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Faunistic transit between the Atlantic and the Mediterranean : the deep-water Pycnogonida

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Abstract : Twenty species of Pycnogonida (and some unidentifiable specimens) are recorded from deeper waters (135-2110 m) on both sides of the sill of Gibraltar (Alboran Sea, Straits of Gibraltar and the Ibero-Moroccan Bay). The biogeography of these taxa is discussed in relation to the distribution of the outflow of Mediterranean waters into the Atlantic.

Résumé : Vingt espèces de Pycnogonides (et quelques exemplaires non-déterminables) ont été signalées des eaux profondes (135-2110 m) aux deux côtés du seuil de Gibraltar (mer d'Alboran, détroit de Gibraltar et golfe ibérico-marocain). On discute la biogéographie de ces taxa en relation avec l'influence de l'écoulement d'eau méditerranéenne en Atlantique.

INTRODUCTION

Apart from one paper by Munilla (in press) nothing is known about the pycnogonid fauna of the Straits of Gibraltar. Munilla's work is restricted to mediolittoral and shallow-water taxa (0-12 m). The present collections, from deeper waters (135-2110 m), form an excellent complement to Munilla's study. The material treated in the present paper was collected in May-June 1984 aboard R/V "Cryos" during the cruise BALGIM, conducted for the Centre national de la recherche scientifique (PIROCEAN), under the direction of Dr. P. Bouchet. It has been sorted by the Centre national de tri océanographique (CENTOB), Brest. The objectives of the BALGIM project are a study of (1) the faunistic transit between the Atlantic and the Mediterranean, and (2) the correlation between the composition of the benthic fauna and the origin of water masses, more in particular of the mid-water outflow of Mediterranean waters, over the sill of Gibraltar, into the Atlantic.

The gear used during the BALGIM 84 project consisted of a rock dredge (abbreviated DR in the station lists), an epibenthic Warren dredge (DW), and a beam trawl (CP).

A few samples from the Bay of Biscay, collected during the cruise EPI I (O/V "Suroît"), organized by the INFREMAR-Centre, Brest, are included in this paper as well.

TAXONOMIC PART

Family Ammotheidae

Achelia echinata Hodge, 1864

2♀, BALGIM DR 42: 35° 54.5'N 06° 13.3'w, 135 m, shelly sand, 2 June 1984.- 1♂, DW 43 : 35° 54.1' N 06° 14.5' W, 150 m, shelly sand, 2 June 1984.

A common medio-littoral and shallow-water species, from Norway to the Canary Islands in the Atlantic, and in the Mediterranean. One of the more common species in shallow waters of the Straits of Gibraltar (Munilla, in press).

Ascorhynchus pudicum Stock, 1970

Stock, 1970: 6-7 figs. 1-7 ; Rack, 1971: 112.

2 specimens, BALGIM DW 43 : 35° 54.1' N 06° 14.5' W, 150 m, shelly sand, 2 June 1984.

This species has been found only once before (the citation by Rack is in a list of type material present in the Hamburg Museum), viz. at "Meteor" Stn. 132, Josephine Bank (36° 40.0'N 14° 17.7'W), 256 m. It is unknown from the Mediterranean.

Ascorhynchus spec.

1 juv., BALGIM DW 142: 35° 56.6' N 03° 06.4' W, 167 m, debris of shells and foraminifera, 16 June 1984.

A juvenile in this large and difficult genus must remain unidentified.

Cilunculus ?europaeus Stock, 1978

Stock, 1978 a : 198-201, figs. 4, 5a-c.

1 fragmentary specimen, BALGIM CP 109 : 36° 14.5' N 07° 56.4' W, 1200 m, foraminifera, ahermatypic corals, pteropods, 10 June 1984.

All previous records are from the Bay of Biscay and the entrance of the English Channel, 660-1175 m, so the present record extends the range to W. of Gibraltar.

Paranymphon spinosum Caullery, 1896

Stock, 1978 a : 204-205, fig. 5d-g (refs.) ; Child, 1982: 18-19 ; Sorbe, 1982: 15 ; Bamber, 1983 : 69, figs. 2, 3B ; Stock, 1986 : 413, fig. 4.

5 specimens, BALGIM DW 07: 36° 46.1'N 09°27'W, 1141 m, shell debris, foraminifera, pteropods, 29 May 1984.- 3 specimens, DW 16: 36° 45.8'N 09° 29.4'W, 1283 m, bottom as in DW 07, 30 May 1984.- 1 specimen, DR 23 : 36° 38.8' N 07° 19.5' W, 556 m, shell debris and pteropods, 31 May 1984.- 1♀, DW 24: 36° 41.1'N 07° 19'W, 545 m, shell debris and pteropods, 31 May 1984.- 5 specimens, CP 25: 36° 41.5'N 07° 19.4' W, 544 m, same bottom as DW 24, 31 May 1984.- 2 specimens, DW 27:

36° 46.3' N 07° 07.3' W, 370 m, shell debris and foraminifera, 31 May 1984.- 1 specimen, DW 28: 36° 45.8' N 07° 07.7' W, 398 m, bottom as in DW 27, 31 May 1984.- 1 specimen, CP 34: 36° 48.8' N 07° 04.9' W, 180 m, shelly sand, 1 June 1984.- 1 specimen, DR 45: 35° 44.1'N 06° 17.4'W, 293 m, shelly sand and pteropods, 2 june 1984.- 1 specimen, DW 47: 35° 43.5' N 06° 18.2' W, 281 m, shelly sand, 2 June 1984.- 3 specimens, DW 53: 35° 41' N 06° 30.5 W, 364 m, pteropod and foraminifera mud, 3 June 1984.- 2 specimens, DR 56: 35° 41.4'N 06° 35.8', 481 m, shelly sand, pteropods, 3 June 1984.- 1 specimen, DR 71: 33° 52.1'N 08°07.4'W, 155 m, shell debris, 6 June 1984.- 21 specimens, DW 74: 33° 52.1'N 08° 12.8'W, 181 m, fine and shelly sand, 6 June 1984.- 4 specimens, DR 81: 33° 45.9'N 08° 29.9'W, 309 m, shell debris, 6 June 1984.- 1 specimen, CP 86: 34° 15.1'N 07° 21'W, 512 m, shell debris, 7 June 1984.- 4 specimens, DW 87: 34° 15.6' N 07° 17.9' W, 500 m, shell debris and foraminifera, 7 June 1984.- 3 specimens, DW 88: 34°20.1'N 07° 18.6'W, 740 m, foraminifera, pteropods, 7 June 1984.- 1 specimen, CP 90: 34°21.4'N 07° 23.6'W; 890 m shells, pteropods, hexactinia, 7 June 1984.- 1 specimen, CP 91: 34° 22.3' N 07° 25.1' W, 948 m, same bottom as in CP 90, 7 June 1984.- 1 specimen CP 109: 36° 14.5' N 07° 56.4' W, 1200 m, foraminifera, pteropods, aharmatypic corals, 10 june 1984.- 3 specimens, CP 155 : 36° 19.8' N 07° 40.6' W, 903 m, shells, foraminifera, pteropods, 18 June 1984.- 2 specimens, DW 159: 36° 14.9'N 08°02.5'W, 1360 m, bottom as in CP 155, 18 June 1984.- 12 specimens, CP 160: 36° 14.6'N 08°00.9'W, 1350 m, same bottom as in CP 155, 18 June 1984.

Widely distributed in the northern Atlantic (385-2300 m) and western Mediterranean (67-1180 m). All the above records are Atlantic. Why the species occurs in shallower waters in the Mediterranean is at the moment an unsolved question.

Rhynchothorax mediterraneus Costa, 1861

Costa, 1861: 8-9, Pl. I; Dohrn, 1881: 90, 98, 117-120, 211-215, Pl. XVII figs. 1-9; d'Arcy Thompson, 1901: 55 ; d'Arcy Thompson, 1909: 535, figs. 271, 284 ; Arnaud, 1972: 408-409 ; Stock, 1974 : 15, fig. 3 ; Arnaud, 1976 : 70.

3 specimens, BALGIM DR 42 : 35° 54.5' N 06° 13.3' W, 135 m, shelly sand, 2 June 1984.

A most characteristic species, known from several stations in the Mediterranean (Naples, Aegean Sea, Corsica, N. Africa, Marseille) and one in Madagascar. Records from the coast of Brazil (Zilberberg, 1963 ; Zago, 1970) may involve other species of the genus *Rhynchothorax*.

The present BALGIM record, just W of the Straits of Gibraltar, is the first from the eastern Atlantic Ocean.

Family Colossendeidae

Colossendeis angusta Sars, 1877

Fry & Hedgpeth, 1969: 52-53, figs. 7, 8 (refs.) ; Losina-Losinsky, 1964: 336 ; Daniel & Sen, 1980 : 165 ; Child, 1982: 50-51; Bamber, 1983 : 70-71.

2 specimens, BALGIM CP 65 : 35° 26 .5' N 07° 59.9' W, 1805 m, foraminifera and pteropod mud, 4 June 1984.- 1 specimen, CP 66: 35°21.3'N 08° 10.5'W, 2110 m , foraminifera and pteropod mud, 5 June 1984.

World-wide in abyssal waters ; in the High Arctic in (much) shallower waters (12-18 m) (Fry & Hedgpeth, 1969). Not known from the Mediterranean.

Colossendeis arcuata A. Milne Edwards in Filhol, 1885

Stock, 1978 b: 403-405, fig. 1 g-j (refs., syn.) ; Bamber, 1983: 71-72, fig. 5; Stock, 1984: 745; Stock, 1986: 417-418.

1 specimen, BALGIM CP 68: 35° 11.9' N 07° 52.6'W, 2035 m, foraminifera and pteropod mud, 5 June 1984.- 1 specimen, CP 98 : 34° 28.7'N 07° 41.8'W, 1747 m, shells, foraminifera, pteropods, 9 June 1984.

A northern Atlantic deep-water species, more common in European than in American waters. The northernmost record in Europe is in the English Channel, the southernmost off NW Africa. Not in the Mediterranean.

Colossendeis colossea Wilson, 1881

Bouvier, 1917: 13-16, PL I fig. 2, PL II fig. 1 ; Hedgpeth, 1948: 271-272, fig. 50b ; Fry & Hedgpeth, 1969: 53-54, fig. 8 (refs.) ; Arnaud, 1974: 170 ; Stock; 1975: 987 : Grassle *et al.,* 1975 : 462, 465, 467, fig. 6b ; Stock, 1978 b : 6-7 ; Marshall, 1979 : 204, fig. 88 ; Daniel & Sen, 1980: 165 ; Stock, 1983 : 300.

2 specimens, BALGIM CP 98: 34° 28.7'N 07°41.8'W, 1747 m, shells, foraminifera, pteropods, 9 June 1984.- 3 specimens, CP 99: 34° 28.2'N 07° 43.3'W, 1870 m, pteropods, foraminifera, 9 June 1984.- 2 specimens, CP 106 : 36° 05.5' N 08° 05.2' W, 1906 m, foraminifera, pteropods, 10 June 1984.

A truly bathyal/abyssal species, distributed in all major oceans. Not known from the Mediterranean.

Colossendeis macerrima Wilson, 1881

Fry & Hedgpeth, 1969: 53, figs. 7-8 (refs.) ; Stock, 1975: 985-987, fig. 11 a-b ; Stock, 1978 b : 400-402, fig. 2 m (syn.) ; Daniel & Sen, 1980: 165 ; Stock, 1981: 455 ; Child, 1982: 51 ; Bamber, 1983: 71 ; Stock, 1984 : 746 ; Stock, 1986 : 417.

1 specimen, BALGIM CP 65 : 35° 26.5'N 07° 59.9' W, 1805 m, foraminifera and pteropod mud, 4 June 1984. - 2 specimens, CP 66: 35°21.3'N 08° 10.5' W, 2110 m, foraminifera and pteropod mud, 5 June 1984.- 3 specimens, CP 68: 35° 11.9'N 07° 52.6'W, 2035 m, foraminifera and pteropod mud, 5 June 1984.- 2 specimens, CP 98: 34° 28.7'N 07°41.8'W, 1747 m, shells, foraminifera, pteropods, 9 June 1984.- 2 specimens, CP 99 : 34° 28.2' N 07° 43.3' W, 1870 m, pteropods, foraminifera, 9 June 1984.
1 specimen, EPI CP 39: 47° 32.00' N 08° 38.40' W, 2100 m, 30 March 1984.- 1 juv. (probably this species) EPI CP 38 : 47° 33.75' N 08° 42.15' W, 2100 m, 8 March 1984.

The specimens recorded above belong to the "typical" form of *C. macerrima*. The species is recorded from bathyal and abyssal waters of all major ocean basins, but presumably more than one taxon hides under the collective name "C. *macerrima"*. The species is not known from the Mediterranean.

Rhopalorhynchus atlanticum Stock, 1970 (Fig. 12)

Stock, 1970: 7-9, figs. 8-13 ; Rack, 1971: 113.

1 ? and 1 fragmentary specimen, BALGIM DR 42 : 35° 54.5' N 06° 13.3' W, 135 m, shelly sand, 2 June 1984.

Up to now, only a single specimen, likewise a female, of this species was known. It

was collected by the "Meteor" on the Josephine Bank (36° 40.7' N 14° 15.5' W), in 211-241 m. Femur and tibia 1 of the BALGIM female are slightly more clavate than in the Meteor specimen (fig. 12), probably indicating that the former is in a more advanced stage of maturity.

Family Nyphonidae

Nymphon caldarium n. sp. (Figs. 1-11)

1♂ (holotype), BALGIM DR 40: 36°49.9'N 06°08.6'W, 362m, shelly sand, 2 June 1984.- 1♂, DR 115: 35° 47.5'N 06°04.2'W, 340 m, shelly sand, 11 June 1984.- 2♂, DR 152: 35° 56.7'N 05° 34.7'W, 550 m, rock, corals, 17 June 1984.- 1♂ ,1♀, DR 153: 35° 55.8'N 05° 35.3'W, 580 m, rock, corals, 17 June 1984.

Description.- Trunk with intersegmental lines between segments 1 and 2, and 2 and 3. Neck not very slender, anterior part widened. Ocular tubercle above oviger implantation, low, rounded, eyes well-pigmented. Oviger implantation slightly in front of first lateral process. Lateral processes : length subequal to diameter of trunk ; separated by slightly less than own diameter ; distally with low, knobby tubercle. Abdomen overreaching coxa 1 of leg 4. Proboscis widest in middle, tip truncate.

Chelifore scapes strongly diverging. Chela longer than scape. Fingers almost twice as long as palm. Movable finger with regular row of ca. 32 teeth of uniform size ; immovable finger with ca. 22 larger teeth. Shape and ornamentation of teeth as illustrated.

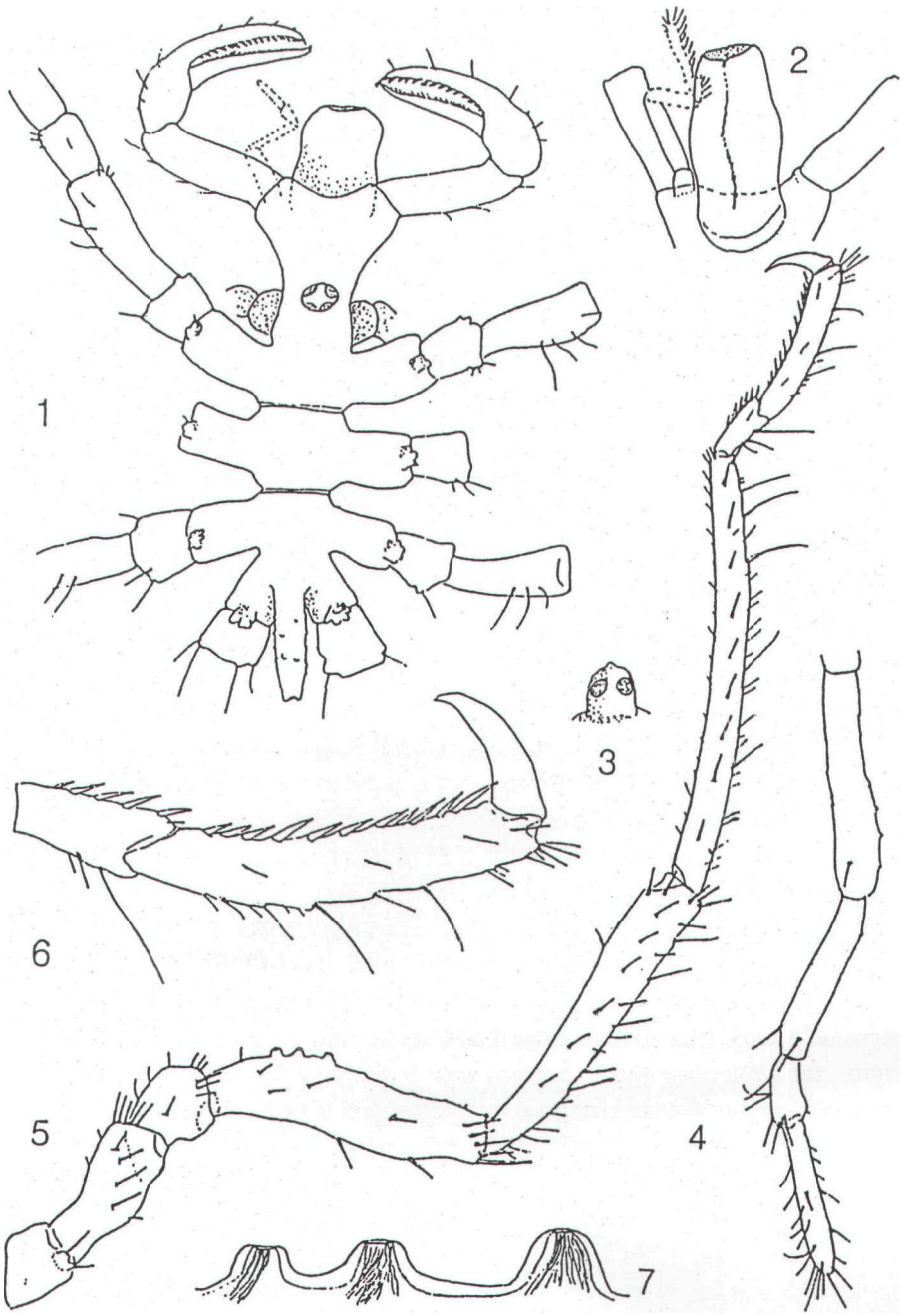
Palp segment 2 longest ; third segm. 75 % of segm. 2 ; segm. 4 shortish ; segm. 5 very elongate (4 + 5 >3). Long setae on segments 4 and 5.

Oviger of male : segm. 5 slightly curved, with row of stiff setae and with small distal apophysis ; segm. 7 to 10 with 6, 4, 3, and 5 compound spines, respectively ; compound spines with 1 or 2 large basal teeth, and 0 or 1 minute teeth on either margin ; terminal claw short, curved, with 6 simple teeth on inner margin. Oviger of female : segm. 5 less elongate, row of setae absent, apophysis absent ; spine formula of distal segments 5 : 3 : 2 : 4 :: 6.

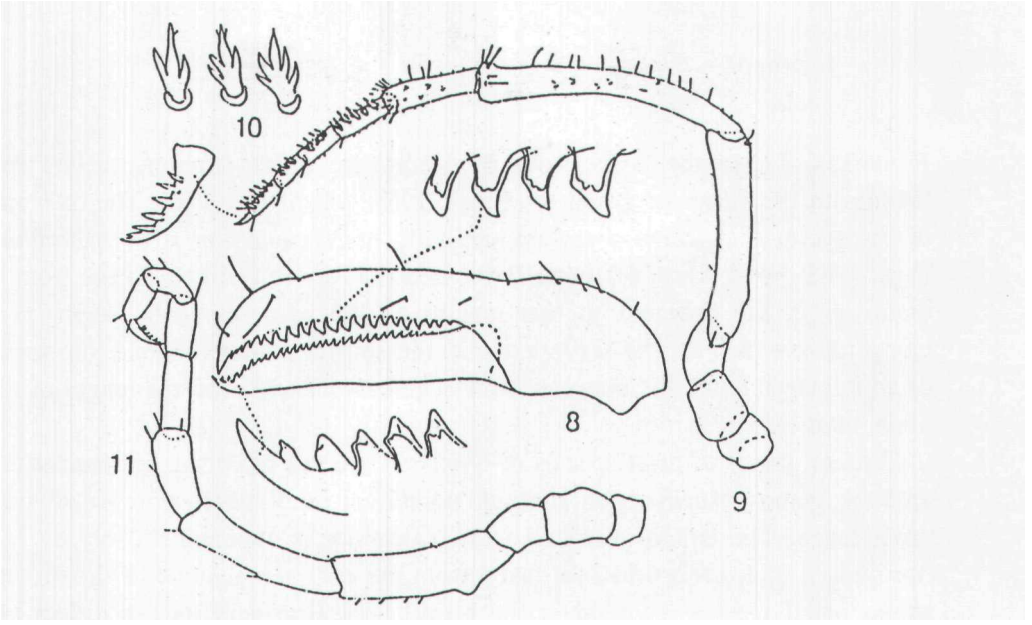
Legs not very slender ; several long setae on all segments. Cement glands opening on proximal half of ventral margin of femur, caldera-shaped ; 3 (more rarely 2 or 1) on each leg. Tibia 2 longer than tibia 1. Propodus 2.5 times as long as tarsus ; ventral margin of tarsus with several spines of uniform size ; propodal sole with ca. 11 spines, heel spines not differentiated. Claw short (about as long as tarsus). No auxiliary claws.

Measurements of holotype in µm :

Length trunk segment 1	978
Length trunk segment 2	343



Figs. 1-7 : *Nymphon caldarium* n. sp., male holotype (BALGIM DR 40). 1, trunk, dorsal (scale ab) ; 2, proboscis, ventral (ab) ; 3, ocular tubercle, frontal (free-hand sketch) ; 4, palp (ac) ; 5, third leg (ab) ; 6, tarsus and propodus of third leg (ac) ; 7, cement glands of third leg (ad). Scales above Fig. 15.



Figs. 8-11 : *Nymphon caldarium* n. sp. (8-10, male holotype, BALGIM DR 40 ; 11, female, BALGIM DR 153).
8, chela (scale ac) (teeth further enlarged, ae) ; 9, oviger (ac) ; 10, some types of special oviger spines (ae) ; 11, oviger (ae). Scales above fig. 15.

Length trunk segments 3 + 4 (to tip of 4th lateral process)	627
Width across 2nd lateral processes	1204
Length abdomen	522
Length proboscis (ventral)	765
Greatest diameter proboscis	401
Length scape	548
Length chela	1020
Palp segm. 1	70
segm. 2	411
segm. 3	282
segm. 4	102
segm. 5	257
Third leg, coxa 1	369
coxa 2	602
coxa 3	343
femur	1180
tibia 1	1388
tibia 2	1811
tarsus	215

propodus	683
claw	245

Remarks.- Within the large genus *Nymphon,* the present uniunguiculate species belongs to the *albatrossi* group (cf. Stock, 1965: 22 ; 1975: 1006). The only species of the group that shows a certain similarity to *N. caldarium* is *N. mauritanucum* Fage, 1942 (West Afica, off Cape Blanc and off Rio de Oro). It differs from *mauritanicum* in the different mutual lengths of the palp segments (segm. 5 more elongate, 4 + 5 >3), the shorter tarsus, the shorter ocular tubercle, the presence of an intersegmental line between trunk segments 2 and 3, and the length of tibia 2 (> > tibia 1).

Cement glands of most species of *Nymphon* are not recorded, but for those that are, the glands usually open through numerous small pores not placed on any prominence. The condition found in *N. caldarium* is approached only by *N. discorsicoxae* Child, 1982, a bathyal taxon from the continental slope of Brazil, and by an unnamed species recorded in the sequel. The Brazilean species differs at the first sight from *N. caldarium* in possessing well-developed auxiliary claws.

The specific name proposed *(caldarium,* Latin, meaning kettle, cf. caldera = crater) alludes to the morphology of the cement glands.

Nymphon spec.

3♂, 1 . BALGIM CP 109: 36° 14.5'N 07°56.4'W, 1200 m, foraminifera, ahermatypic corals, pteropods, 10 June 1984.

This species resembles closely *N. prolatum* Fage, 1942 (West African coast off Dakar) in general body shape, slenderness of the legs, and armature of the fingers of the chelae (viz., larger teeth alternating with very fine teeth). It differs, however, in having the fingers twice as long as the palm (fingers and palm subequal in *prolatum),* in bearing tubercles at the distal end of the lateral processes, and in the fusion of trunk segments 3 and 4 ; in these respects it resembles the new species, *caldarium,* described above. The palp also resembles that of *N. caldarium,* although segment 5 is less elongate in proportion to segment 4. Most remarkably, the cement glands are likewise similar to the condition found in *caldarium,* but the present taxon differs from *caldarium* in a longer coxa 2 (more than half as long as the femur) and in the different armature of the fingers of the chela.

Because all specimens are badly damaged, lacking their distal leg segments, I refrain from naming this species.

Family Callipallenidae

Callipallene brevirostris (Johnston, 1837)

C. brevirostris brevirostris, Stock, 1952 : 5-6, figs. 5-6.
C. brevirostris, Stock, 1986: 424 (refs.).

5 specimens, BALGIM DW 132 : 35° 25.7' N 04° 18.8' W, 170 m, shell debris, 15 June 1984.

Widely distributed on both sides of the northern Atlantic. This is the first certain record from the Mediterranean.

Callipallene emaciata (Dohrn, 1881)

C. emaciata emaciata, Stock, 1952 : 8 figs. 1, 2, 15, 16.
C. emaciata, Child, 1979 : 41-42 (refs.) : Child, 1982 : 365-366 ; Munilla (in press).

1♂ , BALGIM DR 40: 36° 49.9' N 06" 08.6 'W, 362 m, shelly sand, 2 June 1984.

Distributed on both sides of the northern Atlantic and in the Mediterranean. One of most common species in the medio- and infralittoral zones of the Straits of Gibraltar (Munilla, in press).

Callipallene phantoma (Dohrn, 1881)

C. phantoma phantoma, Stock, 1952 : 4, figs. 12, 13, 14, 20, 25, 26, 27.
C. phantoma, Child, 1982 : 26-27.

1♂ , BALGIM DW 74 : 33° 52.1' N 08" 12.8' W, 181 m, shell debris, 6 June 1984.

Rather common in the Mediterranean and Black Seas ; furthermore recorded from New England, Florida and the Bahamas in the western Atlantic, and from Japan. This is the first record from the eastern Atlantic (off Morocco).

Callipallene producía (Sars, 1888)

C. brevirostris producía, Stock, 1952: 6, figs. 9-11.
C. producía, Stock, 1978 a : 215.

19, BALGIM CP 25: 36°41.5'N 07° 19.4'W, 544 m, shell debris, foraminifera, 31 May 1984.- 5 specimens, DW 43: 35° 54.1'N 06° 14.5'W, 150 m, shelly sand, 2 June 1984.- 6 specimens, DW 74: 33" 52.1'N 08° 12.8'W, 181 m, shell debris, 6 June 1984.- 1 juv. (fragm.), CP 109: 36° 14.5' N 07° 56.4' W, 1200 m, foraminifera, ahermatypic corals, pteropods, 10 June 1984.- 17 specimens, DW 133: 35° 25.8'N 04° 17.4'W, 195 m, shell debris, 15 June 1984.- 16 specimens, DW 134: 35° 25.8'N 04°17'W, 205 m, shell debris, 15 June 1984.- 6 specimens, DW 159: 36° 14.9'N 08° 02.5'W, 1360 m, foraminifera, ahermatypic corals, pteropods, 18 June 1984.

Widely distributed on the eastern side of the North Atlantic, especially in deeper waters ; rarely recorded from the Mediterranean. Amongst the above records, two (DW 133 and DW 134) are Mediterranean.

Callipallene tiberi (Dohrn, 1881)

C. emaciata tiberi, Stock, 1952: 8-11, figs. 3, 4, 17, 18; Nogueira, 1956; 73-74: King, 1972: 622; Krapp, 1973 : 72 ; Saldanha, 1974, 332.
C. tiberi, Krapp & Krapp, 1975 : 18-21.

1♂ ,29, BALGIM DR 42: 35° 54.5'N 06° 13.3'W, 135 m, shelly sand, 2 June 1984.- 3♂ ,1♀ , DR 49 :

35° 53' N 06° 32.8' W, 521 m, shelly sand, 3 June 1984.- 1♂, DW 50 : 35° 52.7' N 06° 31.9' W, 523 m, shelly sand, 3 June 1984.

This species is known from the western Mediterranean and the coasts of western Europe, from Portugal to the narrowest part of the English Channel.

Callipallene sp.

3 juv., BALGIM DW 114: 35° 45.5'N 06° 04.2'W, 150 m, shelly sand, 11 June 1984.- 1♀ (fragm.), CP 160: 36° 14.6' N 08° 00.9' W, 1350 m, foraminifera, ahermatypic corals, pteropods, 18 June 1984.

Callipallenidae gen.? sp.?

1 juv., BALGIM DW 142 : 35° 56.6' N 03° 06.4' W, 167 m, shell debris, foraminifera, 16 June 1984.

Family Phoxichilidiidae

Anoplodactylus arnaudae Stock, 1978

Stock, 1978 a : 217-219, fig. 10 ; Stock, 1984: 749.

1♂, 3♀, BALGIM CP 109: 36° 14.5'N 07° 56.4' W, 1200 m, foraminifera, ahermatic corals, pteropods, 10 June 1984.- 1 juv., CP 160 : 36° 14.6' N 08° 00.9' W, 1350 m, bottom as in CP 109, 18 June 1984.

This species was previously recorded from the entrance of the English Channel (W. of Brest) to the Hebrides, from dephts between 330 and 860 m. The present records extend both the geographical range (to W of Gibraltar) and the bathymetrical range (to 1350 m).

Anoplodactylus petiolatus (Kröyer, 1844)

2♀, BALGIM DW 20: 36° 35.9'N 07°24.5'W, 452 m, shell debris, 21 May 1984.- 1♂, DR 42 : 35° 54.5'N 06°13.3'W, 135 m, shell debris, 7 June 1984.- 4 specimens, DW 43: 35° 54.1'N 05° 14.5'W, 150 m, shell debris, 2 June 1984.- *IS,* (probably this species), CP 109: 36° 14.5'N 07° 56.4'W, 1200 m, foraminifera, ahermatypic corals, pteropods, 10 June 1984.- 5 specimens, DW 114: 35° 45.5'N 06° 04.2'W, 150 m, shelly sand, 11 June 1984.- 1 juv., DW 132: 35° 25.7'N 04° 18.8'W, 170 m, 15 June 1984.- 1♀, DW 146 : 35° 56.5 N 03° 08.6' W, 555 m, shell debris and foraminifera, 16 June 1984.

A common species in the northern and southern Atlantic, both on the Afro-European and American coasts ; likewise in the Mediterranean and Black Seas ; from the intertidal to deep waters.

Anoplodactylus typhlops Sars, 1888

A. typhlops, Stock, 1955: 235 (refs.) ; Turpaeva, 1973, 181-183, fig. 1 ; Turpaeva, 1974: 288 ; Child, 1982 : 21.

A. neglecta Hoek, 1898 : 298-295, figs. 7-10 (new synonymy).

3♂ 6♀ BALGIM CP 109: 36° 14.5'N 07° 56.4'W, 1200 m, foraminifera, ahermatypic corals, ptero-

pods, 10 June 1984.- 19, CP 160 : 36° 14.6' N 08" 00.9' W, 1250 m, bottom as in CP 109, 18 June 1984.

A deep-water species known from the Atlantic Ocean, the N.E. Pacific, Antarctic and Subantarctic waters. Hedgpeth (1948: 229) was the first to suspect the synonymy of *A. typhlops* and *A. neglectus,* but kept them apart on geographical grounds. Turpaeva's records have shown, however; that *typhlops* is widely distributed in the major oceans, thus there exists no reason any more preventing synonymy.

Anoplodactylus sp.

1 larva, BALGIM DW 128 : 35° 35,3' N 03° 45.1' W, 480 m, shell debris, foraminifera, 14 June 1984.- 1 larva, 3 juv., DR 130: 35" 25.3' N 04° 19.3' W, 145 m, shell debris, 15 June 1984.- 1 larva, DW 136 : 35" 26.5' N 04° 18.4' W, 298 m, shell debris, 15 June 1984.

These larvae and juveniles have to remain unidentified.

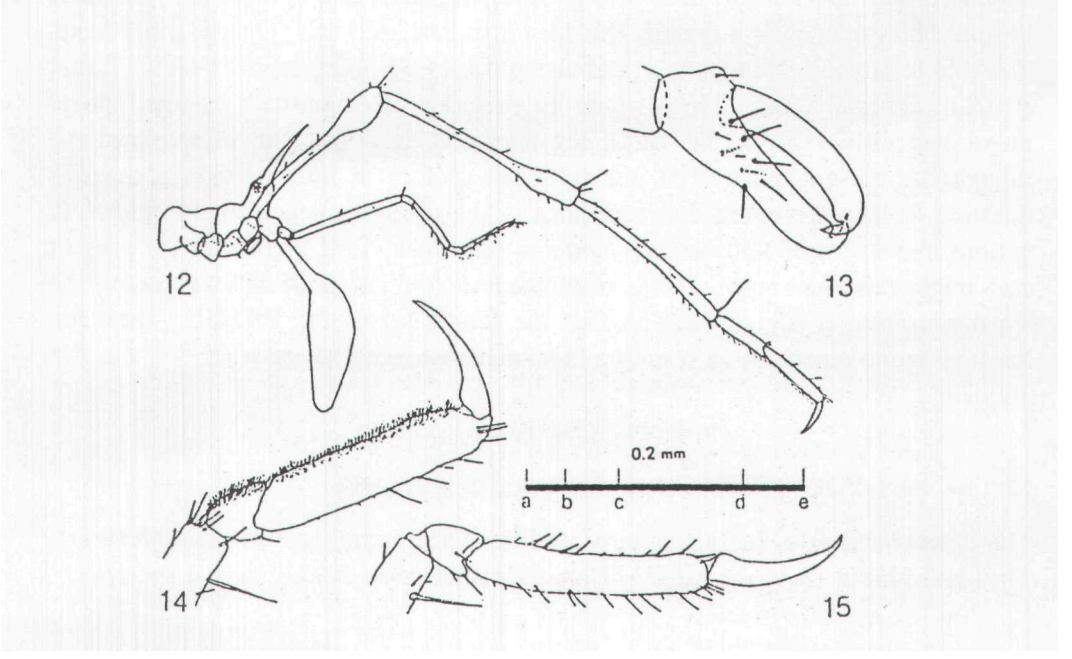


Fig. 12 : *Rhopalorhynchus atlanticum* Stock, 1970, female (BALGIM DR 42), anterior part of trunk and first leg, from the right (scale ab).

Figs. 13-15 : *Pallenopsis (Bathypallenopsis) scorparia* Fage, 1956, juvenile (BALGIM DR 153). 13, chela (scale ab) ; 14, distal segments of leg 3 (ab) ; 15, distal segments of leg 4 (ab). Each scale unit (ab, ac... ae) represents 200 µm.

Pallenopsis (Bathypallenopsis) scoparia Fage, 1956 (Figs. 13-15)

Fage, 1956: 171-172: figs. 1-4; Arnaud, 1973: 149-150, figs. 1-2; Mauchline, 1984: 318-320, fig. 3 ; Child & Harbison, 1986 : 113-117, figs. 1-2.

1 juv., BALGIM DR 153 : 35° 55.8'N 05° 35.3' W, 580 m, rock, corals, 17 June 1984.

This species has been taken in bathypelagic nets, and seems to be associated with Scyphomedusa (Child & Harbison, 1986). Fage's original description was based on a specimen from the Indian Ocean (off Kenya), but later records are all Atlantic (Bay of Biscay, Rockall Trough, Bahamas). The present record extents its range to the western Mediterranean, and is from slightly shallower waters (580 m) than the previous records (660-1520 m).

The female in the present collection shows a most remarkable dimorphism in the armature of the distal leg segments. In P1 through P3, the ventral margin of tarsus and propodus is armed with a dense, brush-like zone of stiff setae (fig. 14) : in P4, however, the tarsus is naked, and the propodal sole bears only one row of some 10 spines (larger a smaller spines intermixed) (fig. 15). Moreover, the propodus of P4 is slightly curved, that of P1-P3 very straight. Mauchline (1984) supposed that males might have brushy distal segments, and females not, but since the present specimen is a female, this idea does not hold true. On the other hand, it seems to support Mauchline's (and Arnaud's, 1973) "Fingerspitzen-Gefühl" that *P. (B.) juttingae* Stock, 1964, which is precisely distinguished by the above-mentioned differences in the distal leg segments, is a synonym of *scoparia*. Although the present material is not sufficient to form a final opinion about this question, it must be noted that variations in the distal leg segments are known in various age stages of *Callipallene phantoma* (cf. Stock, 1952), and that the present case might represent some similar phenomenon. Another possibility to explain the leg dimorphism is the assumption that the fourth leg of the BALGIM specimen has undergone regeneration resulting in an aberrant morphology.

Pallenopsis (Bathypallenopsis) sp.

1♀, 1 juv., EPI I CP 38 : 47° 33.75' N 08° 42.15 W, 2100 m, 29 March 1984.

These specimens are in fragmentary condition, preventing an exact identification. They resemble *P. (B.) longirostris* Wilson, 1881, and might belong to that species.

BIOGEOGRAPHY

During the BALGIM project, 158 stations were sampled ; of these 122 (77.2 %) were in the Atlantic, and 36 (22.8 %) in the Mediterranean. Pycnogonida were encountered in 38 out of the 122 Atlantic stations (31.1 %) and in 10 out of the 36

Mediterranean stations (27.8%). This indicates that the Atlantic stations are slightly more prolific in Pycnogonida than the Mediterranean ones.

The total number of specimens obtained was 237 ; of these 184 (77.6 %) came from Atlantic stations, 53 (22.4 %) from Mediterranean stations ; these percentages are in almost perfect agreement with the greater number of Atlantic stations sampled (77.2 versus 22.8 %), indicating that the pycnogonid biomass in the Atlantic and in the Mediterranean is almost equal. Taking into account that 3.4 times as many Atlantic than Mediterranean stations were visited, the number of species taken shows likewise a close correlation with the station density : 19 species in the Atlantic and 6 in the Mediterranean, i.e. 3.2 times as many in the Atlantic. Although this figure seems to indicate that there is no great difference in diversity between the two seas, an analysis of the species composition shows that the number of Mediterranean endemics is much smaller than those of the Atlantic.

Giant, predominatly abyssal sea-spiders (genus *Colossendeis),* represented by 4 species in the BALGIM collections from the Atlantic, were absent in the Mediterranean BALGIM stations. That this is not just an accidental difference is proved by similar results of previous explorations : a profusion of species (and specimens) of *Colossendeis* in the N.E. Atlantic, none in the Mediterranean. *Colossendeis* is essentially a cold-water genus, as is shown by its abundance in the psychrosphere of the world's oceans and by (much) shallower records in the Arctic and Antarctic regions. In the area studied during the BALGIM project, *Colossendeis* is restricted to stations with a depth of more than 1745 m. It is fair to note, however, that 9 stations over 1700 m in depth were sampled in the Atlantic (of which 6 yielded *Colossendeis),* whereas only one deep station (1738 m) was sampled in the Mediterranean, the remaining Mediterranean stations being roughly less than 1400 m (often much less) in depth. Even in the deepest Mediterranean stations, the water temperatures will have been considerably (ca. 8°) higher than at comparable depths in the Atlantic.

Apart from the various species of *Colossendeis,* the following taxa are known from the Atlantic only : *Ascorhynchus pudicum, Cilunculus europaeus, Nymphon* sp., *Rhopalorhynchus atlanticum, Anoplodactylus arnaudae,* and *A. typhlops,* all deeper water taxa. To those many others, known from the NW coast of Africa or from the Bay of Biscay, could be added, but these are not represented in the BALGIM collections.

During the BALGIM project, 3 species, previously known from only one of the two water-types, were found in the other. *Rhynchothorax mediterraneus,* up to now not recorded from the open Atlantic, was found at Stn. DR 42 (some 100 km W of Gibraltar), and —more signicantly— at a depth of 135 m, which is well above the outflow into the Atlantic of Mediterranean water-masses (which are roughly encountered between 280 and 550 m at that particular station). On the other hand, a deep-water species, *Pallenopsis (Bathypallenopsis) scoparia,* known from the Atlantic and Indian Oceans only, was encountered at Stn. DR 153, just inside the

sill of Gibraltar, at merely 580 m. Furthermore, the shallow-water species *Callipallene brevirostris*, hitherto considered purely Atlantic, was observed at Stn. DW 132 (well inside the Mediterranean, viz. ESE of Tetouan, Morocco).

Outside the sill, but within the outflowing Mediterranean water-masses, two species have been found (*Nymphon caldarium* and *Callipallene emaciata)* ; both are known as well from the Mediterranean itself.

Several species are known from both the Atlantic (outside the influence of Mediterranean waters) and the Mediterranean : *Achelia echinata, Callipallene producía, C. phantoma, C. tiberi, Paranymphon spinsosum,* and *Anoplodactylus petiolatus.* To these can be added a number of species not represented in the BALGIM collections, such as the shallow-water forms *Nymphon gracile, Achila vulgaris, Tanystylum orbiculare, T. conirostrum, Anoplodactylus pygmaeus, A. angulatus, Endeis spinosa,* and *Pycnogonum pusillum,* as well as the deep-water form *Anoplodactylus massiliensis.*

In summary : only 2 species in the BALGIM materials are restricted to Mediterranean water-masses, but 11 are up to now only known from the Atlantic.

REFERENCES

Almost all references previous to 1978 can be found in Fry & Stock, 1978. Only those not mentioned in that bibliography are cited below.

BAMBER, R.N., 1983. Some deep water pycnogonids from the nort-heast Atlantic. Zool. J. Linn. Soc, 77: 65-74.

CHILD, C.A., 1979. Shallow-water Pycnogonida of the Isthmus of Panama and the coasts of Middle America. Smiths. Contr. Zool., 293 : i-v, 1-86.

CHILD, 1982. Deep-sea Pycnogonida from the North and South Atlantic. Smiths. Contr. Zool., 349 : i-iv, 1-54.

CHILD, C.A. & G.R. HARBISON, 1986. A parasitic association between a pycnogonid and a scyphomedusa in midwater. J. mar. biol. Ass. U.K., 66 : 113-117.

DANIEL, A. & J.K. SEN, 1980. Studies of pycnogonids from the collections of the Zoological Survey of India, together with notes on their distribution in the Indian Ocean. J. mar. biol. Ass. India, 17 (for 1975) : 160-167.

FRY, W.G. & J.H. STOCK, 1978. A pycnogonid bibliography. Zool. J. Linn. Soc. London, 63 (1/2) : 197-238;

MARSHALL, N.B., 1979. Developments in deep-sea biology : i-ix, 1-566 (Blandfotd Press, Poole, Dorset).

MAUCHLINE, J., 1984. Pycnogonids caught in bathypelagic samples from the Rockall Trough, northeastern Atlantic Ocean. J. nat. Hist., 18 : 315-322.

MUNILLA T., in press. Premiers Pycnogonides côtiers du détroit de Gibraltar (côte ibérique). Bull. Inst. cat. Hist. nat.

RACK, G., 1971. Die entomologischen Sammlungen des Zoologischen Instituts und Zoologischen Museums Hamburg. Mitt. Hamburg, zool. Mus. Inst., 67 : 109-133.

SORBE, J.-C, 1982. Observaciones preliminares del suprabentos en un transecto batimétrico de la plataforma continental aquitana (suroeste de Francia). Oecologia aquatica, 6: 9-17.

STOCK, J.H., 1978 a. Abyssal Pycnogonida from the north-eastern Atlantic basin, I. Cah. Biol. mar., 19 : 189-219.

STOCK, 1978 b. Abyssal Pycnogonida from the north-eastern Atlantic basin, II. Cah. Biol. mar., 19 : 397-413.
STOCK, 1981. Abyssal Pycnogonida from the Walvis Basin, southern Atlantic. Cah. Biol. mar., 22 : 453-471.
STOCK, 1983. Pycnogonides des campagnes CORINDON et MUSURSTOM II (détroit de Makassar et Philippines), avec description de Pallenopsis dentifera sp. nov. Bull. Mus. nat. Hist. nat. Paris, (4) 5 (A, 1) : 299-305.
STOCK 1984. Deep-water Pycnogonida of the INCAL, BIOGAS, GEOMANCHE and SAFARI cruises. J. mar. biol. Ass. U.K., 64: 743-749.
STOCK, 1986. Pycnogonida from the Caribbean and the Straits of Florida. Bull. mar. Sci. Miami, 38 : 399-441.