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On *Scambicornus* Heegard, 1944, a senior synonym of *Preherrmannella* Seymour Sewell, 1949 (Copepoda, Cyclopoida)

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During the preparation of a report dealing with poecilostomes associated with holothurians, it was found desirable to obtain more information concerning a number of genera formerly described. Through the courtesy of Dr. T.Wolff of the Zoologisk Museum of Copenhagen, I was able to reexamine the type-specimens of *Scambicornus hamatus*, described by HEEGAARD, 1944, from a Japanese holothurian.

Scambicornus hamatus HEEGAARD, 1944

Material examined. One female carrying a fragment of an ovisac; one female broken into two parts; one male. The label indicates that the specimens were found in the pharynx of *Thyoniformis alexandri* (however, in his paper Heegaard states "clinging to the tentacles of.... *Thyonidium alexandri*"), from Okinose, Sagami Sea, Japan, in 400 m.

Although the label bears the word "TYPE", no specimen is singled out as the holotype, so that all specimens are syntypes. HEEGAARD (1944, p. 360) mentions that he had only one male and one female available; in fact his sample contains one male and two females. None of them has heen indicated as the holotype. Since HEEGAARD illustrates (fig. 1) the ovigerous female, I have selected this specimen as the lecto-holotype; the unique male is the lecto-allotype; the third specimen, a female, becomes a paralectotype.

I have made a permanent mount of dissections of the paralectotype. The

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appendages of the lecto-allotype male were removed, while great care was taken to keep the body intact; this "empty shell" is preserved in alcohol, and the appendages have been mounted on a slide. All female appendages, except for the fifth leg that was damaged in the paralectotype, could be studied under oil immersion; all lecto-allotype appendages, except the fifth leg and caudal rami, which were not taken off the body, could be examined in the same way. The appendages of the latter specimen were, however, partly covered with a dark, stiff mucus, which made detailed observation of the finer ornamentation of spines and setae sometimes impossible. In the following description, all that could be made out with certainty from the study of the type-specimens, has been assembled.

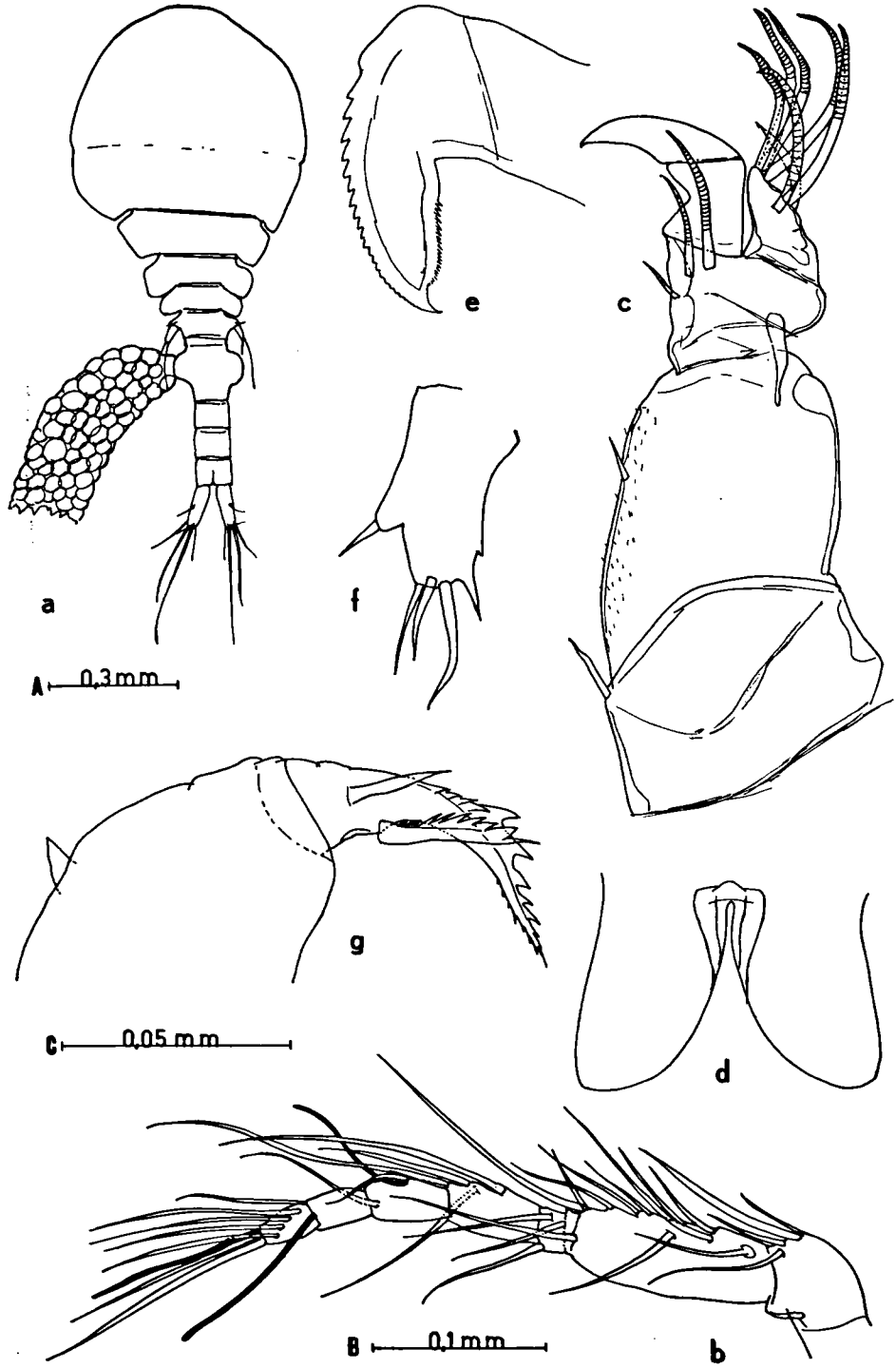
Description. The lecto-holotype (♀) has a length of 1.13 mm (fig. 1a), the lecto-allotype (♂) of 0.97 mm (fig. 2a) (in both cases excluding the furcal setae). The first pedigerous segment is not very distinctly separated from the cephalosome. The genital segment (♀) has its central part much enlarged; that of the male is regularly rounded. There are 3 postgenital urosomal segments in the ♀, 4 in the ♂. The anal segment does not bear any ornamentation or armature. The caudal rami (fig. 2c) are about 3 times as long as wide and distinctly longer than the anal segment; each ramus carries a lateral seta near the middle of its length, a subterminal lateral seta, three very shortly barbed terminal setae and a subterminal, dorsal, interior seta. There is no sexual dimorphism in the caudal rami.

A rostral fold is clearly defined; part of its margins (dashed in fig. 2b) seems to be fused with the ventral surface of the cephalosome; a beak-shaped, posteriorly directed, point is clearly defined.

The first antenna of the ♀ (fig. 1b) is 8-segmented. The 3rd segment is not very clearly demarcated and wedge-shaped. Segments 6, 7 and 8 each carry an aesthete. As far as could be made out, the male A 1 has the same structure and armature as the female A 1.

The second antenna (fig. 1c) is identical in both sexes. It is 4-segmented; the short, rectangular basal segment is provided with 1 interno-terminal spine; the 2nd segment with 1 spine at about $^2/_3$ of its internal margin and with a zone of very short hairs; the 3rd segment is laterally expanded to carry the excentrically implanted, palp-like 4th segment; its internal margin carries, in addition to 3 annulated setae, a very strong, curved, seemingly 2-segmented claw; the digitiform 4th segment is distally provided with the usual 7 annulated setae; this segment reaches distally just to the articulation or pseudo-articulation of the big claw.

FIG. 1. *Scambicornus hamatus* HEEGAARD, 1944; a, lecto-holotype (♀); b—g, paratype (♀).
a, entire animal, in dorsal view (scale A); b, first antenna (scale B); c, second antenna (scale D); d, labrum (scale C); e, mandible (scale C); f, first maxilla (scale C); g, second maxilla (scale C).


a
A 0,3mm
e
f
c
g
C 0,05 mm
d
B 0,1mm
b

The labrum (fig. 1d) is deeply cleft. The mandible has a relatively short blade (fig. 1e), its median side being serrated, its lateral margin provided only with fine spinules. The first maxilla (fig. 1f) is a one-segmented lobe, terminally armed with 3 setae and a spiniform projection; at one side this appendage bears a spine placed on a basal protuberance, on the other side a small toothlike projection. The second maxilla (fig. 1g) consists of a strong basal segment and a slender terminal portion; the medial margin of the terminal portion bears 11 teeth, the proximal 4 of which differing in size and orientation; the other margin of this terminal portion is provided with small denticles only. A toothed auxiliary lash and a smooth, robust spine, arise from the basal part of the terminal portion.

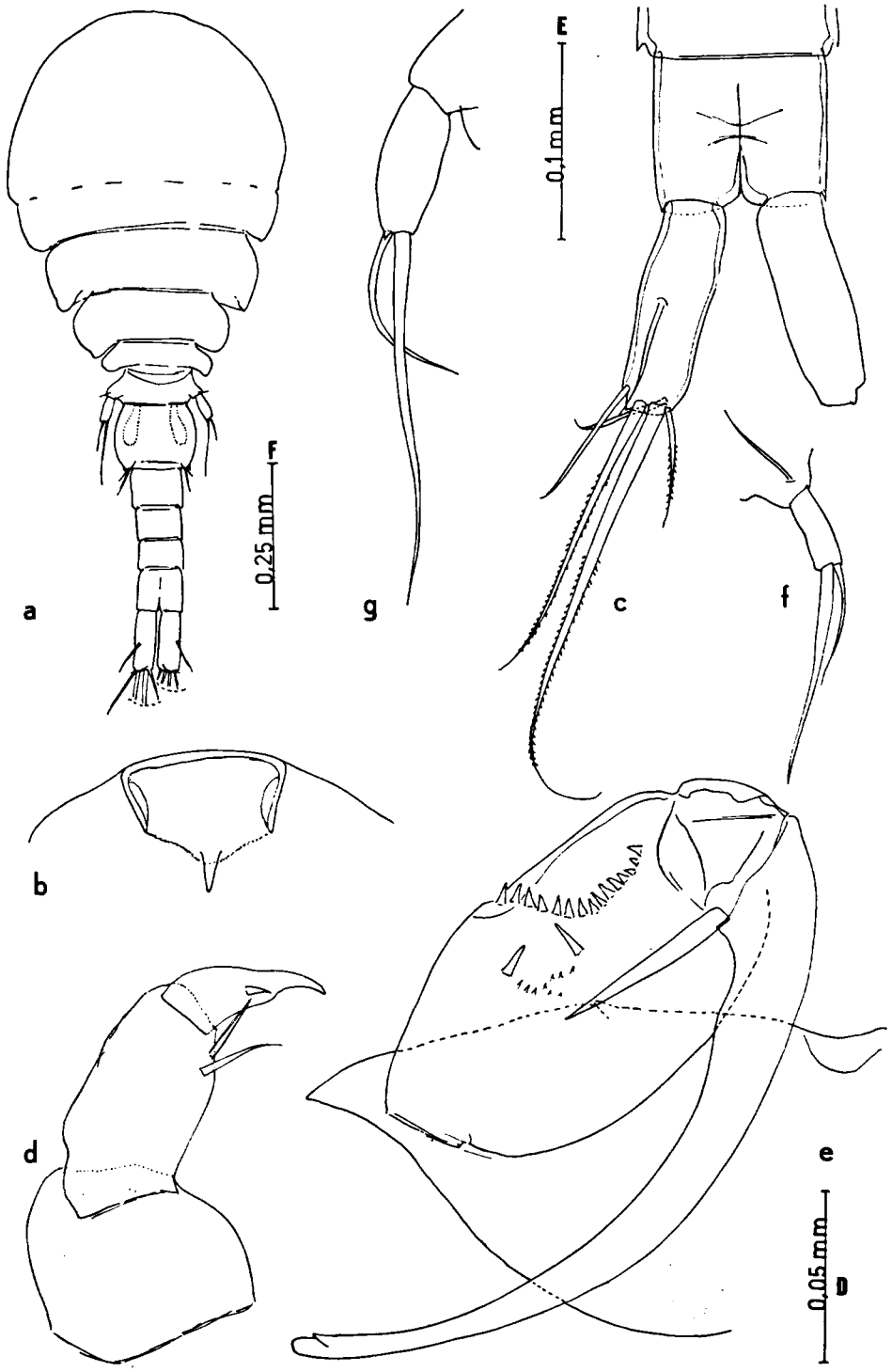
The maxilliped of the female (fig. 2d) is 3-segmented; the basal segment is smooth, the second segment is the longest and bears 2 elements (setae), the terminal segment is claw-shaped and bears a spine near the middle. The male maxilliped (fig. 2e) is 4-segmented. The basal two segments are homologous with those of the female maxilliped; in addition to the 2 elements (spines), the second segment bears a row of denticles. The third and fourth segment, fused to a claw in the female, are separate in the male; the third segment carries a long spine; the fourth segment is a long, curved, terminally bifid, claw. The first segment of the male maxilliped has a curious strong triangular projection.

The legs show the usual sexual dimorphism for this genus: while the exopods of P 1 and P 2 and the entire P 3 and P 4 are similar in both sexes, the endopods of P 1 and P 2 are three-segmented in female, two-segmented in male. The bisegmentation in the male is apparently reached by fusion of the terminal two segments. Quite characteristic also is the somewhat feeble appearance of the 4th endopod, whose terminal segment is armed with 5 slender spines. Figures 3a through f and the following table show better than words the shape and armature of the legs:

		P 1	P 2	P 3	P 4
♀	exopod	I—0; I—1; III-I-4	I—0; I—1; III-I-5	I—0; I—1; III-I-5	I—0; I—1; II-I-5
	endopod	0—1; 0—1; I-5	0—1; 0—2; III-3	0—1; 0—2; IV-2	0—1; 0—1; V-0
♂	exopod	I—0; I—1; III-I-4	I—0; I—1; III-I-5	I—0; I—1; III-I-5	I—0; I—1; II-I-5
	endopod	0—1; I-6	0—1; III-5	0—1; 0—2; IV-2	0—1; 0—1; V-0

FIG. 2. *Scambicornus hamatus* HEEGAARD, 1944; a, e and g, lecto-allotype (♂); b and f, lecto-holotype (♀); c and d, paratype (♀).

a, entire animal, in dorsal view (scale F); b, rostal area (freehand sketch); c, anal segment and caudal rami (armature of the right ramus omitted) (scale E); d, maxilliped (scale D); e, maxilliped of other sex (scale C); f, fifth leg (scale E); g, fifth leg of other sex (scale D). In f and g, the ornamentation of the setae, if any, is omitted.


a
F
0,25 mm
g
E
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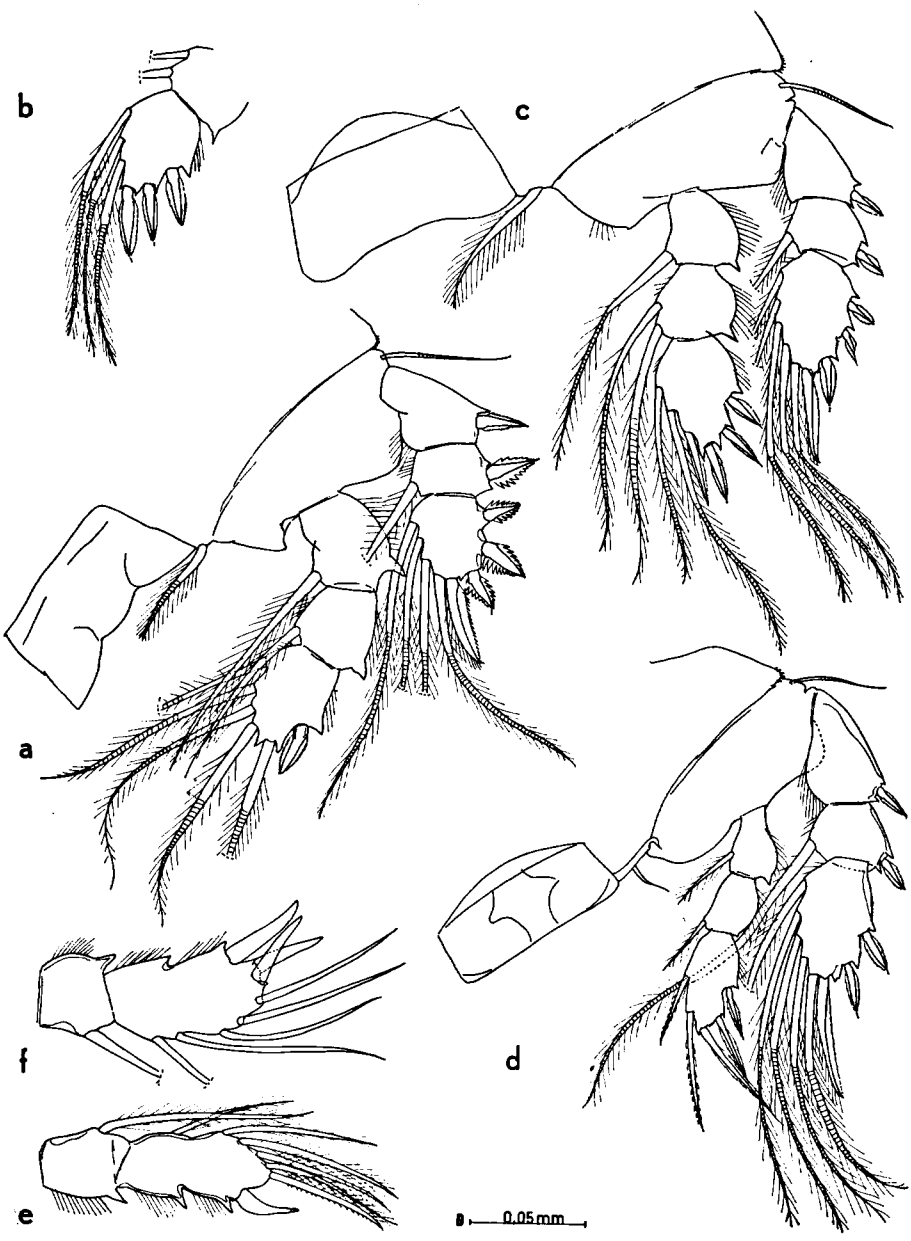

FIG. 3. *Scambicornus hamatus* HEEGAARD, 1944; a—d, lecto-holotype (♀); e and f, lecto-allotype (♂).
a, first leg; b, terminal part of endopod of second leg; c, third leg; d, fourth leg; e, endopod of first leg; f, endopod of second leg (ornamentation of spines and setae, if any, omitted). All figures to scale D.

The fifth leg (♀: fig. 2f; ♂: fig. 2g) is elongatedly rectangular, distally armed with 2 very unequal setae. The ornamentation of these setae could not be made out in the specimens examined. Hairs, probably representing the sixth leg are present on the genital segments of both sexes; the exact configuration of this rudimentary sixth leg has to be restudied when more material becomes available. The female lecto-holotype bears a fragment of one of the ovisacs (fig. 1a); the shape of the entire ovisac remains uncertain. Heegaard illustrates the left ovisac as more or less cylindrical, the right ovisac elongatedly pear-shaped. At any rate, the eggs seem to be smaller and more numerous than Heegaard's illustration suggests. The male spermatophores are narrow and small (fig. 2a).

Remarks: HEEGAARD's figure 7 of the female fifth leg is satisfactory. The descriptions and figures of the remaining appendages are such that ILLG (1949, p. 399) was certainly justified in stating "lack of information.... requires assigning the form as a *genus incerta sedis* among the Lichomolgidae, if it belongs in that family, as the author claims.... It seems possible that *Scambicornus* may be related to *Paranthessius*". In fact *Scambicornus* is identical with *Preherrmannella*, species of which were included by Illg in *Paranthessius*, which shows how right Illg's suppositions were.

The following characters of *Scambicornus* clearly indicate that this genus is identical with *Preherrmannella*, described 5 years later by SEWELL (1949): (1) the nature of the 2nd antenna with its reduced, palp-like and excentrically offset terminal segment, armed with (usually 7) setae, while the prehensile function has moved to the 3rd segment (♀, ♂); (2) the tendency towards an 8-segmented first antenna (♀, ♂); (3) the mandible, that lacks a long apical lash (♀, ♂) (4) the first maxilla, that bears, in addition to the normal setae, a number of spine-like projections (♀, ♂); (5) the proximal teeth of the main lash of the second maxilla stand in a plain different from that of the distal teeth (♀, ♂); (6) the 3-segmented maxilliped (♀); (7) the 3-segmented 4th endopod (♀, ♂); (8) the armature (consisting of 5 spines) of the 3rd segment of the 4th endopod (♀, ♂); (9) the expansion of the genital segment at the level of the genital openings (♀); (10) the 2-segmented endopods of P 1 and P 2 (♂); (11) the presence of a rostrum (♀, ♂); (12) the association with holothurians (♀, ♂). It must be remarked that not all known species of *Preherrmannella* combine all 12 characters mentioned above, but on the whole the genus forms a good unity.

HEEGAARD (p. 359, 365) compared *Scambicornus* with "*Synapticula teres* from the intestine of *Synapta kefersteini*" (no doubt he means *Synapticola teres* VOIGT, 1892, from the body cavity — "Leibeshöhle" — of *S. kefersteini*), which is, according to Heegaard, the only other copepod parasitic on holothurians. He was apparently unaware of *Lecanurius* KOSSMANN, 1877 (although HEEGAARD discusses Kossmann's work in his paper, p. 366), *Synaptiphilus* CANU & CUÉNOT, 1892, and *Diogenidium* and several other genera parasitic in holothurians created by EDWARDS, 1891. WILSON, 1932, records also *Colaceutes* HARTMANN, 1856, from holothurians; to our regret

Hartmann's publication was unavailable to us. After Heegaard's publication, some more genera of holothurian associates have been created, as *Nanaspis* HUMES & CRESSEY, 1959, *Allantogynus* CHANGEUX, 1958 and *Cucumaricola* PATERSON, 1958.

The resemblance of *Scambicornus* to "*Hermannella*" (instead of *Herrmannella*) *prehensilis* SARS, 1918, is mentioned by HEEGAARD (p. 365), but dismissed as "regarding the month appendages there are some differences between these two genera". Yet, *H. prehensilis* is a true *Preherrmannella*, thus *Scambicornus*. The extent to which the mouth-parts differ can be measured by comparing the original 1944 drawings and those in the present paper and by HEEGAARD's statement (p. 361) that he "could not make any dissections. The . description is therefore based on the observations which could be made without dissection. The examination of the mandible was rather difficult . . and the description of this appendage is, therefore, not quite reliable in all details".

The genus *Scambicornus* now contains the following species: (1) *hamatus* HEEGAARD, 1944 (type species, by monotypy); (2) *prehensilis* (SARS, 1918); (3) *robustus* (THOMPSON & A. SCOTT, 1903); (4) *serendibicus* (THOMPSON & A. SCOTT, 1903); (5) *nicobaricus* (SEWELL, 1949); (6) *adduensis* (SEWELL, 1949); (7) *idoneus* (HUMES & CRESSEY, 1961); (8) *tuberatus* (HUMES & CRESSEY, 1961); (9) *modestus* (HUMES & CRESSEY, 1961); (10) *campanulipes* (HUMES & CRESSEY, 1961); (11) *subtilis* (HUMES & CRESSEY, 1961); (12) *subgrandis* (HUMES & CRESSEY, 1961); (13) *poculiferus* (HUMES & CRESSEY, 1961); (14) *petiti* (STOCK & KLEETON, 1963); (15) *changeuxi* (STOCK & KLEETON, 1963); (16) *propinquus* (NICHOLLS, 1944); (17) *armoricanus* (BOCQUET, STOCK & KLEETON, 1963); (18) *finmarchicus* (T. SCOTT, 1903); (19) *tenuicaudis* (SARS, 1918); (20) *brevicauda* (SEWELL, 1949).

These species fall, according to the armature of the segments 3 and 4 of the second antenna, into three groups:

(a) a strongly prehensile, usually 2-segmented, element present on segment 3; segment 4 set off laterally, palplike; this group includes the species 1 to 15 of the above list;

(b) a moderately important prehensile element on segment 3; segment 4 normally developed; species 16 and 17;

(c) prehensile elements absent or setiform; segment 4 normally developed; species 18 to 20.

It must be remarked that *robustus* and *serendibicus* are included in this genus on the authority of SEWELL, 1949. The published descriptions leave some doubt as to the generic status of these two Indian species. HUMES & & CRESSEY (1961), in their key to the species of *Preherrmannella*, omitted them all together.

The genus *Lecanurius* Kossmann may be related to *Scambicornus*; at least the structure of its second antenna and the armature (with 5 elements) of the 3rd segment of P 4, suggest this. But the mandible and second maxilla, as

far as one can judge from Kossmann's plate, are rather different from the *Scambicornus* pattern.

The tendency of fusion of the endopod segments of the legs is also present in the genus *Synapticola* Voigt, but it seems that the transformations under influence of the endoparasitic mode of life have gone farther in *Synapticola* than in *Scambicornus*. Thus, all endopods (not only the first two) seem to be 2-segmented and the second antenna looks more simplified. Also the furcal setae are reduced in *Synapticola*.

Both *Lecanurius* and *Synapticola* are too incompletely known, however, to make a detailed comparison with *Scambicornus* possible.

Diogenidium Edwards, a West Indian associate of holothurians, is close to *Herrmannella*, an opinon expressed already by ILLG (1949) and confirmed by recently collected fresh material.

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