

1.3 times longer than urosome. Lateralmost terminal seta slender, ventrally curved proximally, base bulbous with acute dorsal process. Medialmost terminal seta stout proximally, tapering distally, about 1/2 length of lateralmost terminal seta. Medialmost and lateralmost terminal setae ornamented with fine hairlike setules, median terminal seta ornamented with short stiff setules.

Rostrum short. Antennule (Fig. 3b) of eight articles, article 4 with long esthetasc reaching past end of antennule, article 8 with shorter esthetasc. Antenna (Fig. 3c) biarticulate, exopodite uniaarticulate with four setae.

Legs 1–4 (Fig. 4a–d) each with triarticulate exopodite; endopodite of leg 1 triarticulate, longer than exopodite; endopodites of legs 2–4 each biarticulate. Formula for major armament as follows:

Leg 1	basis 1-1	exp 0-1; 1-1; 0,2,2
		enp 1-0; 1-0; 1,2,0
Leg 2	basis 0-1	exp 0-1; 1-1; 1,2,2
		enp 1-0; 1,1,1
Leg 3	basis 0-1	exp 0-1; 0-1; 2,2,2
		enp 0-0; 1,1,1
Leg 4	basis 0-1	exp 0-1; 1-1; 2,2,2
		enp 0-0; 1,1,1

Major lateral spines of leg 3 exopodite ar-

ticles 1 and 2 large, curved posteriorly. Distal medial setae of endopodites of legs 3 and 4 short. Couplers of all legs without ornament.

Leg 5 (Fig. 4e), medial expansion of basoendopodite reaching less than $\frac{1}{2}$ length of exopodite. Basoendopodite with four setae, lateralmost seta very short and two medial setae longest. Exopodite with three setae, medialmost seta very short.

Male.—Length of allotype 0.52 mm, of paratype 0.51 mm. Urosomite 3 with one row of small spines on ventral and lateral margin. Anal somite (Fig. 4f) similar to female, but with one spine near posteroventral margin above each caudal ramus. Caudal ramus (Fig. 4f) subrectangular, with dorsal keel extending about $\frac{1}{2}$ length of ramus, dorsal seta biarticulate at base, two lateral setae each with transverse row of four spines at base. Median and lateralmost terminal setae without bulbous bases.

Legs 1, 2, and 4 similar to those of female. Leg 3 (Fig. 4g) exopodite, major lateral spines of articles 1 and 2 very large, curved posteriorly; major setae and spines of article 3 shorter than those of female. Leg 3 endopodite triarticulate, modified, spiniform process of article 2 reaching only midlength of exopodite article 3, article 3 with two short apical plumose setae.

Leg 5 (Fig. 4h) basoendopodite reduced, lacking armament; exopodite slightly longer than broad and bearing four spines, next innermost spine longest.

No variation was observed between specimens of either sex.

Etymology.—Named for the lovely aspect of the body, especially the female caudal rami.

Remarks.—The type locality is the same as that of *Attheyella* (*Mrazekiella*) *spinipes* Reid, 1987.

Comparisons.—*Elaphoidella amabilis*, like *E. carterae* is highly distinctive in the structure of the caudal rami and caudal setae. The major setation of the swimming legs of the female is the most reduced of known North American species (Table 1).

The male resembles *E. subgracilis* in setation of the swimming legs, as far as the latter species has been described, but differs in lacking a papilla on the lateral surface of the caudal ramus.

Keys to Continental North American Species of *Elaphoidella*

The following key to females of continental North American species of *Elaphoidella* represents a considerable departure from the previous key of Hunt (1979) in that it is based primarily on the setation of legs 2–4. These meristic characters are easier to interpret than are descriptions of form in a key without illustrations. However there is always the possibility of variation in number of setae and users should consult the original species descriptions. As an additional aid, a more complete description of setation is given in Table 1.

Hunt (1979) did not furnish a key to males of continental North American *Elaphoidella*. The males of *E. californica*, *E. carterae* and *E. kodiakensis* are undescribed. The male of *E. subgracilis* is incompletely described.

Key to females:

1. Leg 2 endopodite article 2 with total of three setae 2
 - Leg 2 endopodite article 2 with total of four or five setae 3
2. Leg 3 endopodite article 2 with three setae *amabilis* Ishida, new species
 - Leg 3 endopodite article 2 with five setae *shawangunkensis* Strayer, 1988 (1989)
3. Leg 3 endopodite article 1 with one medial seta, article 2 with five or six setae 4
 - Leg 3 endopodite article 1 naked, article 2 with four setae *carterae* Reid, new species
4. Caudal ramus with small or no dorsal keel, not ending in hook; hyaline membranes of somites smooth 5
 - Caudal ramus with pronounced

- dorsal keel, ending in large hook; hyaline membranes of somites coarsely toothed *bidens* (Schmeil, 1893) s. 1.
- 5. Leg 3 endopodite article 2 with six setae, leg 5 exopodite with five setae 6
 - Leg 3 endopodite article 2 with five setae, leg 5 exopodite with four setae *subgracilis* (Willey, 1934)
 - Leg 3 endopodite article 2 with five setae, leg 5 exopodite with five setae *californica* Wilson, 1975
- 6. Caudal ramus 2–3 times longer than broad, anal somite not expanded dorsally over caudal ramus, most of ramus visible in dorsal view 7
 - Caudal ramus slightly longer than broad, anal somite with postero-dorsal expansions, most of caudal ramus not visible in dorsal view ... *wilsonae* Hunt, 1979
- 7. Apex of ramus with three processes, two of these digitiform and flexible *kodiakensis* Wilson, 1975
 - Apex of ramus with normal apical setae only *reedi* Wilson, 1975

Key to males:

- 1. Leg 5 exopodite with four setae; leg 2 endopodite article 2 with three or four setae 2
 - Leg 5 exopodite with three setae; leg 2 endopodite article 2 with three setae *shawangunkensis*
- 2. Leg 2 endopodite 2 with three setae 3
 - Leg 2 endopodite 2 with four setae 4
- 3. Caudal ramus with small distally directed papilla at posterior ¾ of lateral surface *subgracilis*
 - Caudal ramus lacking ornament on distal ½ of lateral surface ... *amabilis*
- 4. Leg 4 biarticulate, article 1 with none, article 2 with three setae .. 5
 - Leg 4 uniarticulate, with two setae *bidens*
- 5. Caudal ramus tapering distally,

- medial and lateral surfaces slightly expanded in dorsal view ... *wilsonae*
- Caudal ramus bottle-shaped, medial and lateral surfaces incurved in dorsal view *reedi*

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(JWR) Research Associate, Department of Invertebrate Zoology, NHB 163, National Museum of Natural History, Smithsonian Institution, Washington, D.C. 20560, U.S.A.; (TI) 372 Irifunecho, Yoichimachi, Hokkaido, 046 Japan.