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A NEW SPECIES OF CANDACIA (COPEPODA: CALANOIDA) FROM THE WESTERN NORTH ATLANTIC OCEAN

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The new species of *Candacia* described below was discovered independently by the authors while engaged in studies of plankton collections made by the U. S. Fish and Wildlife Service (USFWS). The plankton tows were made off the southern Atlantic coast of the United States by the *Theodore N. Gill* and in the Gulf of Mexico by the *Alaska* as part of general oceanographic surveys of the two regions.

In addition to the new species described below, seven known species of *Candacia* have been found in the collections. *C. bipinnata* Giesbrecht, *bispinosa* Claus, *curta* Dana, *longimana* Claus, *pachydactyla* Dana, and *simplex* Giesbrecht occurred in both regions surveyed, whereas *armata* Boeck has been found only in collections made at some of the most northern stations occupied by the *Gill*, off Beaufort, N. C. These stations appear to represent approximately the southern boundary of the distribution of this species along the Atlantic coast of the United States. As pointed out by Thompson and Scott (1903, p. 250), Brady's (1884, p. 68) records from *Challenger* stations are probably erroneous. The only other published records from Indo-Pacific or tropical western Atlantic localities are contained in C. B. Wilson's *Carnegie* (1942) and *Albatross* (1950) reports. Examination of *Carnegie* and *Albatross* specimens in the U. S. National Museum

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(USNM) identified by Wilson as *C. armata* was carried out. Almost all of Wilson's determinations proved to be erroneous; *C. armata* was not present at any of the *Carnegie* stations and only at *Albatross* station 2195 (lat. 39°44′ N., long. 70°03′ W., off Cape Hatteras).

C. aethiopica Dana, a widespread species in temperate and tropical waters of all the oceans, was not found in either the *Alaska* or *Gill* collections. It will probably be found at least in the region covered by the *Gill*, since it has been reported from the Bermuda area (Moore, 1949), and Mr. Philip St. John (personal communication) has found it in plankton hauls made off the coast of North Carolina.

Candacia norvegica (Boeck), found in the cooler part of the North Atlantic Ocean, appears to be limited to waters of lower temperature than those surveyed by the *Alaska* and the *Gill*. In Wilson's *Carnegie* and *Albatross* papers this species was reported to have been found in the Sargasso and Caribbean regions and in many parts of the Pacific Ocean. As in the case of *C. armata*, Wilson's determinations have been found to be incorrect. *C. norvegica* was not present in any of the *Albatross* or *Carnegie* material in the U. S. National Museum.

Candacia paenelongimana, new species

FIGURES 1; 2,*a–g*

LOCALITIES AND MATERIAL: Gulf of Mexico: Lat. 23°35′ N., long. 82°23′ W. (USFWS *Alaska* cruise 4, station 29, Jan. 19, 1952, 1 meter depth of tow, one female); lat. 23°31′ N., long. 86°44′ W. (*Alaska* cruise 4, station 36, Jan. 24, 1952, 1 meter depth of tow, one female).

Gulf Stream: Off Florida coast, lat. 27°40′ N., long. 79°41′ W. (USFWS *Theodore N. Gill* cruise 1, station 6, Feb. 17, 1953, 60 meters depth of tow, one female); off South Carolina coast, lat. 32°41′ N., long. 77°03′ W. (*Gill* cruise 1, station 62, Mar. 3, 1953, 75 meters depth of tow, one female, one male).

MEASUREMENTS: All measurements made from dorsal view along midsagittal plane; cephalothorax measured from anteriormost margin of forehead to posterior margin of intersegmental fold between thoracic fusion segment IV–V and genital segment; length of abdomen from anterior margin of genital segment to articulation between fifth innermost seta and right furcal ramus. Measurements made at 100× magnification with aid of ocular micrometer, specimens immersed in solution of 50 percent glycerine, 50 percent water. Slender glass rods used to support cephalothorax and abdomen in horizontal position during measurements of each.

The total length and cephalothorax-abdomen ratio, presented in that order, for individuals collected at different localities are as follows: Adult females: holotype, 2.92 mm., 4.1 : 1; paratypes, 2.54

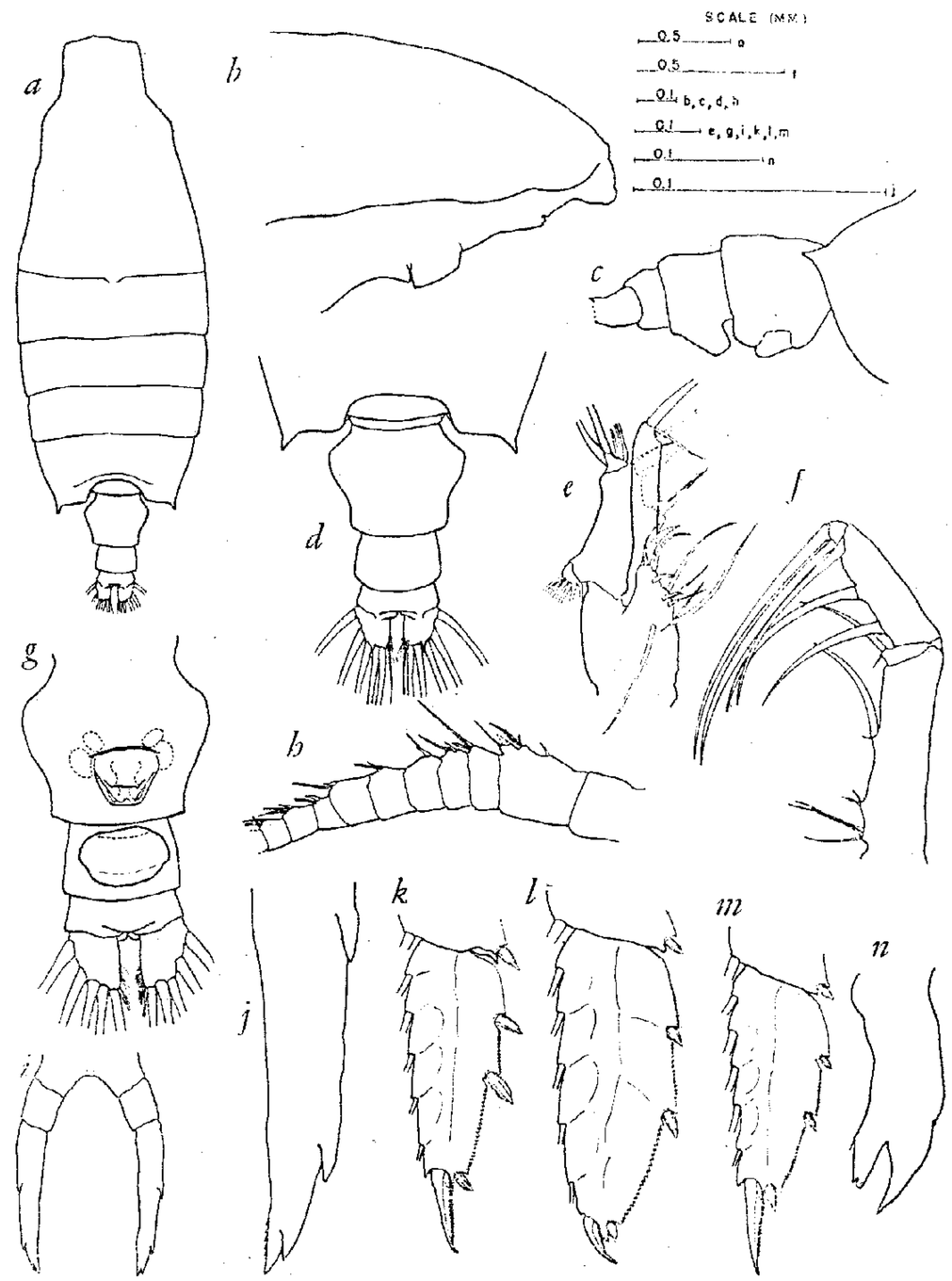

FIGURE 1.—*Candacia paenelongimana* new species, female (*a-j* and *n* are holotype, *k-m*, paratype): *a*, dorsal view; *b*, cephalon, lateral view; *c*, abdomen, lateral view; *d*, abdomen, dorsal view; *e*, second maxilla; *f*, maxilliped; *g*, abdomen, ventral view; *h*, proximal portion of first antenna; *i*, fifth legs; *j*, ramus of fifth leg, distal half; *k*, third exopodal segment of fourth leg; *l*, third exopodal segment of third leg; *m*, third exopodal segment of second leg; *n*, mandible, gnathal lobe.

mm., 3.9 : 1 (*Alaska* station 29); 2.57 mm., 3.7 : 1 (*Gill* station 62) 2.66 mm. (*Gill* station 6). Adult male: allotype, 2.49 mm., 3.4 : 1.

DIAGNOSIS: Adult female; similar to *C. longimana* (Claus) with respect to cephalothorax, cephalic appendages, and swimming legs 1–4 (fig. 1,*e,f,h,k–n*).

Abdominal details differing from *longimana*: Genital segment with somewhat angular lateral swellings, greatest width anterior to mid-length of swellings (fig. 1,*d,g*); measured at greatest width, genital segment wider than long (0.82–0.85 : 1); second abdominal segment produced ventrad in a broad lobiform process (fig. 1,*c*); process extends ventrad and somewhat anteriad, almost reaching posteroventral margin of genital segment.

Fifth legs differing from *longimana*; spines of ramal segment small; ramus with two apical subequal spines, two appressed spines along lateral margin; medial margin of ramus with longitudinal row of about five small denticles near apex (fig. 1,*i,j*).

Adult male similar to *longimana* with respect to cephalic appendages and swimming legs 1–5.

Posterior process of right fifth thoracic segment relatively longer and of rather different form than that of *longimana*. Seen from above (fig. 2,*c*) process tapers gradually and turns slightly outward at tip; in lateral view (fig. 2,*b*) it curves upward to tip, which has an expansion on its posterior side.

Genital segment (fig. 2,*a,d*) similar to that of *longimana*, but process on right side without thickening near the middle as characteristic of *longimana*.

Fifth legs (fig. 2,*e*) like those of *longimana* in all details.

TYPES: Holotype, USNM 98618, female, *Alaska* cruise 4, station 36. Allotype, USNM 98619, male, *Gill* cruise 1, station 62. Paratypes: USNM 98622, female, *Alaska* cruise 4, station 29; USNM 98621, female, *Gill* cruise 1, station 6; USNM 98620, female, *Gill* cruise 1, station 62.

ADDITIONAL DESCRIPTION: Abdominal segments plus furca with following proportions: Female (based on holotype), 48.5, 25.0, 12.0, 14.5=100; male, 37.5, 30.0, 27.0, 12.5, 20.0=100.

FIGURE 2.—*a-g*, *Candacia paenelongimana* new species, male allotype: *a*, dorsal view; *b*, fifth thoracic segment and first abdominal segment, seen from the right side; *c*, posterior corner of right fifth thoracic segment, dorsal view; *d*, process of first abdominal segment, dorsal view; *e*, fifth legs; *f*, right first antenna, segments 15–19, dorsal view; *g*, right furcal ramus, dorsal view. *h-l*, *Candacia longimana* (Claus): *h*, abdomen, dorsal view, male from South Pacific, USNM 80116; *i*, portion of fifth thoracic and first abdominal segments, dorsal view, male from same lot as *h*; *j*, posterior corner of right fifth thoracic segment, dorsal view, male from *Carnegie* Sta. 66, off Chile, USNM 80115; *k*, same, lateral view; *l*, fifth legs, female, *Gill* Cruise 1, Sta. 71, off North Carolina; *m*, abdomen, lateral view, same specimen. *n*, *Candacia chirura* Cleve, abdomen, lateral view, from Farran (1929).

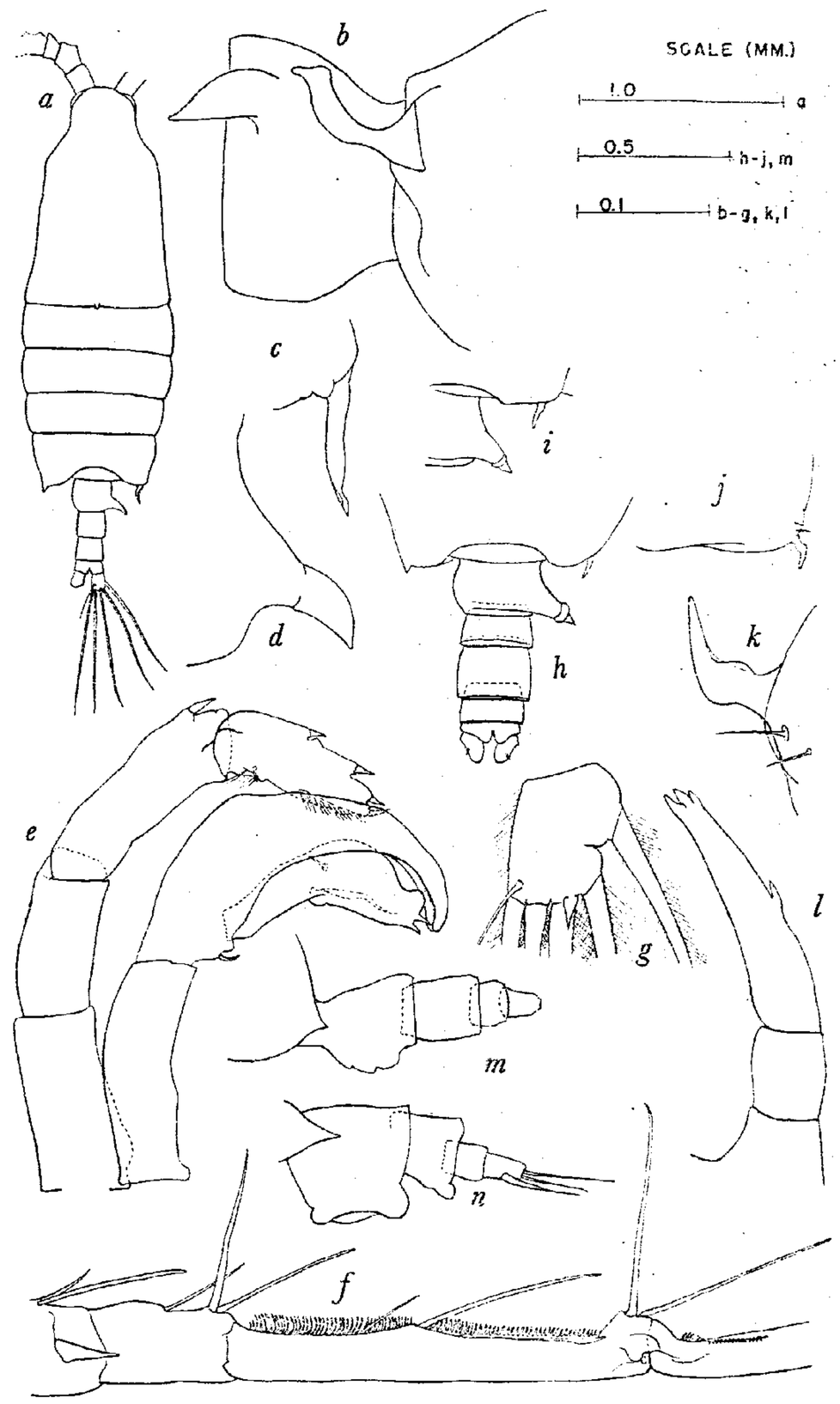

FIGURE 2.—Explanation on facing page.

Cephalothorax-abdomen length ratio of female *longimana* Claus, according to Giesbrecht (1892, p. 428), approximates 2.9±.3:1. However, ratios of *longimanna* collected by *Gill* and *Alaska* similar to range in *paenelongimana*; a female *longimana* from Gulf of Mexico (unpublished data; lat. 23°50′ N., long. 82°19′ W., Jan. 19, 1952, 1 meter depth) with ratio of 3.8:1; two *longimana* females from off Cape Lookout (unpublished data; lat. 34°03′ N., long. 75°15′ W., Mar. 6, 1953, 35 meters depth) with ratios of 3.6:1 and 4.1:1. Cephalothorax-abdomen length ratio, therefore, appears to be of no value in distinguishing between individual females of the two species.

Genital segment tends to be longer and furcal rami shorter in female *paenelongimana* as compared to available specimens and Giesbrecht's figures (1892, pl. 39, figs. 4, 6) of *longimana*.

REMARKS: The female can be easily recognized by the characteristic ventral process of the second abdominal segment. While processes from the vental surface of this segment are developed to varying degrees in several species of *Candacia*, the process is directed anteriad only in *paenelongimana*. Both *Candacia chirura* Cleve (fig. 2,*n*) and *C. armata* (Boeck) have conspicuous processes, directed posteriad.

The male can easily be confused with the male of *longimana*, but can be distinguished by the shape of the process on the right side of the fifth thoracic segment, especially when examined from the side. In *longimana* this process is somewhat variable, but is relatively shorter and heavier than in the single male *paenelongimana*. In dorsal view (fig. 2,*h–j*) it is more pointed and usually curves medially. Seen laterally (fig. 2,*k*) it bends abruptly upward just beyond the thickened middle and narrows uniformly to the pointed distal end. A number of male specimens of *longimana* from both the Atlantic and Pacific Oceans have been examined; in none of them did this process closely resemble that of *paenelongimana* with its uniform curvature and expanded apex.

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