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PNEUMODERMOPSIS TESCHI N. SP., AND NOTES ON SOME OTHER PTEROPODA OF THE "THOR" EXPEDITIONS 1903-1910 (GASTROPODA)

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ABSTRACT

Part of the "Thor" collections are studied, with the aid of notes by Dr. J.J. Tesch. A new species, *Pneumodermopsis (Pn.) teschi*, is described, and the variability of some taxonomic characters in *Thliptodon* are mentioned. A distributional map for the "Thor" records, based on material from the collection of the Zoological Museum in Copenhagen and on the notes left by Tesch, is provided.

INTRODUCTION

Some sheets of paper with notes on pteropods in the handwriting of Dr. J.J. Tesch were kindly given to the present author by Dr. C.O. van Regteren Altena. Careful examination of the pencil writing made by Tesch under the drawings showed that a new species in *Pneumodermopsis* and one in *Notobranchaea* were involved. The material on which these two species are based, was collected by the "Thor" expeditions. Some of the notes left by Tesch make me suppose that they were made for use in correspondence with a colleague. This colleague may have been Prof. Dr. O. Paulsen as can be concluded from Tesch's comment (1946: 47-48 footnote): "This Mediterranean material" ("Thor" Expeditions to North Atlantic and Mediterranean, 1908 - 1910)" was kindly sent by Prof. O. Paulsen, complying with my desire to see it, and I studied the greater part during 1912-13. Owing to the outbreak of war in 1914 and to various other circumstances nothing has been published by me on this collection. Meanwhile, Prof. Paulsen made extensive notes on the range of some Mediterranean and North Atlantic species, and whilst my present report was being prepared had them sent

to me .....". Since the notes are in the French language it is also possible that they were made for Dr. A. Pruvot-Fol.

If the material discussed was studied by Tesch during the years 1912-1913 indeed, it is strange that he never gave more attention to the results. May be the material, on which the most interesting notes are based, has gone lost during World War I, either in the museum or in the mail. This may also explain why I did not succeed in finding the figured specimens.

The notes by Tesch induced me to re-investigate the "Thor" collections preserved in the Zoological Museum at Copenhagen. Most species of this collection do not need taxonomic comment so that it suffices to put some of the records in distribution maps (fig. 1). Facts of taxonomic interest are dealt with separately.

The author is highly indebted to Dr. C.O. van Regteren Altena and Dr. J. Knudsen for their help in collecting the data and material used for this paper. He also wishes to express his great admiration for Dr. J.J. Tesch, whose excellent descriptions and figures, make us feel the miss of him not being able to publish his findings personally.

MATERIAL

The localities given in the maps (fig. 1 a-c) are based on the station numbers and dates given on the labels. As the handwriting on the labels was sometimes rather obscure, it was not possible to compare the labels accurately with the data given in the station lists by Schmidt (1912). Some records in the maps are based on specimens seen by Tesch only, but these records have only been incorporated in the present paper when the notes made by Tesch were completely clear.

The knowledge of the distribution of Gymnosomata is still rather fragmentary so that many of the records provide new views on the range. Probably some of the records of *Pneumodermopsis (Crucibranchaea) macrochira* Meisenheimer, 1905, and some of *Pneumodermopsis (Pn.) ciliata* (Gegenbaur, 1855) were already published by Tesch (1946). Since no exact data were given by Tesch (1946), it was, however, not clear which of the samples were involved.

TAXONOMY

In *Pneumodermopsis* Keferstein, 1862, two subgenera are recognized viz.: *Pneumodermopsis* s. str. with a median sucker arm and *Crucibranchaea* Pruvot-Fol, 1942, without such an arm. *Pneumodermopsis (Crucibranchaea) macrochira* shows five small median suckers but a real median arm is absent, about 20 suckers and a very large terminal lateral sucker are found on each lateral arm. The median radula plate is tricuspoid. *Pneumodermopsis (Crucibranchaea) michaelsarsi* Bonnevie, 1913, a somewhat dubious species probably belonging to this subgenus, shows also a tricuspoid median plate. The structure of the fragments constituting the holotype differ from that in *Pn. (C.) macrochira*.

The suckers in the subgenus *Pneumodermopsis* are arranged in three groups, two lateral groups situated on lateral arms or on the buccal wall and the central group composed of five suckers situated on the median arm. Real lateral arms are found in *Pn. (Pn.) canephora* Pruvot-Fol, 1924, and *Pn. (Pn.) ciliata*. In the other species: *Pn. (Pn.) pupula* Pruvot-Fol, 1926, *Pn. (Pn.) simplex* (Boas, 1886), *Pn. (Pn.) oligocotyla* Massy, 1917, *Pn. (Pn.) paucidens* (Boas, 1886) forma *paucidens* (Boas, 1886) and forma *pulex* Pruvot-Fol, 1926, *Pn. (Pn.) polycotyla* (Boas, 1886), and *Pn. (Pn.) minuta* (Pelseneer, 1887) the lateral suckers are placed on the buccal wall. Lateral suckers are placed in one single row in *Pn. (Pn.) simplex*, *Pn. (Pn.) oligocotyla*, and *Pn. (Pn.) paucidens* and in more than one row in *Pn. (Pn.) pupula*, *Pn. (Pn.) polycotyla*, and *Pn. (Pn.) minuta*. The number of lateral suckers at one side is approximately 7 in *Pn. (Pn.) ciliata*, 1 in *Pn. (Pn.) canephora*, 5 in *Pn. (Pn.) paucidens*, 1 in *Pn. (Pn.) oligocotyla*, 2 in *Pn. (Pn.) simplex*, 14 in *Pn. (Pn.) polycotyla*, 14 in *Pn. (Pn.) minuta*, and 6 in *Pn. (Pn.) pupula*. The equipment of the median sucker arm consists: in *Pn. (Pn.) canephora* of one large top sucker and two pairs of small suckers; in *Pn. (Pn.) ciliata* of an average sized top sucker, an extremely large posterior sucker pair and a small anterior pair; in *Pn. (Pn.) minuta* the 5 median suckers are subequal in size and in *Pn. (Pn.) polycotyla*, *Pn. (Pn.) simplex*, and *Pn. (Pn.) paucidens* only the top sucker is larger

than the subequal other four.

Bicuspoid median radula plates are found in *Pn. (Pn.) paucidens* and *Pn. (Pn.) canephora*, but in general tricuspoid plates are found. In *Pn. (Pn.) ciliata*, however, bi-, tri-, and tetracuspoid plates are found which affirms the variability of this character. The number of hooks (of one hooksac) is 30-60 in *Pn. (Pn.) canephora*, 30-40 in *Pn. (Pn.) ciliata*, 40-50 in *Pn. (Pn.) simplex*, 40 in *Pn. (Pn.) oligocotyla*, 4-6 in *Pn. (Pn.) paucidens*, and 10 in *Pn. (Pn.) polycotyla*.

So far the most useful characters for identification of *Pneumodermopsis* species are given. Special attention will be given below to the "variability" in the "*ciliata*-group", with free lateral arms.

Pneumodermopsis (Pn.) teschi n. sp.

From this new species the four samples from the "Thor" expeditions will be described separately before giving the diagnosis. Sample I is the one studied by Tesch.

I. Material from "Thor" Stat. 183, 37°52'N 23°09'E, 20 specimens, is described and figured by J.J. Tesch in a jotter bearing the name "*meisenheimeri*". His figures are reproduced here (fig. 2 a-e). His description runs as follows:

"Longueur 3 mm, mais très contractés. Tégument transparent, grisâtre. Branchie latérale à bord glandulaire. Partie médiane du pied allongée, très contractile, quelquefois atteignant le cercle ciliaire du milieu du corps. Tête bilobée, large, aplatie.

La trompe contient des ventouses: la terminale du bras médiane est la plus grosse, 3-4 fois plus grande que les 4 autres de ce bras, qui sont d'une taille égale, à pédoncle court. Les ventouses latérales sont disposées en deux groups de 7-8 et sont presque sessiles. A la base du bras médian se trouvent chez un seul individu deux papilles (ventouses rudiment?).

Radula 3.1.3. Dent médiane à deux cuspides assez longs; dent intermédiaire à crête saillante (au moins dans la partie postérieure de la radula) et le point pas courbé; dents latérales (2) courbées, unciformes.

Sacs à crochets; la gaine extérieure bien développée, le sac luimême peu profond, contenant un fiasceau de 8-9 crochets à base large, tous environ de la même taille, leur point courbé en angle droit. Mâchoire en fiasceau de fibres assez molles, convergeantes vers leur extrémités.

Cette espèce ne peut être *Pn. polycotyla*, car d'après Kwietniewski chez celle-ci, à une taille de 0,8 mm, les groups latéraux des ventouses sont placées en deux rangées alternantes".

In an attempt to find the specimens studied by Tesch, three specimens were discovered which show slightly other characters than those described. The three specimens are, however, so closely similar to those described by Tesch, that they are considered the same, new species.

II. *Pneumodermopsis* specimen from "Thor" Stat. 183, 61°30'N 19°05'W (fig. 3 a-b). Body length 7.5 mm, body width 4.3 mm, rather contracted. Skin semitransparent. Lateral gill and footlobe as described by Tesch. Median arm with large terminal sucker and two strongly reduced sucker pairs. Lateral arms with 6 short-stalked suckers. The arrangement is not as described by Tesch, but more like found in *Pn. (Pn.) ciliata*. Radula 6-1-6. Median plate tricuspoid and for the rest identical to that of the following specimens and the one described by Tesch. Hooksacs and hooks as described by Tesch but the number is larger, up to 35 at each side. Probably this specimen is older than the one described by Tesch, which may explain the larger number of lateral teeth and hooks.

III. *Pneumodermopsis* specimen from "Thor" Stat. 286, 61°49'N 18°46'W (fig. 4 a-c). Body length 9.05 mm, body width 4.83 mm, probably the most full-grown specimen in this material. Skin semitransparent, the visceral mass shines through and reaches a little below the ciliated prolongation of the lateral gill found around the body. The border of the lateral gill is ciliated and provided with some glandular cells. Median footlobe long but by bending and heavy contraction it does not reach far caudal. A longitudinal striated median foot tubercle is clearly seen, the lateral footlobes are broad and form a triangle, the small wings show heavy contraction. Anterior tentacles small.

Median sucker arm with one large terminal sucker, and a strongly reduced posterior sucker pair, the anterior suckers have disappeared completely. Lateral sucker arms each with 10 short-stalked, subequal suckers. Two groups are not found, the arrangement is identical to that found

in *Pn. (Pn.) ciliata*. The penis show no penial sucker.

Radula 7-1-7. Median plate bicuspoid and also in the other characters identical to the one described by Tesch. Hooks and hooksacs as found by Tesch, but the number is higher, up to 40 at each side, which may be due to the age of the present specimens. Jaw like the one described by Tesch. This specimen is selected as the h o l o t y p e of *Pn. teschi*.

IV. *Pneumodermopsis* specimen from "Thor" Stat. 82, 51°00'N 11°43'W. Body length 4.9 mm, body width 3.3 mm. Body shape rounded. This specimen is not desected. But the following characters are observed: visceral mass filling nearly the whole body, skin subtransparent, dorsal gland patch distinct, median arm with 1 large top sucker, and 4 reduced suckers; lateral arms with 6 subequal suckers; lateral gill with glandular border. Median foot tubercle distinct.

Comparing the descriptions above with those given for *Pn. ciliata* by Boas (1886), Pruvot-Fol (1932, 1924) and Tesch (1950), it is clear that a species new to science is involved, for which, in honour of Dr. J.J. Tesch, the name *Pneumodermopsis (Pn.) teschi* is proposed.

Diagnosis of *Pneumodermopsis (Pn.) teschi* n. sp. (fig. 4 a): The body is less slender than in *Pn. (Pn.) ciliata*, the ratio body length/body width for specimens preserved in alcohol, varies between 1.5 and 1.9. The skin is semitransparent, gray-brown with some small chromatophores, especially along the upper part of the ventral side. The lateral and posterior footlobes are similar to those in *Pn. (Pn.) ciliata*. The median tubercle between the lateral lobes is present and seems to be more strongly developed than in *Pn. (Pn.) ciliata*. The tubercle shows longitudinal striation. A posterior gill is absent and the lateral gill is well-developed though probably slightly smaller than in *Pn. (Pn.) ciliata*. The ciliated border of the lateral gill continues along the ventral side as in *Pn. (Pn.) ciliata* and *Pn. (Pn.) canephora*. Some specimens show an undulation of the glandular border of the ventral gill but this may be an artefact due to fixation. The visceral mass reaches just beyond the middle of the body in animals of 4-9 mm in length but in smaller animals of 3-4 mm it sometimes fills the whole body. The labial tentacles are rather small as in *Pn. (Pn.) ciliata*. The median sucker arm is reduced. The terminal sucker is large, of the same size as the terminal one in *Pn. (Pn.) ciliata*. The anterior and posterior sucker pairs are strongly reduced, sometimes one of the two sucker pairs is not traceable. The lateral suckers are inserted on free lateral arms, their number on each arm varies between 6 in the smallest and 10 in the largest specimen. The suckers are subequal and placed on short stalks. The radula formula is 7-1-7, or 6-1-6 in specimens of 4-9 mm (Tesch found the formula 3-1-3 for specimens of 3 mm). The median plate is tri- or bicuspoid. The number of hooks found by Tesch in specimens of 3 mm was 9, in larger specimens there are about 35 hooks. The penis is slender and not provided with a penial sucker. This species is most closely related to *Pn. (Pn.) ciliata* (fig. 5 a-b).

Type locality: 61°49'N 18°46'W; 2-IX-1904; the holotype is preserved in the Zoological Museum, of the University of Copenhagen.

The only problem left is the fact that Tesch described this species from the Eastern Mediterranean while the specimens on which the species is now actually described are from the transitional Atlantic (S.W. of Ireland) and northern Atlantic (S. of Iceland). The discovery of this species by the present author was by chance, and had no relation with Tesch's studies. The different localities from which Tesch's and my own specimens came may be responsible for the small differences in the morphology. However, it is not justified to conclude that different forms are concerned, on the basis of Tesch's description only.

Pneumodermopsis (Pn.) canephora Pruvot-Fol, 1924 (fig. 6).

The record at "Thor" Stat. 69 (36°13'N 09°48'W) is

from the area included in the range of this species by Pruvot-Fol (1924). The picture made by Tesch of this specimen is reproduced here, chiefly because the lateral gill is much smaller than described by Pruvot-Fol. This does not seem due to extreme contraction as the animal does not show other indications of strong contraction.

Thliptodon (figs. 7 a-b, 8 a-b).
The species with the footlobes intimately united in a triradiate star (*Th. gegenbauri* Boas, 1886; *Th. schmidti* Pruvot-Fol, 1942; and *Th. antarcticus* Meisenheimer, 1906) are difficult to distinguish. Concerning *Th. diaphanus* (Meisenheimer, 1902) I refer to a previous discussion (Van der Spoel, 1970). The finding of a "*Th. schmidti*-like" specimen (fig. 7 a-b) in the "Thor" collections needs some comment. In external characters the present specimen resembles exactly *Th. schmidti* but the radula is exactly like that described for *Th. gegenbauri*. Footlobes are completely absent which may be an indication that the present specimen belongs to *Th. schmidti*. The radula which is, also in the opinion of Pruvot-Fol (1942), the only valuable character in this genus, is identical with that of *Th. gegenbauri*. This proves that external characters in *Thliptodon* can not be used in taxonomy.

The only specimen of *Th. antarcticus* found, is illustrated for comparison (fig. 8 a-b). The animal corresponds with the descriptions (Massy, 1917; Tesch, 1950). The radula, the most important character for identification, needs, however, further attention. The median plate is very slender and provided with a distinct undulating crest resulting in a minor dentation. The intermediate plate is completely aberrant from that given by Tesch (1950, fig. 12), and resembles a little more that figured by Pruvot-Fol (1926, fig. 73). The intermediate plate consists of one body, broad in the middle with some tubercles on the outer border, the inner part of the intermediate plate is curled-over like a median plate and shows the same dentation, the cusp of the plate is blunt. This makes the impression as if there is a median plate bordered at each side by a structure resembling median plates of the "*Cephalobranchaea* type". The three lateral plates are composed of a basal section and a hook connected with the basal part by a free articulation. *Th. schmidti* is fully described by Pruvot-Fol, so that only *Th. akatukai* Tokioka, 1950, needs further study.

Notobranchaea macdonaldi Pelseneer, 1886 (fig. 9 a-c).
The description of one specimen, "Thor" Stat. 183, 37° 52'N 23° 09'E, considered a new species by Tesch, runs as follows:

"Taille 6.5 mm. Tégument bleu-grisâtre, surtout sur la tête et le pied; le corps jaunâtre. La masse viscérale atteint le pôle aboral; ici se trouve une branchie postérieure tri-radiale, mais les rayons ne s'unissent pas. Branchie dorsale très distincte, mais courte; elle porte à chaque côté 2-3 rayons secondaires qui sont subdivisés. Branchie droite n'est qu'une crête longitudinale du tégument.

Lobes latérales du pied en triangle, la base assez étroite; entre ces lobes pas de tubercule; partie médiane assez allongée, à la base forte et musculeuse, à l'extrémité mince. Tête séparée du corps par un cou.

Deux cônes buccaux, courtes, épais, à papilles nombreuses. Les cônes de chaque côté sont séparés par un pli du bulbe buccal, et le dorsal est un peu plus grand que le ventral.

Sacs à crochets: environ 20 crochets, courts, peu courbés. Nageoires très larges, arrondies. (Je ne trouve pas dans mes notes des observations sur la mâchoire, ni sur la radule)".

More recent studies by Pruvot-Fol (1942) and Tesch (1950) prove that this specimen must belong to *N. macdonaldi*. Pruvot-Fol (1942) described a new variety which comes very near to the description and figures given here for the "Thor" specimen.

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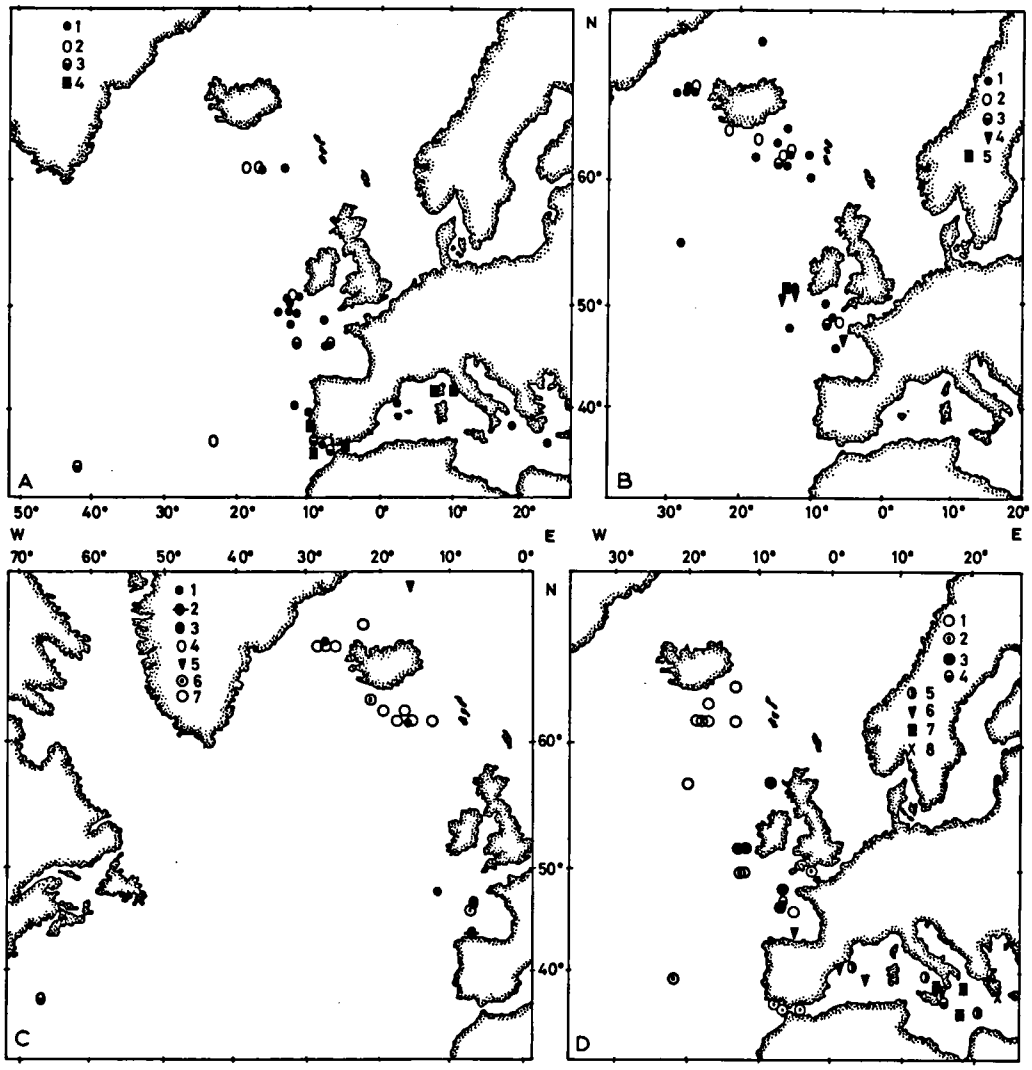


Fig. 1 A-D A, Records of *Pneumodermopsis (Pn.) ciliata* (1); *Pn. (Pn.) teschi* (2); *Pn. (C.) macrochira* (3); *Pn. (Pn.) canephora* (4).

B, Records of *Clione l. limacina* (1); *C. l. gracilis* (2); *C. l. minuta* (3); *Thliptodon gegenbauri* (4); *Th. antarcticus* (5).

C, Records of *Limacina helicoides* (1); *Pneumoderma atlanticum* forma *boasi* (2); *Prionoglossa tetrabranchiata* (3); *Cliopsis krohni* (4); *Limacina helicina* forma *helicina* (5); *L. r. retroversa* (6); *L. r. balea* (7).

D, Records of *Clio p. pyramidata* (1); *C. p. lanceolata* (2); *C. p. lanceolata* + *C. cuspidata* (3); *Pn. paucidens* (4); *Pneumoderma mediterraneum* (5); *Fowlerina setesios* (6); *P. atlanticum* (7); *Notobranchaea macdonaldi* (8).

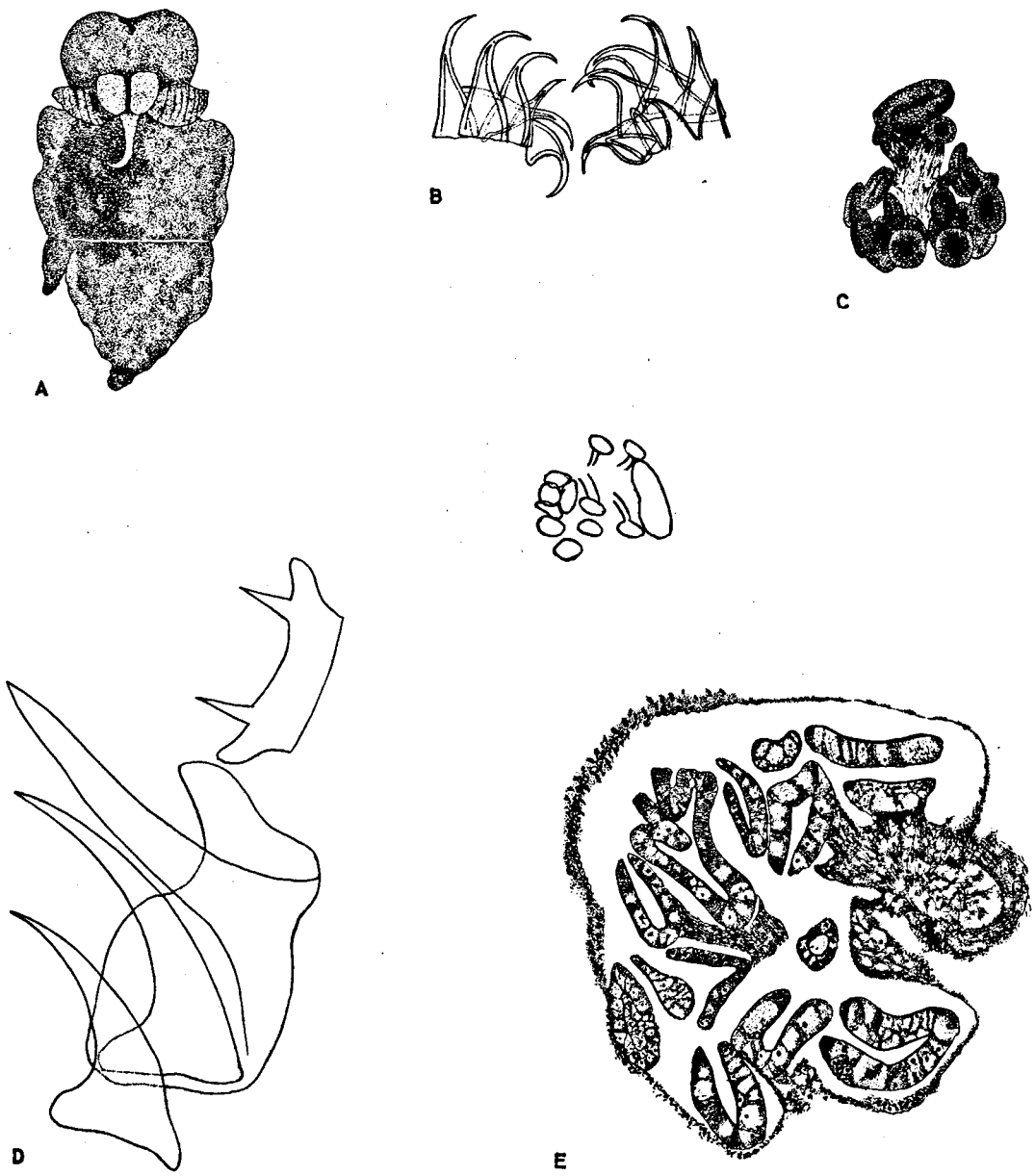


Fig. 2 A-E *Pneumodermopsis (Pn.) teschi* n. sp.

A, This figure was provided with the following text in pencil: "*Pneumodermopsis* n. sp. St. 183, 37° 32'N 29° 00'E., 16-III-'10. 17 x 1.3 mm".

B, Hooksac of probably the same specimen, this figure was provided with the following text in pencil: "left hooksac 200 x (right one with 9 hooks, 4 small ones and 5 larger ones; sometimes at both sides 8-9 hooks, outer sheat of the hooks very well developed)".

C, The suckers of probably the same specimen, this figure was provided with the following text in pencil: "Central arm with suckers *Pneumodermopsis* n. sp. St. 183, 16-III-'10, 25 x".

D, The radula of the same specimen as in figure C as proved by the suckers given in the left upper corner, this figure was provided with the following text in pencil: "Radula *Pneumodermopsis* n. sp. 540 x (In the posterior part of the radula the cusps of the median plate are bend sidewards)".

E, Transversal section through the arms, this figure was provided with the following text in pencil: "*Pneumodermopsis meisenheimeri*" 80 x Querschnitt Schlund Saugnäpfe". J.J.Tesch del.

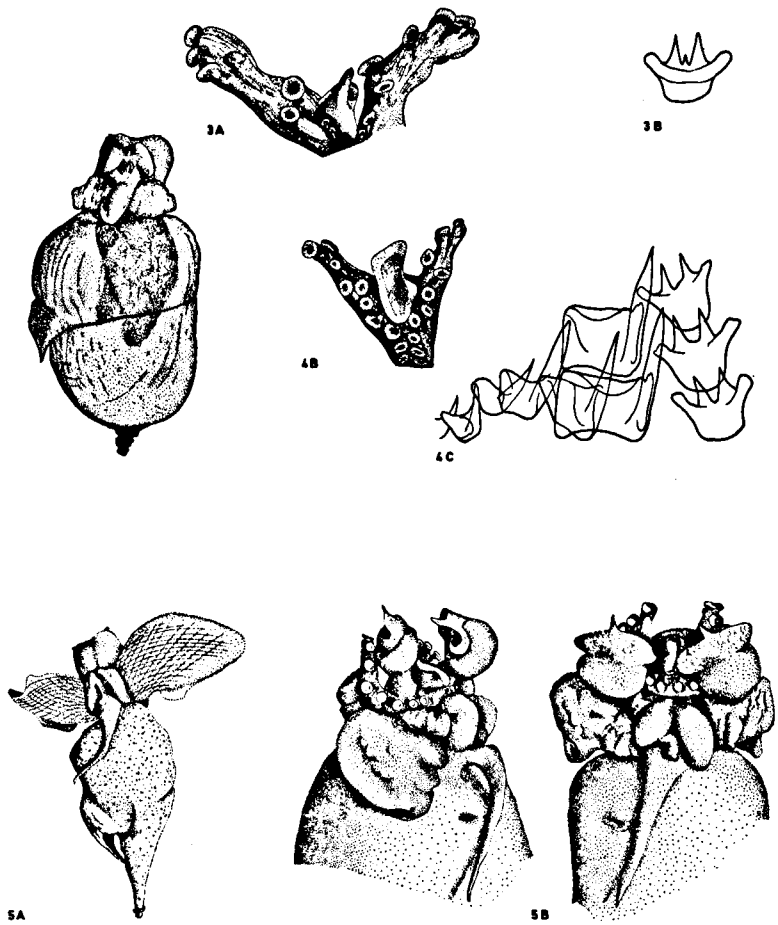


Fig. 3 A-B *Pneumodermopsis (Pn.) teschi* n. sp. "Thor" Stat. 183, 61° 30'N 19° 05'W.
A, sucker arms.
B, median radula plate.

Fig. 4 A-C *Pneumodermopsis (Pn.) teschi* n. sp. "Thor" Stat. 286, 61°49'N 18°46'W.
A, animal (ventral).
B, sucker arms.
C, part of the radula.

Fig. 5 A-B *Pneumodermopsis (Pn.) ciliata* (Gegenbaur, 1885).
A, animal (7.4 mm long), in ventral view ("Thor" Stat. 286, 61°49'N 14°11'W).
B, with expanded sucker arm from the right and ventral side ("Thor" Stat. 88, 49°09'N 8°30'W).

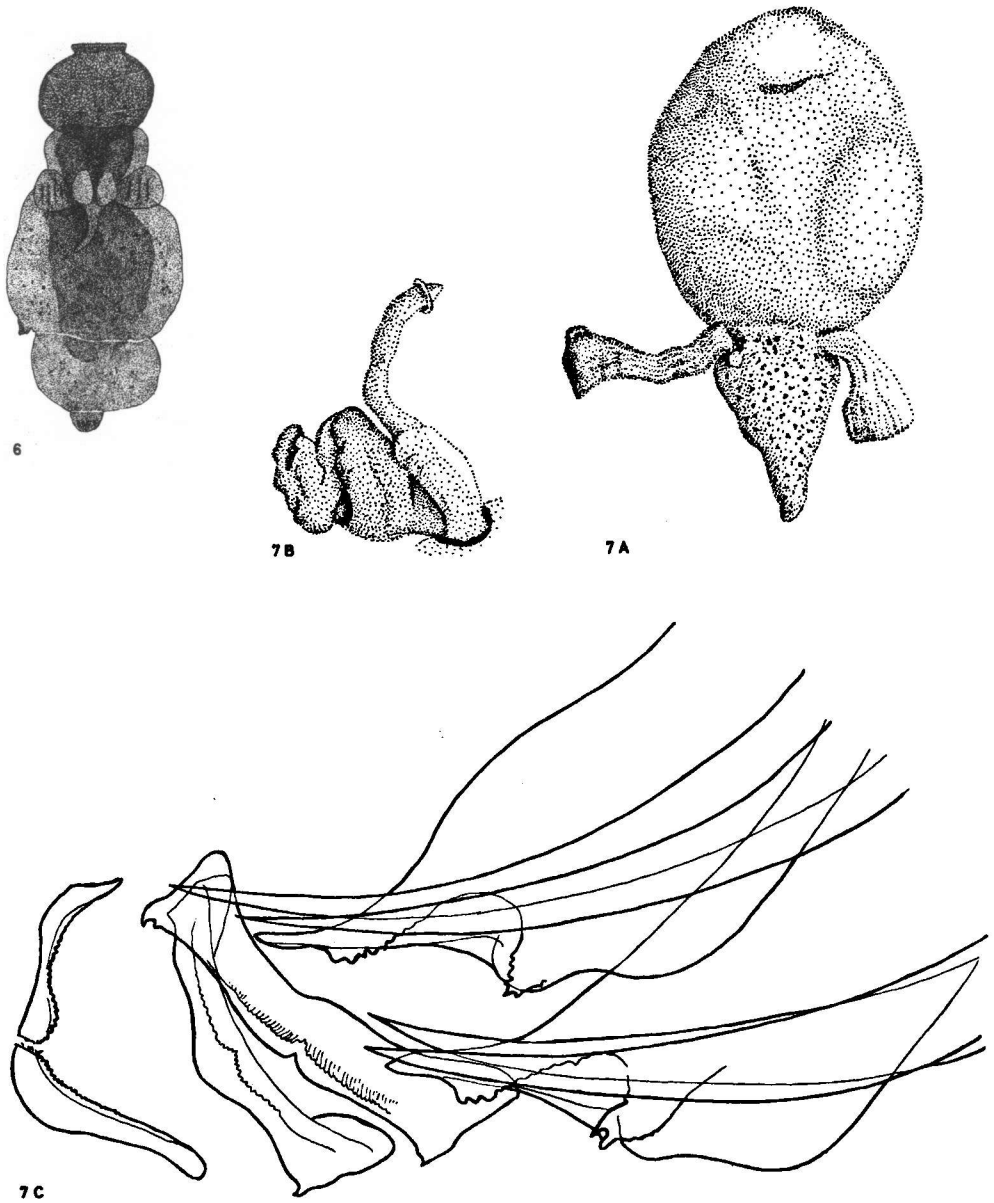


Fig. 6 *Pneumodermopsis (Pn.) canephora* Pruvot-Fol, 1924. This figure was provided with the following text in pencil: "Thor" Stat. 69, 36°12'N 9°44'W, 28-II-'09 300 mm. 4.5 mm, 15 x membrane ext. de la ventouse omise". J.J. Tesch del.

Fig. 7 A-C *Thliptodon gegenbauri* Boas, 1886, ("Thor" Stat. 82, 51°00'N 11°43'W).
A, animal (6 mm long) in ventral view.
B, penis.
C, part of the radula.

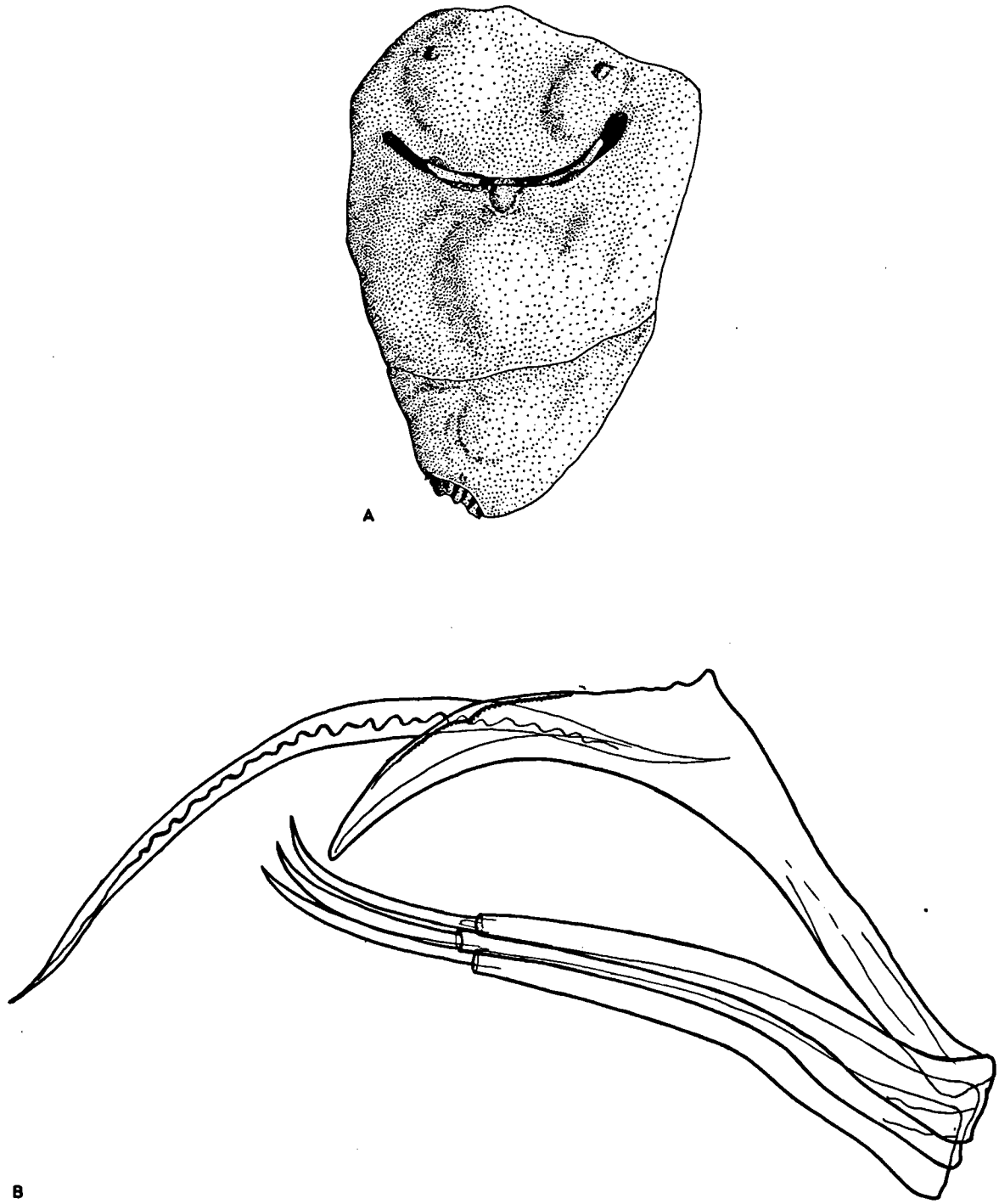
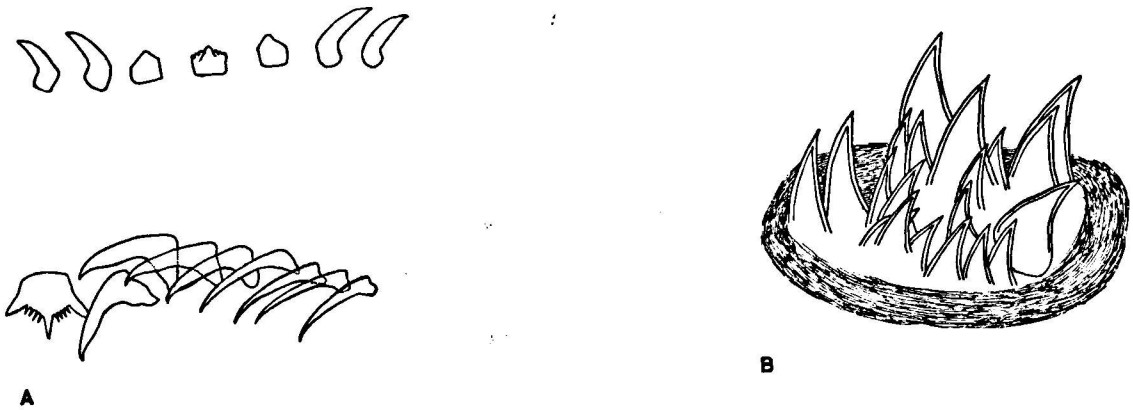


Fig. 8 A-B *Thliptodon antarcticus* Meisenheimer, 1906, ("Thor" Stat. 82, 51°00'N 11°43'W).
A, animal in ventral view, with enlarged foot parts.
B, part of the radula.



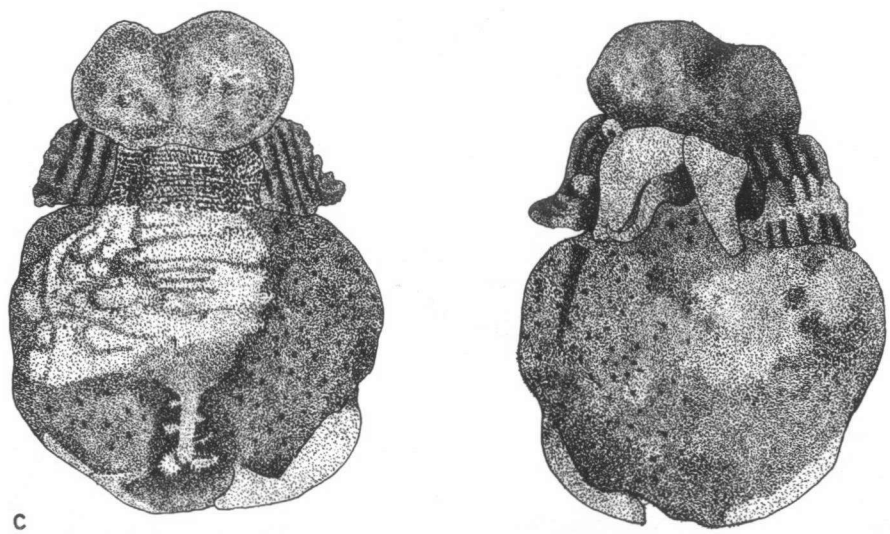


Fig. 9 A-C *Notobranchaea macdonaldi* Pelseneer, 1886.

A, This figure was provided with the following text in pencil: "Notobranchaea n. sp. Oberkiefer Radula 300 x Schlund sehr pigmentiert mit zahlreichen streifenartig angeordneten Drussenzellen an der Innenwandung. Zwei Buccalkegel. Radula with a median plate and 8-9 lateral plates in each transversal row of which the points which are bent hook-like becomes gradually thinner from the center of the row to the side.
Hakensack mit etwa 20 Haken. Haken, wenig tief. Oberkiefer nicht deutlich mit 7 stumpfen Zähnen die beiden äusseren hakenförmig gekrümmt".

B, Hooksac; this figure was provided with the following text: "Notobranchaea n. sp. Hooksac Enl. 300".

C, The specimen from the dorsal and ventral side, this figure was provided with the following text in pencil: "10 x "Thor" St. 185, 37°52'N 23°9'E". J.J. Tesch del.

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