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ON *SIRPUS*, A GENUS OF
PIGMY CANCROID CRABS

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ISABELLA GORDON

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ON *SIRPUS*, A GENUS OF PIGMY CANCROID CRABS

By ISABELLA GORDON, D.Sc., Ph.D.

SYNOPSIS

The paper contains an emended diagnosis of the genus *Sirpus* Gordon, a fuller description of the type species *S. zariquieyi* from Spain, and a description of a new species, *S. monodi*, from West Africa. Both species are of very small size, though some of the specimens are sexually mature. The affinities of the genus are discussed; while it bears some resemblance to *Trachycarcinus* Faxon, it seems to be much nearer to *Pirimela* Leach and is referred provisionally to the family Pirimelidae.

INTRODUCTION

IN September, 1947, I received from Dr. Ricardo Zariquiey Alvarez of Barcelona two tiny specimens of what appeared to be a species of Spider Crab from Cadaqués on the north-east coast of Spain. Although the specimens were minute it was obvious that they were females, but I did not at that time observe that the larger one has the genital openings perforate and filled with what appear to be fertilization plugs. Later Dr. Zariquiey sent me a somewhat larger ovigerous female and two males and Dr. H. Boschma of the Leiden Museum lent me a male specimen, all from the same locality. For a time I was much puzzled by this pigmy species of Brachyuran; while at first sight it seemed to belong to the Oxyrhyncha or Spider Crabs, it proved on closer examination to belong to the Cancroid assemblage, in the wide sense employed by Rathbun, 1930. But its position in that assemblage was not easy to determine, so I consulted Dr. H. Balss, formerly of the Munich Museum, and Dr. Th. Monod of the Institut Français d'Afrique Noire, Dakar. Shortly afterwards Dr. Monod wrote to say that he was sending me some specimens from West Africa that he had found among his undetermined material and which seemed to belong to the same genus. They proved to represent another new species which is described in this paper. Pending the arrival of Monod's specimens I wrote a preliminary paper describing the Mediterranean species under the name of *Sirpus zariquieyi* n.g. and sp., and discussed very briefly the affinities of the genus. Now that a second species is available I am able to give an emended diagnosis of the genus; more figures, a fuller description and details as to habitat of the type species, and a detailed account of my reasons for referring the genus to the family Pirimelidae are also included.

Genus *Sirpus* Gordon

Gordon, 1953, p. 304.

DIAGNOSIS (emended). Carapace hexagonal, convex, areolate, the lobes bearing granular clusters or nodules. Front rather narrow, produced, trispinose, the spines or teeth diverging from a common base and thus not in one plane. Orbits large,

with forward aspect, shallow and imperfect posteroventrally; two gaps in dorsal margin, a wide one below and one at the inner angle. Eyestalks long, cylindrical, with a bulbous base, retractile within the shallow orbits; eyes deeply pigmented and protected by the postocular or first anterolateral spine. Anterolateral and posterolateral margins about equal, the former with four spines or teeth, the third of which is the smallest. Antennal flagellum long and setose; basal segment (2 + 3) of peduncle but slightly enlarged, not quite filling hiatus at inner angle of orbit but attaining the front, subcylindrical and armed at outer distal angle; segments 4 and 5 subequal. Antennules folded rather obliquely. Anterior margin of buccal cavity distinct. Sternum long and rather narrow. Abdomen rather narrow in both sexes and terminal somite triangular, longer than wide; all seven somites free in female, three to five coalesced in male. No appreciable gap between external maxillipeds; a rounded lobule at antero-internal angle of merus and antero-external angle rounded; antero-internal angle of ischium not produced. Chelipeds equal, carpus and palm of chela nodular and/or granulose. Walking legs rather short, one longitudinal dorsal ridge on carpus, two on propodus; dactyli not compressed but longitudinally ridged, longer than propodus. Male openings coxal; first pleopod a long slender style, about four times as long as the second.

As I explained in the preliminary paper, I have used the less usual spelling of *scirpus* in deference to the wishes of my botanical colleagues because *Scirpus* is a large and well-known genus or plants. According to Lewis and Short, *A Latin Dictionary*, Oxford, 1917, *scirpus*, sometimes *sirpus*, has two meanings: (i) a *rush* or *bulrush*, and (ii) by transference "deriving the idea of intricacy from plaited work of rushes, a *riddle, enigma*," and I use it in the latter sense. The gender is masculine.

Two species are known at present, the type species *Sirpus zariquieyi* Gordon from Cadaqués, and *Sirpus monodi* n. sp. from Dakar. The affinities of the genus appear to be with *Pirimela* and *Trachycarcinus*, perhaps nearer to the former—see p. 59–63.

Sirpus zariquieyi Gordon

Gordon, 1953, p. 305.

DIAGNOSIS as for the genus. In this species there is considerable sexual dimorphism, the carapace in the female being distinctly wider and more ovoid than in the male (cf. Figs. 1A, 4 and 5).

MATERIAL. From Dr. Zariquiey: (a) Two small females collected from fishermen's nets while being cleaned ashore, but from 20 to 40 metres in the neighbourhood of Cadaqués, Provincia de Gerona, Spain. Summer, 1947.

(b) One ovigerous female (the holotype) and two small males from *Cystoseira* growth on the rusty iron plates of a sunken ship, in about 20 metres, off Cadaqués, viii. 51.

From Leiden Museum: (c) One small male, from a fishing net and caught in the vicinity of Cadaqués, 4th–16th August, 1949.

Dr. Zariquiey has very kindly presented the holotype and one male specimen to the British Museum Collection.

DESCRIPTION OF OVIGEROUS FEMALE. This specimen, the largest at my disposal, measures almost exactly 5 mm. from posterior margin of carapace to apex of rostrum and 7.1 mm. in greatest width (between the last pair of anterolateral spines).

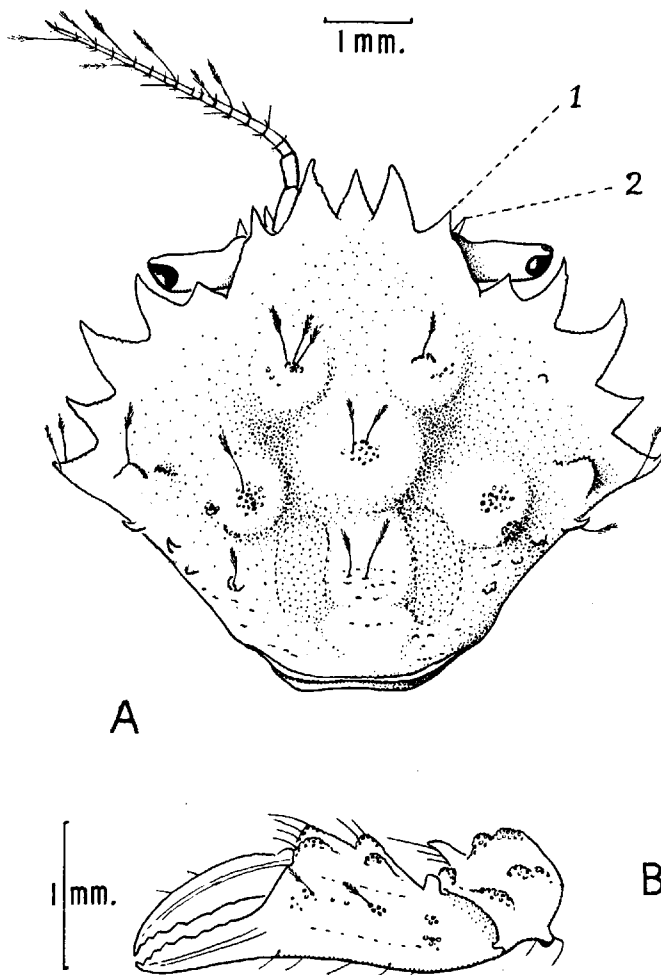


FIG. 1. *Sirpus zariquieyi* Gordon. A. Holotype, an ovigerous female, in dorsal aspect, pereopods and right antenna omitted. B. Left chela and carpus of holotype. 1. Supraorbital spine. 2. Infraorbital spine.

The form of the *carapace* is represented in dorsal aspect in Fig. 1A. The front consists of three subequal spines; the median one, or rostrum, is directed obliquely downwards, while the lateral ones are directed forwards and are slightly upturned apically. The *orbits* are wide, so that the distance between the postocular spines (first pair of anterolateral spines, Fig. 1A) exceeds two-thirds of the maximum cara-

pace width. Each orbit is well formed anteriorly but is shallow and incomplete ventro-posteriorly, so that the retracted eye is protected only by the postocular spine. The supraorbital and infraorbital angles are each produced to form a short triangular spine (Fig. 1A, 1 and 2 respectively). The dorsal orbital margin slopes obliquely backwards and outwards to meet the base of a wide triangular spine intercalated between it and the postocular spine. Behind the orbit the anterolateral margin comprises three large spinose projections, the anterior of which is the largest. The posterolateral margins are slightly concave and convergent; the posterior margin bears a high submarginal crest, and is only a trifle wider than the trispinose front.

The dorsal surface of the carapace is distinctly areolated as represented in Fig. 1A, and the apex of each lobe is beset with some granules. The gastric region has three lobes, two protogastric and one mesogastric—the latter followed by a cardiac and a small intestinal lobe. On either side of the cardiac lobe is a dark reniform depression. The branchial region bears a median lobe (slightly behind and external to the mesogastric lobe), a triangular lobule near the base of the posterior anterolateral spine, and two spinules and a few granular rugosities near the posterolateral margin (Fig. 1A). A number of rather long plumose setae are present as indicated in the figure, but others may have been rubbed off. The anterior portion of the carapace is represented in profile in Fig. 2B.

The *antennae* are long and setose; the ventral spine on the outer distal angle of segment 2 + 3 of the peduncle is visible in dorsal aspect; the fourth segment is a trifle longer than the fifth (Fig. 1A, see also Fig. 2A). The flagellum is a trifle more robust than I have indicated in the figure and comprises some 14–16 segments, some of which bear long, distally plumose setae.

The *eyestalk* is much swollen basally, cylindrical in the distal two-thirds, the corneal area is terminal.

The *chelipeds* are equal; the distal segments of the left one are represented in Fig. 1B. As the carapace is wider than in the male, the merus reaches the apex of the third anterolateral spine and only a small portion is visible dorsally—cf. Fig. 4 where more of the merus is visible beyond the anterolateral margin. The spine on the inner border of the carpus is much longer than in the male (which is of smaller size); on the anterior margin a blunt lobule articulates with a similar one on the chela; the distal half of the outer margin is cristate or lobulate and beset with granules; on the dorsal surface are two inner, and two or three outer clusters of granules. The fingers of the chela are rather longer than the dorsal margin of the palm; each bears a median crest or ridge; the cutting edges are in close contact distally, leaving a slight gap proximally. The dorsal margin of the palm bears a large distal and a smaller median granular prominence, and there are two similar prominences a short distance from the actual margin. Below these is a median series of low granular clusters. The *walking legs* or pereiopods II–V are for the most part bent inwards round the mass of ova and I did not attempt to straighten them out, so have omitted them from the figure. The first pair are about as long as the chelipeds. The right pereiopod V is represented in Fig. 3B; the merus is about two and a half times as long as wide, the carpus bears a low dorsal ridge near which

is a distal depression. The propodus, which is as long as the carpus, has two parallel dorsal ridges; the dactylus is half as long again as the propodus and bears longitudinal ridges; in none is it compressed.

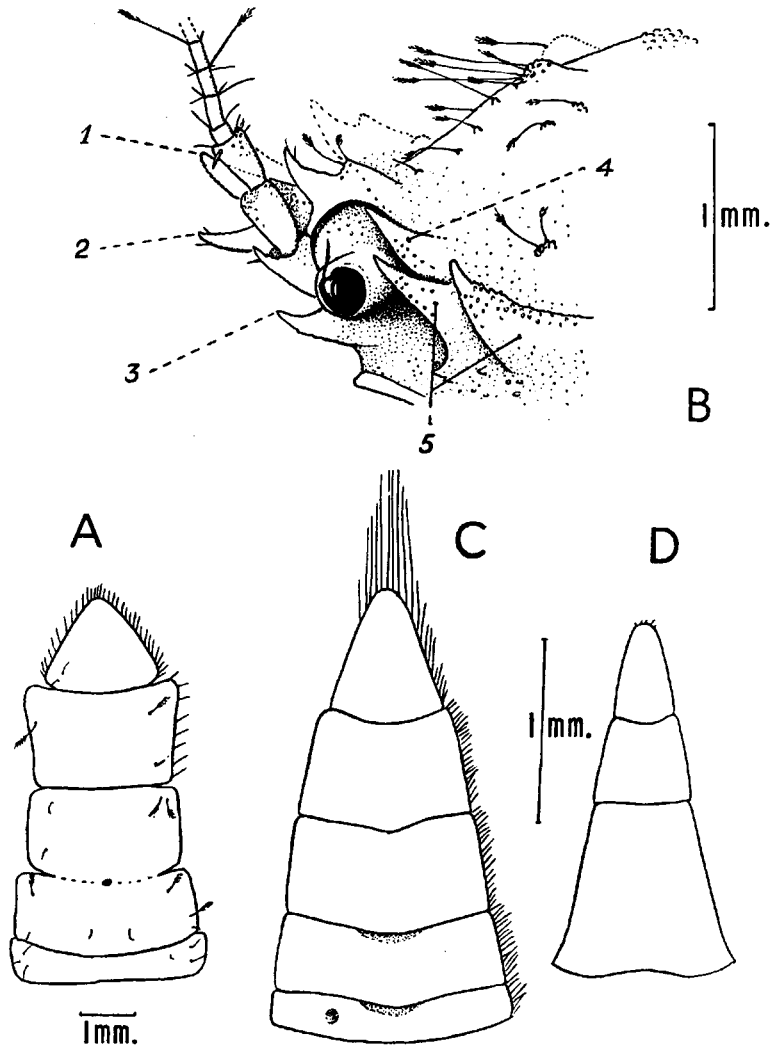


FIG. 2. *Trachycarcinus glaucus* Alc. & And. A. Abdominal somites 3 to 7 of male syntype (*c.l.* = 16.1, *c.b.* = 14.8 mm.)

Sirpus zariquieyi Gordon. B. Left anterior portion of carapace of larger paratype from Lot *a*, in lateral aspect, to show divergence of the frontal spines. C. Abdominal somites 3 to 7 of same specimen. D. Abdominal somites 3 to 7 of male paratype. 1. Lateral frontal spine. 2. Median frontal spine. 3. Infraorbital spine. 4. Supraorbital spine. 5. First and second anterolateral spines.

The *antennules* are enclosed in deeper, more developed sockets than in the male represented in Fig. 3A and the crest on the anterior margin of the basal segment of the peduncle is more pronounced. The separation between the base of the rostrum and the epistome is also more pronounced in the female, and the median notch on the anterior margin of the buccal cavity is less distinct. The longitudinal furrow on the ischium of maxilliped 3 is also more pronounced than in the male.

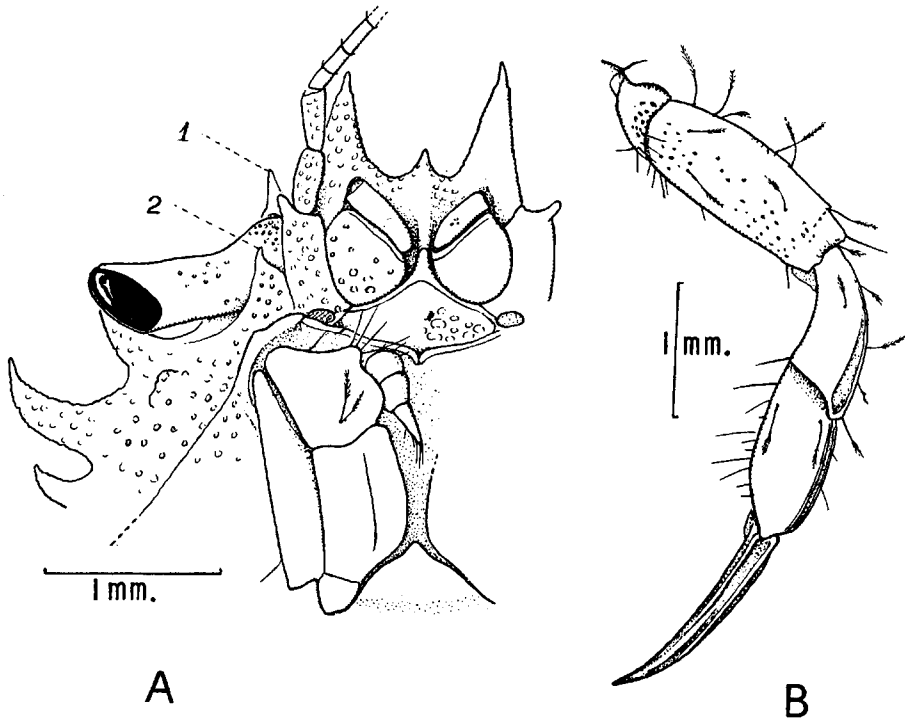


FIG. 3. *Sirpus zariquieyi* Gordon. A. Right anterior portion of carapace of larger male paratype from Lot *b*, in ventral aspect, to show details of orbit, epistome, buccal cavity, etc. B. Right pereiopod V of holotype. 1. Supraorbital spine. 2. Infraorbital spine.

All seven segments of the *abdomen* are free; the first segment is very short and has a transverse granular ridge; the next three are progressively longer while the last three are of equal length, the terminal one being narrowly triangular with a rounded apex. The abdomen is comparatively narrow, since at its widest it scarcely exceeds the width of the posterior border of the carapace. Somites 3 to 7 are represented in Fig. 2c.

The *ova* are numerous, and measure approximately 0.25 to 0.30 mm. in diameter.

REMARKS. The larger female from Lot *a* measures 4.85 by 5.52 mm. and is very similar to the holotype. It appears to be sexually mature, for the genital openings are distinct and seem to be filled with dark brown fertilization plugs. The clusters of granules on the carapace are more pronounced, and from them arise

groups of distally plumose setae. The swollen basal part of the eyestalk is also closely beset with small granules and is separated from the distal portion by a distinct depression. The smaller female from Lot *a* measures 4.00 by 4.81 mm. and is

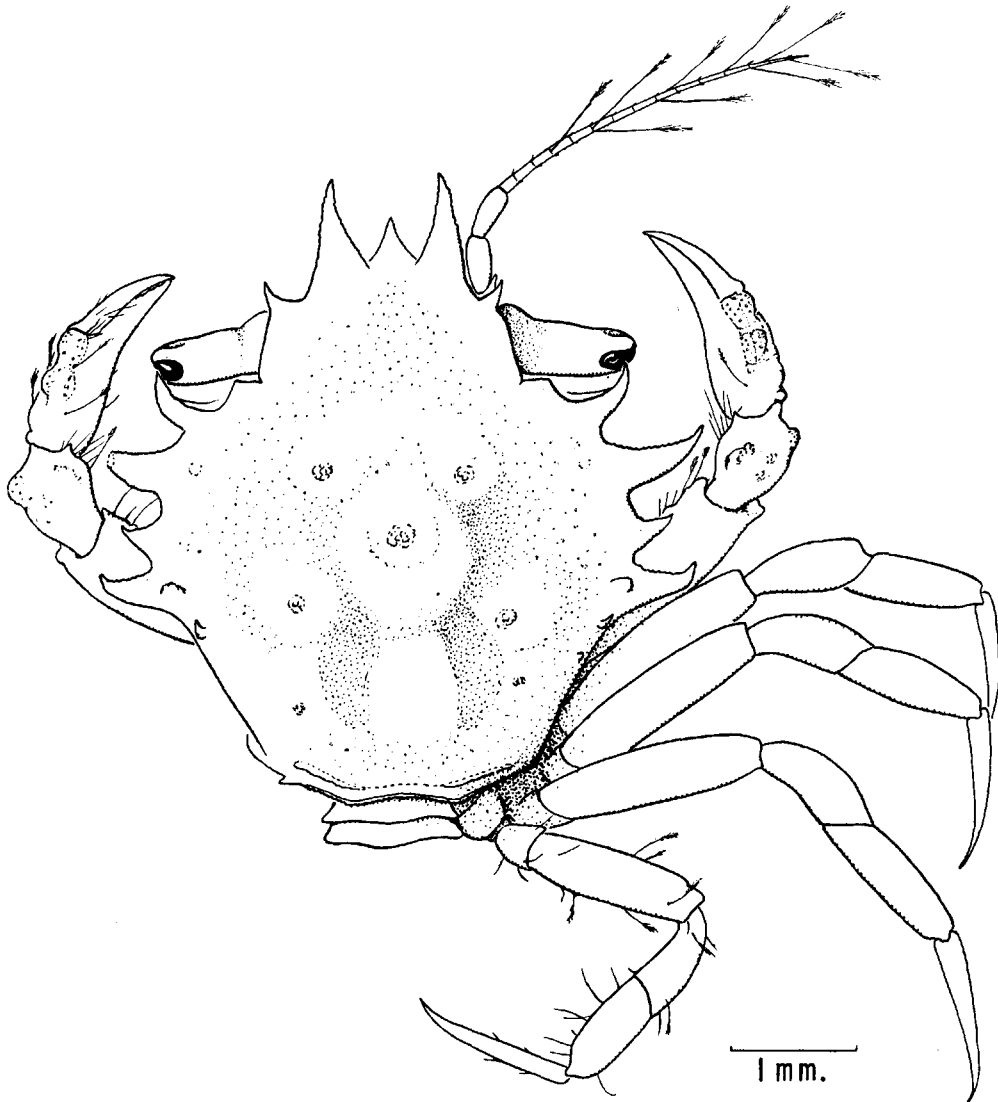


FIG. 4. *Sirpus zariquieyi* Gordon. The larger male paratype from Lot *b*, in dorsal aspect, left antenna and pereiopods II to V omitted.

sexually immature; it also is markedly granulose, and the eye-stalk has a depression distal to the bulbous base.

The *male* paratype from Lot *b* represented in Fig. 4 measures 4.60 by 4.72 mm. It differs appreciably in outline from the female, since the carapace is relatively

narrow and the anterolateral spines project but a short distance beyond the orbit. The lateral frontal spines as well as the anterolateral ones are longer and more slender and the intercalated lobe on the orbital margin is less pronounced. The areolation and the granulation of the dorsal surface of the carapace are also less conspicuous. The chelipeds are equal, and the merus projects some distance beyond the anterolateral spines (cf. Figs. 4 and 1A). The spine at the inner angle of the carpus is small; the two pairs of granulose humps on the dorsal border of the palm

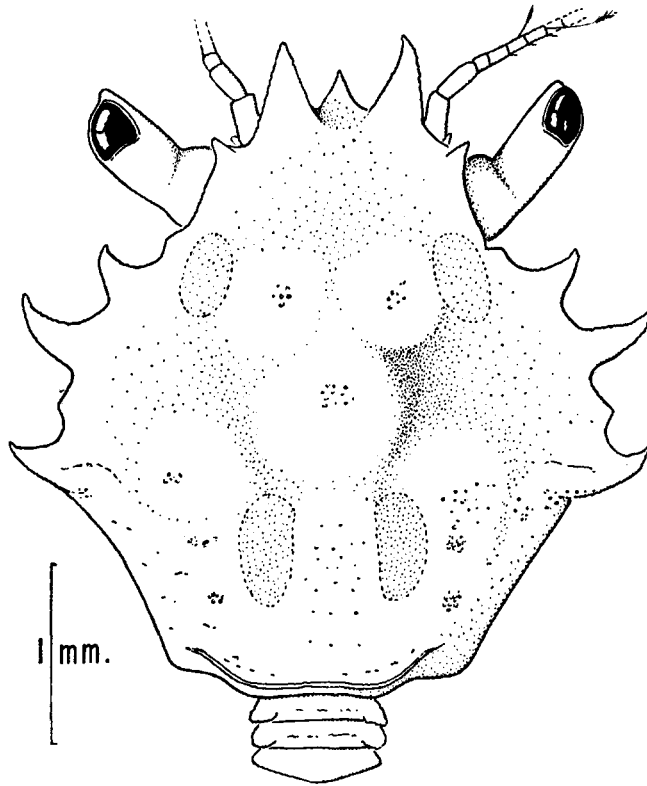


FIG. 5. *Sirpus zariquieyi* Gordon. Carapace of male paratype from Lot *c*, in dorsal aspect.

tend to merge, and the fingers are, as in the female, rather longer than the dorsal palmar margin. The walking legs are more slender than in the female; the merus of pereopod V is rather more than three times as long as wide, and the ridges on carpus, propodus and dactylus are less distinct. The details of epistome, buccal cavity, orbit, external maxilliped, etc., are shown in Fig. 3A. The abdomen is narrowly triangular; somites 3 to 5 are coalesced, and somite 7 is rather longer than the preceding one (Fig. 2D). The first pleopod, represented in Fig. 6B, is a long slender style reaching almost to the apex of the abdomen; the second pleopod is short, about one-fourth of the first.

The specimen received on loan from the Leiden Museum is also a male, and though measuring only 3.42 by 3.58 mm. also has the first pleopod well formed and nearly as long as the abdomen. It differs from the larger male chiefly in that the penultimate anterolateral spine and the intercalated spine of the orbital border are each only incipient (cf. Figs. 5 and 4). The separation of basal and distal portions of the eyestalk is also more marked by the depression mentioned as present in the females from Lot *a*. This specimen has, in addition to the two dark posterior reni-

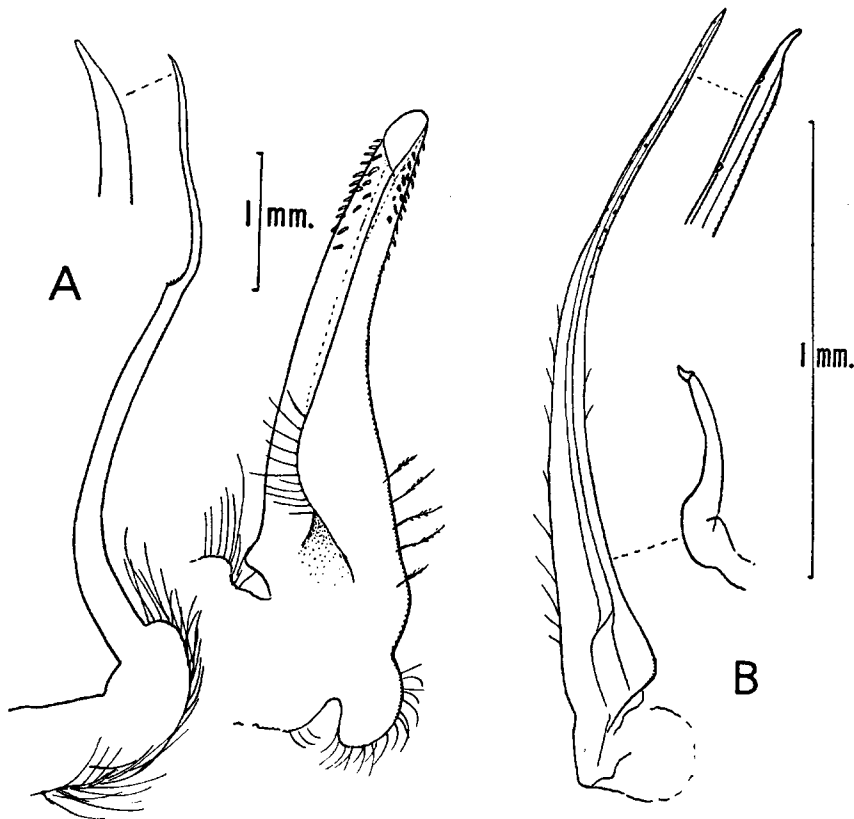


FIG. 6. *Trachycarcinus glaucus* Alc. & And. A. First and second pleopods of male syntype.

Sirpus zariquieyi Gordon. B. First and second pleopods of largest male paratype.

form areas, a similar dark patch anteriorly near each orbit. The well-formed pleopods of all these minute males suggests that they may be capable of impregnating females, though they are rather young.

HABITAT. Dr. Zariquiey informs me that the specimens from Lot *b* "were captured a short distance from the coast, at a depth of about twenty metres, amongst long *Cystoseira* algae growing in great quantity on the rusty iron plates of the hulk of a sunken vessel. On examining at home the pieces of rust and algae, I found the

Sirpus at the base of the said algae and on the pieces of rusty iron among other small algae (not determined). In the same place I found hundreds of *Catapaguroides timidus* (Roux), *Thoralus cranchii* (Leach), *Galathea bolivari* Zariquiey, *Porcellana longicornis* (Pennant), *Alpheus dentipes* Guérin and *Synalpheus laevimanus* (Heller)." . . . "The exact point is next to Punta Oliguera facing a sector of the coast called Los Cayals, in the vicinity of Cadaqués (South of Cabo de Creus), Provincia de Gerona, Spain."

***Sirpus monodi* n. sp.**

MATERIAL. (a) Collected by M. R. Sourie, at Dakar, 7.iii.1950. See also under habitat p. 57. One ovigerous female, the holotype (*c.l.* = 7 mm., *c.b.* = 7.3 mm.).

(b) Collected by MM. Th. Monod and P. Budker on 10.i.41 near Dakar, dredged by the "Cabellou," station 6 bis ("à l'Est de la bouée du Banc de Bel Air, 14° 42' N., 17° 24' W.), in about 12 m. Bottom "Sable grossier." One male (*c.l.* = 4.9 mm., *c.b.* = 5.1 mm.).

(c) Collected by M. Paraiso at Gorée, near Dakar, on 1.ix.50. Entangled in net used for fishing "langoustes" (*Panulirus regius*) and set in a few metres depth only. One female with genital openings long narrow slits and so probably slightly immature (*c.l.* = 3.9 mm., *c.b.* = 3.8 mm.).

DESCRIPTION OF HOLOTYPE. The *carapace*, represented in dorsal aspect in Fig. 7A, is only a trifle wider than long; the dorsal surface is markedly nodular in such a manner as to emphasize the areolation. The general outline is hexagonal, with the anterior and posterior margins shorter than the other sides (the orbit being considered along with the anterolateral margin as one side of the hexagon). The front comprises three subequal, bluntly triangular spines, the median one situated below the level of the lateral ones and directed obliquely forwards and downwards. The *orbit* is oblique, rather shallow but well formed anteriorly, imperfect postero-ventrally as shown in Fig. 8A, so that the retracted eye is protected only by the postocular spine and the corneal area is visible both dorsally and ventrally. The main lobe of the dorsal orbital margin terminates anteriorly in a blunt supraorbital spine or tooth, and is separated by a narrow hiatus from the blunt lobe intercalated between it and the postocular (or first anterolateral) spine. The ventral margin of the orbit is formed partly by segments 2 + 3 of the antennal peduncle and partly by the lobe bearing the infraorbital spine (Fig. 8A, 2), behind which it gradually fades out.

The anterolateral margin is divided into four spines, of which the third is the smallest and the anterior is the longest; the last, though short, is much wider than the third. The posterolateral margins are straight or even a trifle convex, and somewhat convergent. The submarginal crest parallel to the posterior margin is low and interrupted medially.

The two protogastric lobes bear each a blunt, forwardly directed spine or tooth, while the summit of the mesogastric lobe has a prominent wide cluster of granules. On the summit of the cardiac lobe is a pair of granular clusters. A high blunt hump, also beset with granules, is situated near the base of the last anterolateral spine. On either side of the shallow depression separating mesogastric and cardiac

lobes is a prominent branchial lobe, with a prominent granular hump on its summit and a smaller one some distance behind this. In addition, there are numerous granular patches or striae on the posterior half of the carapace.

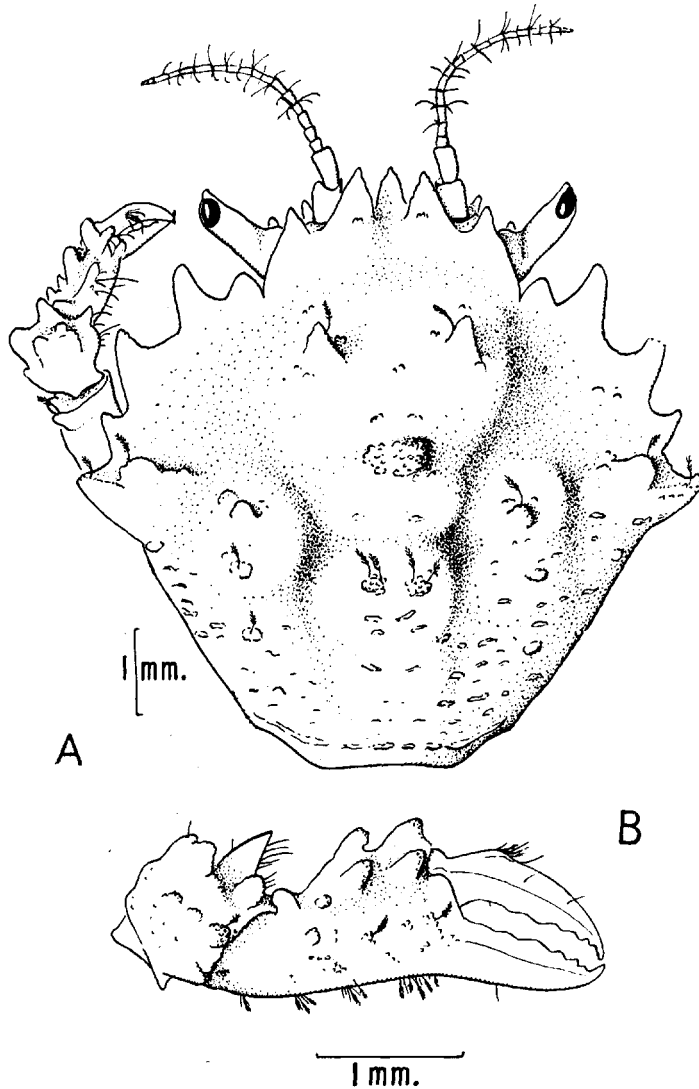


FIG. 7. *Sirpus monodi* n. sp. Holotype, an ovigerous female. A. Carapace and left cheliped, in dorsal aspect. B. Carpus and chela of right cheliped.

The *antennae* are long and setose, but the setae are simple, not plumose. The blunt spinose anteroventral angle of segments 2 + 3 of the peduncle is visible in dorsal aspect (Figs. 7A and 8A); segments 4 and 5 are of equal length, but the former is the more robust.

The *eyestalk* is swollen and bulbous proximally, slender and cylindrical throughout most of its length; the distinctly pigmented corneal area is rather small and terminal.

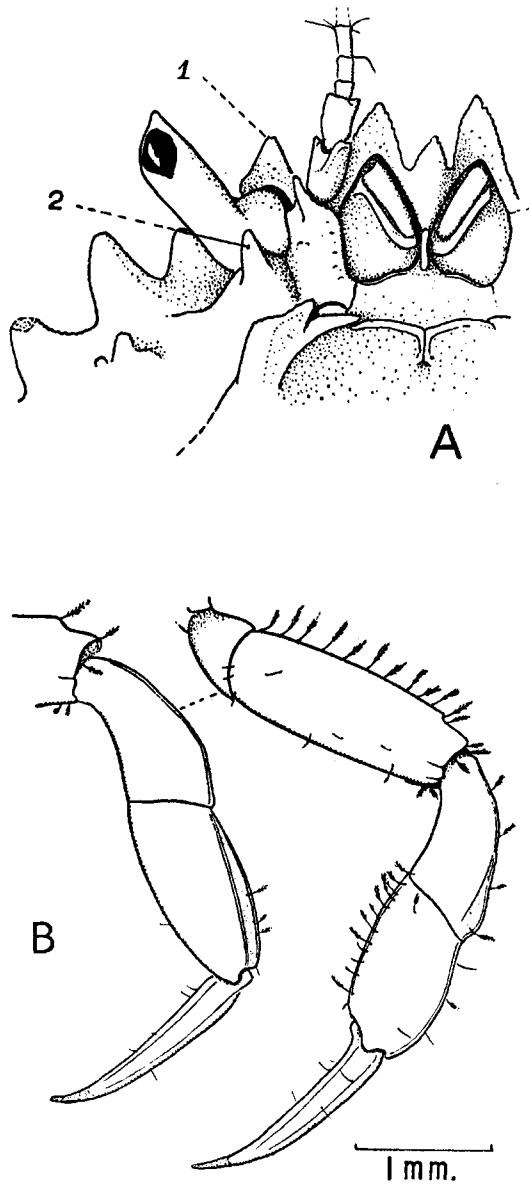


FIG. 8. *Sirpus monodi* n. sp. Holotype. A. Right anterior portion of carapace, in ventral aspect, to show details of orbit, epistome, buccal cavity, etc. B. Pereiopod V and distal segments of pereiopod IV. 1. Supraorbital spine. 2. Infra-orbital spine.

The *chelipeds* are equal; the right, which is detached from the specimen, is represented at a higher magnification in Fig. 7B. Part of the merus is visible in dorsal aspect beyond the two posterior anterolateral spines. The carpus and palm of the chela are both conspicuously nodular; the fingers are rather longer than the dorsal margin of the palm, and there is a proximal tuft of setae on the upper border of the dactylus, about one-third of the way along. When closed, the cutting edges of the fingers are in contact distally, leaving a narrow proximal gap; the outer surface of each finger bears a low ridge. The maximum height of the palm is almost equal to the length of the dorsal margin. The spine on the inner border of the carpus is conspicuous.

The *walking legs*, pereopods II to V, are bent inwards round the large bunch of ova and so have been omitted from Fig. 7A. The distal segments of pereopod IV are represented in Fig. 8B; there is a low median dorsal ridge or carina on the carpus, two dorsal ridges on the propodus and several longitudinal ridges on the dactylus, which is not compressed. Pereopod V is shown also in Fig. 8B; the merus is not quite three times as long as wide, the dorsal ridge on the carpus is more prominent distally, the propodus is more compressed and the two dorsal ridges are very close together.

The *antennules* are set in deep sockets beneath the front as represented in Fig. 8A; they are folded obliquely, and there is a conspicuous crest or carina on the swollen basal segment of the peduncle. The *epistome* sends forwards a narrow prominent median carina to meet the backward projection of the front. The anterior margin of the buccal cavity is distinctly marked by a ridge, as shown in Fig. 8A.

All seven somites of the narrow *abdomen* are free; the maximum width across somites 3 and 4 scarcely exceeds the width of the posterior margin of the carapace. Somites 5 and 7 are equal, and each a trifle longer than somite 6; the terminal one is narrowly triangular.

The *ova* are numerous and small (a trifle larger than in the type species).

THE MALE. The single male specimen is represented in dorsal aspect in Fig. 9. Most of the pereopods are detached from the left side, while the last one, pereopod V, is missing on the right side. The *carapace* is very similar in outline to that of the female; the frontal and anterolateral spines are all rather blunt and massive and the supraocular lobe is broad and rounded. As the specimen is younger than the holotype the areolation of the carapace is less pronounced, but the nodular prominences on the principal lobes are distinct. The *eyestalks* are relatively more robust than those of the holotype. The crest near the posterior margin of the carapace is more distinct and continuous. The *abdomen* is rather damaged near its junction with the carapace, as Dr. Monod had dissected out the pleopods from one side and mounted them on a slide, so that my reconstruction of that part may not be quite correct (Fig. 9). Somites 3 to 5 are coalesced; the distal somites are very similar to those of *S. zariquieyi*, represented in Fig. 2D. The first pleopod is slightly distorted in the micropreparation, but is a long slender style reaching nearly to the apex of the abdomen. It is very similar to that of *S. zariquieyi*, as is the second pleopod. The chelipeds are equal, rather more massive than those of the holotype,

although as yet the nodular condition is less highly developed on carpus and palm; the cutting edges of the fingers each bear six well-formed lobes or teeth, the proximal ones being more pronounced than in the older female.

REMARKS. The rather immature female is also very similar to the holotype.

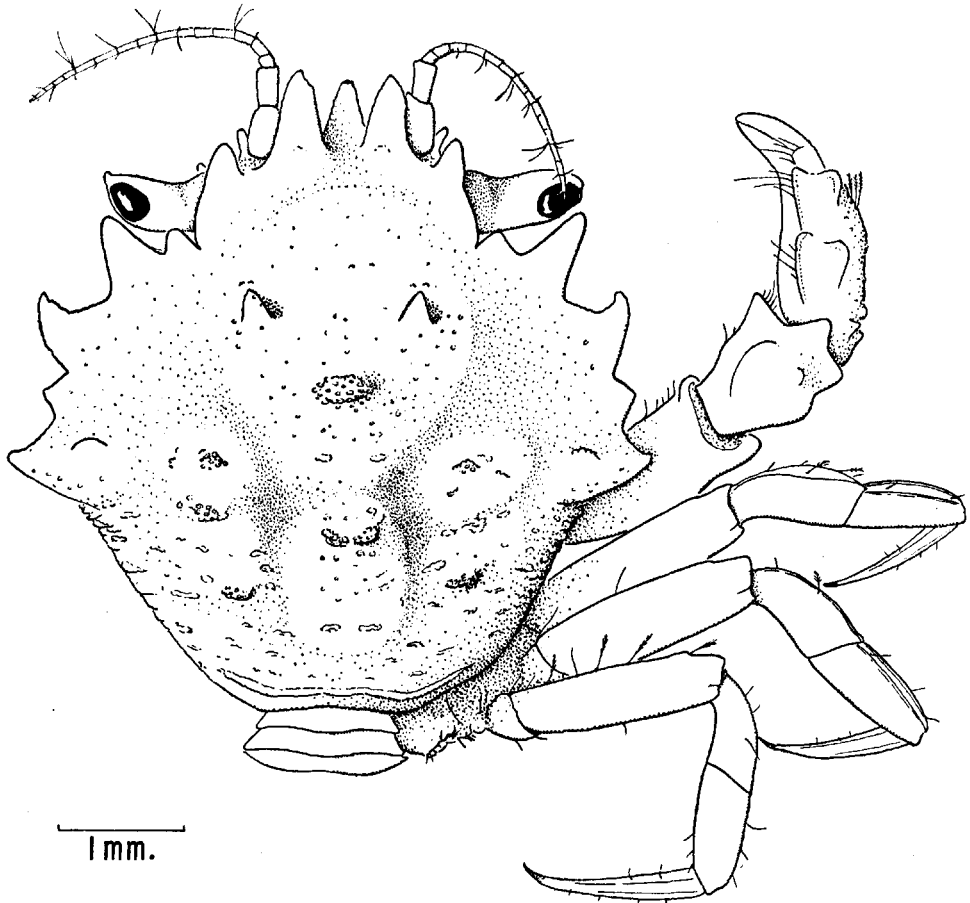


FIG. 9. *Sirpus monodi* n. sp. Male paratype, in dorsal aspect, pereiopods on left side omitted.

This species undoubtedly belongs to the genus *Sirpus* and, like the type species, it reaches sexual maturity at a remarkably small size. *S. monodi* differs from *S. zariquieyi* chiefly in the following respects: (i) It is a much more nodular form, with shorter and much more massive spines on front, orbits and anterolateral borders. (ii) There is no marked difference between the sexes as regards the shape of the carapace. (iii) The chelipeds and walking legs are relatively more robust, and the latter rather shorter as well. The propodus of pereiopod V is rather more compressed. (iv) The setae on the antennal flagellum are simple and rather short, instead of long

and distally plumose; the segments of the peduncle are much more robust (cf. Figs. 8A and 3A).

HABITAT. Dr. Monod informs me that the holotype was collected "à marée basse, à Dakar (Anse Bernard) au niveau de l'affleurement de tufs volcaniques (la même station a fourni des *Perimela*¹ *denticulata*). M. Sourie me dit que le petit crabe, très homochrome, était très difficile à apercevoir sur le sable." Summing up for all three localities he writes: "l'Espèce semble donc, pour le moment être littorale, depuis la zone intercotidale jusqu'à 10-15 m." (letter dated 11.iii.53).

The holotype will be deposited in the Paris Museum, the male paratype in the IFAN at Dakar, and the female paratype in the British Museum Collection.

Since the MS. went to press, Dr. Monod has found an ovigerous female measuring 4.5 by 4.8 mm. amongst some undetermined material in the Paris Museum. The specimen was collected by A. Gruvel on 2.iv.08, at Pointe Cansado, C. Blanco, Morocco, much further north than the type material. It agrees well with the holotype but, being smaller, it has many more granular striations on the dorsal surface of the carapace.

THE SYSTEMATIC POSITION OF THE GENUS

When Dr. Zariquiey first sent me the two small female specimens comprising Lot a of *S. zariquieyi* he referred to them in his letter dated 16.ix.47 as "dos Maiidae formas juveniles de sp. ?". On examining them my first impression was that they might be very young stages of *Pirimela denticulata* (Montagu) but this proved not to be the case, and I also was inclined to regard them as young stages of a species of Spider Crab. Now that an ovigerous female is available and I have examined them more carefully, I am convinced that they are not referable to any family of the large subtribe Oxyrhyncha. No Oxyrhynchous crab has the median frontal spine so well formed that the front looks trispinose; when present the median spine or rostrum is minute, and much more ventral in position than the well-developed rostral (or pseudorostral) horns (e.g., in *Maia* or in *Mithrax*). Moreover, in the Oxyrhyncha it is unusual for the anterolateral and posterolateral borders of the carapace to be clearly separated, and the basal segment (or more correctly segments 2 + 3) of the antennal peduncle usually forms a larger part of the lower orbital border. The general form of the carapace in the ovigerous female is distinctly Cancroid, in the wide sense employed by Rathbun, 1930, apart from the front, the median spine of which slopes obliquely downwards and so lies in a different plane from the other two (Figs. 1A and 2B). It would appear that my first impression—that they are closely related to *Pirimela*—was fairly sound. Dr. Balss, who has done so much to elucidate the classification of the Oxyrhyncha and to whom I sent some sketches, writes (6.x.52): "Das Bild einer jugendlichen Krabbe, das Sie mir übersandt haben, gibt nicht eine Oxyrhynche Krabbe, sondern eine primitive Portunide (*Carcinus maenas*? oder eine verwandte Art)." He was relying entirely on memory, being too ill to go to Munich to consult the literature. Dr. Monod, to

¹ According to Monod (1933, *Bull. Com. d'Études hist. sci. Afr. Occ. Fr.* 15, 2-3: 52) *Pirimela* is etymologically incorrect.

whom I also sent sketches and who has since found the specimens belonging to the second species *S. monodi*, writes (j.xii.52): "ne devrait-on pas chercher du côté des Ateleyclidés, aux alentours de *Trachycarcinus* par exemple?" Thus all three of us are agreed that the genus belongs to the Cancroid or Cyclometopous Crabs in the wide sense used by Rathbun, 1930.

Carcinus maenas or *Carcinides maenas* (L.) is one of the few species of European brachyura the postlarval development of which is known in detail (see, e.g., Shen, 1935, p. 19, text-fig. 20), and the specimens from Cadaqués do not fit into this series. The nearest approach to these specimens that I have discovered so far is a

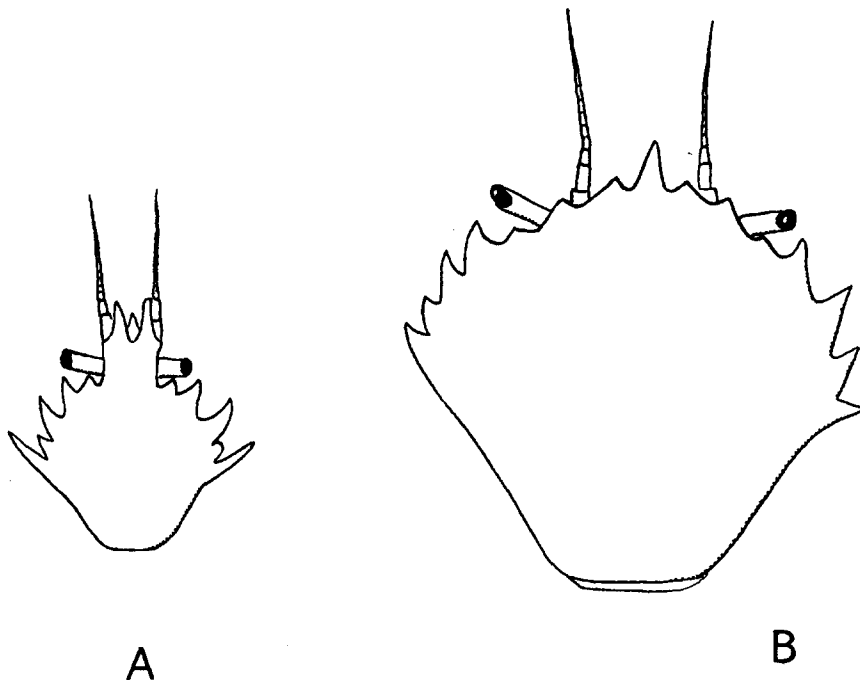


FIG. 10. Two figures after Cano, at twice his magnification.

- A. "*Maja verrucosa*, stadio postlarvale" from 1893, taf. 34, fig. 29 ($\times 8$).
 B. "Fase adulta (giovane) di *Pirimela*" from 1891, 1892, tav. iv, fig. 4G (Cano's magnification not specified).

young crab stage referred to *Maia verrucosa* H. M.-Edw. by Cano (1893, Taf. 34, fig. 29), and which I have illustrated ($\times 2$) in Fig. 10A. The size of this specimen is approximately 4×4 mm., but I do not think that it can be the first, second or later young crab stage of *M. verrucosa*—Cano did not rear it from the megalopa, of course. Miss Lebour seems to have accepted Cano's interpretation of his specimens, so it is perhaps presumptuous of me to question this stage. The development of *Maia squinado* (Herbst) has been described by Lebour (1927), who obtained the prezoaea, first and second zoeae and megalopa from the eggs. But, as she states on p. 797, in no case did the megalopa turn into a crab. The megalopa of *Maia squinado*

from which she obtained the first three young crab stages was obtained from the plankton. What strikes one about these stages is their marked resemblance to young Portunids; although the front is rather more pointed medially, the general resemblance of these young *Maia* to the corresponding stages of several species of *Portunus* and of *Carcinides* is unmistakable (cf. Lebour, 1927, Pl. III, fig. 10 with Lebour, 1928, Pl. VI, figs. 1-3 and pl. 7, figs. 1 and 3). The young crab stages of *Macropodia* and of *Inachus*, on the other hand, are unmistakably Oxyrhynchous (see Lebour, 1927, Pl. 3, figs. 5 and 8). I cannot help wondering whether the megalopa from which these three young stages were obtained is really referable to the genus *Maia*.

To return to Cano's young "*Maja verrucosa*," it resembles the specimens from Cadaqués as regards the front, eyestalks and orbits, and in the number of anterolateral spines. If the supraorbital spines were omitted from Figs. 4 and 5 and the orbital margins were carried straight back from the bases of the lateral frontal spines, and the anterolateral spines on either side of the smallest one were exaggerated slightly, the result would be much as in Cano's figure (Fig. 10A).

Bouvier (1942) has separated the crabs of "la tribu des 'Corystoidea'" from the rest of the Brachyryncha; to the Corystoidea he has referred the Euryalidae (= Corystidae restr.), Atelecyclidae and Cancridae of Rathbun (1930, pp. 10, 148 and 176) and others, placing the genera in five families (see pp. 47-48 for his scheme). The genus *Trachycarcinus* he places in the family Corystidae, subfamily Atelecyclinae; *Pirimela* in the monotypic family Pirimelidae. I had noted the rather striking resemblance between the males of *Sirpus zariquieyi* and *Trachycarcinus corallinus* Faxon for example. In the British Museum Collection the genus is represented by one male syntype of *T. glaucus* Alcock & Anderson and one male specimen of *T. balssi* Rathbun received from Dr. Sakai of Japan. *Sirpus* agrees with the diagnosis of *Trachycarcinus* given by Rathbun (1930, p. 164) as regards the orbits, which are "large, with forward aspect, imperfect," but it differs in many respects: (i) The eyestalks are retractile within the orbits but they are not "very small," nor are the eyes "dull and faintly pigmented." (ii) The front is wider and, though trispinose, the spines do not lie in one plane as they do in *Trachycarcinus*. (iii) The anterior margin of the buccal cavity is very distinct and the ridges of the endostome are less pronounced than in *T. balssi* for example. The external maxillipeds also differ in the two genera; in *Trachycarcinus* there is a considerable gap between the maxillipeds anteriorly, the anterior inner angle of the ischium is advanced and the merus is "obliquely truncated without emargination at antero-internal angle" (Rathbun, 1930, p. 164, pl. 72, fig. 6). (iv) The carapace is not pentagonal with long, nearly straight, anterolateral margins, but hexagonal (more ovoid in the female of the type species *S. zariquieyi*). (v) The antennules do not fold longitudinally or lengthwise as in the Atelecyclidae, but obliquely, as shown in Figs. 3A and 8A. (vi) The abdomen of the male is more narrowly triangular, with a longer apical somite and somites 3 to 5 completely coalesced (cf. Figs. 2D with 2A—somites 4 and 5 are imperfectly coalesced in *Trachycarcinus glaucus* and in *T. corallinus* but all seven somites are free in *T. spinulifer*); and, judging from the figure given by Rathbun (1930, pl. 72, fig. 5), that of the female is also narrower, with a much longer apical

somite, in *Sirpus*. (vii) The pleopods of the male also differ markedly in the two genera as represented in Fig. 6A and B; in *Trachycarcinus* the first pleopod is relatively straighter, more robust and shorter, while the second pleopod is longer than the first and has a terminal lash. In all the genera of the Atelecyclinae that I have examined, namely *Telmessus*, *Peltarion*, *Atelecyclus*,¹ *Trachycarcinus* and *Pliosoma*, pleopod 2 of the male is as long as or longer than pleopod 1 *except* in *Pliosoma*; in the latter pleopod 2 is very short, measuring only about one-sixth of pleopod 1, and the genus may be referable to a different subfamily. I should expect *Erimacrus* and *Trichopeltarion* to conform to the general pattern (i.e., to have pleopod 2 long), but I have no material at my disposal; Rathbun and Bouvier both omitted to

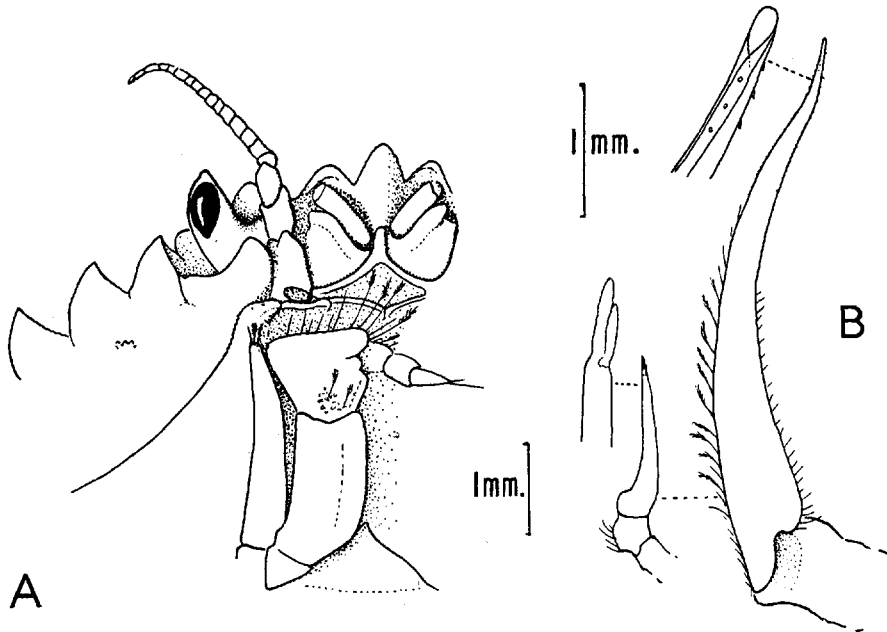


FIG. 11. *Pirimela denticulata* (Montagu). A young male from Jersey (width of carapace approx. 10.7 mm.). A. Part of carapace, in ventral aspect, to show details of orbit, epistome, buccal cavity and third maxilliped, etc. B. First and second pleopods, with apex of each further enlarged, of young male (10.4 × 11.4 mm.).

mention the form of the male pleopods. In the Corystidae (or Corystinae of Bouvier) pleopod 2 varies in relative length, being longer than pleopod 1 in *Pseudocorystes* and *Podocactes*, about the same length as pleopod 1 in *Gomezia* and *Jonas*, shorter than, but exceeding half the length of, pleopod 1 in *Corystes*. In the family Bellidae of Bouvier's scheme (Acanthocyclinae in that of Rathbun) pleopod 2 reaches nearly to the apex of pleopod 1 in *Bellia*, but is rather less than half as long as pleopod 1 in *Acanthocyclus*. In the genus *Cancer* pleopod 2 is rather longer than pleopod 1—

¹ Stephensen (1945, p. 222) is in error when he says of the subfamily Atelecyclinae, "Plp. 2 short, of usual shape"; Brocchi, to whom he refers, says on p. 103 that pleopod 2 of *Atelecyclus cruentatus* Desm. is long, and his fig. 199 shows a long slender appendage which exceeds pleopod 1 (figs. 197-8).

family Cancridae of Bouvier's scheme—whereas it is short in *Thia*, *Kraussia* (family Thiidae) and in *Pirimela* (family Pirimelidae) (see Fig. IIB).

Fig. 12 represents a small male specimen of *Pirimela denticulata* (Montagu) from Jersey in dorsal aspect. The areolation of the carapace is very similar to that found in both species of *Sirpus*. The front is trilobed, the median one being the most prominent, and all lie in the same plane. The antennae are rather long but as a rule are not setose, though a few very short plumose setae may be present in some

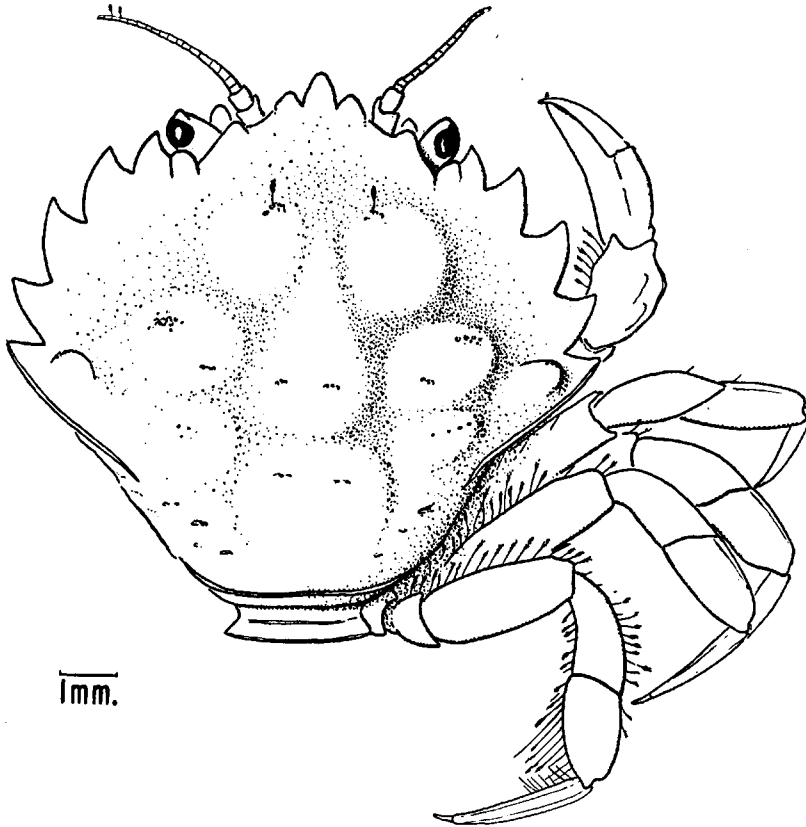


FIG. 12. *Pirimela denticulata* (Montagu). Young male, in dorsal aspect, left pereiopods omitted.

specimens. The orbit is closed and narrow, but the dorsal border comprises three lobes, separated by two notches; the eystalks are rather short, but the basal portion is bulbous (Fig. IIA). The anterolateral margin bears five forwardly directed spinose lobes. *Pirimela denticulata* grows to a larger size and is far less precocious than either of the species of *Sirpus*—the first trace of the genital opening appears when the females measure 9 to 10 mm. in maximum width, and the opening is not fully formed until they measure 11 to 12 mm. across the last pair of anterolateral spines. It is not so easy to ascertain when the males reach sexual maturity; in a

small specimen measuring 7 mm. in width the first pair of pleopods is short and obviously immature, but by the time the carapace measures 8.5 to 9 mm. in width these pleopods are well-developed long styles. *Sirpus* appears more closely related to *Pirimela* than to *Trachycarcinus* in the following respects: (i) The manner in

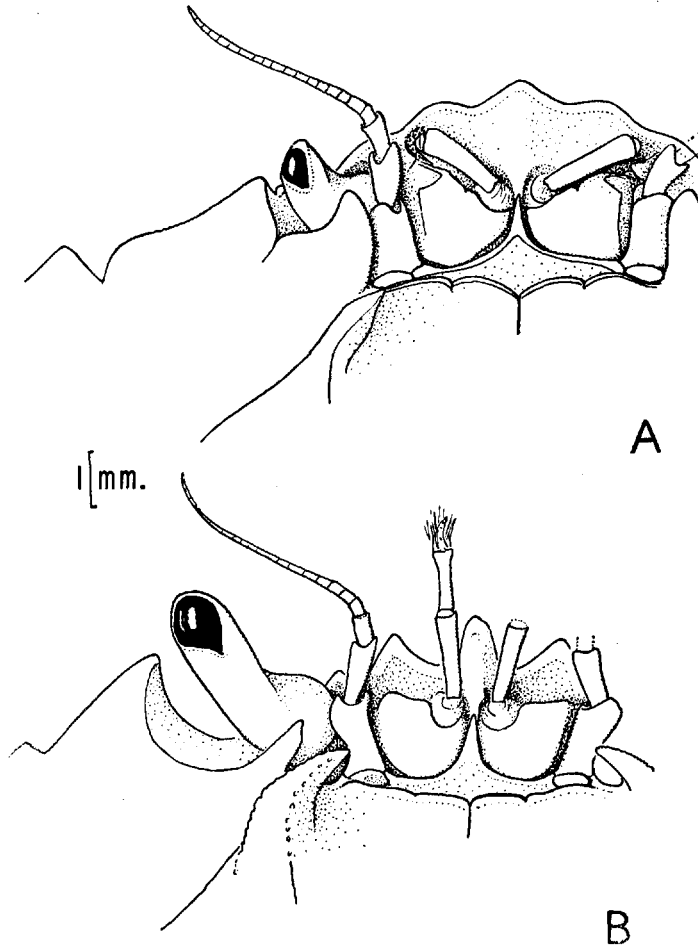


FIG. 13. A. *Portumnus biguttatus* Risso. B. *Portumnus latipes* (Pennant). Anterior portion of carapace, in ventral aspect, to show details of front, orbit and eyestalk, antenna and antennules, epistome and anterior margin of buccal cavity.

which the antennules are folded, the distinct anterior margin to the buccal cavity, the well-pigmented eyes and the form of the external maxilliped (cf. Figs. 3A and 8A with 11A). (ii) The form of the abdomen in both sexes. (iii) The form and relative lengths of the pleopods of the male (cf. Figs. 6B and 11B). (iv) The lobulation of the carapace—the female of *S. zariquieyi* also approaches more nearly to *Pirimela* in general form of the carapace (cf. Figs. 1A, 7A and 12). (v) The walking legs are also very similar. At present we do not know how large either of the species of

Sirpus may become, but they would appear to be really of very small size, since even in the smallest males the pleopods are already well formed, and in all but the smallest female the genital openings are visible. It is unlikely that the females would alter appreciably with increase in size, since in each species the largest bears ova.

Cano (1891, tav. iv, fig. 4G—published in 1892) gives a figure of what he calls the "fasa adulta (giovane) di *Pirimela*," which I have reproduced at twice his magnification in Fig. 10B. As Cano does not appear to give his magnification I do not know the size of his specimen. It differs appreciably from all the stages that I have examined chiefly in having wide shallow orbits, long eyestalks and only four anterolateral spines—in these respects his specimen recalls *S. zariquieyi* even more than *Pirimela*, although the front is nearer to that of the latter (Cano's specimen is represented in his figure as rather asymmetrical). At present the postlarval development of *Pirimela denticulata* is not known[†]; it seems unlikely that Cano's specimen is a young crab stage of *Pirimela*, but if it is the orbit must alter markedly with age and the number of anterolateral spines increase to five (cf. Figs. 12 and 10A).

The wide shallow orbit alone would not necessarily exclude these new species from Cadaqués and West Africa from the genus *Pirimela*. The two European species of the genus *Portumnus* differ from each other markedly as regards orbit and eyestalk as represented in Fig. 13A and B. In *Portumnus biguttatus*¹ Risso the orbit is closed, narrow, and deep enough to conceal the cornea of the retracted eye dorsally, though not ventrally (owing to the deep gap or hiatus in the ventral margin). The trilobed front is separated by a wide shallow emargination from the low rounded supraorbital lobe. The principal segment (2 + 3) of the antennal peduncle fills the gap between the orbit and the antennular fossa, and, in the specimen from which the figure was made, is slightly movable. In *Portumnus latipes* (Pennant) the front is more markedly three-pronged; the orbit is wide and shallow, affording no concealment for the cornea of the retracted eye; moreover, there is a wide gap between the infraorbital spine or angle and the antennal peduncle (Fig. 13B). *Sirpus* and *Pirimela* differ from each other as regards orbit and eyestalk in much the same way as do these two *Portumnus* species. However, *Sirpus* differs sufficiently from *Pirimela* as regards the form of the front, the number and form of the anterolateral spines, the more setose antennae, and in the absence of a "lobe portunien" on the endopodite of the first maxilliped (see Bouvier, 1942, p. 32, fig. 15), to justify the erection of a new genus. But these differences hardly seem sufficient to justify a new family for the reception of *Sirpus*.

Authors do not seem to agree as to the systematic position of the genus *Pirimela*. Pesta (1918, pp. 386–387) places it with *Cancer* and *Carcinides* in the family Cancridae; most authors place *Carcinides* in the Portunidae. Nobre (1931, p. 84; 1936, pp. 48–49) refers it to the Cancridae along with *Cancer* and *Xantho*! In the Plymouth Marine Fauna, 2nd edition, 1931 the family Cancridae includes *Cancer* and *Atelecyclus*, while *Pirimela* is referred to the monotypic family Pirimelidae. Bouvier (1942, pp. 47–48) includes the Cancridae and the Pirimelidae, each with only the genus from which the family name is derived, in his Corystoidea, which he removes from the Brachyrhyncha (and yet he refers to *Pirimela* as having a

¹ Referred to the genus *Portumnoides* by Bohn 1902, p. 448.

4 See LEBOUR's emendation of 1st crab stage of "*Pirimela*" (1928) to that of *Portumnus* (1944)

narrow "lobe portunien" as mentioned above). Lebour (1944, p. 15) writes: "As far as we know from its larval stages *Pirimela* is probably related to *Portunus* and *Cancer*, perhaps more nearly to *Cancer*." Enough has been said to show that the classification of the Brachyura is in need of thorough revision. In the meantime I am inclined to place *Sirpus* near to *Pirimela* rather than to *Trachycarcinus*, although it shows some resemblance to the latter. In the shape of the abdomen in both sexes and also of the male pleopod I it is much nearer to *Pirimela* than to *Carcinides* and the dactylus of pereopod V is not compressed as in the latter genus, which is a primitive Portunid (see p. 57 for Dr. Balss' view).

The two genera of the family Pirimelidae may be distinguished as follows:

- A. Front trilobed, the lobes in one plane; orbits narrow and complete; anterolateral margin divided into five teeth; antennal flagellum not obviously setose; specimens reaching a fair size (up to 25-30 mm. across carapace)
Pirimela, Leach.
- B. Front trispinose, the spines not in one plane; orbits wide and incomplete ventro-posteriorly; anterolateral margin divided into four teeth or spines of which the third is the smallest; antennal flagellum setose; specimens of very small size *Sirpus*, Gordon

The study of these small crabs was particularly difficult, I think, because of their extreme sexual precocity, as a result of which they have inevitably retained a number of juvenile characters. For example, the great fronto-orbital width, the projecting front, the relatively large frontal, orbital and anterolateral spines and the long setose antennae are all strongly reminiscent of the first postlarval stage of *Cancer pagurus*, figured by Cunningham (1898, *Proc. zool. Soc. London*, p. 204, pl. xxi, fig. 1).[†] Shen has figured the outline of the carapace of the first nine young crab stages of *Carcinus maenas* (1935, p. 19, fig. 20), so that one can see at a glance how the shape and relative proportions vary with age. As regards size, the largest ovigerous females of the genus *Sirpus* would be equivalent to the sixth young crab stage of *Carcinus* and sexual maturity is reached even at a smaller size. The two species of the genus *Sirpus* may therefore be regarded as neotenous. de Beer (1951, 'Embryos and Ancestors,' revised edition, p. 52), applies the term neoteny to "cases where the adult animal retains larval characters"; where a complicated metamorphosis occurs, however, it is more likely to be the postlarval characters that are retained by the adult.

Acknowledgments.

I wish to thank Dr. Zariquiey of Barcelona, Dr. Boschma of Leiden and Dr. Monod of Dakar for sending me these very interesting specimens for study. I am also grateful to Dr. Balss of Munich and Dr. Monod for giving me their views on the relationship of the genus, and to my colleague Mr. A. C. Townsend for assistance in finding a name for it.

The authorities of the British Museum (Nat. Hist.) are much indebted to Dr. Zariquiey for presenting to their Collection the holotype and a male paratype of *S. zariquieyi*, and to Dr. Monod for presenting the female paratype of *S. monodi*.

† and was more so of the first crab stage of *Portunus latipes*
(see LEBOUR 1928, pl. viii fig. 4 and 1944, fig. 3e)

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