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IN THE MEDITERRANEAN

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# THE OCCURRENCE OF SCYLLARUS PYGMAEUS (BATE) IN THE MEDITERRANEAN

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*Scyllarus arctus* (L., 1758) is one of the best known species of Mediterranean Crustacea, and already attracted the attention of early authors. So Rondelet (1554: 546, under the name *Squilla caelata sive Cicada Aeliani*) mentioned the occurrence of the species in the Mediterranean and provided an excellent figure and description of it. So far *S. arctus* has been considered to be the only representative of its genus in European and North African waters. Examination of various collections, however, has shown that a second species of *Scyllarus*, *S. pygmaeus* (Bate, 1888), occurs in the Mediterranean, where it is far from rare, but probably has always been mistaken for juvenile *Scyllarus arctus*. The differences between the two species are not very marked and may easily be overlooked; this is evidently the reason why *Scyllarus pygmaeus* has not been reported from the Mediterranean.

## *Scyllarus pygmaeus* (Bate)

*Arctus pygmaeus* Bate, 1888, Rep. Voy. Challenger, Zool., 24: 75, pl. 10 fig. 4.

*Arctus immaturus* Bate, 1888, Rep. Voy. Challenger, Zool., 24: 71, pl. 10 fig. 3.

*Arctus pygmaeus* Bouvier, 1905, C. R. Acad. Sci. Paris, 140: 479.

*Arctus pygmaeus* Bouvier, 1905a, Bull. Mus. océanogr. Monaco, 28: 2.

*Scyllarus pygmaeus* Bouvier, 1915, C. R. Acad. Sci. Paris, 160: 288.

not *Arctus immaturus* Borradaile, 1916, Nat. Hist. Rep. Brit. Antarct. Exped., (Zool.) 3 (2): 90.

*Scyllarus immaturus* De Man, 1916, Siboga Exped., 39 (a2): 64.

*Scyllarus pygmaeus* De Man, 1916, Siboga Exped., 39 (a2): 65, 67.

*Scyllarus arctus* De Man, 1916, Siboga Exped., 39 (a2): 70.

*Scyllarus pygmaeus* Bouvier, 1917, Rés. Camp. sci. Monaco, 50: 105-108, 114, 115, pl. 10 figs. 4-8.

*Scyllarus arctus* juv. De Man, 1921, Zool. Meded. Leiden, 6 (2): 93, fig. 2.

*Scyllarus pygmaeus* Monod, 1932, Bull. Com. Étud. sci. Afr. Occid. Franç., 15: 467.

*Scyllarus pygmaeus* Bouvier, 1940, Faune de France, 37: 91.

Material examined (the abbreviations CZ, ML, MP, and ZSN stand for Collection R. Zariquiey Alvarez (Barcelona), Museum Leiden, Museum Paris and Zoological Station of Naples, respectively):

Mediterranean

Melilla, Spanish Morocco; June 1945; J. Rutlant. — 1 female (CZ).

Melilla, Spanish Morocco; December 1945; J. Rutlant. — 2 females (CZ).

- Rosas, N. E. Spain; September 1948; R. Zariquiey Alvarez. — 2 males, 1 female (CZ and ML).  
 Cadaqués, N. E. Spain; dredged; 2 November 1958; R. Zariquiey Alvarez. — 2 males (CZ).  
 Cadaqués, N. E. Spain; dredged, about 5 m deep; 11 January 1959; R. Zariquiey Alvarez. — 2 males (CZ and ML).  
 Between Punta Oliguera and Isla Massina, Cadaqués, N. E. Spain; depth 32 to 35 m; vomited by a fish (*Scorpaena spec.?*); 15 August 1959; L. B. Holthuis. — 1 female (ML).  
 Gulf of Naples, Italy; November 1878 to June 1879; A. A. W. Hubrecht. — 1 female (ML).  
 Gulf of Naples, Italy; Zoological Station Naples; Collection E. Caroli. — 18 males and 28 females (6 ovigerous) (ZSN and ML).  
 Marseilles, France?; E. L. Bouvier det. — 3 males, 4 females (2 ovigerous) (MP, old collection, with *S. arctus* and *S. beriboidii* Paulson, cf. infra, p. 162).

Atlantic <sup>1)</sup>.

- Canary Islands, 28°57' N, 13°17' W; dredging no. 45; depth 1200 m; sand; 3 August 1882; "Travailleur" (doubtful data <sup>2)</sup>) — 2 males, 1 ovigerous female (MP).  
 Madeira, 31° N, 16°31' W; dredging no. 52; depth 100 m; coral, rocks, sand; 9 August 1882; "Travailleur". — 2 males, 2 females (1 ovigerous) (MP).  
 Canary Islands, 28°48' N, 13°46' W; dredging no. 56; depth 162 m; sand, rocks; 28 June 1883; "Talisman" (doubtful data <sup>3)</sup>). — 3 males, 5 females (2 ovigerous) (MP).  
 Cape Verde Islands, 17° N, 25°03' W; dredging no. 107 <sup>4)</sup>; depth 90-75 m; sand, shells; 29 July 1883; "Talisman". — 1 male (MP).  
 Fogo, Cape Verde Islands; station no. 34; depth 20-25 m; calcareous algae; 20 November 1959; "Calypto". — 1 male (MP).

The length of the males varies between 17 and 39 mm, that of the females between 23 and 54 mm. The twelve ovigerous females are from 23 to 54 mm long. Of six, the date of capture is known: the four atlantic ovigerous females of 25, 27, 23, and 34 mm were taken on 3 August 1882, 9 August 1882, and 28 June 1883, respectively, and the two mediterranean ones of 34 and 35 mm on 19 June 1952 and 28 June 1949. The largest specimen reported upon in the literature was definitely smaller than our largest specimen: Bouvier wrote (1915: 289) "ses plus grands exemplaires atteignent au plus 40 mm".

The species was originally described and figured by Bate (1888: 73, pl. 10 fig. 4) under the name *Arctus pygmaeus* after a specimen of 22 mm length from the Canary Islands. In the same publication Bate (1888: 71, pl. 10 fig. 3) described a new Scyllarid under the name *Arctus immaturus* from off Cape Verde, West Africa. According to Bouvier (1915: 290; 1917: 114, 115) the specimen of *A. immaturus* is nothing but the second Nisto-stage of *Scyllarus pygmaeus*. Under *Arctus immaturus*, Bate (1888: 72) also dealt with two specimens of

<sup>1)</sup> Here are listed the "Travailleur" and "Talisman" specimens already mentioned by E. L. Bouvier in various papers (1905, 1905a, 1915, 1917, 1940) without complete collecting data.

<sup>2)</sup> The original collecting label has "Dragage n° XLV" but also "Profondeur 30". In the list of stations, the depth of this dredging is noted as 1200 m, and there is no station with a depth of 30 m; nevertheless some doubt exists about the correctness of the depth of 1200 m for the capture of *S. pygmaeus*.

<sup>3)</sup> The original label has "Dragage n° 56" but the depth ("Profondeur 30") agrees better with dredging no. 54, on the same day. The data relating to this latter station are: near La Bocayna, 28°48' N, 13°46' W; 182-259 to 30 m; sand, shells, stones; 8 hauls.

<sup>4)</sup> The original label has "Dragage n° 108" but the depth ("Profondeur 75") is that of dredging no. 107 (90-75 m). Besides, in the list of stations, no. 108 (318 m) is noted as "sondage sans dragage". Therefore the depth 318 m given by Bouvier (1915, 1917) is to be corrected to 90-75 m.

*Scyllarus* from the Canary Islands, which were collected by the Challenger Expedition together with the type of *S. pygmaeus*. Bate did not definitely assign these specimens to any species, but according to Bouvier (1917: 114) they are Nisto-stages of *Scyllarus arctus* (L.). The names *Arctus pygmaeus* Bate, 1888, and *A. immaturus* Bate, 1888, were first published in the same paper and for the purposes of nomenclature rank from the same date. It thus is up to the first reviser to decide which of the two names takes precedence over the other. This first reviser was Bouvier (1917: 115) who synonymized the two and used the name *Scyllarus pygmaeus* for the species. In his 1915 paper Bouvier, it is true, pointed out that one had to consider *Arctus immaturus* "presque sans doute, comme un représentant du second stade post-larvaire" of *Scyllarus pygmaeus*, but he did not definitely identify the two forms, this was done for the first time in his 1917 paper<sup>5</sup>). The specific name *pygmaeus* is thus the correct name for the species and that of *immaturus* has to be treated as a junior subjective synonym.

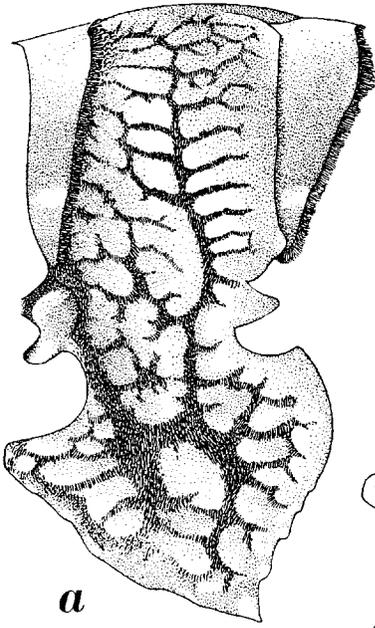
After the original publication *Scyllarus pygmaeus* was more or less forgotten till Bouvier between 1905 and 1917 in various papers dealt with material from the "Travailleur" and "Talisman" expeditions and from the cruises of the Prince of Monaco; in these publications he made the position of both *Scyllarus pygmaeus* and *Arctus immaturus* clear. In 1916 Borradaile with some doubt brought material from New Zealand waters to *Arctus immaturus*; it is evident that Borradaile's specimens are post-larval stages of a species of *Scyllarus* different from *S. pygmaeus* and can be left out of consideration here.

In his 1917 paper Bouvier provided excellent illustrations of the adult *Scyllarus pygmaeus*. In the same paper, in the text concerning *Scyllarus arctus* (: 107) Bouvier gave very useful characters for the distinction of *S. pygmaeus* from *S. arctus*. Most of these differences were found to be more or less distinct in our more extensive material, some proved too variable to be of much use. The differences that we found are the following:

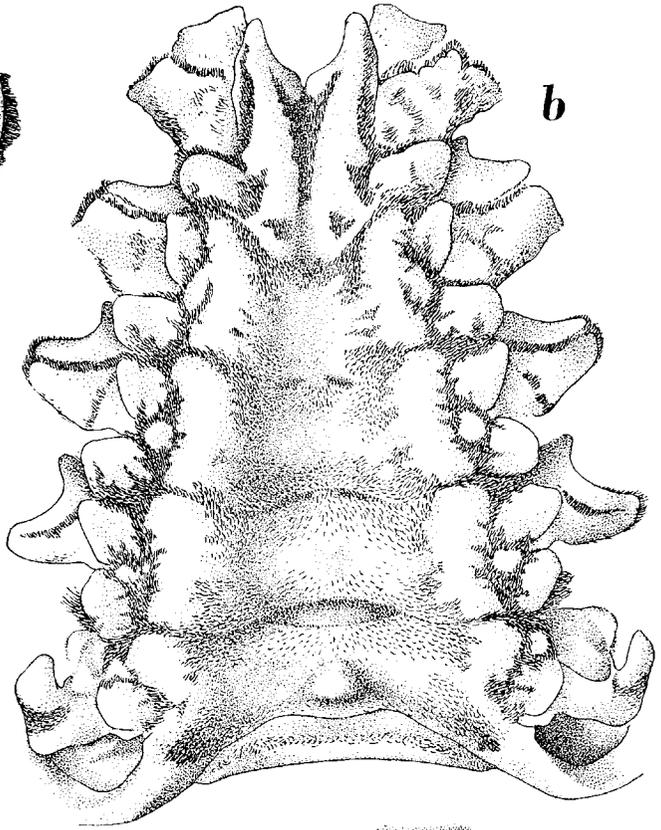
1. The smooth anterior part of the tergites of the second to sixth abdominal somites—namely the part which slides under the preceding somite when the abdomen is fully stretched—shows in *Scyllarus pygmaeus* a distinct transverse groove on each half; this groove bears a row of posteriorly directed hairs (fig. 1c). In *Scyllarus arctus* there is no trace of either the grooves or the hairs, the anterior part of the tergites being perfectly smooth (fig. 1a).

<sup>5</sup>) In Bouvier's (1917) text on p. 114 line 8 from the top, there occurs a lapsus which obscures the meaning of the sentence. On this line the name *Arctus pygmaeus* must be replaced by *Arctus immaturus*, as is confirmed by what Bouvier wrote in the last paragraph of his p. 115.

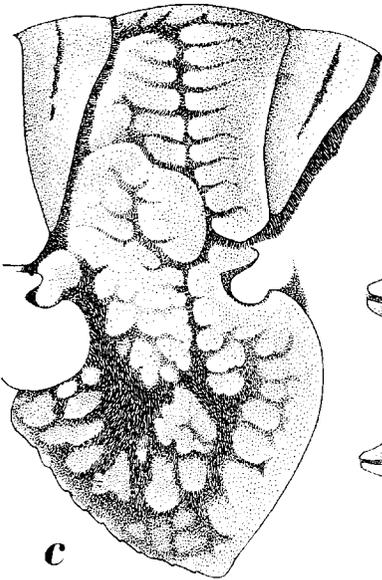
Fig. 1. a, b, *Scyllarus arctus* (L.), female, 75 mm long, Punta de Cayals, Cadaqués, N. E. Spain, 18 August 1959. a, second abdominal somite and smooth anterior part of third somite, lateral view; b, thoracic sternum, ventral view. a, b,  $\times 5$ . c, d, *Scyllarus pygmaeus* (Bate), ovigerous female, 54 mm long, Gulf of Naples, Italy. c, second abdominal somite and smooth anterior part of third somite, lateral view; d, thoracic sternum, ventral view. c, d,  $\times 6.5$ . H. Heijn del.



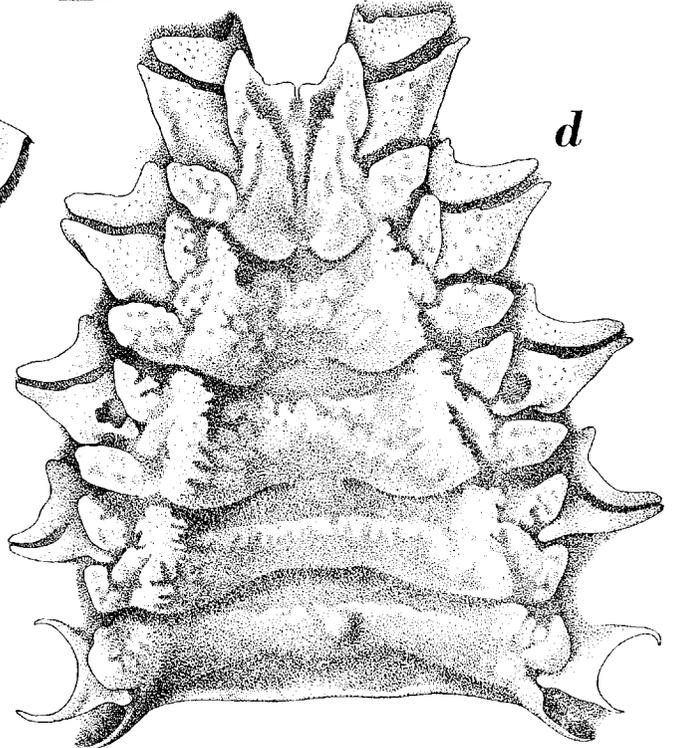
*a*



*b*



*c*



*d*

2. In *Scyllarus arctus* the pleuron of the second abdominal somite has the tip acute and posteriorly curved (fig. 1a), while in *S. pygmaeus* it is blunt and directed ventrally (fig. 1c).

3. The four teeth on the posterior margin of the anterior calcified portion of the telson are more sharply pointed in *S. arctus* than in *S. pygmaeus*.

4. The teeth on the anterior dorsal margin of the antennular somite are better developed and more acute in *S. arctus* than in *S. pygmaeus*.

5. The anterior end of the thoracic sternum shows a deep notch with concave margins in *S. arctus* (fig. 1b); in *S. pygmaeus* this notch is much shallower, relatively wider, especially at the posterior end, and often with two tubercles in the middle (fig. 1d).

6. In *Scyllarus pygmaeus* the sternite of the fifth thoracic somite bears in the middle a conical tubercle (fig. 1d). In *S. arctus* this tubercle is antero-posteriorly compressed and never has a conical shape (fig. 1b).

7. The adult specimens of *Scyllarus arctus* are much larger than the largest adult specimens of *S. pygmaeus* known thus far; the former species may attain a length of more than 100 mm, while the largest specimen of *S. pygmaeus* so far known is 54 mm long.

Especially the characters listed here under nos. 1, 2, 5, and 6 prove to be constant and of high systematic value; they can be very easily used for the distinction of the two species. The characters mentioned under 3 and 4 are too variable to be of much direct use.

The first carcinologist who came to the conclusion that two species of *Scyllarus* are found in the Mediterranean evidently was the late Dr. Ernesto Caroli, who during his lifetime was librarian of the Zoological Station at Naples. The extensive collections of Mediterranean Decapoda brought together by Dr. Caroli and bequeathed by him to the Zoological Station, contain large series of both *Scyllarus pygmaeus* and *S. arctus* of various sizes. This material was examined by us when, at the invitation of the Direction of the Naples Zoological Station, we studied Dr. Caroli's collections during a visit to Naples in the spring of 1959. Several of the tubes with *S. pygmaeus* contained labels in Dr. Caroli's handwriting indicating that he considered the specimens to be juvenile *S. arctus*, which, however, were aberrant in that the pleopods were as in the adults. In one tube, however, a label was found with the indication "*Scyllarus pygmaeus?*". Dr. Caroli's long series of juvenile *Scyllarus arctus* and of *S. pygmaeus* made it possible for us to confirm his last mentioned supposition that the small specimens with well developed pleopods are not aberrant at all but represent a distinct species, which indeed is identical with *Scyllarus pygmaeus*. As far as is known to us Dr. Caroli has not published anything about his observations on the small *Scyllarus* specimens.

Another author who observed the differences between *S. arctus* and *S. pygmaeus* from the Mediterranean, be it without realizing that these differences are of a specific nature, was Dr. J. G. de Man. In his key to the species of the genus

*Scyllarus*, De Man (1916: 70) ranged *S. arctus* under the species with the "notch at the anterior extremity of sternum not deep and triangular, but presenting only a minute incision in the middle of the truncate, posterior margin". As De Man explained in a later paper (1921: 92-94) this statement was based on a mistake, since adult specimens of *S. arctus* have the "anterior extremity of the sternum with a deep triangular notch", and the shallow excavation according to De Man should be found only in very young specimens of *S. arctus*. His 1916 statement was based on such a "very young specimen", viz., a female from the Gulf of Naples, measuring 34 mm from the tip of the antennae to the tip of the telson. To illustrate the difference between this "young" specimen and the adult *Scyllarus arctus*, De Man (1921) figured the anterior end of the sternum of both (De Man, 1921, figs. 2 and 1 respectively). The "juvenile" female mentioned by De Man is still preserved in the collection of the Leiden Museum, it is the specimen listed above on p. 157, which between November 1878 and June 1879 was collected in the Gulf of Naples by Dr. A. A. W. Hubrecht, who during that time occupied the Dutch table at the Zoological Station of Naples. Examination of the specimen proved that it is not a juvenile *S. arctus*, but, as could already be surmised from De Man's figure, an adult specimen of *Scyllarus pygmaeus* (Bate), showing all the characters of the latter species. The fact that De Man had only this single specimen of *S. pygmaeus* at his disposal, while all of his *S. arctus* material was much larger explains why he failed to recognise it as belonging to a distinct species. The male specimen of 54 mm mentioned by De Man (1921) was in the same lot with the specimen of *Scyllarus pygmaeus* and proved to be the true *Scyllarus arctus*.

Monod's (1932) and Bouvier's (1940) publications contain no new data on the species.

In 1957 the first of the present authors (Forest) received for study from Dr. R. Zariquiey Alvarez of Barcelona three specimens of *Scyllarus* from Melilla, Spanish Morocco, which were found to differ from *S. arctus* and on examination proved to belong to *S. pygmaeus*.

In August 1959 the second author (Holthuis) at the invitation of Dr. Zariquiey Alvarez spent some time in Cadaqués on the Mediterranean coast of N.E. Spain, where in Dr. Zariquiey's company each morning a visit was made to the local fishermen who then had just returned with their catches. Fishing is done there with vertical nets which in the evening are placed in water of 5 to 35 m depth and are left out during the night, to be collected in the morning. The fish and edible Crustacea caught in this way were sold, but the other Crustacea were given by the fishermen to Dr. Zariquiey. On August 1959 a small Scyllarid was found on the bottom of one of the fishing boats, the specimen was covered by mucus and had evidently been vomited by a fish, presumably a specimen of *Scorpaena* which had been caught that morning. Examination of the Scyllarid, which was still in a pretty good condition, proved it to be a female of *Scyllarus pygmaeus*. This find caused Dr. Zariquiey and Holthuis to re-examine all of Dr. Zariquiey's *Scyllarus* material,

among which the specimens from Rosas and Cadaqués were found which are listed above. According to the fishermen small specimens of *Scyllarus*, when caught are usually immediately thrown back into the sea. *Scyllarus arctus*, namely, is sold for food, small specimens being returned into the sea in the hope that they may grow up to marketable size. This was given by the fishermen as the main reason why *S. pygmaeus* appeared so rarely in their catches.

The type locality of *Scyllarus pygmaeus* is off Gomera, Canary Islands, 28° 35' N 16° 5' W, depth 143 m (Bate, 1888). The other localities from where the species has been reported are Madeira, depth 100 m (Bouvier, 1915, 1917), Pico-Fayal Strait, Azores, depth 98 m (Bouvier, 1917), the Canary Islands, depths 162 and 1200 m <sup>6)</sup> (Bouvier, 1905, 1905a, 1915, 1917), the Cape Verde Islands, depth 318 m <sup>7)</sup> (Bouvier, 1915, 1917) and 20-25 m ("Calypso", supra, p. 157); the type of Bate's *Arctus immaturus* came from off Cape Verde, West Africa (exact depth and other data unknown). Bouvier (1915: 288, footnote) remarked that he had examined a sample of *Scyllarus* specimens, which, according to the label, originated from the Mediterranean. This sample, apart from some 10 (actually 21) specimens of *Scyllarus arctus*, contained 5 (actually 7) specimens of *S. pygmaeus*. But as in the same lot two specimens of the Chinese species *Scyllarus haanii* Berthold (= *S. bertholdii* Paulson) were found, the correctness of the label proved to be questionable. According to Bouvier, therefore, this material could not be used as a proof for the occurrence of *Scyllarus pygmaeus* in the Mediterranean, though he thought it very likely that the species would ultimately be found there (Bouvier, 1917: 107). This last supposition has now proved to be entirely correct. Bouvier's idea that *Scyllarus pygmaeus* is a species restricted to deeper water ("*S. pygmaeus* provient vraisemblablement d'une adaptation de l'*arctus* aux profondeurs", Bouvier, 1940: 91) is erroneous since the Mediterranean specimens listed above for the larger part, and the one caught by the "Calypso" Expedition off the Cape Verde Islands do not originate from deep water. Unfortunately we know very little about the exact depth at which the Mediterranean specimens were taken, the only positive information is that concerning two specimens from Cadaqués, one of which was taken at about 5 m depth, the other between 32 and 35 m, but none of the Spanish specimens can have been caught at depths of more than 50 m. The present material thus not only extends the known horizontal range of the species, but also the vertical.

#### RÉSUMÉ

*Scyllarus pygmaeus* (Bate), espèce connue de l'Atlantique orientale, depuis les Açores et les Canaries jusqu'aux îles du Cap Vert, est signalé pour la première fois avec certitude en Méditerranée où ce petit Scyllare, qui n'est pas rare, a jusqu'à présent été en général pris pour un jeune *S. arctus* (L.).

Ces deux espèces, assez proches, présentent cependant un certain nombre de différences constantes. *S. pygmaeus* se distingue en particulier de *S. arctus* par la présence d'un sillon pilifère transverse sur

<sup>6)</sup> Doubtful depths. See p. 157, footnotes 2) and 3).

<sup>7)</sup> Actually 90-75 m. See p. 157, footnote 4).

la partie antérieure lisse des tergites abdominaux, par le pleuron du 2e tergite abdominal qui est arrondi au lieu d'être en pointe aiguë dirigée vers l'arrière, par l'échancrure antérieure du sternum thoracique moins profonde et plus large, et enfin par la forme du tubercule médian sur le sternite du 5e somite thoracique qui est régulièrement cônica et non comprimé antéro-postérieurement. D'autre part le plus grand *S. pygmaeus* connu ne mesure que 54 mm de long, alors que *S. arctus* dépasse fréquemment la taille de 100 mm.

Si *S. pygmaeus* n'a jamais été signalé de façon certaine en Méditerranée, l'examen de la collection de la station zoologique de Naples a montré que le Dr. Caroli avait séparé des jeunes *S. arctus* une série de *S. pygmaeus*, en les rapportant avec doute à cette dernière espèce. Quant à De Man qui a eu entre les mains un *S. pygmaeus*, il a considéré qu'il s'agissait d'un *S. arctus* juvénile.

Une partie des spécimens méditerranéens mentionnés ici appartiennent à la collection R. Zariquiey et proviennent d'une profondeur inférieure à 50 m. de la région de Cadaqués et de Rosas. Un autre individu a été récemment capturé aux Îles du Cap Vert (Expédition de la "Calypso") par 20-25 m de fond. On doit donc considérer comme inexacte l'hypothèse de E. L. Bouvier selon laquelle *S. pygmaeus* représenterait une adaptation de *S. arctus* aux profondeurs.

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