ABYSSAL PYCNOGONIDA FROM THE NORTH-EASTERN ATLANTIC BASIN, PART I

by

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Résumé

Vingt-cinq espèces de Pycnogonides ont été trouvées sur les grands fonds (330-4 7l6 m) de l'Océan Atlantique, au large des côtes française et ibérique. Sept espèces sont nouvelles pour la science, plusieurs autres ont été signalées pour la première fois dans cette partie du monde. Deux genres non encore rencontrés auparavant dans les mers européennes : *Cilunculus* — avec deux espèces — et *Pantopipetta* — également avec deux espèces — sont signalés.

Through the good services of the "Centre National de Tri d'Océanographie biologique" (Centob), Brest, I received a great number of abyssal pycnogonids collected during various cruises organized by the "Centre Océanographique de Bretagne" and the "Centre National pour l'Exploitation des Océans" in the period 1970-1974. I have reported before on other materials from the same source (Stock, 1971; 1975) but the present collections are made in a different area; they are much larger and contain a surprising number of new or remarkable species, especially under the animals of small size. These samples were taken in the North-Eastern Atlantic Basin, from the entrance of the Channel off Brittany, throughout the Bay of Bicay, and off Portugal.

For technical reasons, pertaining to the availability of publication space, the report has been divided into two parts, part I containing all families except the Colossendeidae, part II — to be published in the next issue of the same journal — containing the Colossendeidae and the list of references.

Zoogeographic remarks

Quite a few species are either new to science or new to the general area, deep waters off south-western Europe. This is an indication that the abyssal pycnogonid fauna is still far from com-

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pietely known. The records seem to confirm the general pattern of abyssal zoogeography, viz. (a) most genera have a world-wide distribution; (b) several species have a very large distribution (in more than one, often in all, major oceans); (c) several other species seem to have more localized ranges, being restricted to smaller portions of the deep-sea.

Examples of group (a) can be found in the genera *Colossendeis, Nymphon, Ascorhynchus, Pantopipetta, Cilunculus, Anoplodactylus.* None of these genera is restricted however to the deep-sea; some are even mainly shallow-water taxa *(Anoplodactylus);* others seem to be most abundant in cool waters, irrespective of depth *(Colossendeis, Nymphon).* Species with a large distribution (group b), found during the present survey, are for instance *Pantopipetta brevicauda* (southern and northern Atlantic, southern — and possibly also northern — Pacific), *Colossendeis colosseo* and *C. macerrima* (all major oceans), *Nymphon laterospinum* (southern and northern Atlantic). Species of more limited distribution (at least as far as we know) are *Colossendeis arcuata* (northern central Atlantic), *Paranymphon spinosum* (northern Atlantic and western Mediterranean), *Pantopipetta armoricana, Ascorhynchus turritus,* and *Cilunculus europaeus* (off South-western Europe).

Surprising discoveries during this survey are European members of otherwise widely dstributed deep-sea genera, which were hitherto unknown from the northern Atlantic, viz. two species of *Pantopipetta* and two of *Cilunculus.* Both genera were described from the deep-sea in the East Indies; additional species were found in other seas but now members of these genera have been discovered so to say at our doorstep in the european Atlantic.

The following species are recorded in part I of this paper:

Family Ammotheidae: *Ascorhynchus turritus* n. sp.; *Ammothella tubicen* n. sp.; *Cilunculus europeaeus* n. sp.; *C. alcicornis* n. sp.; *Paranymphon spinosum* Caullery, 1896.

Family Colossendeidae, with 5 species: see part II of this paper.

Family Austrodecidae: *Pantopipetta brevicauda* Stock, 1963; *P. armoricana* n. sp.

Family Nymphonidae: *Nymphon tubiferum* n. sp.; *N. laterospinum* Stock, 1963; *N.* spec. 1, 2, 3, and 4; *Neonymphon* spec.

Family Callipallenidae: *Callipallene producto* (Sars, 1888); *C. acus* (Meinert, 1898).

Family Phoxichilidiidae: *Pallenopsis* spec. (aff. *calcanea* Stephensen, 1933); *Anoplodactylus petiolatus* (Kröyer, 1884); *A. oculatus* Carpenter, 1905; *A. arnaudae* n. sp.

The station denomination

For each record, the geographic position (latitude N and longitude W) is given. The records are preceded by the name of the project ("Biogas" I-VI, "Polygas", "Thalassa", "Walda") and the number of the sample. The

sample number consists of a group of letters and a group of numerals. The letters form a code with the following meaning:

— projects 'Biogas" and "Polygas" — CP = «chalut à perche » (= beam trawl), 5m, type 'Honfleur';
CV = Blake's trawl, 3m;
DS = Sanders' dredge
a = a lower-case "a" added to the sample number indicates that the organisms were taken in a small nel (opening 40cm, mesh 0.5mm) mounted on the upside of the trawl.

— project "Thalassa" — W = 1970; X = 1971; Y = 1972; Z = 1973.
GB = large Boillot dredge;
PB = small Boillot dredge;
F = "faubert" (= swab);
C = beam trawl.

— project "Walda" — CY = Blake's trawl, 3.60m.

The "Biogas" and "Polygas" samples were taken roughly around six pre-flxed stations, called Stations 1 to 6 (see fig. 1); if not taken near these, they are marked HZ («hors de la zone»).

The sampling areas of the "Thalassa" project are also indicated in fig. 1.

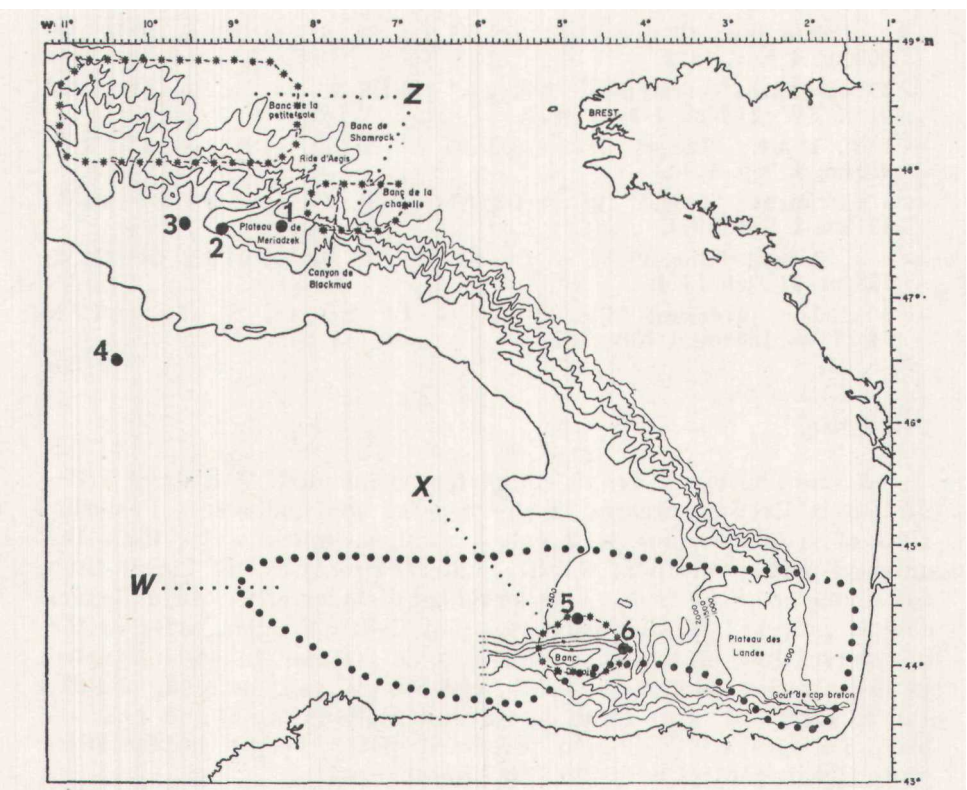

FIG. 1

The position of the "Biogas", "Polygas", and "Thalassa" stations. Nrs. 1 to 6 are the six pre-fixed stations of "Biogas" and "Polygas" near which the sampling was executed.

The letters *W* — *Z* denote the sampling areas of the "Thalassa" projects (1970 = *W;* 1971 = *X;* 1973 = Z). The 1972 campaign (letter Y) was carried out off the coast of Portugal, between Lisboa and Porto, and falls outside the region covered by the map.

TAXONOMIC PART

ASCORHYNCHUS TURRITUS n. sp. (Fig. 2).

Material examined.

All from the Bay of Biscay:

— 1 ♀ (holotype), 2 ♂ and 6 chelate juveniles (paratypes); "Biogas" VI — CP 24a (= St. 6), 44°08'1N 04°16'2W, 1995m, 31 Oct. 1974.

— 2 ♀,1 ♂; "Biogas" II — DS 31 (= St. 2), 47°32'5N 09°04'2W, 2813m, 19 Apr. 1973.

— 1 juv.; "Polygas" — DS 27 (= St. 5), 44°25'3N 04°44'5W, 4411m, 2 Nov. 1972.

— 2 chelate juv.; "Polygas" — DS 25 (= St. 6), 44°08'2N 04°15'7W, 2096m, 1 Nov. 1972.

— 39 specimens (paratypes); "Polygas" — DS 26 (= St. 6), 44°08°2 N 04°15'7W, 2 076m, 1 Nov. 1972.

— 1 ♂,1 juv.; "Biogas" III — DS 50 (= St. 6), 44°08'9N 04°15'9W, 2124m, 1 Sep. 1973.

— 5 specimens; "Biogas" VI — DS 87 (= St. 6), 44°05'2N 04°19'4W, 1913m, 1 Nov. 1974.

— 1 ♂,3 juv.; "Biogas" VI — GP 23a (= St. 6), 44°04'6 N 04°21'4W, 1980m, 31 Oct. 1974.

— 2 chelate juveniles; "Biogas" VI — CP 25a (= St. 6), 44°05'N 04°17'W, 1894m, 1 Nov. 1974

Description.

A small species. Trunk completely segmented. A distinct articulation is likewise present at the base of the abdomen. Posterior rims of trunk somites 1, 2 and 3 swollen, much wider than the anterior part of the next somtie. Lateral processes not longer than the diameter of the trunk, each provided distodorsally with a slender conical process. Similar processes, but lightly smaller, arise in the mid-dorsal line of trunk somites 1 to 3. Ocular tubercle situated in the anterior half of the neck, exceedingly tall, pointed, slightly curved foreward; two small lateral indentations are found near its base; no eyes are visible in preserved state. Oviger implantation pratically in contact with the first lateral process.

Proboscis robust, tripartite, basal part the narrowest, rounded at the tip. Abdomen short, not recurved, reaching to the end of coxa 1 of leg 4.

Chelifores short; scape 2-segmented, segment 1 shorter than segment 2; chelae reduced in adults, perfectly chelate (gaping) in juveniles.

Palp 10-segmented; segment 2 the longest; segments 7 to 10 slender, 8 to 10 subequal, 7 distinctly longer.

Oviger similar in both sexes; segments 4 and 5 elongated, 4 longer than 5; segment 6 more than half as long as segment 5. Compound spines in 3 rows on segments 7 and 8, in 2 or 3 rows on segment 9, in 1 or 2 rows on segment 10. The main row contains the largest spines. The compound spine formula of the holotype is 6 (+ 5 +4): 5 (+4 +3): 4 (+3 +2): 5 (+ 3):: 0. Terminal claw short, unarmed.

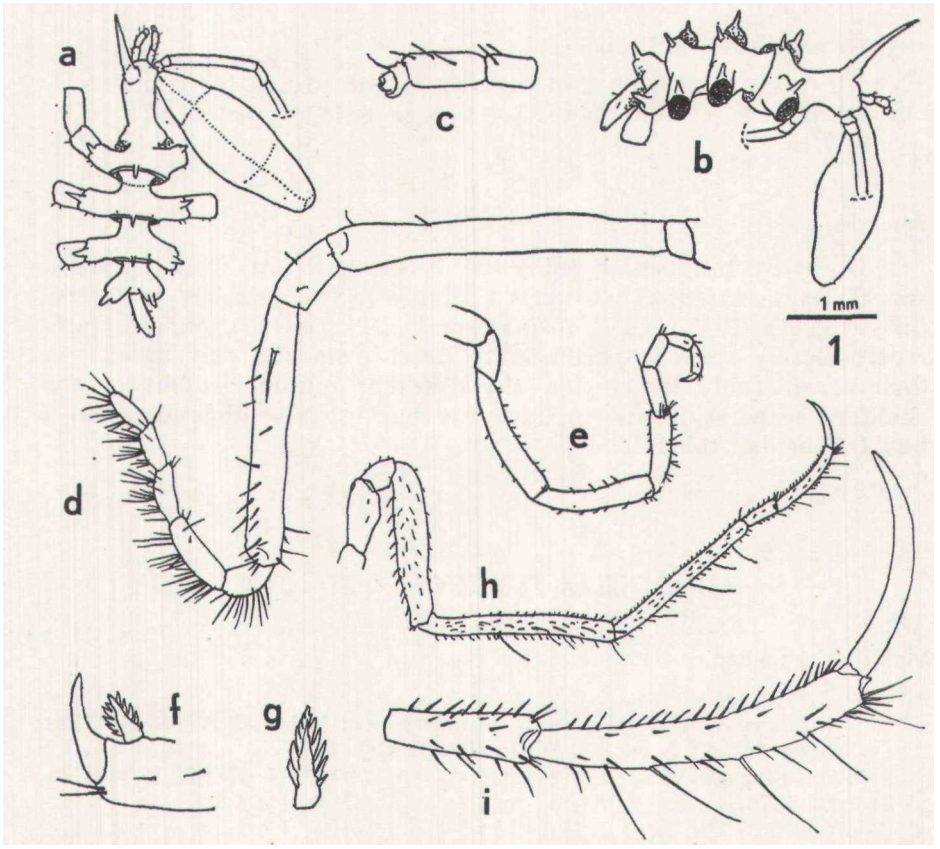

FIG. 2

Ascorhynchus turritus n. sp. (from "Biogas" VI — CP 24a). a: trunk, ♀, dorsal (scale 1); b: trunk, ♀, from the right (1); c: chelifore, ♂ (4); d: palp, ♂ (4); e: oviger, ♂ (3); f: tip of oviger, ♂ (5); g: compound spine of 7th oviger segment, ♂ (5); h: third leg, ♀ (1); ı: distal segments of third leg, ♀ (4).

Measurements of 9 holotype (in mm).

Trunk somite 1	1.31
Trunk somite 2	0.53
Trunk somite 3	0.47
Trunk somite 4 (to base of abdomen)	0.34
Width across 2nd lateral processes	1.12
Length proboscis	1.97
Greatest diameter proboscis	0.78
Height ocular tubercle	0.65
Length abdomen	0.40
Length chelifore (incl. chela)	0.40

Third leg: 1st coxa 0.30; 2nd coxa 0.69; 3rd coxa 0.29; femur 1.61, 1st tibia 2.01; 2nd tibia 1.85; tarsus 0.37; propodus 0.80; claw 0.57.

Remarks.

The very tall ocular tubercule is characteristic (the proposed specific name, *turritus* = towering, alludes to this feature). A. *serratus* Hedgpeth, 1948, and A. *losinalosinskyi* Turpaeva, 1971, are apparently closely related species; both differ from the new species in their considerably larger size, the different mutual lengths of the chelifore scape segments, in having a more slender abdomen, and a less tall ocular tubercle.

AMMOTHELLA TUBICEN n. sp. (Fig. 3).

Material examined.

Bay of Biscay:
— 1 ♀ (holotype), 1 ♂ (allotype), 45 paratypes; "Biogas" VI — CP 23a (= St. 6), 44°04'6N 04°21'4W, 1980m, 31 Oct. 1974.
— 1 juv.; "Biogas" VI — CP 24a (= St. 6), 44°08'l N 04°16'2W, 1995m 31 Oct. 1974.

Description.

Trunk completely segmented. Lateral processes very long, widely separated, without tubercles. Cephalic segment with a slight tendency of forming an anterior hood, covering the implantation of the chelifore scapes. Ocular tubercle very tall, pointed, slightly curved foreward; no eyes visible in preserved state. No middorsal tubercles on trunk somites 1 to 3; a low rounded swelling is present on somite 4, at the base of the abdomen. Abdomen clavate, reaching beyond the first coxa of leg 4.

Proboscis regularly elliptical in outline.

Chelifore scape 2-segmented (the segmentation is usually very distinct, but in some specimens it is faint). Scape segment 1 short,

bearing a few short setae; segment 2 distally widened in a trumpet-like way, bearing several long setae; in a distal excavation of the scape the rudimentary chela is hidden. Juveniles perfectly chelate.

Palp 9-segmented, segment 2 the longest; distal segments fairly elongate.

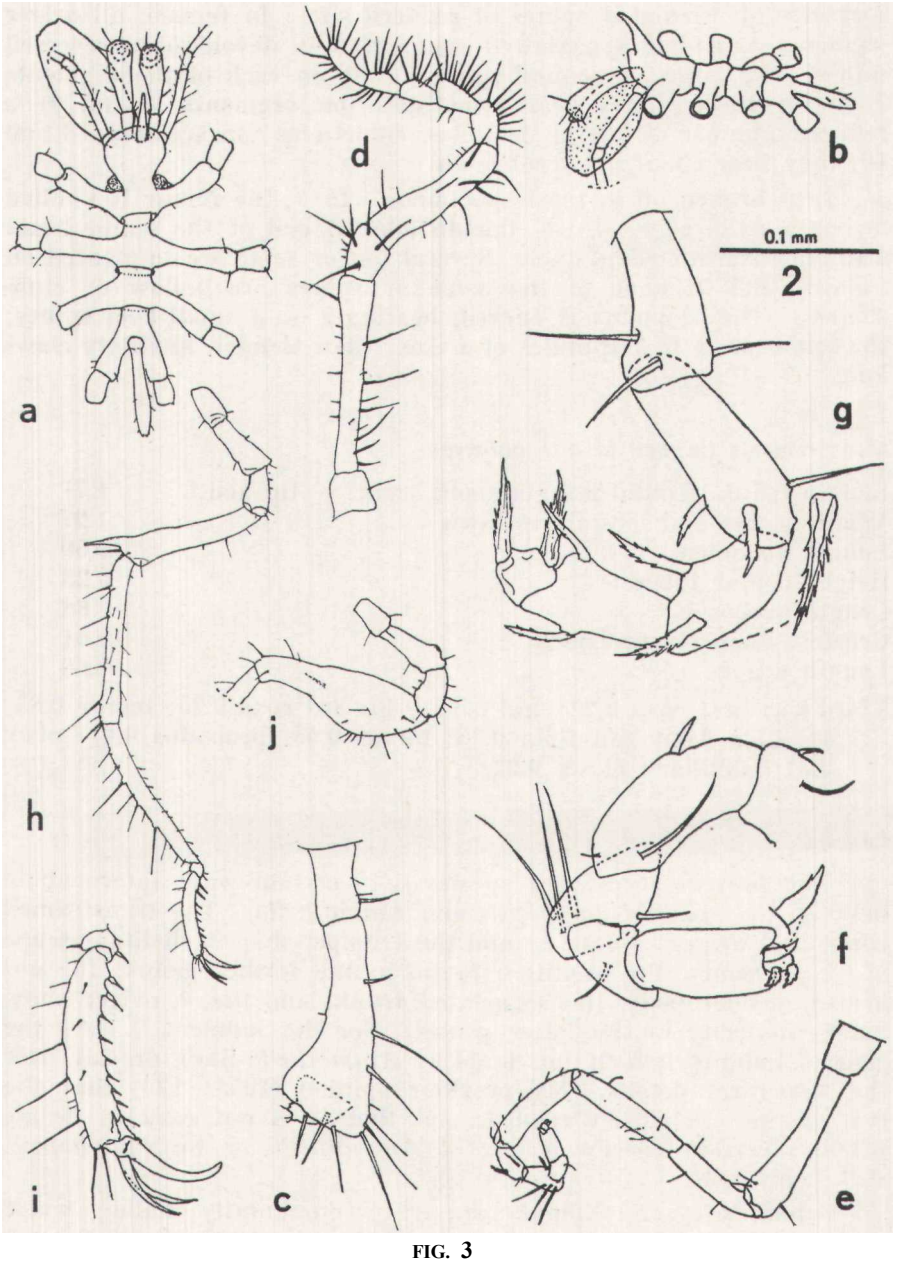

FIG. 3

Ammothella tubicen n. sp. (from "Biogas" VI — CP 23a). a: trunk of ♂, dorsal (scale 3); b: trunk of ♀, from the left (3); c: chelifore, ♀ (4); d: palp, ♀ (4); e: oviger, ♂ (4); f: distal portion of oviger, ♂ (2); g: distal portion of oviger, ♀ (2); h: third leg, ♂ (3); i: distal segments of third leg, ♂ (4); j: proximal segments of third leg, ♀ (3).

Oviger 10-segmented; segment 2 the longest. In male, the distal segments are transformed: segments 7 and 8 articulate anaxially; segment 6 bears a reversed spine. Compound spines occur on the elongated, rectangular segment 9 and on the rudimentary, knob-like segment 10. Segment 9 bears 1 distal compound spine, almost without lateral denticulations, slightly hook-shaped. Segment 10 bears two denticulated spines of reduced size. In female, all oviger segments articulate synaxially ; segment 6 is devoid of a reversed spine. Two large, compound spines occur on each of the segments 7 to 10; these spines bear sometimes (on segments 7 and 9) a reduced number of lateral denticles, sometimes (on segments 8 and 10) they bear about 5 lateral teeth.

Legs broken off in most specimens. In ♀, the femur is swollen to contain the eggs. In ♂, the distodorsal end of the femur bears a tubular cement gland duct. Several longer setae are implanted on tibiae 1 and 2; none of the setae or spines are hollow or club-shaped. The propodus is curved, bearing 2 or 3 small heel spines; the sole bears 4 to 7 spinules of a size. Claw slender, auxiliary claws long.

Measurements (in mm) of a ♂ paratype.

Length trunk (frontal margin ceph. segm. — tip abd.)	1.77
Width across 2nd lateral processes	1.27
Length abdomen	0.50
Height ocular tubercle	0.28
Length proboscis	0.88
Greatest diameter proboscis	0.41
Length scape	0.66

Third leg: first coxa 0.22; 2nd coxa 0.40; 3rd coxa 0.25; femur 0.83; 1st tibia 0.99; 2nd tibia 0.98; tarsus 0.05; propodus 0.47; claw 0.31; auxiliary claws 0.22.

Remarks.

The present deep-water species is in certain ways intermediate between the genera *Ngmphopsis* and *Ammothella.* The transformed compound oviger spines (♂) and the trumpet-shaped chelifore scape (♂, ♀), resemble the condition found in the former genus; the unarmed, slender body, the segmented trunk, and the ♀ oviger show more similarity to the latter genus. For the moment, I have the general habitus (which no doubt is AmmofheZla-like) prevail over the structural details. My previous opinion (1954: 120) that the two genera are closely related, and that it is not easy to decide whether certain species belong to *Ammothella* or to *Nymphopsis,* still holds true.

Ammothella and *Nymphopsis* are predominantly shallow water genera. The abyssal *A. profunda* Hedgpeth, 1949 (from Japan) resembles in the shape of the ocular tubercle and in the absence of eyes, the present material from the Gulf of Biscay, but is so different in numerous details, that it is doubtless not even closely related to *A. tubicen.*

Derivation nominis.

The proposed specific name, *tubicen* (latin = trumpeter), alludes to the trumpet-shaped chelifore scape.

GENUS *CILUNCULUS* Loman, 1908

As remarked by several authors (Hedgpeth, 1949; Fry and Hedgpeth, 1969; Pushkin, 1973), *Cilunculus* and *Ammothella* are very closely related taxa. Fry and Hedgpeth even consider *Ascorhynchus* very similar to these two genera. I cannot share their opinion for as far as *Ascorhynchus* is concerned. In *Ascorhynchus,* the cement glands open through pores, in *Cilunculus* and *Ammothella* through a duct. In *Ascorhynchus,* the oviger has a terminal claw, and compound spines are arranged in rows, whereas in the other two genera a terminal oviger claw is lacking and the compound spines are single, or placed in pairs, per segment. In *Ascorhynchus,* the second oviger segment is short, in *Ammothella* it is moderately elongate, in *Cilunculus* it is very elongate. In *Ascorhynchus,* the propodus is "intermediate" (i.e., without heel, without auxiliary claws) whereas the two other genera have at least a well-developed heel. The presence of an overhanging rim or hood of the cephalic somite, covering the insertion of the chelifores, is most clearly developed in *Cilunculus;* the chelifores in this genus are short. In *Ascorhynchus,* no cephalic hood is present; in *Ammothella* a tendency towards hood formation is available. In the former genus, the chelifores are short; in the latter genus they are long.

I feel that the differences between *Ascorhynchus,* at the one hand, and *Ammothella* and *Cilunculus,* at the other, are so pronounced that there can be little doubt about their separate status. The differences between *Ammothella* and *Cilunculus* are much more subtle, but for the moment I keep these two genera separate, on the basis of the better development of the cephalic hood in *Cilunculus,* the longer chelifores in *Ammothella* and the nature of the cement gland opening (an articulated duct in *Ammothella,* a chimney-shaped out-growth of the femur in *Cilunculus).*

The genus *Cilunculus* counted 10 deep-water species; two more were discovered in the present collections. The species can be distinguished with the aid of the following key:

1 a) Uniunguiculate 2
b) Auxiliary claws present 3
2 a) Chelifore scape 2-segmented. Mid-dorsal line of trunk somites 1 to 3 with a tubercle . . . . . *C. acanthus* Fry and Hedgpeth, 1969
b) Chelifore scape 1-segraented. Mid-dorsal line without tubercles . . . . . *C. kracovi* Pushkin, 1973
3 a) Auxiliary claws much less than half as long as the main claw 4
b) Auxiliary claws at least half as long as the main claw 6
4 a) Scape 1-segmented. No mid-dorsal trunk tubercles, no horn-like processes on the cephalic hood . . . . . *C. frontosus* Loman, 1908
b) Scape 2-segmented. Either mid-dorsal trunk tubercles, or a pair of horn-like processes, or both, well-developed 5

5 a) Mid-dorsal trunk tubercles well-defined, tall; cephalie hood tuberculated but without a pair of "horns" ..... *C. sewelli* Calman, 1938 (= *C. gigas* (Fage, 1956))
b) Mid-dorsal tubercles well-defined, small and low; "horns" not well-developed ..... *C. hirsutus* Clark, 1963
c) Posterior margins of segments swollen, not forming well-defined tubercles; "horns" very well developed .. *C. frontosus* Loman, 1908

6 a) Scape 2-segmented. Mid-dorsal trunk tubercles present 7
b) Scape 1-segmented. No mid-dorsal tubercles 9
c) Scape l-segmented. Mid-dorsal tubercles present ..... *C. alcicornis* n. sp.

7 a) Long setae on dorsal trunk tubercles and lateral processes ..... *C. cactoides* Fry and Hedgpeth, 1969
b) Trunk with short setae only 8

8 a) Anterior "horns" with setae; mid-dorsal tubercles tall ..... C. *australiensis* Clark, 1963
b) Anterior "horns" smooth; mid-dorsal tubercles low ..... *C. armatus* (Böhm, 1879)

9 a) Ocular tubercle tall. Abdomen short .... C. *antillensis* Stock, 1955
b) Ocular tubercle inconspicuous. Abdomen long .. *C. europaeus* n. sp.

CILUNCULUS EUROPAEUS n. sp. (Figs. 4, 5a-c).

Material examined.

Bay of Biscay:

— 1 ♂ (holotype), 1 ♀ (allotype); "Thalassa" Stat. X 340, 44°07'0-44°06'9 N, 04°29'8-04°29'6 W, 860-910m, bottom calcareous, yellow, with large sandstone cobbles and fine granite, 16 Oct. 1971.

Entrance of the English Channel:

— 1 ♀; "Thalassa" Z 406, 47°44'4 N 08°04'2 W, 1055m, 23 Oct. 1973.
— 1 ♀; "Thalassa" Z 417, 48°12'0 N 09°09'5 W, 865m, 24 Oct. 1973.
— 1 ♂; "Thalassa" Z 422, 48°21'0 N 09°39'5 W, 1175m, 24 Oct. 1973.
— 1 chelate juv.; "Thalassa" Z 431, 48°38'2 N 09°47'3 W, 800m, 25 Oct. 1973.
— 1 ♀; "Thalassa" Z 435, 48°39'7 N 09°53'2 W, 1050m, 26 Oct. 1973.
— 1 specimen fragm.; "Thalassa" Z 443, 48°56'0 N 11°02'0 W, 660m, 27 Oct. 1973.

Description.

Trunk completely segmented, without dorsal tubercles, but with swollen posterior rims of the somites 1 to 3. Lateral processes slender, separated by more than their own diameter, dorsally armed with 1 to 3 long setae. Cephalic somite with an overhanging anterior hood, which covers the proximal part of the chelifore scape. Abdomen inserted dorsally, long, without long setae, basically articulated. Ocular tubercle or eyes lacking; an inconspicuous swelling on the neck between the insertions of the palps, may represent a vestige of the ocular tubercle.

Proboscis ovate, type B 1, inserted on the ventral side of the neck; it may carried against the ventral surface of the trunk (as in Fig. 4a, b), but it can also be streched in frontal direction.

Chelifore scape 1-segmented, armed with some spinules or setules; distal end excavated; the rudimentary chelae can be retracted into the excavation, but upon a slight pressure (e.g. with a needle) on the distal end of the scape, they expand and show membranous zone (dotted in Fig. 4d) used for expansion and retraction of the

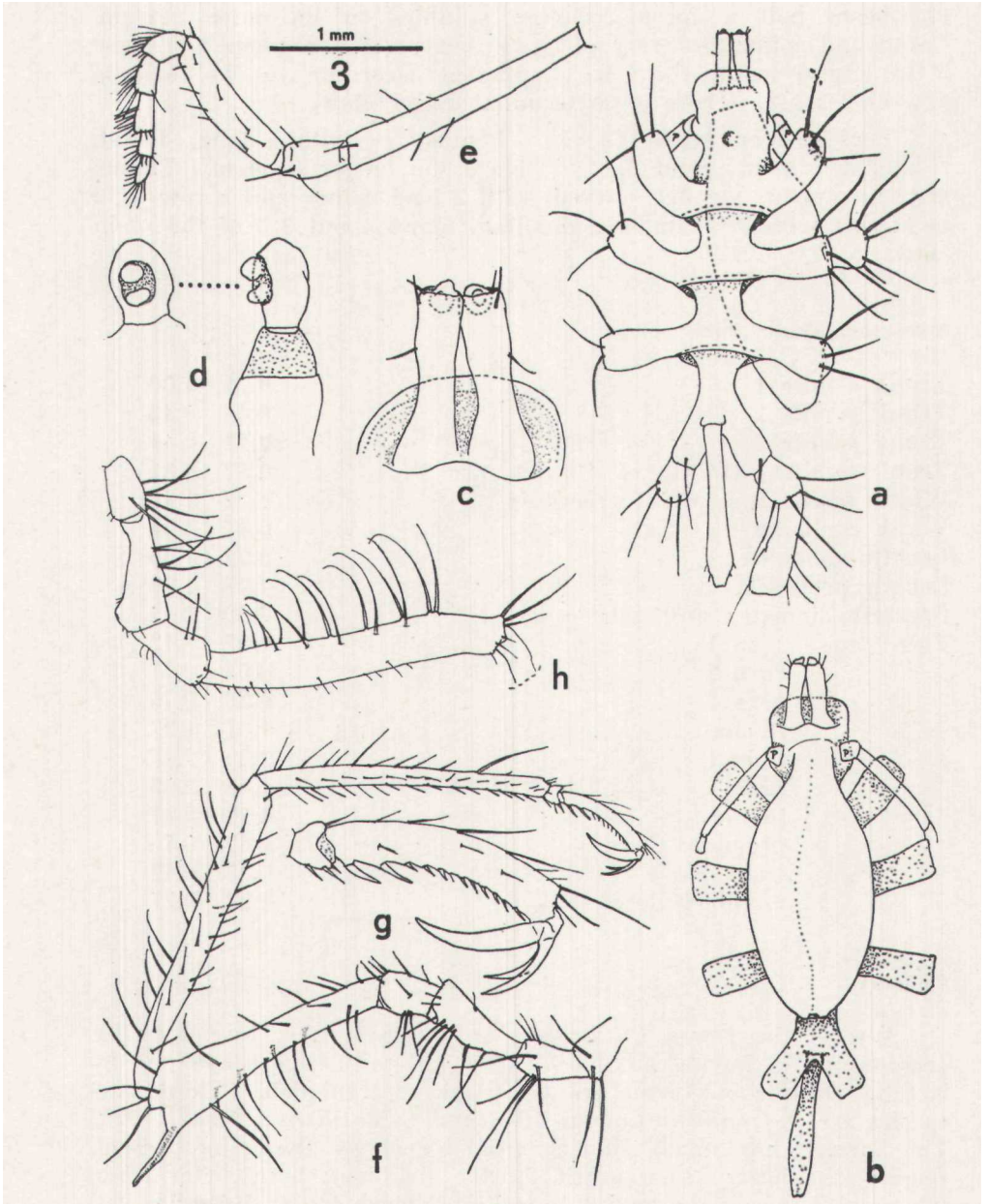

FIG. 4

Cilunculus europaeus n. sp. (from "Thalassa" X 340).

a: trunk, ♀ dorsal (scale 3), b: trunk, ♀ ventral (3); c: cephalic hood, ♀, ventral (4); d: chelifore, ♂, in two different views (5); e: palp, ♂ (4); f: third leg, ♂ (3); g: distal segments of third leg, (4); h: proximal segments of third leg, ♀ (3).

chelae. The chela is provided with 2 swellings, which no doubt represent the rudiments of the fingers.

The palp is inserted on the lateral side of the neck; it is 9-segmented; segment 2 is the longest.

The male oviger is more slender than the female one; segment 5 (♂) bears half a dozen recurved spinules on its outer margin. Compound spines are very elongate, bearing (on segment 10) some 8 to lateral teeth; they are implanted according to the formula (♂, ♀) 2:2:1:2. There is no terminal oviger claw.

Legs slender, setose (♂, ♀). Femur (♂) with a long, dorsal, subdistal, cement gland duct. Tibia 1 the longer segment. Tarsus short; propodus slender, curved, with 2 heel spines and a row of 9 to 11 sole spines. Claw long, auxiliary claws about 2/3 of the main claw.

Measurements (in mm).

	♂	♀
Trunk somite 1	0.75	1.00
Trunk somite 2	0.45	0.43
Trunk somite 3	0.42	0.44
Trunk somite 4 (to tip of 4th lat. proc.)	0.51	0.81
Width across 2nd lateral processes	1.37	1.49
Width cephalon	0.47	0.51
Length abdomen	0.92	1.05
Length proboscis	1.27	1.69
Greatest diameter proboscis	0.60	0.82
Third leg — coxa 1	0.37	0.42
coxa 2	0.63	0.71
coxa 3	0.36	0.45
femur	1.61	1.92
tibia 1	2.00	2.43
tibia 2	1.82	2.06
tarsus	0.10	0.11
propodus	0.62	0.70
claw	0.33	0.42
auxiliary claws	0.23	0.27

Remarks.

Within the genus *Cilunculus,* only two species resemble the present one in having auxiliary claws, an unimerous scape and in lacking conspicuous armature on trunk or cephalon. These two species are C. *frontosus* Loman, 1908 and *C. antillensis* Stock, 1955 The former has much shorter auxiliary claws than the present species; the latter has a much shorter abdomen; both differ from the present species in having a well-developed ocular tubercle.

Up to now not a single member of *Cilunculus* was known from Europe and only one species (C. *antillensis)* was known from the Atlantic Ocean. For this reason, the specific name *europaeus* has been proposed for the new species.

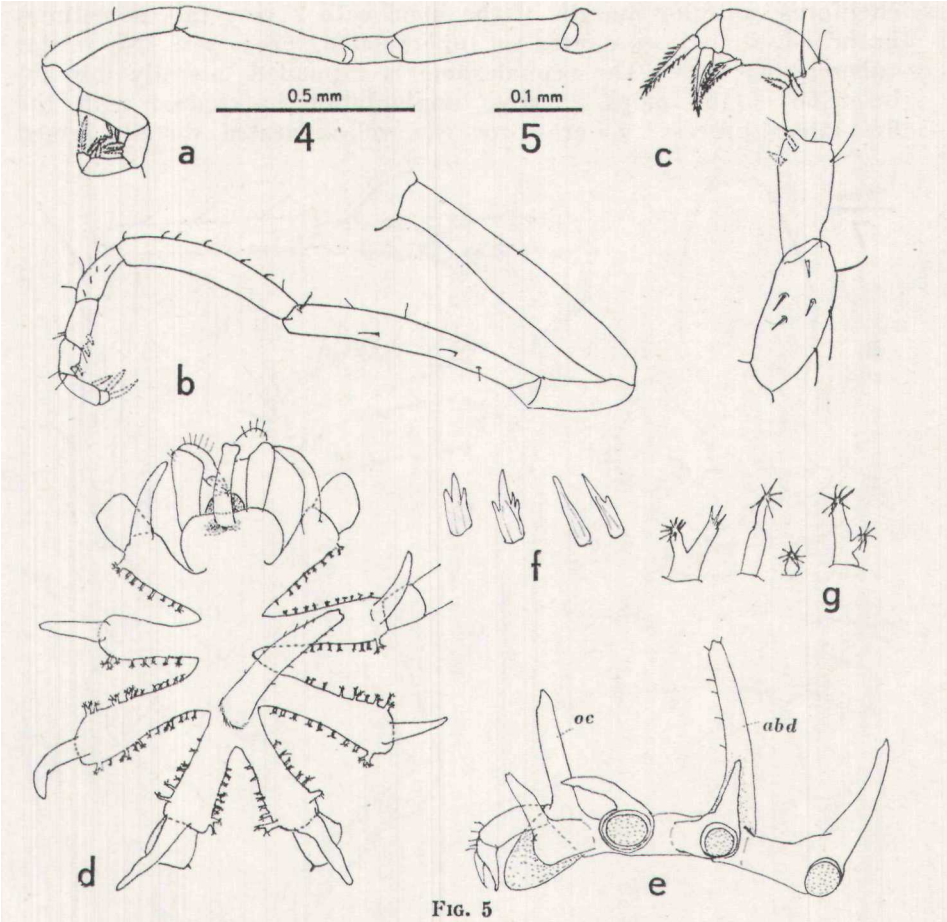

FIG. 5

a-c. *Cilunculus europaeus* n. sp. (from "Thalassa" X 340).
a: oviger, ♀ (scale 4); b: oviger, ♂ (4); c: distal portion of oviger, ♂ (5).
d-g, *Paranymphon spinosum* Caullery, 1896 (from "Biogas" VI — CP 24a).
d: trunk, dorsal (scale 3); e: trunk, lateral (3); f: compound oviger spines (free-hand sketch); g: stellate integumental structures (free-hand sketch).

CILUNCULUS ALCICORNIS n. sp. (Fig. 6).

Material examined.

Entrance of the English Channel:

— 1 ♂ (holotype), 1 ♀ (allotype); "Thalassa" Stat. Z 417, 48°12'0 N, 09°09'5 W, 865m, sandy mud, sometimes clayish, nullipores, 24 Oct. 1973.

— 1 juv.; "Thalassa" Z 414, 48°05'0 N 08°29'8 W, 650m, 24 Oct. 1973.

Description.

Male: Trunk completely segmented; somites 1, 2, and 3 with a fairly tall mid-dorsal tubercle. Cephalic somite forming a strongly overhanging anterior hood, covering almost half the scape of the

chelifores; anterior margin of the hood with 2 very tall, sometimes branched, sometimes curved or tuberculated, processes. No ocular tubercle, no eyes. The cephalosome is expanded laterally into the insertion of the palps. Oviger implantation in contact with the first lateral process. Lateral processes well-separated, distally armed

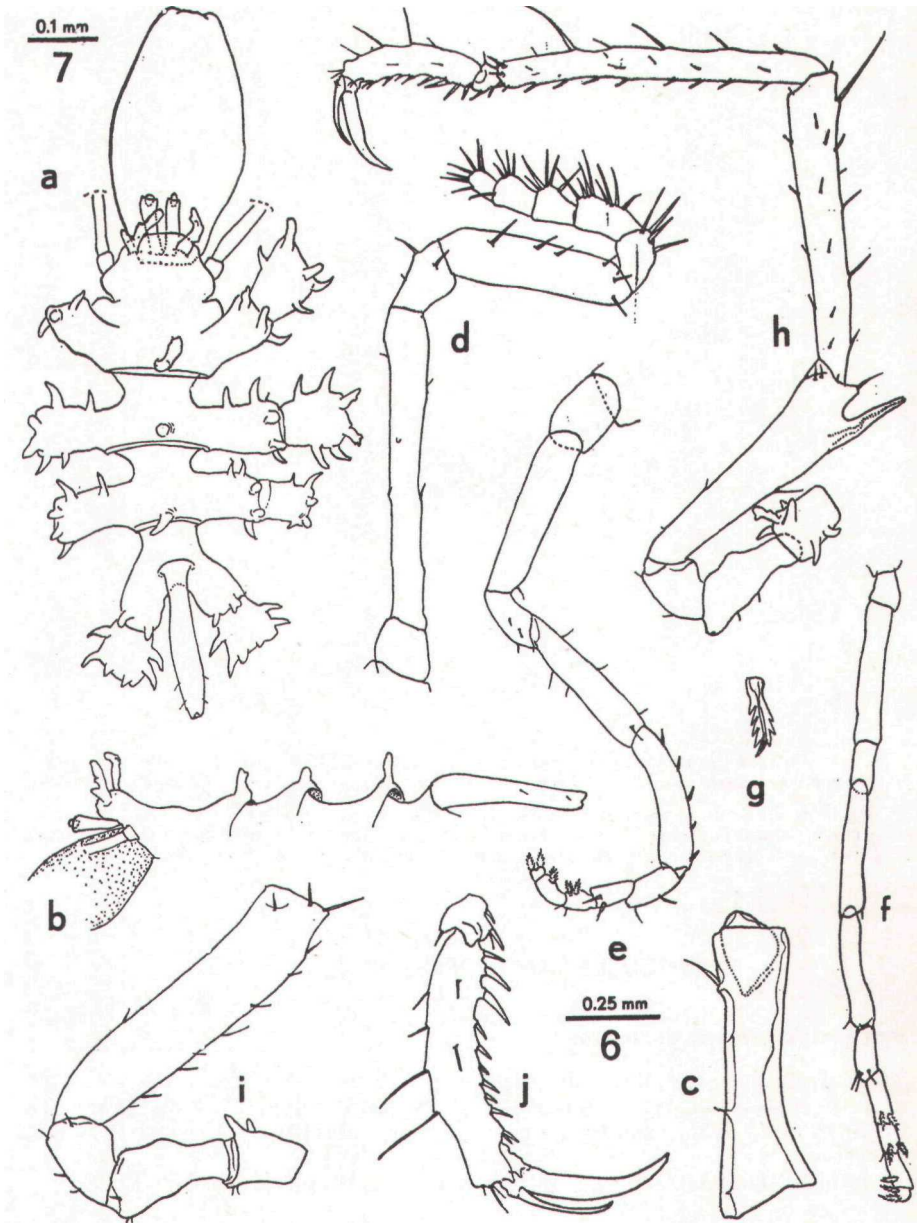

FIG. 6
***Cilunculus alcicornis* n. sp. (from "Thalassa" Z 417).**

a: trunk, ♂, dorsal (scale **6); h:** dorsal contour **of** trunk, ♂ **(6);** c: chelifore, ♂ **(11);** d: palp, ♂ **(7); e: oviger,** ♂ **(10), f: oviger,** ♀ (10); **g:** compound spine **of** oviger segment **8,** ♀ **(12) ; h :** third leg, ♂ **(6) ; i :** proximal segments **of** third leg, ♀ **(10); j:** distal segments **of** third leg, ♀ **(6).**

with 2 spurs; lateral process 1 moreover with one distoposterior, curved spur; lateral processes 2 and 3 with 2 curved anterior spurs, and 1 or 2 posterior spurs. Abdomen with a basal articulation line; reaching beyond the distal end of coxa 1 of leg 4.

Proboscis of type B1, regularly elliptical with a truncate tip; implanted under the cephalic hood.

Chelifore scape 1-segmented; rudimentalry chela for the greater part hidden in a distal excavation of the scape.

Palp 9-segmented; segment 2 the longest, segment 10 the shortest.

Oviger 10-segmented. Segment 2 as long as segment 4; segment 5 slightly shorter, armed with recurved spines; segment 7 with 2 simple spines; segments 8 to 10 with compound spines, according to the formula 2:1:2. Each compound spine lanceolate, provided with 3 or 4 lateral teeth. No terminal oviger claw.

Legs rather slender. Coxa 1 with a strong armature, consisting of tall tubercles or curved spurs, usually 2 distal ones, 1 or 2 anterior ones, and 1 or 2 posterior ones. Genital process on coxa 2 of legs 3 and 4 inconspicuous. The femoral cement gland opens through a dorsal, subdistal, tapering, chimney-shaped process. Tibiae subequal, bearing some spines. Tarsus short. Propodus curved, with 3 larger heel spines, and about 8 smaller, irregularly sized, sole spines. Claw slender; auxiliary claws about 3/5 of the main claw.

Female : armature of the mid-dorsal line and the cephalic hood as in male. Spurs on lateral process 1 as in male, only smaller; on lateral processes 2 and 3 only 2 distal spurs are present. On the first coxa of P1 to P4 only 2 distal spurs are present. Genital openings on all legs. Femur slightly swollen, of course without cement gland duct. Oviger segment 2 the longest. Segments 7 to 10 with compound spines, according to the formula 2:2:1:2.

Measurements (in mm).

	♂	♀
Length cephalic somite	0.46	0.53
Length trunk somite 2	0.24	0.26
Length trunk somite 3	0.25	0.26
Length trunk somite 4 (to base of abdomen)	0.14	0.15
Length proboscis	0.75	0.96
Greatest diameter proboscis	0.45	0.55
Width across 2nd lateral processes	0.87	0.99
Third leg— coxa 1	0.23	0.24
coxa 2	0.29	0.40
coxa 3	0.16	0.22
femur	0.81	1.07
tibia 1	0.96	1.26
tibia 2	0.99	1.25
tarsus	0.07	0.08
propodus	0.41	0.52
claw	0.30	0.34
auxiliary claws	0.17	0.21

Remarks.

This is the only species in the genus that shares the presence of mid-dorsal trunk tubercles with a 1-segmented chelifore scape. The *Achelia-like* armature of the lateral processes and first coxae, especially in the male, and the curiously shaped, antler-like anterior processes of the cephalic hood (hence the proposed specific name, *alcicornis),* characterize this species likewise very clearly.

PARANYMPHON SPINOSUM Caullery, 1896 (Fig. 5 d-g).

Paranymphon spinosum Caullery, 1896: 361-362, pl. XII figs. 1-6; Bouvier, 1917; 16-17, pl. III figs. 3-6 (older refs.); Hedgpeth, 1948: 253, fig. 41; Nogueira, 1956: 93-95, refs.); Stock and Soyer, 1965: 415-416; Stock, 1966: 408-409, fig. 1; Nogueira, 1967: 328, pl. XIV; Arnaud, 1973: 150-151; Krapp, 1975: 284.

Material **examined.**

Bay of Biscay:

— 3 specimens; "Polygas" DS 26 (= St. 6), 44°08'2N 04°15'W, 2076m, 1 Nov. 1972.
— 4 specimens; "Biogas" VI — CP 23a (= St. 6), 44°04'6N 04°21'4W, 1980m, 31 Oct. 1974.
— 1 specimen; "Biogas" VI — CP 24 (= St. 6), 44°08'l N 04°16'2 W, 1995m, 31 Oct. 1974. Moreover 1 specimen from CP 24a, same data.
— 2 specimens; "Biogas" VI — DS 86 (= St. 6), 44°04'8 N 04°18'7 W, 1950m, 31 Oct. 1974.
— 5 specimens; "Biogas" VI — DS 87 (= St. 6), 44°05'2N 04°19'4 W, 1913m, 1 Nov. 1974.

Entrance of the English Channel:

— 2 specimens; "Thalassa" Z 416, 48°13'5 N 09"07'5 W, 480m, 24 Oct. 1973.
— 3 specimens; "Thalassa" Z 417, 48°12'0N 09°09'5 W, 865m, 24 Oct. 1973.
— 19 specimens; "Thalassa" Z 420, 48°19'8 N 09°37'8 W, 950m, 24 Oct. 1973.
— 1 specimen; "Thalassa" Z 422, 48°23'0 N 09°39'5 W, 1175m, 24 Oct. 1973.
— 1 specimen; "Thalassa" Z 435, 48°39'7N 09°53'2 W, 1050m, 26 Oct. 1973.
— 1 specimen; "Thalassa" Z 439, 48°42'0N 10°23'4W, 500m, 26 Oct. 1973.
— 1 juvenile; "Thalassa" Z 451, 48°39'3 N 10°36'5 W, 1400m, 28 Oct. 1973.

Remarks.

A variable species. Some specimens have stellate cuticular outgrowths on the lateral processes, like the specimen described and illustrated by Norman, 1908; others have smooth lateral processes. The stellate integumental structures are usually unbranched, but sometimes bi- or even tricuspidate (Fig. 5g in the present paper). The length of the ocular tubercle and of the spurs on the distal

end of the lateral processes are also rather variable; the smaller the specimen, the lower the tubercles. The palp ends into 3 or into 4 short articles. The oviger spines may be simple or bear 1 or 2 lateral teeth. The terminal oviger claw may be smooth or armed with 1 or 2 inner teeth. The number of teeth on the movable finger of the chela fluctuates from 6 to 15, on the immovable finger from 6 to 11 (older, larger specimens usually have more teeth).

I suppose that these "variations" depend on the age of the specimens; at any rate I was unable to split the material taxonomically into different forms, and I thus do consider all the material as a single species.

PANTOPIPETTA *BREVICÁUDA* Stock, 1963.

Refs. — Stock, 1975: 993.

Material examined.

Bay of Biscay:
— 7 ♀, 6 ♂; "Biogas" III — DS 41 (= St. 2), 47°28'3 N 09°07'2 W, 3548m, 26 Aug. 1973.
— 2 ♀, 3 ♂; "Biogas" IV — DS 58 (= St. 2), 47°34'1 N 09°08'2 W, 2775m, 23 Feb. 1974.
— 5 ♀, 1 ♂; "Biogas" VI — DS 74 (= St. 2), 47°33' N 09°07'8 W, 2777m, 21 Oct. 1974.
— 1 ♀; "Biogas" VI — DS 75 (= St. 2), 47°28'1 N 09°07'8 W, 3250m, 22 Oct. 1974.
— 1 ♂; "Biogas" VI — CP 12a (= St. 2), 47°32'5 N 09°11'6 W, 2925m, 22 Oct. 1974.

West Africa, off Annobon Island:
— 1 ♂; "Walda" — CY 22, 00°20'7 S 05°48'4 E, 3244m, 30 July 1971.

Remarks.

Most previous records were the southern hemisphere, although Stock, 1975, recorded the species from the Gulf of Guinea (02°57' N). The present records extend the range to the Bay of Biscay. It seems that this species is a constant inhabitant of the Station 2 area in the Bay.

Turpaeva, 1974, supposed that *P. brevicauda* is a clinal, shallower water, variation of P. *longitnberculata* (Turpaeva, 1955). Apart from the length of the abdomen, the two forms are very similar indeed. The present material is of the typical *brevicauda* morphology (the ratio trunk length / abdomen length is 3.5 for the specimen from "Biogas" VI-CP 12a, 3.6-3.8 for the specimens from "Biogas" VI-DS 74 and DS 41, and 4.0 for the specimen from "Walda" CY 22). This points to some variation in the abdomen length, but no correlation with the depth was apparent, since all the samples recorded above came from a small depth range.

The á cement gland duct in the present material is a slightly more tall and produced cone than in the type-material.

PANTOPIPETTA ARMORICANA n. sp. (Fig. 7).

Material examined.

All from the entrance of the English Channel:

— 1 ♀ (holotype), 1 ♀ (paratype); "Thalassa" Stat. Z 421, 48°22'5 N 09°33'5W, 950m, 24 Oct. 1973.
— 1 ♂ (allGtype), 28 paratypes; "Thalassa" Z 414, 48°05'0N 08°29'8W, 650m, 24 Oct. 1973.
— 2 ♀ ,6 ♂,2 juv.; "Thalassa" Z 413, 48°03'l N 08°29'4W, 805m, 24 Oct. 1973.
— 1 ♀ ,1 ♂; "Thalassa" Z415, 48°07'2N 08°26'2W, 380m, 24 Oct. 1973.
— 1 ♀; "Thalassa" Z416, 48°13'5N 09°07'5W, 480m, 24 Oct. 1973.
— 7 ♀, 3 ♂; "Thalassa" Z417, 48°12'0N 09°09'5W, 865m, 24 Oct. 1973.
— 2 ♀; "Thalassa" Z 422, 48°23'0N 09°39'5W, 1175m, 24 Oct. 1973.
— 1 ♀; "Thalassa" Z 425, 48°27'9N 09°44'0W, 700m, 25 Oct. 1973.
— 1 ♀; "Thalassa" Z 436, 48°39'8 N 09°56'4 W, 1210m, 26 Oct. 1973.

Description.

Trunk completely segmented. Lateral processes not very elongate, separated by intervals twice as wide diameter of each lateral process. Distal end of each lateral process with a very elongate, almost thread-like, dorsal spur. Ocular tubercle extremely tall (often broken off), in intact specimens slightly swollen at the tip; eyes, at least in preserved state, invisible. Abdomen slender, reaching beyond the distal end of coxa 2 of leg 4; an articulation line separates the abdomen from trunk somite 4. Proboscis proximally slightly swollen, tubiform in its remaining part; distal half annulated.

The distal spur on the left lateral process of trunk somite 1 in a female from Stat. Z 421 is aberrant in that its tip is bifid, not unlike the tall of a dolphin (Fig. 7c). Presumeably, this is a malformation caused by a previous injury.

No chelifores. Palp 7-segmented; segment 2 the longest; segment 4 bears 6 spines on its medial margin, two of these spines are hook-like; segment 6 is implanted slightly eccentrically to segment 5; segment 7 is small.

Oviger 10-segmented; segments 4 and 6 elongate. Segments 6 to 10 with compound spines, according to the formula 3:2:2:3. The compound spines are more or less triangular in shape, bearing a few minute denticulations on their proximal margin. Oviger segment 10 is curiously tapering, curved, distally slightly excavated; in the distal excavation, the minute, unarmed terminal claw is lodged.

The legs are slender. Coxa 1 is unarmed; coxa 2 is not very elongate (2 to 2 2/2 times as long as its greatest diameter); coxa 3

bears a very tall, almost thread-like, dorsal spur, and a low, conical, ventral process. Femur smooth, straight, with a strong distal seta. Tibiae subequal in length; tibia 1 with a distal seta, tibia 2 with a subdistal seta; a number of rugosities occur on the ventral margin of the first tibia in particular. Tarsus short, less than twice as long as wide. Propodus more than 6 times as long as the tarsus, slightly curved; sole with some 12 spinules of a size. Length of the claw some 38 % of that of the propodus; inner margin of the claw smooth. No auxiliary claws. Cement gland duct present on the femur of P3 and P4 of the male (very rarely also on P2).

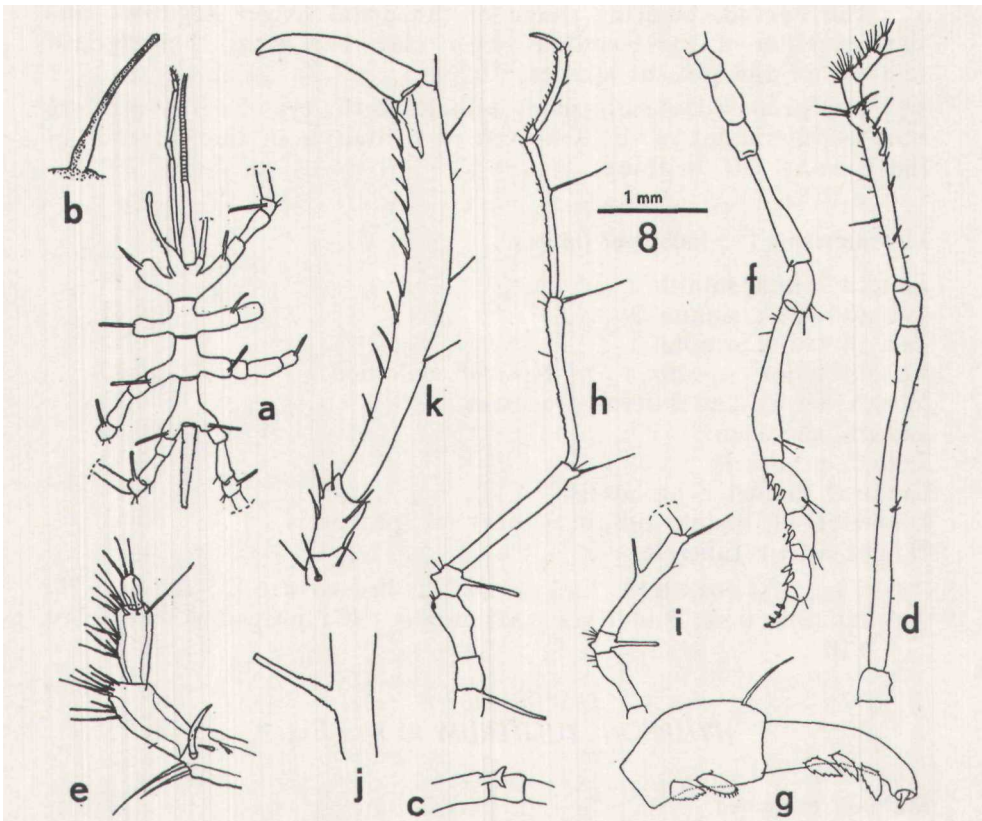

FIG. 7

Pantopipetta armoricana n. sp. (from "Thalassa" Z 241).

a: trunk, dorsal (scale 8); b: ocular tubercle, from the right (free-hand sketch); c: fjrst left lateral process of an aberrant specimen (9); d: palp, ♀ (4); e: distal palp segments, ♀ (5); f: oviger, ♀ (10); g: distal oviger segments, ♀ (13); h: third leg, ♀ (9); i: proximal segments of third leg, ♂ (9); j: cement gland duct of thira leg, ♂ (10); k: distal segments of third leg, ♀ (5).

The ovaries are situated in all trunk segments, all lateral processes, and in the 1st and 2nd coxae of all legs. The eggs in the ovarial tissues are mostly placed in an uniserial arrangement.

In juvenile specimens, the dorsal spurs on lateral processes and 3rd coxae are still low.

Remarks.

The only *Pantopipetta* with 7-segmented palpi is P. *aconae* Hedgpeth and McCain, 1971, wich differs clearly from the present species by the possession of a pair of dorsal spurs on coxa 1, whereas the spurs on the lateral processes and the third coxae are short.

The only *Pantopipetta* that has long spurs on the lateral processes is *P. capensis* (Barnard, 1946) in which, however, the long spurs are confined the lateral processes 2 to 4, whereas in the present species a long spur is also found on lateral process 1.

The curved, tapering shape of the distal oviger segment, and the reduction of the terminal oviger claw are other characteristic features of the present species.

The proposed specific name alludes to the type-locality *(armoricana* = inhabitant of the sea-coast of Brittany), in the entrance of the Channel off Brittany.

Measurements (♀, holotype) (in mm).

Length trunk somite 1	0.28
Length trunk somite 2	0.31
Length trunk somite 3	0.32
Length trunk somite 4 (to base of abdomen)	0.43
Width across 2nd lateral processes	0.95
Length abdomen	0.54
Length proboscis	1.59
Greatest diameter proboscis	0.13
Diameter of distal, tubiform part of proboscis	0.055
Height ocular tubercle	0.78

Third leg: 1st coxa 0.18; 2nd coxa 0.32; 3rd coxa 0.13; femur 0.78; 1st tibia 0.82; 2nd tibia 0.82; tarsus 0.07; propodus 0.43; claw 0.16.

NYMPHON TUBIFERUM n. sp. (Fig. 8).

Material examined.

Off Portugal:
— 1 ♂ (holotype); "Thalassa" Stat. Y 407, 40°33'5N 09°24'0W; 740m; soft mud, sandy and granular, numerous broken shells; Sep. 1972.

Description.

Trunk completely segmented, without tubercles or major setae. Neck widened anteriorly; oviger implantation well in front of the first pair of lateral processes. Lateral processes slender, narrow, unarmed; separated by a distance much greater than their own diameter. Abdomen reaching to the end of coxa 1 of leg 4. Ocular tubercle pointing foreward; distally bifid; at the base of the distal fork, a small dorsal swelling is visible; eyes are not found in the preserved specimen.

Proboscis straight, of type C'''

Chelifore scape slender, armed with a few short setules. Chela slender, slightly longer than the scape; palm rectangular in outline, almost glabrous; fingers longer than the palm, slightly curved, dis-

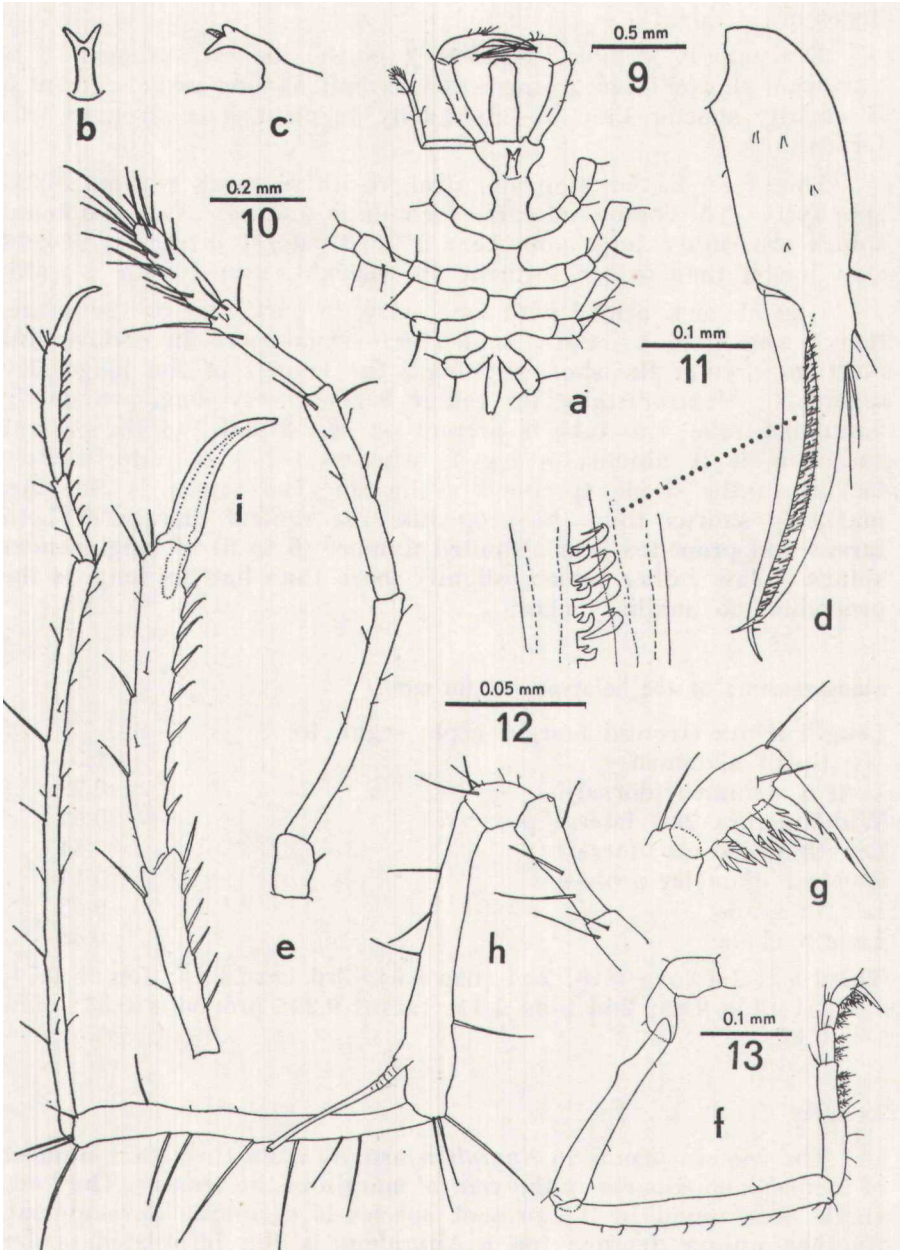

FIG. 8

Nymphon tubiferum n. sp., ♂ (from "Thalassa" Y 407).

a: trunk, dorsal (scale 9); b: ocular tubercle, dorsal (10); c: ocular tubercle, from the left (10); d: chela (11), with some of the proximal teeth more strongly enlarged (12); e: palp (5); f: oviger (10); g: distal portion of oviger (13); h: third leg (4); i: distal segments of third leg (5).

tally crossing; both fingers with about 25 major teeth; on the immovable finger the major teeth are almost straight, spiniform, and alternate with much smaller, needle-like accessory teeth; on the movable finger, the teeth are hook-like, with an acessory tooth at the proximal side of their base (the distalmost teeth on the movable finger are straight).

The palp is slender; segment 2 is the longest; segment 3 is somewhat shorter than 2; segment 4 is half as long as 2; segment 5 is slightly shorter than 4. Especially segment 5 is strongly setiferous.

The oviger has an elongate, straight 5th segment, without distal apophysis. The compound spine formula is 4:3:2:4. The compound spines are rather large, and bear 2 or 3 lateral denticles. Distal claw longer than oviger segment 10, straight, armed with 4 teeth.

Legs slender, armed with long setae, in particular on the coxae, femur, and tibia 1. Coxa 2 slender; sexual pore in distoventral position. Femur the shortest, tibia 2 the longest of the longer leg segments. Ventrodistally, the femur bears a very long, proximally annulated, tube; this tube is present on legs 2 and 3 of the present specimen, it is absent on leg 1, whereas leg 4 is unfortunately lacking in the single specimen available. The tarsus is elongate, markedly shorter than the propodus; the ventral margin of both tarsus and propodus bear a limited number (6 to 8) of long, slender spines. Claw rather robust, slightly more than half as long as the propodus; no auxiliary claws.

Measurements of the holotype ***{$)*** **(in mm).**

Length trunk (frontal margin ceph. segm. to tip of abdomen)	1.34
Length abdomen (dorsal)	0.28
Width across 2nd lateral processes	0.62
Length proboscis (dorsal)	0.44
Greatest diameter proboscis	0.14
Length scape	0.43
Length chela	0.48

Third leg: 1st coxa 0.18; 2nd coxa 0.34; 3rd coxa 0.13; femur 0.74; 1st tibia 0.88; 2nd tibia 1.41; tarsus 0.20; propodus 0.33; claw 0.17.

Remarks.

The cement glands in *Nymphon* usually open through a number of inconspicuous pores on the ventral margin of the femur. The long, single duct found in the present species is a unique development. Another unique feature for a *Nymphon* is the bifurcated ocular tubercle, although similar developments are known from certain other deep-sea species (e.g. *Scipiolus bifidus* Stock, 1968, *Pallenopsis bicuspidatus* Stock, 1968, *Cilunculus antillensis* Stock, 1955). In using the key to the uniunguiculate species of *Nymphon* (vide Stock, 1965), the present species keys out with *N. longicoxa* Hoek,

1881 and *N. prolatum* Fage, 1942. After 1965, one more species sharing the same characters has been described, viz. *N. puellula* Krapp, 1973.

N. longicoxa has naked legs, and has numerous small spinules on the tarsal and propodal soles. iV. *prolatum* has a longer abdomen than the present species, and is oculate. *N. puellula* has a differently armed chela, more numerous oviger spines, whereas the compound spines itself have about 5 lateral denticles.

NYMPHON LATEROSPINUM Stock, 1963 (Fig. 9 a-d).

Stock, 1963: 322-323, fig. 1.

Material examined.

All from the Bay of Biscay:

— 1 ♀,1 juv.; "Polygas" — DS 20 (= St. 3), 44°33'N 09°36'7W, 4226m, 24 Oct. 1972.
— 2 juv.; "Biogas" IV — DS 55 (= St. 3), 47°34'9 N 09°40'9W, 4125m, 22 Feb. 1974.
— 1 juv.; "Biogas" IV — DS 56 (= St. 3), 47°32'7N 09°28'2W, 4050m, 23 Feb. 1974.
— 1 ♀; "Biogas" IV — DS 60 (= St. 2), 47°26'8N 09°07'2W, 2742m, 24 Feb. 1974.
— 12 specimens; "Biogas" VI — DS 76 (= St. 3), 47°34'8 N 09°33'3W, 4228m, 23 Oct. 1974.
— 1 ♂, 1 9, 1 juv.; "Biogas" VI — DS 77 (= St. 3), 47°31'8 N 09°34'6W, 4240m, 24 Oct. 1974.
— 1 juv.; "Biogas" VI — CP 14a (= St. 3), 47°32'N 09°35'9W, 4237m, 23 Oct. 1974.
— 1 young 9; "Biogas" VI — CP 15 (= St. 4), 46°32'2N 10°28'5 W, 4715m, 25 Oct. 1974.
— 1 juv.; "Biogas" VI — CP 25a (= St. 6), 44°05'N 04°27'W, 1894m, 1 Nov. 1974.

Remarks.

This species was described after a single specimen, a male, caught at a depth of 1500-1580 fathoms in the Atlantic Ocean off Saldanha Bay, South Africa. The present records thus constitute an enormous extention of the known range (parenthetically, *Pantopipetta brevicauda* Stock, 1963, found together with *Nymphon laterospinum* at its type-locality, also turned up in the present collections).

The material from the Bay of Biscay shows some slight differences from the holotype: the spurs on the lateral processes are heavier than in the type; on the frontal margin of the neck, one may find a minute tubercle, but no real spur as in the type. In young specimens, the cephalic somite is (at the level of the oviger implantation) dorsally swollen and provided with 2 minute papillae (Fig. 9a). No doubt, this swelling is a vestige of an ocular tubercle.

In the adult female from "Biogas" IV — DS 60, these papillae are not visible; this female resembles in this respect the male holotype.

The female sex is recorded here for the first time; the swollen femora (Fig. 9c), containing the ripening eggs, are the most typical for this sex.

The species has a wide bathymetrical range in the Bay of Biscay: 1894 (St. 6) to 4715 m (St. 4).

In addition to the two *Nymphon* species described above, the collections contain at least four other *Nymphon* species, all unfortunately in fragmentary condition, which will be recorded in the sequel as *Nymphon* spec. 1 through 4.

NYMPHON spec. 1 (Fig. 9 e-j).

Material.

Bay of Biscay:

— 1 ♂ ovig., 1 ♀ (both fragmentary); "Biogas" V — DS 65 (= St. 1), 47°36'1N 08°40'5W, 2360m, 15 June 1974.

Remarks.

Two specimens, lacking all the legs, of a curious *Nymphon* deserve special mention. They have no ocular tubercle, but the anterior part of the neck is slightly swollen and bears 2 feebly pigmented (in preserved state yellowish), rounded patches and 2 tubercles. I presume the rounded patches are the reduced anterior eyes; a similar case (although perhaps the ocular tubercle is slightly better developed) is found in *Heteronymphon bioculatum* Turpaeva, 1956.

Turpaeva, 1970, discussed the delimitation of the genus *Heteronymphon* against *Nymphon.* In her opinion there are two characters distinguishing *Heteronymphon,* viz. the anterior implantation of the ocular tubercle (or of the rudiments thereof) and the absence, or reduction to an unarmed structure, of the terminal oviger claw.

The present specimens tend to bridge the gap between *Heteronymphon* and *Nymphon:* the anterior position of the rudimentary ocular tubercle is a *Heteronymphon* character, but the oviger claw is present, and bears 2 rows of small teeth, and resembles in this respect more closely a *Nymphon.* Parenthetically, all species belonging to *Heteronymphon* sensu Turpaeva (1970) agree with one another in having the 2nd palp segment considerably shorter than the third. Although this is not a character of generic value, it should be stressed that the present specimens do not show this condition.

I include a number of illustrations of the "Biogas" material. I presume it represents a new species, but since the specimens are so mutilated, being devoid of all legs, I refrain from naming them.

All important characters are shown in the figures, except for the chelar armature (about 17 small, triangular teeth of a size

on each finger) and the oviger special spine formula (8:6:6:6). The measurements (in μm) of the ovigerous male are as follows : Length proboscis (dorsal) 698; greatest diameter proboscis 262; length scape 921; length chela 469; length 1st trunk somite 1015; length

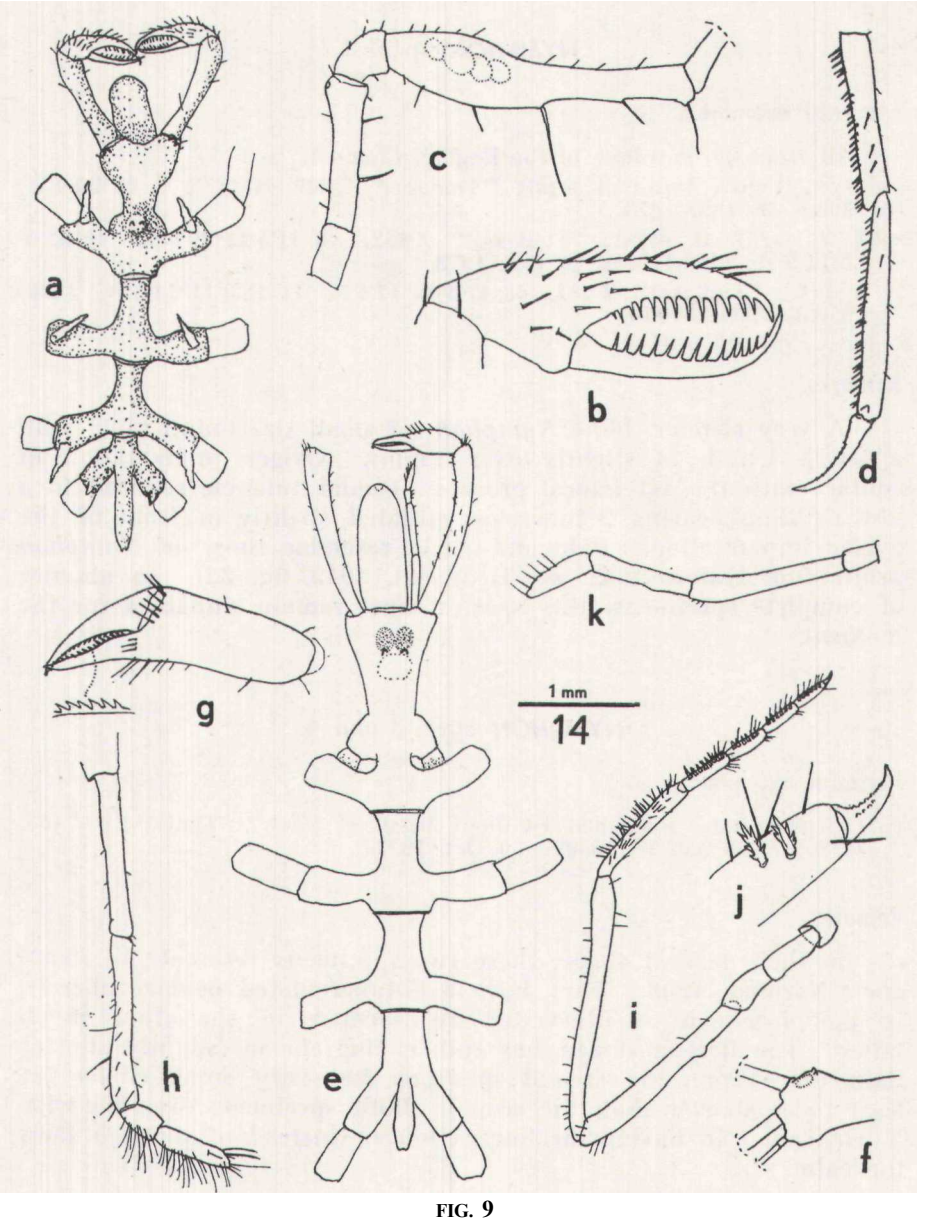

FIG. 9

a-d, *Nymphon laterospinum* Stock, 1963 (a, b, and d from "Biogas" VI — CP 15, c from "Biogas" IV — DS 60).
a: trunk, young ♀ (scale 14); b: chela, young ♀ (10); c: proximal leg segments, adult ♀ (14); d: distal segments of third leg, young ♀ (6).
e-j, *Nymphon* spec. 1 (from "Biogas" V — DS 65).
e: trunk, ♂, dorsal (scale 9); f: frontal part of cephalosome, ♂, from the left (free-hand sketch); g: chela, ♂ (10), some of the teeth more strongly enlarged; h: palp, ♂ (10); i: oviger, ♂ (9); j: distal portion of oviger, ♂ (11).
k, *Neonymphon* spec, ♂ (from "Biogas" VI — CP 23a), palp (scale 10).

2nd trunk somite 515; width across 2nd trunk somite 515; length 3rd trunk somite 487; length 4th trunk somite (to tip of abdomen) 704; length abdomen 513.

NYMPHON spec. 2.

Material examined.

All from the entrance of the English Channel:

— 1 ♂,1 juv. (without legs); "Thalassa" Z 429, 48°28'0N 09°50'0W, 1300m, 25 Oct. 1973.

— 1 ♂ (without legs); "Thalassa" Z 452, 48°41'5-48°39'0 N, 10°53'0-10°55'2W, 1420-1470m, 28 Oct. 1973.

— 1 juv.; "Thalassa" Z 447, 48°47'3-48°47'4 N, 11°12'0-11°14'3 W, 1430-1550m, 27 Oct. 1973.

Remarks.

A very slender, blind *Nymphon,* of small size (adult male with a trunk length of slightly over 2 mm). Oviger implantation in contact with the 1st lateral process. Ocular tubercle reduced to a low swelling bearing 2 tubercles, situated slightly in front of the oviger implantation. Palp and chela resemble those of *Nymphon profundum* Hilton, 1942 (see Hedgpeth, 1949, fig. 33). In absence of complete specimens, this species must remain unnamed for the moment.

NYMPHON spec. 3 and 4.

Material examined.

— 1 fragmentary specimen (without legs) of each; "Thalassa" Z 435, 48°39'7N 09°53'2 W, 1050m, 26 Oct. 1973.

Remarks.

In their general shape, these two specimens resemble *N. stenocheir* Norman, 1908. They have a bi-tuberculated ocular tubercle, in one specimen as illustrated by Norman, in the other much taller. The first specimen has rather long chelae (slightly shorter than the scape), the second specimen has very small chelae (at least twice shorter than the scape). Both specimens disagree with *N. stenocheir* in having the fingers longer (instead of shorter) than the palm.

NEONYMPHON spec. (Fig. 9k).

Material examined.

Bay of Biscay:

— 1 ♂ (without legs); "Biogas" VI — CP 23a (= St. 6), 44°04'6 N 04°21'4W, 1980m, 31 Oct. 1974.

Remarks.

There is only a single species of *Neonymphon* known, viz. *N. caecum* Stock, 1955, from the West Indies. The present specimen is certainly different from *N, caecum,* but since it is devoid of all its legs, I will refrain from naming it. The shape of the body is very similar to that of *Nymphon* spec. 1, described above. The two anterior eyes are situated and pigmented as in that species; the two minutes tubercles are also present. In *N. caecum* the rudiments of the ocular tubercle are placed more posteriad, over the oviger bases.

The most noteworthy character of the present specimen is the 4-segmented palp (Fig. 9k), a generic character. The oviger has a terminal claw, and resembles closely that of *Nymphon* spec. 1. It is possible that the specimen belongs to that species but has a mutilated palp.

CALLIPALLEN E PRODUCTA (Sars, 1888), s. str.

Refs.: Stock, 1952.

Material examined.

Entrance of the English Channel:

— 1 ♀; "Thalassa" Z 447, 48°47'3-48°47'4 N 11°12'-11°14'3 W, 1430-1550m. 27 Oct. 1973.

— 1 ♂ (probably this species, legs lacking); "Thalassa" Z 400, 47°33'4 N 07°19'0W, 1175m, 22 Oct. 1973.

— 1 ♂ (probably this species, legs lacking); "Thalassa" Z 459, 48°37'3 N 09°53'0W, 1180m, 29 Oct. 1973.

This species is widely distributed, especially in deeper waters, of the northern Atlantic.

CALLIPALLENE ACUS (Meinert, 1898).

Refs.: Stock, 1964: 46, fig. 1.

Material examined.

Entrance of the English Channel:

— 19 specimens; "Thalassa" Z 429, 48°28'0 X 09°50'0W, 1300m, 25 Oct. 1973.

— 1 ♀; "Thalassa" Z 430, 48°37'0 N 09°52'2 W, 1080m, 25 Oct. 1973.

Like the foregoing species, widely distributed in abyssal waters of the northern Atlantic.

PALLENOPSIS spec. (aff. *CALCANE A* Stephensen, 1933).

Material examined.

Bay of Biscay:
— 1 specimen without legs; "Biogas" IV — CP 02 (= St. 1), 47°33'2N 08°41'4W, 2177m, 26 Feb. 1974.

Remarks.

Arnaud (1973) records two species of the *calcanea-complex* from the Bis of Biscay, viz. P. *juttingae* Stock, 1964 and *P. scoparia* Fage, 1956. The chela of the present specimen has regularly curved fingers without distal notch, and thus agrees better with P. *calcaneo* Stephensen, 1933, than with *juttingae* or *scoparia.* The legs, which offer a number of distinctive characters, are lacking in the specimen at hand, so a certain identification is excluded.

ANOPLODACTYLUS PETIOLATUS (Kröyer, 1844).

Refs.: Hedgpeth, 1948: 222; taxonomic characters see Stock, 1975: 1072.

Material examined.

All from the entrance of the Channel:
— 4 ♂; "Thalassa" Z 415, 48°07'2 N 08°26'2 W, 380m, 24 Oct. 1973.
— 1 ♂ juv.; "Thalassa" Z 416, 48°13'5 N 09°07'5W, 480m, 24 Oct. 1973.
— 1 ♂, 2 ♀; "Thalassa" Z417, 48°12'0N 09°09'5W, 865m, 24 Oct. 1973.
— 1 ♂ juv.; "Thalassa" Z 427, 48°27'0N 09°48'4W, 380m, 25 Oct. 1973.
— 1 ♀; "Thalassa" Z 457, 48°38'2N 09°52'6W, 800m, 29 Oct. 1973.
— 1 ♀; "Thalassa" Z 459, 48°37'3N 09°53'0W, 1180m, 29 Oct. 1973.

This species has a wide range in the Atlantic Ocean in particular; also its bathymetrical range is considerable — from the intertidal zone to abyssal depths.

ANOPLODACTYLUS OCULATUS Carpenter, 1905

Carpenter, 1905: 4-5, pl. II figs. 7-11.

Material examined.

All from the entrance of the Channel:
— 1 ♂ juv., 3 larvae; "Thalassa" Z 420, 48°19'8 N 09°37'8W, 607m, 24 Oct. 1973.
— 1 ♀ juv.; "Thalassa" Z 425, 48°27'9 N 09°44'0 W, 700m, 25 Oct. 1973.
— 1 larva; "Thalassa" Z 428, 48°27'2N 10°49'7W, 850m, 25 Oct. 1973.
— 1 ♀; "Thalassa" Z 434, 48°40'7N 09°54'1 W, 720m, 26 Oct. 1973.

This species was recorded only once before, off Ireland, 306 fms.

ANOPLODACTYLUS ARNAUDAE n. **sp.** (Fig. **10).**

Material examined.

All from the entrance of the English Channel:

— 1 ♂ (holotype); "Thalassa" Stat. Z 426, 48°28'2 N 09°39'1 W, 860m, sandy mud, 25 Oct. 1973.
— 1 ♀ (allotype), 2 juv.; "Thalassa" Z 398, 47°36'0 N 07°16'8 W, 330m, fine sand with large shells, 22 Oct. 1973.
— 1 ♂ juv.; "Thalassa" Z 397, 47°33'8 N 07°12'6 W, 511m, 22 Oct. 1973.
— 1 ♀ juv.; "Thalassa" Z 425, 48°27'9 N 09°44'0 W, 700m, 25 Oct. 1973.

Description.

Male: Trunk with 2 segmentation lines, somites 3 and 4 fused. Neck long and narrow, unarmed. Lateral processes separated by slightly less than their own diameter; distally armed with 1 (lat. proc. 1) or 2 (lat. proc. 2 to 4) distal tubercles. Abdomen erect, shorter than the 4th lateral process. Base of the neck widened into the oviger implantation. Ocular tubercle highly conical; eyes well-pigmented.

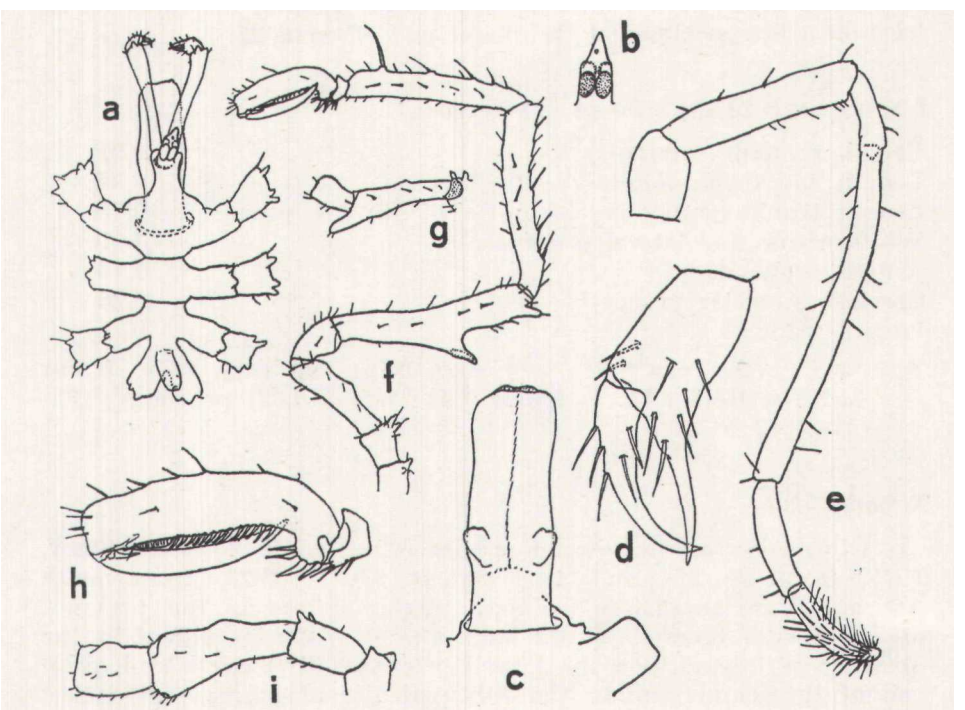

FIG. 10

Anoplodactylus arnaudae n. sp. (♂ from "Thalassa" Z 426, ♀ from "Thalassa" Z 398).

a: trunk, ♂, dorsal (scale 14); b: ocular tubercle, ♂, front view (free-hand sketch); c: proboscis, ♀, ventral (9); d: chela, ♂ (7); e: oviger, ♂ (6); f: second leg, ♂ (14); g: coxae of fourth leg, ♂ (14); h: distal segments of second leg. ♂ (6); i: lateral process and coxae of fourth leg, ♀ (9).

Proboscis straight, of type B'''.

Chelifore scape slender, distally armed with 2 spinules and 1 tubercle. Chela with curved, gaping fingers; several strong, spiniform setae are inserted both on the palm and on the proximal part of the fingers. Fingers slightly longer than the palm.

No palps. Oviger with very elongate 3rd segment; segments 4 and 5 subequal; segment 6 small, knob-like; segments 5 and 6 armed with numerous stiff, reversed setae.

Legs: The holotype has only the 2nd left leg completely intact. The first coxa distally bears 4 tubercles. The 2nd coxa is more elongate in legs 3 and 4 than in legs 1 and 2; the two posterior pairs of legs bear a long genital spur. Femur of all legs with a very heavy, almost triangular, cement gland cone; distal end of femur with a low spur and 2 small tubercles. Propodus without distal spur; heel strong, armed with 2 stronger and 2 feebler spines; sole with some 13 curved spines in front of a small but distinct lamina; claw long; auxiliary claws present but rudimentary.

Female: Articulation line between trunk somites 3 and 4 present. Tubercles on lateral processes and first coxae almost as strong as in male. Ocular tubercle slightly less pointed above the eyes. Proboscis with 2 ventral outgrowths. Lateral expansion of the neck with a tubercle (rudiment of a palp). Genital openings on all legs, on a low swelling at the distal end of coxa 2.

Measurements of the holotype (♂) (in mm).

Length cephalic somite	0.91
Length 2nd trunk somite	0.34
Length trunk somites 3+4 (to tip of 4th lat. proc.)	0.75
Width across 2nd lateral processes	1.19
Length proboscis	1.16
Greatest diameter proboscis	0.36
Length scape	0.75

Second leg: 1st coxa 0.31; 2nd coxa 0.76; 3rd coxa 0.35; femur 1.51; 1st tibia 1.44; 2nd tibia 1.41; tarsus 0.09; propodus 0.85; claw 0.63.

Remarks.

Obviously, this deep-water species is related to *A. iuleus* Stock, 1975, from Florida, and *A. pelagicus* Flynn, 1928, from South Africa. From the latter the new species differs in the presence of a propodal lamina. From both, the new species differs in the presence of tubercles on the lateral processes, first coxae and distal end of the femur, and in the subequal size of oviger segments 4 and 5 (5 much shorter than 4 in the other two species).

From the *Anoptodactylus* species with a distal femoral spur (cf. Stock, 1975) the present taxon can be differentiated at once by the presence of a propodal lamina.

Superficially, the new species resembles *A. oculatus* Carpenter,

1905, recorded like the present form from deep waters in the North-Eastern Atlantic Basin, but *oculatus* also lacks a propodal lamina, and has a quite different cement gland, that opens through several pores instead of through a well-defined cone.

Finally, there is a certain resemblance to the circumtropical shallow water species *A. portus* Calman, 1927, which has like the the present species, ventral outgrowths on the S proboscis, rudimentary palps in 9, and a chimney-like cement gland opening. In *A. portus* the gland opening is shorter, however, whereas the 9 genital spurs are longer; its propodus is less elongate and has a very short lamina only.

It is possible that the present species is the same as the single female, recorded by Arnaud 1974, from the Azores in a depth of 600 m, under the provisional name of *Anoplodactylus* cf. *digitatus* (Böhm).

It is a pleasure to dedicate this species to Madame Françoise Arnaud, of Marseille, in recognition of her work on the taxonomy of the Pycnogonida.

Summary

Twenty-five species of Pycnogonida are recorded from depths between 330 and 4715m in the Atlantic Ocean off the coasts of France and the Iberian Peninsula. Seven species are new to science, several others are new to this part of the world. Genera never recorded before from European waters are *Cilunculus,* with two species, and *Pantopipetta,* likewise with two species.