

XII. — THE GRAPSOID GENUS PYXIDOGNATHUS A. MILNE-EDWARDS, WITH DESCRIPTION OF A NEW SPECIES.

BY Dr. J. J. TESCH. — (WITH PLATE XI).

The genus *Pyxidognathus* was established by A. Milne-Edwards (Bull. Soc. Philom. Paris, ser. 7, t. 3, 1878, p. 109) on a species, named by him *P. granulosus*, that was found in fresh or slightly brackish water in the island of Ovalau. A few months afterwards, in April 1879, de Man described a specimen under the name *Hypsilograpsus deldeni* nov. gen. nov. spec. (Notes Leyden Mus., v. 1, p. 72), collected by van Delden in 1836 near Manado (Celebes); this specimen, however, was recognized by de Man himself (Notes Leyden Mus., v. 5, 1883, p. 159) as being probably identical with the species of Milne-Edwards, having had the opportunity of examining an original drawing of the animal, prepared by the French author.

Dr. de Man has, on my request, kindly sent me this drawing, and after a careful comparison between this and the original *Hypsilograpsus* specimen, I am fully convinced that the specimens of Milne-Edwards and of de Man belong really to the same species, and that the name *Pyxidognathus* therefore has priority.

In 1888 de Man made known another species of this genus, *P. deianira* (Journ. Linn. Soc. London, v. 22, p. 148, pl. 10, f. 4—6), observed in mangrove-swamps of the Mergui Archipelago, and finally Alcock described a third species *P. fluviatilis* (Journ. As. Soc. Bengal, v. 69, prt 2, 1900, p. 408, Ill. Zool. „Investigator”, Crust., prt 10, 1902, pl. 66, f. 3—3a), collected in fresh water in the Jessore District (British India).

The discovery of a new species, referable to this genus, in a collection belonging to the Amsterdam Zoological Museum, induced me to give an account of *Pyxidognathus*, the more readily because I could not only provide a drawing of the type species (the original specimen of *Hypsilograpsus deldeni* still being present in our Museum), no figure of which has as yet been published, but also examine an adult male of *P. deianira*, that was still unknown in the full-grown state.

Both Milne-Edwards and de Man perfectly recognized the close relationship of *Pyxidognathus* to *Ptychognathus* Stimpson (= *Gnathograpsus* A. Milne-Edwards); indeed, among the Grapsidae, both genera are distinguished by the exognath of the external maxillipeds being as broad as, or even broader than, the ischium. But whereas in *Ptychognathus* the carapace is thin and flattened, the front horizontal, and the chelae are often provided externally with a tuft of hairs, the carapace is thicker and much

more vaulted in *Pyxidognathus*, the front is deflexed and the chelae are hairless.

1. *Pyxidognathus granulosus* A. Milne-Edwards (Pl. XI, Fig. 2).

As already said, I examined the type specimen of *Hypsilograpsus deldeni* de Man, of which this author in 1879 published a very good description. It seems useless to redescribe it at length, but, as the species has never been figured, I give a drawing, and shall indicate some characters, that may distinguish the species from the next.

The carapace is very much vaulted in both directions, so that in front view it appears almost semi-globular (f. 2a). The maximum breadth is found between the tips of the posterior lateral teeth, and exceeds somewhat the length of the carapace. The distance between the external orbital angles is about 79% of the greatest breadth of the carapace; the orbital angles themselves are subacute, and the lateral borders distinctly diverge backward towards the anterior epibranchial teeth, the tip of which is obtuse, little projecting and lying midway between the external orbital angle and the tip of the posterior epibranchial tooth, that is equally shaped; behind these latter teeth, at the end of the anterior third of the lateral border, these borders distinctly converge backwards towards the bases of the last pair of legs. The posterior margin of the carapace slightly exceeds the distance between the anterior lateral angles of the front. This latter is not marked off posteriorly from the protogastric region, as it keeps the same regular convex curve of the carapace, the anterior margin has three wide sinuses, one median and two, somewhat narrower and deeper, lateral, which latter are bordered externally by the lateral angles of the front, that are projecting and subacute (f. 2a). The infra-orbital border is straight and has a small erect tooth at the median end, which tooth reaches upward to the same level as the tip of the lateral angle of the front, but is placed somewhat externally with regard to this angle, so that a small hiatus is left for the antenna, that enters the orbit. The anterior border of the buccal cavity is projecting. The whole outline of the carapace, including the borders of the nearly circular orbits, a horizontal line immediately beneath these and the anterior border of the buccal cavern is granulated; moreover the whole upper surface of the carapace is likewise covered with granules. This granulation is especially marked on the hepatic and branchial regions, where the granules are largest, they are more crowded and smaller on the protogastric region, where two median postfrontal lobes, separated by a broad and shallow, smooth furrow, and two lateral lobes, situated much farther behind, are distinguishable (f. 2a); on the front there are four groups of granules,

two median, that are elongated transversely, and two lateral, rounded ones. The grooves, defining the usual regions on the carapace are strongly marked, especially the cervical groove, separating the mesogastric and cardiac region, at either end of which groove a rhombic region may be distinguished; the gastric region is well defined, though protogastric and mesogastric part are not clearly separated off; the hepatic area is also distinct from the branchial one, but cardiac and intestinal region pass into each other.

The external maxillipeds, as also the pterygostomian regions, are somewhat hairy; the ischium, that is longer than the merus, is as broad as the exognath (in the ♀); the latter reaches nearly to the strongly auriculated, anterior border of the merus, that is much broader than long.

All the legs are, as observed by de Man, short, and the chelipeds of the ♀ are equal in size; the meropodite of these is very short, granulated at outer surface, with a strongly-curved superior border, that shows some long hairs in the first half; the carpopodite is likewise granulated externally, and the inner angle is produced and subacute, though not spiniform; the palm is as high at the base of the fingers as long, slightly longer than the fingers, there is a horizontal row of 3—4 granules, besides some other ones, at the inner surface (de Man does not mention these granules), the outer surface is convex, with some sparse hairs and large granules, of the latter there are two conspicuous, horizontal rows, diverging somewhat distally, the ventral row continued on to the tip of the immobile finger, the interspace between the rows is smooth, and above the upper row, which it itself composed of somewhat larger granules than those of the other, are similar large granules, irregularly placed; the fingers are excavated at the tip, that is lined by a dark brown, thickened margin, the cutting margins are provided with some hairs, and with a few small, obtuse teeth, two quite near the base of the movable finger, and 3—4 on the immobile finger, which latter are clearly visible by their chalk-white hue.

The walking legs are scarcely longer than the chelipeds, the first three pairs of nearly equal length, the last pair considerably shorter. The upper surface of the meropodites is granular, the anterior border is unarmed, but the upper margin of the posterior border is armed near the distal end with some teeth: there is one large tooth and 2—3 smaller teeth; only in the last pair of legs also the under margin of this border has a few small teeth, diminishing in size distally, and beginning near the basal end of the joint. Carpo- and propodites of the ambulatory legs are very short, in the case of the middle pairs the propodite is very slightly longer than the dactylus, in the first and four pair it is shorter;

the margins of the propodites are beset with some very short hairs near the distal end of the joint; the dactyli are somewhat curved, short, with horny, acute tips, and quite hairless.

Dimensions:

Length of carapace	18.5	mm.
Maximum breadth of carapace.	22.25	"
Breadth of anterior margin of front.	8.—	"
Breadth of posterior margin of carapace	9.—	"
Horizontal length of palm and immobile finger	9.5	"
Height of palm.	5.5	"
Length of penultimate pair of legs	26.—	"

Besides at the localities already mentioned (Ovalau Island and Manado), this species has been observed in fresh water at Flores (de Man, M. Weber's Erg. Reise niederländ. Ost-Indien, Bd 2, 1892, p. 317).

2. *Pyxidognathus subglobosus* n. sp. (Pl. XI, Fig. 1).

In many respects this species resembles the type species of the genus: the carapace is much vaulted in both directions (f. 1c), the maximum breadth (between the tips of the posterior lateral teeth) is only slightly more than the length of the carapace, so that the latter is subquadrate, and the walking legs are short, slightly longer than the breadth of the carapace, and nearly hairless. There are, however, notable differences in the granulation of the carapace and in that of the chelipeds, as well as in the relative thickness of the ischium and the exognath of the external maxillipeds.

On careful comparison of the two species in front view the new species proves to be less strongly vaulted transversely, and the longitudinal convexity is likewise less. The postfrontal lobes are very little prominent; the median ones are narrow, separated by a broad, shallow groove, the lateral lobes are situated much farther back, directed obliquely, and defined only at the anterior margin. The various grooves on the carapace are found here in the same way as in *P. granulatus*, but they are less deeply cut; the cervical groove, and the grooves parting from its ends are the most distinct, hepatic and branchial regions are separated by a groove, that shows three shallow pits; the protogastric region is scarcely separated from the hepatic area.

The external orbital angle is less prominent than in *P. granulatus*, its lateral margin is straight, and longer than that of the first epibranchial tooth, whereas in the foregoing species these margins are equally long; both the epibranchial teeth are obtuse, not acute; behind the posterior teeth the margins are considerably converging towards the

bases of the penultimate pair of legs. The posterior margin of the carapace is equal to the breadth of the front and $\frac{2}{3}$ of the maximum breadth of the carapace (between the tips of the posterior epibranchial teeth). The front agrees with that of *P. granulosus*: it has three emarginations, the median broader and shallower than the lateral, and the external angles of the front are projecting and subacute. The orbits are subcircular in front view; the upper orbital border is less oblique than in the foregoing species, but the granulated, raised line beneath the inferior orbital border, the similar line bordering the frontal margin of the buccal cavern, and the hairy pterygostomian regions are the same in both species. The epistome is somewhat less deep and less concave in longitudinal direction in the present species. The whole carapace is, as in the preceding species, bordered by granules, that are finest at the posterior margin; the surface, on the contrary, is not granulated, but everywhere finely pitted, most densely so on the cardiac, intestinal and branchial regions, the strongly sloping sides of the latter are not pitted, but somewhat granulated, and the transition of sculpture is marked by an oblique, interrupted row of granules; a similar row occurs above the base of the last pair of legs.

The front has the same four groups of granules as in the preceding species: two median, on the projecting inner lobes of the front, and two lateral ones, that are much larger and longitudinally developed, above the bases of the short and thick eye-stalks. The postfrontal lobes, on the proto-gastric region, are likewise provided each with a group of granules.

The external maxillipeds are finely pitted, naked, not hairy, as in *P. granulosus*, the ischium has a deep longitudinal groove, is longer than the merus, and somewhat narrower than the exognath (fig. 1a); the latter reaches nearly to the anterior margin of the strongly auriculated external part of the merus, that is much broader than long.

The abdomen of the male presents only slightly-converging margins, so that the base of the penultimate segment is more than half the breadth of the first; the margins of the penultimate segment are subparallel in the proximal two-thirds of their length and then abruptly curve inward towards the base of the terminal joint, so that the base of the latter is slightly more than half the base of the penultimate joint; the 5th, 6th and 7th segment are of nearly equal length, longer than the 4th segment; the side margins of the terminal segment are slightly concave, and the segment is as long as broad at the base.

The chelipeds of the male are of equal size (though this is not indicated in the figure). The meropodite is very short and thick, does not project beyond the carapace and is entirely hairless; inner and under surface are smooth, but the outer surface shows numerous transverse rows of

granules, especially towards the much curved upper border; a groove runs parallel with and near to the articulation with the carpopodite, at inner and outer surface of the arm, and the distal external angle of the latter has a somewhat prominent, obtuse tooth. The wrist is short, somewhat inflated, with a smooth, finely-pitted upper surface and an obtuse inner angle; from this angle a row of granules runs backward along the under border of the inner surface of the wrist. The chela (f. 1*b*) is large, much inflated; the height is equal to the horizontal length of the palm; outer and inner surface of the latter are convex; the outer surface is smooth, finely pitted everywhere, and moreover provided with the same longitudinal rows, as are observed in *P. granulosus*, but in the present species they are not formed by granules, but by two very inconspicuous folds of the surface, the inferior row is somewhat stronger and is continued till the tip of the immobile finger, following the same elegant, concave curve as the inferior margin of the palm and that of the immobile finger; the inner surface of the palm has a longitudinal row of 5—6 large granules in the middle and, besides, some similar granules beneath the row, towards the articulation with the wrist; the fingers are short, curved inwards, and are not excavated and spoon-shaped at the tip, unlike those of the preceding species; the mobile finger is about as long as the horizontal length of the palm, with a slight curve in the distal half, but somewhat concave near the base, roughly pitted like the immobile finger, and provided along the cutting margin with a row of 6—7 obtuse teeth, of a chalk-white colour, and of subequal size; the cutting margin of the immobile finger is very broad, and along the outer margin there is a row of 6 chalk-white teeth, of very unequal size: the first two, near the base are very small, the next two very large, cone-shaped, between these and the tip there are again two much smaller teeth, the tip itself has a very short horny margin.

As in the preceding species the walking legs are very short; the two middle pairs, that are the longest, somewhat exceeding the maximum breadth of the carapace, the last pair by far the shortest; the meropodites somewhat more than twice as long as broad, rugose at upper surface, and, like the carpopodites, quite hairless. In all the legs, but the last, the propodite is somewhat longer than the slightly-curved dactylus; in the last pair these joints are of equal length, and the propodite is broadened, so that it assumes the appearance of a swimming-paddle; the distal part of the inner margin of the propodite in all the legs and the base of the inner margin of the dactylus are fringed with very short hairs, intermingled with a few longer hairs; this character becomes more distinct in the hinder legs. Again, as in *P. granulosus*, the upper hind margin of the

meropodites is spiny; there is only one white-tipped larger tooth, followed by a few much smaller ones, that are more properly to be called sharp granules rather than teeth, in the interspace between the large tooth and the articulation with the carpopodite; in the case of the last pair of legs, there are moreover one or two teeth at the under hind margin of the meropodite, near the basal end. These characters of the legs agree almost wholly with those of *P. granulosus*.

Dimensions :

Length of carapace	16.5 mm.	
Maximum breadth of carapace	18.5 "	
Breadth of anterior margin of front	7.— "	
Breadth of posterior margin of carapace	7.— "	
Horizontal length of palm and immobile finger	13.5 "	
Height of palm	8.5 "	
Length of penultimate pair of legs	21.5 "	
Posterior margin of penultimate segment	} of male } } abdomen }	4.25 "
Anterior margin of penultimate segment		2.25 "
Length of penultimate segment		2.— "
Length of terminal segment		2.25 "

The single specimen, a male, was found at Nias, near the west coast of Sumatra, by Dr. Kleiweg de Zwaan. Whether it occurred in fresh or brackish waters is not known.

3. *Pyxidognathus deianira* de Man (Pl. XI, Fig. 3).

De Man (l. c.) has given a minute description of this species, but his only adult specimen was a female. The concise account of Alcock (Journ. As. Soc. Bengal, v. 69, prt 2, 1900, p. 407) was based on the two young males mentioned by de Man. I have examined an adult male, and it may be of some use to indicate shortly its characters. In giving a full description I should have to repeat chiefly de Man's statements.

The present species is distinguished from the two preceding ones by the following features:

- 1^o The carapace has nearly parallel side-margins; the two epibranchial teeth, behind the external orbital angle, are spiniform, prominent, and the incisions separating the three teeth of either side are deep and sharply cut; the external orbital angle is as large as the two other teeth together, its lateral margins are diverging backward; the posterior tooth is smaller than the preceding one. The granulation forming the outline of the carapace is much finer than in the two preceding species.
- 2^o The carapace is much less vaulted especially in transverse direction, and is nearly entirely smooth, with scarcely any indications of the

- usual regions, the cervical groove and two very short other ones parting from either end being the only ones that are distinct. On the surface of the front there are mere traces of two median postfrontal lobes, and between them a very short mesial furrow. The whole surface is finely punctate; I observed only some minute granules on the sloping part of the branchial regions, and there is a curved granulated row above the bases of the last pair of legs. Besides, there are four rounded white spots, not tubercles, in a single transverse row on the mesogastric region; the outer ones are sunk into rather deep pits.
- 3° The anterior margin of the front measures about 37% of the maximum breadth of the carapace in the case of the male, 35% in the female (de Man, l. c., p. 152—153); the posterior border of the carapace is about equal to this breadth of the front, which agrees with the proportions found in *P. subglobosus*. The external angles of the front are subacute, directed obliquely-outward; the median lobes are large and broad, separated by a small, triangular incision.
- 4° The epistome is longer in the middle than laterally, gut-like, and bordered below by the usual granulated anterior border of the buccal cavern; the latter is much broader anteriorly than behind, so that the exognaths of the external maxillipeds (f. 3c) are much diverging forward; these exognaths, as has been already observed by de Man and Alcock, are much broader than the narrow ischia of these maxillipeds, and do not reach as far as the anterior margin of the strongly auriculated external part of the meri.
- 5° The abdomen of the male has been accurately described by de Man (p. 151): it is narrow and parallel-sided, the bases of all but the terminal joint are subequal in breadth, and the abdomen does not occupy all the space between the bases of the posterior legs. The penultimate segment, that is the longest of all the preceding ones, is not so abruptly narrowed as in the preceding species, so that its posterior margin is less than twice that of the terminal segment; the latter is as long as broad at the base and longer than the preceding joint, the side margins are slightly concave and the tip is rounded.
- 6° The chelipeds agree on the whole with those of *P. subglobosus*: the meropodite is very short, with a much curved upper and a roughly dentate inner and outer border, the external surface likewise shows transverse rugosities towards the upper border; the carpopodite is very finely granulate, the inner angle is somewhat produced into a small obtuse tooth, directed forward, but not exactly spiniform, as Alcock says, and behind this angle there is a row of 4—5 small granules running backward, near the base a small tuft of hairs is found,

and between the inner angle and the articulation with the palm there is again a row of granules. The chela in my specimen are equal in size; according to de Man they are somewhat unequal, the left being the larger. Both in the female of de Man as in my male specimen the chela is scarcely twice as long as high, but, whereas in the female the fingers are nearly as long as the palm, the mobile finger of the male is distinctly shorter, and apparently more strongly curved (cf. de Man's f. 6 and my f. 3*a* and 3*b*); the palm is much inflated, convex at both surfaces, minutely punctate and rounded at upper and under border, the basal half of the upper border is marked with a row of minute granules; in the middle of the inner surface there is a longitudinal row of granules and, above it, a group of finer granules (f. 3*b*), which granulation seems to be less pronounced in the female; at the outer surface of the palm (f. 3*a*) there is a conspicuous row of granules close to and parallel with the under border, this row is continued till the tip of the immovable finger, which latter is in the same level with the under border of the palm and not curved downward; the fingers are short, gaping at the base, excavated at the tip; the cutting margin of the immobile finger is armed with three teeth, two of which are large, the third (distal) tooth is very small; the mobile finger has three or four small teeth in the basal half, followed by two very small ones, and finally a large tooth at the end, immediately before the horny margin of the tip. All these teeth are again chalky-white.

- 7^o With regard to the walking legs, there is some diffidence between de Man's figure of the female and my (male) specimen. Firstly I have not observed the peculiar blotted appearance of these legs as depicted by de Man, though this character may have disappeared, but especially the shape of the meropodites is rather different: instead of the rather thick, inflated shape of these joints as figured by de Man (l.c., pl. 10, f. 4), they are parallel-sided, with straight anterior and posterior margin; there is a sharp subdistal tooth at the anterior margin, and this tooth is even present in the case of the posterior legs, though it is here very small; in the female it seems to be wanting at these legs. The posterior margin of all the meropodites show again, at the upper border, the spines, characteristic of the genus, and they are more developed in the present species than in its congeners: near the distal end there are on each meropodite two or more sharp, acute, depressed teeth, diminishing rapidly in size distally; only in the first pair of legs there are some sharp granules following the acute subdistal tooth; in the hind legs, again, the under posterior margin of the

meropodites bears one or two similar but smaller teeth near the basal end. The upper surface of the meropodites is rugose, especially towards the anterior border, which latter is slightly crenulate. Carpo- and propodite are more slender and more elongate than in the preceding species, so that the length of the middle pairs of legs distinctly exceeds the breadth of the carapace; the said segments are hairy in a very characteristic manner: the anterior (under) surface of the propodite has a short hairy covering, that disappears rapidly from the anterior legs backward and is entirely absent in the case of the last pair of legs; besides, both margins of the propodite and the distal parts of these margins of the preceding segment are fringed with long hairs. The slender, falciform dactyli, which are considerably shorter than the propodites, in the case of the middle pairs of legs, but equal in length to these joints in the case of the first and the fourth pair, are likewise fringed with hairs, that are much longer on the posterior or inner margin.

Dimensions:

Length of carapace		10.25 mm.
Maximum breadth of carapace		13.5 "
Breadth of anterior margin of front		5.— "
Breadth of posterior margin of carapace		5.5 "
Horizontal length of palm and immobile finger		10.25 "
Height of palm		5.5 "
Length of penultimate pair of legs		17.— "
Posterior margin of penultimate segment	} of male abdomen }	3.25 "
Anterior margin of penultimate segment		2.— "
Length of penultimate segment		1.5 "
Length of terminal segment		1.75 "

The single specimen, a male, was brought home from the Bay of Batavia by Dr. Buitendijk, but its precise habitat, whether in fresh or brackish water, is not known. As has been mentioned de Man's specimens, from the Mergui Archipelago, were collected in mangrove-swamps.

4. *Pyxidognathus fluviatilis* Alcock.

This species, which I have not seen, seems to show a close relationship to *P. deïanira*, and though Alcock (l. c., see p. 408) describes the carapace as „markedly convex” this seems to be merely a question of subjective appreciation.

The outline of the carapace, the nearly complete absence of grooves on the surface, perfectly agree in both species. The difference is lying chiefly in the shape of the walking legs, the three last joints of which

are flattened in the present form and fringed with long hairs at the margins; the meropodites are armed with a single spine at the posterior border and likewise fringed at both sides.

Only a single specimen, a female, has been found, „clinging to the floats of a fisherman's net in the R. Ichamutty above Bongong in the Jessore District" (Alcock l.c., p. 409). The author supposes that the shape of the legs enables the animal to swim.

The following key will serve to distinguish between the species of the present genus.

1. Carapace very much convex in longitudinal and transverse direction.
Exognath of external maxillipeds as broad as or slightly broader than ischiognath. Walking legs short, with sparse and very short hairs. Surface of carapace deeply furrowed. 2.
Carapace much less convex, especially in transverse direction. Exognath of external maxillipeds distinctly broader than ischiognath. Walking legs longer and somewhat more slender, fringed with long hairs. Surface of carapace finely punctate and regions scarcely or not at all indicated, the cervical groove only being present 3.
2. Surface of carapace roughly granulate. Palm of cheliped likewise with rounded granules, partly arranged in two longitudinal rows at outer surface *P. granulosus* A. Milne-Edwards
Surface of carapace punctate. Palm of cheliped smooth, punctate, with two very inconspicuous longitudinal folds at outer surface.
P. subglobosus n. sp.
3. Walking legs not flattened; meropodites not hairy, with several teeth along posterior border near distal end; dactyli conical, short.
P. deïanira de Man
Walking legs flattened, at least the terminal joints; meropodites hairy along both margins, with a single tooth at posterior border near distal end; dactyli flattened, as long as preceding joints. *P. fluviatilis* Alcock.

EXPLANATION OF PLATE XI.

- Fig. 1. *Pyxidognathus subglobosus* n. sp., ♂, magn. 1½. Fig. 1a, external maxilliped, magn. 3. Fig. 1b, right chela, outer view, magn. 3. Fig. 1c, front view of animal, magn. 2.
- Fig. 2. *Pyxidognathus granulosus* A. Milne-Edwards, ♀, magn. 1½. Fig. 2a, front view of animal, magn. 2.
- Fig. 3. *Pyxidognathus deïanira* de Man, ♂, magn. 3. Fig. 3a, right chela, outer view, magn. 2. Fig. 3b, the same, inner view, magn. 2. Fig. 3c, external maxilliped, magn. 2.

