

SMITHSONIAN MISCELLANEOUS COLLECTIONS

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(COPEPODA, CALANOIDA)

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In a publication<sup>1</sup> discussing the sand and mud of beaches as a copepod habitat, C. B. Wilson included a drawing of a first antenna labeled "*Arenocalanus tumidus*, female, a new genus of sand-dwelling calanids, showing an exceptional increase in the number of aesthetascs." In the text the only reference made to this drawing was in part of a sentence: "in the female either the number of aesthetascs is multiplied as in figure 4, or . . . ." No other figure or description of either genus or species was ever published.

Recently, while checking the collections that came to the National Museum after Wilson's death in 1941, I found a large, partially identified collection from Mount Desert Island, Maine, in which was included a vial labeled "*Arenocalanus tumidus*." An examination of the specimens in the vial revealed that they did not represent a new genus but belonged to the genus *Platycopia*. A study of all the individuals showed that not one, but two species were present, neither of which can be assigned to the species *tumidus* as characterized by Wilson's drawing. The specimen dissected for this illustration is apparently no longer extant, for it was not found among the few remaining temporary glycerin mounts that Dr. Wilson made of all his dissections, and which are now in the National Museum.

However, some incomplete notes and drawings relating to this species were found among Wilson's papers. Although they disagree in some details with his published figure of the first antenna, there are enough clues to enable me with some degree of assurance to assign the specific name he used to one of the two species found in his Mount Desert material (see under *Remarks*, p. 13). The antenna as figured by Wilson in no wise constitutes a description by which the species can be recognized; nevertheless I am describing it as *Platycopia tumida* (C. B. Wilson) in order to avoid any confusion that may result from bibliographic reference to this hitherto inadequately characterized species.

<sup>1</sup> Wilson, C. B., *Smithsonian Misc. Coll.*, vol. 94, No. 7, p. 7, fig. 4, 1935.

Because of the similarity in size and outward appearance of the two species it was thought advisable to dissect, at least partially, all the specimens in the collection. The appendages have been mounted in glycerin between cover glasses of unequal width, which have then been inverted on a slide in damar or balsam. They have been studied not only with a high dry but with a 1.8 mm. (95 $\times$ ) oil immersion objective, with which both 10 $\times$  and 15 $\times$  oculars were used. This use of oil immersion gave much greater resolution than is possible with high dry objectives. The study of detail in this genus proved easier than it is in many calanoids, because of the unusual flatness of most of the appendages. All drawings have been made to the same scale.

I am indebted to Dr. Waldo L. Schmitt, head curator of biology, U. S. National Museum, for encouragement during the progress of the work and suggestions in preparing the final draft of the paper.

#### SYSTEMATIC DISCUSSION

The genus *Platycopia* hitherto has included but two species, both described by G. O. Sars from the southern coast of Norway, and not since reported. The two additional species described in this paper were collected by C. B. Wilson at Mount Desert Island, Maine (northeastern coast of United States), probably in 1930.

Both of the Norwegian species were taken with bottom samples of coarse, muddy sand, but because of the depth from which they were dredged it cannot be stated exactly whether these species lived in the mud, among the grains of sand, or hovered near the bottom. From observations of bottom-living calanoids Sars<sup>2</sup> concluded that they keep themselves "constantly close to the ground over which they move in a peculiar gyrating manner."

The Mount Desert Island specimens came from a large tidal pool which was described by Wilson<sup>3</sup> as being about the size of a small room, and containing sand "made up very largely of rounded grains of quartz." Apparently he obtained these specimens of *Platycopia* from the washings of the sand from this tidal pool, and believed that they inhabited the sand. This is borne out by the caption under the figure mentioned above which reads "new genus of sand-dwelling calanids." If that is the case, it may well be that many of the calanoids obtained in bottom samples, even at considerable depths, actually dwell in sand or mud. However, it is possible that these specimens

<sup>2</sup> Sars, G. O., *Archiv Math. Naturv.*, vol. 31, No. 7, p. 13, 1911.

<sup>3</sup> Wilson, C. B., *Smithsonian Misc. Coll.*, vol. 94, No. 7, p. 3, 1935.

of *Platycopia* may have been hovering very close to the bottom of the pool, in the manner that Sars described, and they could thus have been swept up with sand dipped from the bottom.

The Norwegian species of *Platycopia* were both dredged from the same type of bottom at Korshavn, but at different stations. They varied from one another in the presence or absence of inside setae or spines on segments 1 and 2 of the exopods of legs 3 to 5; in a reduction of segments in the endopods of legs 2 to 5; and in the shape of the male fifth leg. As the specimens of *Platycopia* in the Mount Desert collection were placed by the collector in one vial, it is not known whether they came from the same spot in the tidal pool or were sorted out from collections made in two or more places. Finding them so closely associated, however, is very interesting, because they vary from one another in much the same way as do the species from Korshavn.

#### Family PLATYCOPIIDAE Sars, 1911

##### Genus PLATYCOPIA Sars, 1911

*Arenocalanus* C. B. WILSON, 1935, Smithsonian Misc. Coll., vol. 94, No. 7, p. 7, fig. 4.

*Diagnosis*.—Antenna 1 shorter than first metasome segment, bearing on segment 1 a long spine ending in a thin filament; neither antenna geniculate in male. Leg 1 much reduced in size, both rami 2-segmented. Exopods of legs 2 to 5 with 2 outer spines on segment 1; endopods 2- or 3-segmented. Fifth legs in female resembling legs 2 to 4; in male, symmetrical, exopods slightly transformed.

*Description* (emended).—Length between 0.50 and 0.95 mm.; male slightly smaller than female of species. Body robust, somewhat cyclopid in form; rostrum stout, triangular from above; eye spot distinct or wanting. Metasome consisting of 5 segments; cephalic segment greatly elongated, with anterior portion strongly vaulted above. Urosome of 4 segments in both sexes, narrow; a pair of anal lappets, conspicuous in dorsal profile, extending from third segment; caudal setae 4, jointed near base. First antennae considerably shorter than first metasome segment, consisting in female of 22 or 23 segments, in male of 15 or 16, both alike, nongeniculate; last segment of female and last two of male elongated; first segment in both sexes much broadened and elongated, bearing beyond the middle a long spine which ends in a thin filament, this spine almost half the length of the antenna; some segments bearing aesthetascs, more numerous and highly developed in the male than in the female. Second antennae

compact, outer ramus larger than the inner, 5-segmented, the first 2 segments dilated. Mandibles not particularly stout, with few denticles and slender palp. First maxillae distinctive; masticatory lobe large, ovoid, armed with short, stout, clawlike spines; palp of very short, slender lobes with comparatively few setae. Second maxillae somewhat cyclopoid in structure, armed with stout spines; maxillipeds of the usual calanoid type, slender and not conspicuously elongated. Legs flattened, with basal segments greatly broadened. Rami of first legs differing from others, much abbreviated, 2-segmented, somewhat lamellar in shape, bearing plumose setae. Distal basal segment of legs 2 to 5 with outer, distally-placed spine. Exopod of legs 2 to 4 with 3 segments, the first bearing 2 spines outside, distal edge of segments 1 and 2 on anterior face extended beyond the middle as a hyaline membrane which partly overlies the succeeding segments, this edge serrate on legs 3 and 4; armature of endopod varying from one leg to another. Setae of both rami of legs 2 to 5 mostly transformed to flattened spines, many bearing marginal hyaline flanges. Female fifth legs like legs 2 to 4, slightly smaller; species differing in segmentation of endopods, and in armature of both rami. Right and left fifth legs of male alike, exopod slightly transformed, 2- or 3-segmented, bearing terminally thin, variable hyaline lappets, flanked internally by a modified spine, differing specifically in shape and size; endopod variable.

*Genotype*.—*Platycopia perplexa* Sars.

#### KEY TO THE SPECIES OF PLATYCOPIA

- a.<sup>4</sup> Endopods of legs 2 to 5 3-segmented; first or second segment of exopods 3 to 5 bearing inner setae or spines (except leg 5 ♂); male fifth exopod elongated, terminal inner spine styliform.
1. Male fifth exopod bearing 1 spine at proximal constriction of second segment, distal segment of endopod with 5 spines.  
*P. perplexa* Sars, 1911
  2. Male fifth exopod bearing 2 spines at proximal constriction of second segment, distal segment of endopod with 4 spines.  
*P. sarsi*, new species
- b. Endopods of legs 2 to 5 varying in segmentation; first and second segments of exopods 3 to 5 lacking inner setae or spines; male fifth exopod compact, terminal inner spine saber-shaped.
1. Second endopod 2-segmented; female fifth endopod incompletely 3-segmented, the whole bearing 4 spines; male fifth exopod 2-segmented, distal segment of endopod with 2 spines.  
*P. pygmaea* Sars, 1919

<sup>4</sup> Because only the male of *P. sarsi* is known, the female sex is omitted from section *a* of the key. The female of *P. perplexa* can, of course, be distinguished from those of section *b* by the major characters given under *a*.



2. Second endopod 3-segmented; female fifth endopod 2-segmented, the whole bearing 6 spines; male fifth exopod 3-segmented, distal segment of endopod with 5 spines...*P. tumida* (C. B. Wilson), 1935

#### PLATYCOPIA PERPLEXA Sars

*Platycoxia perplexa* Sars, 1911, Archiv Math. Naturv., vol. 31, No. 7, p. 4, pls. 1-2.

*Platycoxia perplexa* Sars, 1919, Crustacea of Norway, vol. 7, p. 11, pl. 6, pl. 7, fig. 1.

*Description* (after Sars).—*Female*. Length about 0.95 mm. Eye wanting. Urosome about  $\frac{1}{3}$  the length of the metasome, caudal rami short, slightly longer than broad. Antenna 1 with 23 segments, aesthetascs short, apparently 5 or 6 in number. Masticatory lobe of first maxilla with 6 clawlike spines and 6 setae, most proximally located spine unbranched, bearing spinules on distal margin; rudimentary epipodal lobe present on palp. Leg 1 with seta and a curved spinous process on distal inner edge of basal segment 2. Spines of exopod 2 having margins of hyaline flanges smooth, those of exopods 3 to 5 with serrate margins. Third exopod with inner seta on segment 1, fourth exopod with seta on 1 and spine on 2. Endopods 2 to 4 3-segmented; segment 1 bearing 1 seta; segment 2 unarmed in endopod 2, with 1 spine in 3 and 4; distal segment of endopod 2 with 6 setae and spines; that of endopod 3 with 7 spines; that of endopod 4 with 6 spines. Exopod of leg 5 with inner seta on segment 1 (this shown only in 1919 reference), inner spine on segment 2; segment 3 bearing 6 spines, all well developed and having serrate hyaline flanges. Endopod 5 3-segmented, segment 1 unarmed, segment 2 with 1 spine, segment 3 with 5 small, unequal spines.

*Male*. Length about 0.83 mm. Antenna 1 with 16 segments, aesthetascs much longer than in female, numbering 10 or 12 (number based on illustrations). Legs 1 to 4 exactly like female. Leg 5 with 2-segmented exopod, distal segment somewhat elongated, constricted near the proximal end and bearing a stout, hyaline flanged spine at this point. End of segment transversely truncated and carrying a thin partly ciliated lamella, flanked internally by a long styliform spine and on the outer edge by 2 unequal spines. Endopod 3-segmented, first segment unarmed, second bearing a long slender spine, third with 5 short spines.

*Occurrence*.—Korshavn, southern coast of Norway; dredged from 60 fathoms, coarse, muddy sand.

## PLATYCOPIA SARSI, new species

## Figure 1, A-G

*Specimens examined*.—1 male, 2 immatures, collected from tidal pool at Sea Wall, Mount Desert Island, Maine, by Charles Branch Wilson. Holotype male (1 slide) U.S.N.M. No. 79917.

*Diagnosis*.—*Male*. First antenna with 16 segments. Endopods of legs 2 to 5 3-segmented; exopod 5 with 2 spines at proximal constriction of second segment, distal spine greatly enlarged; third segment of endopod with 4 spines. Mature female unknown.

*Description*.—*Male*. Length about 0.70 mm. Urosome like that of *P. perplexa*, anal lappets somewhat smaller. First pair of antennae (fig. 1, A) with 16 segments, bearing 12 aesthetascs, most of which are jointed near the middle (the shortness of some of the aesthetascs in this unique specimen is due to loss of the distal part, as indicated by broken lines in the illustration); 4 setae on segment 1; 3 on segments 4, 15, and 16; 2 on 2, 6, 9, 10, and 12; 1 on 7, 8, 11, 13, and 14; short spines on 3, 5, and 8. Second antennae and mouth parts like those of the genotype as described by Sars, except for slight differences in the spines of the masticatory lobe of the first maxilla (fig. 1, B). This lobe with 6 large clawlike spines and 6 setae; 2 of the setae placed together near center of the anterior face; most proximally located spine with distal margin branched (fig. 1, C); rudimentary epipodal lobe of palp not found in this specimen. Leg 1 (fig. 1, D) very similar in shape to that of *P. perplexa*, distal segment of exopod with 6 setae, endopod with 3. Inner seta of endopod spiniform (i.e., stiff and straight), set into a stout, well-defined ridge which appears to be more or less demarcated from the surface. A slender seta with its basal part widened arising from the inner surface of second basal segment and overlying a small ovoid ridge near the inner edge of first segment of endopod.

Legs 2 to 4 apparently exactly like those of *P. perplexa*, all endopods 3-segmented, varying from one another in the number of setae and spines. Hyaline flanges of spines of exopod 2 smooth, except that on large terminal spine, mostly serrate in succeeding pairs. Exopod of leg 2 bearing 4 spines and 2 setae on distal segment; endopod (fig. 1, E) carrying an inner seta on segment 1, none on segment 2, and 4 spines and 2 setae on 3. Setae converted to spines in the following pairs of legs, except for seta on segment 1 of endopod. Leg 3 bearing an inner seta on first segment of exopod, distal segment of endopod with 7 spines; leg 4 carrying an inner seta on first segment of exopod and a spine on second; distal segment of endopod with 6 spines.



FIG. 1.—*Platycopia sarsi*, new species. Male, A, antenna 1; B, masticatory lobe of maxilla 1; C, proximal spine of B, greatly enlarged; D, leg 1; E, endopod of leg 2; F, leg 5. Female, G, leg 5, late copepodid stage, prior to molting.  
*Platycopia tumida* (C. B. Wilson). Female, H, leg 2; I, endopod of leg 3.

Leg 5 (fig. 1, *F*) resembling *P. perplexa* in shape and size, and in having a 2-segmented exopod with the inner terminal spine styliform. Differing from *perplexa* in presence of a second spine at proximal constriction of second segment of exopod; this spine almost twice the length of the first with very broad marginal flanges. A thin, serrate, cuneiform, hyaline structure lying on the proximal surface of the segment near outer edge; a heavier, narrow, crescent-shaped ridge near inner edge. Terminal portion of segment irregularly shaped with inner edge extended into a sharp spinous process. Three small, oval-shaped, very thin hyaline lappets hanging between this process and the outer edge. A spatulate-shaped process with rolled hyaline margin, hanging on the outer edge nearly opposite the point of insertion of the inner spine. Endopod 3-segmented, first segment unarmed, second bearing a long inner spine and having a hairy pad across the surface; distal segment carrying 2 short spines inside and 2 terminally, outer and terminal edges set thickly with slender spines.

*Immature forms.*—Two immature forms, referable to *P. sarsi* because of the presence of inner setae and spines on exopods 3 and 4, were present in the collection. Both are copepodid stages; one much less developed than the other may be a male, the other represents a late stage of the female prior to molting, and is briefly described.

*Female, late copepodid stage.* Body more slender, cephalic segment shorter and succeeding segment longer than in mature male. Penultimate segment of urosome longer than in mature male. First antenna with 22 segments, segment 1 somewhat shorter than in mature male, with 4 setae; aesthetascs 5 in number, very slender, segmented near middle. Leg 1 showing same general form as in male, though endopod not completely segmented, ridge and accompanying spiniform seta of endopod well developed, other setae shorter than in mature form. Legs 2 to 4 with segmentation of both rami complete, setae and spines developed, but somewhat smaller than in mature male.

Leg 5 (fig. 1, *G*) not well enough developed to find points to distinguish it from *P. perplexa*. Segmentation of exopod not complete; only 1 spine of first segment and 5 of third segment completely developed; inside spine of second segment partially developed, no evidence of inside seta on segment 1 as in *perplexa*. (This seta in *perplexa* is very slender and was not shown in Sars' 1911 description. Its absence in this immature specimen may or may not indicate its presence in the adult.) Endopod 2-segmented, but showing evidence of further separation; inside spine of segment 2 present; terminal segment with 5 spines. As *perplexa* carries 5 spines on the end seg-

ment there is nothing to suggest what is the differentiation of the females of the two species in the adult form.

#### PLATYCOPIA PYGMAEA Sars

*Platycofia pygmaca* Sars, 1919, Crustacea of Norway, vol. 7, p. 13, pl. 7, fig. 2.

*Description* (after Sars).—*Female*. Length about 0.60 mm. Eye wanting. Urosome very narrow, nearly half the length of the metasome; caudal rami elongated, more than 3 times as long as they are broad. Antenna 1 with 23 segments, number of aesthetascs not known. Mouth parts and leg 1 said to be very similar to *P. perplexa*. Legs 2 to 5 lacking inner setae on exopods. Leg 2 with a 2-segmented endopod, distal segment with 6 spines. Endopods of legs 3 and 4 with division of two distal segments incomplete; spinal formula not given for leg 3; endopod 4 having 1 spine on segment 2, and 5 on segment 3. Leg 5 with third segment of exopod having the 2 inner spines very much shortened and their margins smooth. Endopod incompletely 3-segmented, as in legs 3 and 4, segment 2 with a small inner seta, distal segment with 3 unequal spines.

*Male*. Length about 0.52 mm. Antenna 1 with 16 segments, number of aesthetascs not known. Leg 5 of a compact structure; exopod 2-segmented, the distal segment bearing proximally 2 large spines, truncated terminally as in *perplexa* and carrying a thin hyaline lamella flanked internally by a large saber-shaped spine, and externally by a somewhat similarly shaped spine with the inner edge dentate. Endopod 2-segmented, segment 1 bearing a stout spine, segment 2 somewhat lamellar in shape and bearing 2 short spines.

*Occurrence*.—Korshavn, southern coast of Norway; dredged from 30 fathoms, muddy bottom.

#### PLATYCOPIA TUMIDA (C. B. Wilson)

Figure 1, H-I, Figure 2

*Arenocalanus tumidus* C. B. WILSON, 1935, Smithsonian Misc. Coll., vol. 94, No. 7, p. 7, fig. 4.

*Specimens examined*.—4 females, 1 male. Collected from tidal pool at Sea Wall, Mount Desert Island, Maine, by Charles Branch Wilson. Lectotype female (slides) U.S.N.M. No. 79920; allotype male (slides) U.S.N.M. No. 79921.

*Diagnosis*.—First antenna of female with 22 segments, that of male with 15; first segment of both sexes with a narrow ridge running lengthwise of the middle of the segment, bearing aesthetascs in male.

Endopod of leg 2 3-segmented, of legs 3 to 5 2-segmented. Distal segment of female fifth endopod with 6 spines. Male fifth leg with 3-segmented exopod, distal basal segment bearing a large spine inside; endopod with 5 distal spines.

*Description.*—*Female.* Length about 0.72 mm. Eye spot present, relatively small. Anal lappets of urosome conspicuous in profile; caudal rami more elongate than in *P. sarsi*, apparently not so slender and elongate as in *pygmaea*. First antenna (fig. 2, *A*) with 22 segments; a long curved ridge running lengthwise of the first segment; a stout spine pointing somewhat obliquely across the segment near distal base of ridge. Aesthetascs 8 in number, all jointed near the middle; 1 each on segments 1, 3 to 5, 10, 15, 19, and 22. Six setae and 1 small spine in addition to the larger spine on segment 1; 3 setae on segment 22; 2 on segments 3, 5, 8, and 21; 1 each on segments 6, 9 to 15, and 17 to 20; short spines on segments 2, 4, and 7. Seta of segment 16 not found. Second antennae and mouth parts very similar to those of type male of *sarsi*. Proximal spine (fig. 2, *C*) of masticatory lobe of first maxilla (fig. 2, *B*) unbranched, bearing instead 3 spinules on distal side; palp like that of *sarsi* except for the presence of a small distally placed knob, which may represent the rudimentary epipodal lobe mentioned by Sars.

Leg 1 (fig. 2, *D*) with same number of setae as *sarsi*, inside seta of endopod stiff and spiniform, and set in a similar well-defined ridge. Second basal segment bearing inside a short, broad, curved process in addition to the long seta overlying the endopod. Exopod much like that of *sarsi*, second segment slightly broader with outer margin less elongate and inner more rounded; second segment of endopod much less lamellar, with distal half elongated and narrowed terminally so as to form a distinctly truncated end. Exopods of legs 2 to 4 like those of *sarsi*, but lacking inner setae or spines, as in *pygmaea*. Leg 2 (fig. 1, *H*) with a 3-segmented endopod, inner edge of first segment more bulging and rounded than in *sarsi*, first spine of inner edge of third segment short and smooth. (In *sarsi* (fig. 1, *E*) this spine is much more elongate and bears an inner serrated flange.) Endopods of legs 3 and 4 (figs. 1, *I* and 2, *E*) 2-segmented, each carrying a long inner seta on first segment. (This seta may be lacking in *pygmaea*. This seems at least to be true of endopod 4.) Distal segment of endopod 3 carrying 6 setae and spines, that of 4 with 7 spines.

Leg 5 (fig. 2, *F*) differing from that of *pygmaea* in having the two inner spines of the third segment of exopod larger and with strongly serrate edges; endopod distinctly 2-segmented, first segment

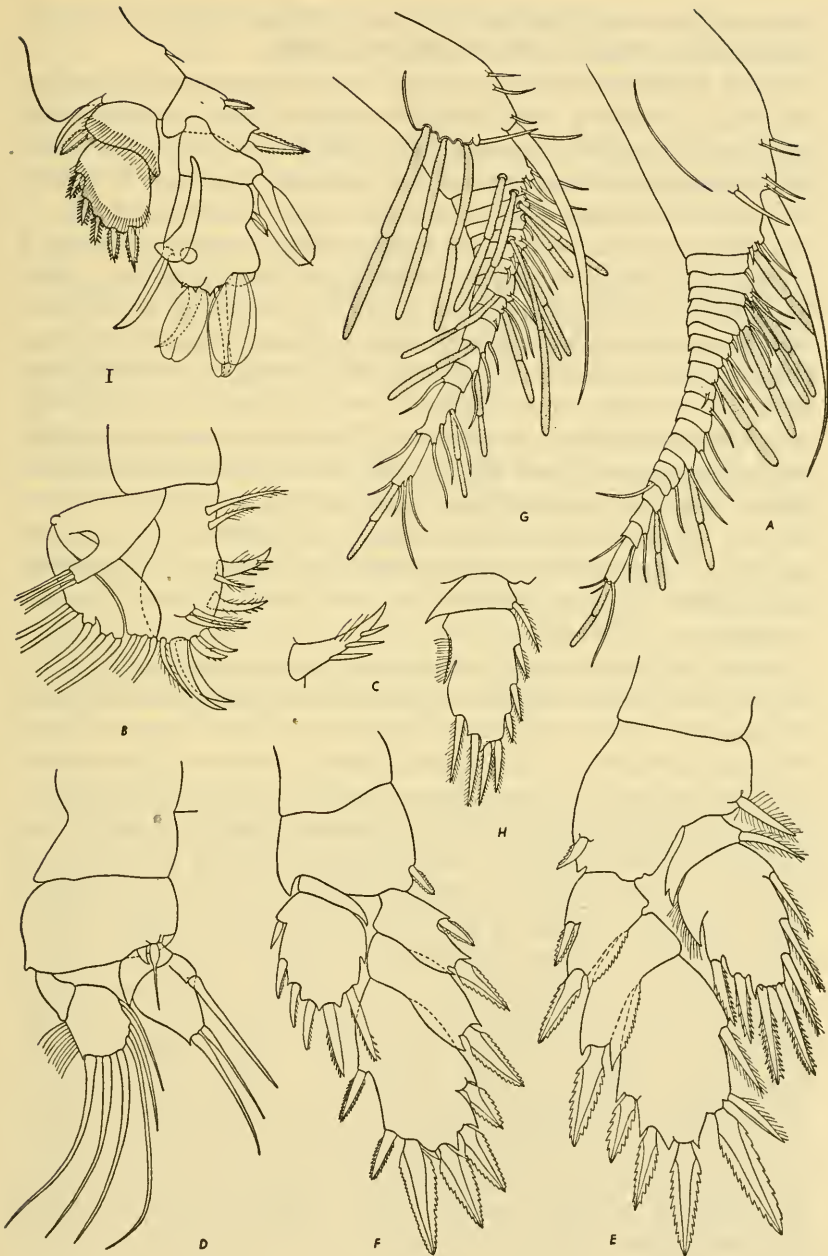


FIG. 2.—*Platycopia tumida* (C. B. Wilson). Female, A, antenna 1; B, maxilla 1; C, proximal spine of masticatory lobe of maxilla 1, greatly enlarged; D, leg 1; E, leg 4; F, leg 5. Male, G, antenna 1; H, endopod of leg 4; I, leg 5.

very narrow, second lamellar in shape, bearing 6 spines which decrease in size from the outer to the inner edge.

*Male.* Slightly smaller than female. The unique specimen examined showing in profile a small distally projected hook in front of the middle of the cephalic segment. Eye spot present, large. Urosome and cephalic appendages, except first antennae, like those of the female. First antenna (fig. 2, G) with 15 segments, bearing 16 aesthetasks, all jointed near the middle, those on segments 1 and 5 exceptionally elongated; many attached in an irregular fashion, giving the antenna the appearance of being almost covered by them. First segment with the ridge arising near its center, curved somewhat differently from that of the female, and bearing 3 very long aesthetasks; the long slender spine set at the distal base of the ridge points diagonally across the segment. This segment carrying a fourth aesthetask near its distal end, 6 setae and 1 small spine along its length; the long modified spine not differing from that of other species. Other aesthetasks borne singly on segments 2 to 9, 11, 12, 14, and 15. Four setae each on segments 14 and 15; 2 on segments 3, 5, 8, and 11; 1 on segments 2, 9, 12, and 13; short spines on segments 4, 6, 7, and 10.

Legs 1 to 4 like those of female, except that endopod 4 (fig. 2, H) has the distal segment narrowed and the upper half of the inner edge invaginated. Fifth leg (fig. 2, I) built on the plan of *pygmaea*, being broad and compact. Exopod with 3 distinct segments; first segment with the usual 2 outer spines, second bearing a long, stout spine with a broadened hyaline flange. Second segment constricted basally and attached to the first near its inner edge, broad distally and not set off sharply from third segment at inner margin; an elongate club-shaped hyaline process, arising in distal half near inner margin, overlies the surface of the succeeding segment for most of its length. Third segment with an irregular shape, inner margin straight and shorter than outer which is indented near the middle; distal part somewhat bulging and slightly irregular marginally. Outer margin bearing proximally a small spine with a hyaline rim. Distal inner spine saber-shaped like that of *pygmaea*, very thin and almost completely hyaline. Terminally there is another stout curved spine near the center of the segment, and toward the outer margin a thin hyaline spinelike process somewhat like the inner spine in shape. Overlying these are 3 very thin, ovoid hyaline lappets. These lappets are much larger than those in similar position in *sarsi*, with a more or less prominent riblike thickening in the center. Endopod 2-segmented, set somewhat deeply into the center of the basipod, lamellar in shape, with a large spine



inside on the first segment, and 5 somewhat small, subequal spines on second. A long curving spine, about twice the length of the inner margin of first segment, set in basal segment near the inner juncture with endopod.

*Remarks.*—The notes found among C. B. Wilson's papers and labeled *Arenocalanus tumidus*, n. sp., contained the following statements which indicate rather clearly that the female specimen he had dissected was the one described above:

First antenna made up of 22 segments. . . . There is a large aesthetask at the inner distal corner of the basal segment, another at the tip end of the segment and 7 others at intervals along the inner margin of the segment. . . . The second endopod [referring to legs] is 3-segmented. In the third, fourth and fifth endopods the two distal segments are fused.

This description disagrees with Dr. Wilson's published drawing of the antenna which has 23 segments and bears 11 aesthetasks. However, the original of this drawing was labeled and included among the notes with other inadequate sketches of the species, and undoubtedly belongs with it. It seems likely that the whole represents only a preliminary description and that the inaccurate drawing was published before a complete study of the species had been made.

The notes are on file at the National Museum with Dr. Wilson's papers in the Division of Marine Invertebrates.

#### DISCUSSION

The genus *Platycopia* has always been considered an anomalous one. There are a few other bottom-living calanoids, among which are *Pseudocyclops*, *Pseudocyclopia* and *Paramisophria*, that have the same compact, somewhat cyclopoid body form and short first antennae, but otherwise are very different. The genus *Pseudocyclops* shows the closest affinities to *Platycopia* in that the fifth leg of the female is not transformed or reduced, but otherwise the relationship seems remote. The two genera differ markedly from one another in the structure of the cephalic appendages, especially the first antennae and the first maxillae. In *Pseudocyclops* the male right antenna is distinctly geniculate, and neither sex has aesthetasks similar to those of *Platycopia*. Though both genera have the legs somewhat flattened and carry broad spines with hyaline flanges, there is still considerable difference between them. Leg 1 of *Platycopia* is very unlike the other pairs of legs, in *Pseudocyclops* leg 1 is not differentiated; in *Platycopia* the setae of legs 2 to 5 are almost wholly transformed to spines, in *Pseudocyclops* the setae are not transformed; and the peculiarities

of structure of the male fifth legs are not at all comparable in the two genera.

Furthermore, *Platycopia* has several characters that are unique for the genus and set it apart from all other calanoids. In addition to the distinctive characters of the first maxillae and the transformation of setae to spines on both rami of legs 2 to 5, there are the presence of two spines on the first segment of the exopods of legs 2 to 5, the exact likeness of the right and left fifth legs in the male, and the similarity of the urosome in the two sexes. As no genus has yet been found to which it is very closely related, it is therefore best to retain the separate family Platycopiidae erected for it by Sars.

Morphologically, the four known species of *Platycopia* fall into two groups and it will be interesting to note if future species will also tend toward one or the other of the two species originally described by Sars. Of these two groups, the *perplexa-sarsi* is the least variable, only the first antennae and fifth legs showing any marked differences. The *pygmaea-tumida* group, however, exhibits differences not only in the first antennae and fifth legs, but also in the endopods of legs 2 to 4. *P. tumida* is certainly the most anomalous of the species, having characters not only different from *pygmaea*, but exhibiting some that are unique in the genus, such as the presence of an eye spot, the unusual ridge of the first segment of antenna 1, the segmentation of the male fifth exopod and the slight sexual difference in the fourth endopod.

There is some question as to just how much *tumida* differs from *pygmaea* as Sars did not describe and figure that species, especially the male, as completely as he did *perplexa*. Probably the species did not show any unusual characters in the first antennae; though not figured, they are described as "being composed of 16 joints" and if there had been unusual features they would certainly have been noticed by so careful a worker as Sars. It is not possible to compare exactly legs 3 and 4 as they are undescribed beyond mention of the incomplete division of the last 2 endopod segments, and only the female endopod of leg 4 is figured. The number of spines on the distal segment of endopod 3 differs from that of endopod 4 in the *perplexa-sarsi* group. This is also true in *tumida*, but the variation is not the same as that of the other group. Sars shows 5 spines on the distal segment of the fourth endopod of *pygmaea*, but one can only guess that this number is more or less than that on leg 3. Whether or not *pygmaea* shows a slight sexual variation in endopod 4 is also open to question, and it must be assumed for the present that it is a character belonging only to *tumida*. *P. perplexa*, *sarsi*, and

*tumida*, though having very similar first legs, show some slight specific differences. Leg 1 of *pygmaea* is not illustrated so it cannot be determined how much, if any, it differs from the others.

Certain things are, however, definitely known. The *pygmaea-tumida* group differs from the *perplexa-sarsi* in having no inside setae or spines on exopods 3 and 4, in the variability of the segmentation of endopods 2 to 5, and in the more compact structure of the male fifth leg. *P. tumida* differs from *pygmaea* in having 15 rather than 16 segments in the male first antenna, and 22 rather than 23 in that of the female. The second endopod of *pygmaea* is 2-segmented, that of *tumida* is 3-segmented, indeed it is very similar to that of *sarsi* and *perplexa*. The endopods of legs 3 and 4 and the female fifth endopod are incompletely segmented in *pygmaea*; in *tumida* this incompleteness of division is so slight that I have considered them as being visibly 2-segmented. Furthermore, the number of spines on the endopods of leg 4, and possibly of leg 3, is different in the two species.

In view of the very apparent natural relationships of the American to the Norwegian species, it is strange to find differences that seem to have no systematic explanation. There is, for instance, no mention in the descriptions of the Norwegian species of the unusual heavy "ridge" of the endopod of the first leg to which is attached the long, spiniform inner seta. This ridge stands out sharply in all the mounted specimens, and is present even in the most immature specimen of *P. sarsi* in which the endopod is still 1-segmented. I find it hard to believe that a character present in two such unlike forms as the American species should be absent in the equally unlike Norwegian forms. The presence of such a ridge is suggested in the original drawing of *perplexa*<sup>5</sup> although the seta is not so stout as it is in *sarsi* and *tumida*. There is little indication of it, however, in the subsequent illustration,<sup>6</sup> but the base of the inner seta is shown as larger than those of the other setae. It is possible, therefore, that this character is common to all representatives of the genus and was overlooked by Sars in describing the Norwegian forms.

Likewise, the aesthetasks on the first antennae of the American species are jointed near the middle, but Sars does not mention such a condition or indicate it in his illustrations. The aesthetasks of *Platycopia* are true aesthetasks and not modified setae, as they accompany rather than transplant the setae on every segment. They are very slender bodies, and their interior has a mottled appearance in glycerin

<sup>5</sup> Sars, G. O., Archiv Math. Naturv., vol. 31, No. 7, pl. 2, fig. 1, 1911.

<sup>6</sup> Sars, G. O., Crustacea of Norway, vol. 7, pl. 7, fig. 1, 1919.

mounts. They are constricted basally, also slightly at the joint, and usually the distal portion is somewhat more slender than the proximal. The line of division is a "joint" insofar as it represents a real joining of two portions; these lines can be seen to be somewhat thickened and circular in form when the aesthetascer is turned at a certain angle.

The American species further differ from the Norwegian in lacking the lamella shown by Sars on the terminal portion of the male fifth exopod. Again it seems strange that these very closely related species should vary so much in what is usually a basic pattern, and in this instance, at least, it may be due to a difference in interpretation. From its position it seems likely that the irregular terminal portion of the segment in *sarsi* corresponds to the "lamella" pictured for *perplexa*, and that in *sarsi* it is a stouter structure and not so sharply demarcated from the rest of the segment. No such extension of the terminal portion is present in *tumida* and I am at a loss in visualizing the structure which Sars described as a "lamella" in *pygmaea*. Both *sarsi* and *tumida* have a few very sheer, hyaline lappets hanging from the terminal portion of the segment. Those in *tumida* are exceptionally large. In both species it is necessary to focus carefully on these lappets, else only the edges are seen, giving the appearance of several cilia extending from the terminal portion. It could be that the cilia shown by Sars on the end of the "lamella" of *perplexa* represent the edges of comparable hyaline lappets. In the case of *pygmaea* the "lamella" may or may not be homologous to the lappets.

I am inclined to consider, therefore, that the terminal portion of the exopod in the *perplexa-sarsi* group is somewhat narrowed and irregularly extended beyond the point of insertion of the inner modified spine, and has hanging from it a few very thin, hyaline lappets, probably rather small. In the *pygmaea-tumida* group the terminal part of the segment is not so extended and the hyaline lappets are attached closer to the point of insertion of the inner spine. The "lamella" of Sars is considered in this view to represent in *perplexa* the extension of the segment, and in *pygmaea* a lappet. I find no other way to interpret the latter when it is compared to the very similar *tumida*, which has comparatively conspicuous lappets.

Only reexamination of the Norwegian species can, of course, decide these points.