GLOBOPILUMNUS XANTUSII (STIMPSON), N. COMB., A STRIDULATING CRAB FROM THE WEST COAST OF TROPICAL AMERICA, WITH REMARKS ON DISCONTINUOUS DISTRIBUTION OF SOME WEST AMERICAN AND WEST AFRICAN GENERA OF BRACHYRHYNCHOUS CRABS [1])

BY

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In a recent article on stridulation in crabs, D. Guinot-Dumortier & B. Dumortier (1960: 138) reported three species of the genus *Globopilumnus* Balss, 1933, as practicing stridulation by reciprocal friction of appendages. These were *G. africanus* (A. Milne Edwards, 1867) and *G. stridulans* Monod, 1956, both from continental and insular West Africa, and *G. calmani* Balss, 1933, from the Indo-West Pacific. Since it had already been determined in connection with studies preliminary to a monograph of the Xanthidae of the Pacific Coast of America that *Pilumnus xantusii* Stimpson, 1860, on the basis of general morphology and structure of the male first and second pleopods, should be transferred to *Globopilumnus,* becoming the first New World member of its genus, it occurred to the writer to reexamine this species with a view of determining if it might also have a stridulating apparatus, and if so, how this might compare with those of the other *Globopilumnus* species.

With the aid of the excellent illustrations provided by Guinot & Dumortier (1960, figs. 20, 21) it proved easily possible to demonstrate such a stridulating mechanism. While it seems incredible that this was not discovered at the time the species was illustrated (Garth, 1946, pl. 59), the corneous serrations on the anterior surface of the meri of the first three pairs of walking legs (fig. 1) would have suggested small patches of an encrusting bryozoan unless the concomitant granulations on the posterior surfaces of the meri of the cheliped (fig. 2) and first two pairs of walking legs (fig. 4) chanced to be observed as well.

Although *Globopilumnus xantusii* is the first member of its genus to be reported

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from the Americas, it is not the first of its subfamily, the Menippinae, with a known capacity for producing sound. Three tropical American species of the genus *Menippe* de Haan, 1833, the Atlantic *M. mercenaria* (Say, 1818) and the Pacific *M. obtusa* Stimpson, 1859, and *M. frontalis* A. Milne Edwards, 1879, stridulate by means of ridges on the inner surface of the palm of the cheliped and a plectrum consisting of fixed tubercles on the suborbital, anterolateral, or pterygostomian surfaces of the carapace (cf. Guinot & Dumortier, 1960, figs. 10, 11). A fourth species, *M. nodifrons* Stimpson, 1859, is without a stridulating apparatus, as indeed are two of the six species of *Globopilumnus.*

DESCRIPTION OF THE STRIDULATING APPARATUS

As with *Globopilumnus stridulans,* the species with which it most closely compares, the outer distal surface of the merus of the cheliped of *G. xantusii* (fig. 2) is provided with sparse granulations, but to the number of 55, rather than about 20 in *G. stridulans.* These rub against a well delimited area of corneous granulations situated on the inner distal surface of the merus of the first walking leg (p2) and arranged in rows of from one to a dozen granules each (fig. 3). Similarly, the external distal surface of that article (fig. 4) bears about 25 sparse granulations that rub against a similar but slightly less extensive zone of granulations on the inner distal surface of the merus of the second walking leg (p3) (fig. 5). An identical disposition is found on the opposing surfaces of the meri of the second and third walking legs (p3 and p4), but the number of granulations is greatly reduced. As with *G. stridulans,* the corresponding parts of the third and fourth walking legs (p4 and p5) are completely smooth.

The species of *Globopilumnus* known to possess a stridulating apparatus can be arranged according to the number of appendages involved. The maximum number, four, would appear to be involved only in *G. stridulans* and *G. xantusii.* According to Guinot & Dumortier (1960: 139) the stridulating zones in *G. calmani* are reduced to the cheliped-first walking leg (p1-p2) and first-second walking leg (p2-p3), and in *G. africanus* to the cheliped-first walking leg (p1-p2) only. If, however, the extent of the areas involved, and particularly the numbers of granules in each area, be considered, *G. xantusii* could be regarded as having a more elaborate stridulating apparatus than *G. stridulans,* with approximately twice the number of granules on comparable areas.

RELATED ATLANTIC SPECIES

Since Stimpson (1860: 213) considered his *Pilumnus xantusii* to be "the western analogue of *P. aculeatus*" (= *Cancer aculeatus* Say, 1818, not *C. aculeatus* O. Fabricius, 1780, nor *C. aculeatus* Herbst, 1790, and presently known as *P. sayi* Rathbun, 1897), a concept perpetuated by Rathbun (1930: 484) in her pairing of the species of *Pilumnus* on the two sides of the American continent, the writer took occasion while visiting the U. S. National Museum in December, 1961, to examine *P. sayi* and several other *Pilumnus* species from the western Atlantic. Not only was *P. sayi* found to lack a stridulating apparatus; it was found inadmissible to *Globopilumnus* and to the Menippinae as well (cf. Balss, 1933). Nor could any western Atlantic species of *Pilumnus* be found with which *G. xantusii* might be paired. The nearest related species to *G. xantusii* is therefore the West African *G. stridulans,* the genus *Globopilumnus* being absent from the Caribbean-West Atlantic region. Such discontinuous distribution is not unknown among brachyurans, however, as attested by the examples to follow.

DISCONTINUOUS DISTRIBUTION

While preparing his monograph on the West African Hippidea and Brachyura (Monod, 1956), Dr. T. Monod became interested in several species of Xanthidae reported from the Galápagos Islands (Garth, 1946) that appeared to have West African counterparts, but were unrepresented in the western Atlantic. Two of these pairs, the West American *Ozius tenuidactylus* (Lockington, 1877) and the West African *Epixanthus helleri* A. Milne Edwards, 1867, and the West American *Acidops fimbriatus* Stimpson, 1871, and the West African *Epimelus cessaci* A. Milne Edwards, 1878, were placed in different genera at the time. As an outcome of the exchange of correspondence and of specimens that ensued, *Ozius tenuidactylus* was transferred to *Epixanthus* Heller, 1861 (Monod, 1956: 235), while *Epimelus cessaci* was transferred to *Acidops* Stimpson, 1871, and *Acidops* to the Goneplacidae as well (Monod, 1956: 359). Neither *Epixanthus* nor *Acidops* is represented in the western Atlantic, unless *Xanthus* (*Xantho*) *dispar* Dana, 1852, of uncertain provenience, should prove to be (a) an *Epixanthus* and (b) from Brazil (cf. Monod, 1956: 235). Like the writer, Dr. Monod failed to associate *Pilumnus xantusii* with either *P. africanus,* which he transferred to *Globopilumnus,* or *G. stridulans,* probably for the reason that a stridulating apparatus for the West American species was undescribed. Had he done so, the relationship of the West African and West American crab faunas, theretofore tenuous, might have been more fully documented at that time.

More recently Guinot (1967: 353) has perceived the close relationship existing between the eastern Atlantic *Actumnus parvulus* A. Milne Edwards, 1869, and the eastern Pacific *Micropanope armstrongi* Garth, 1948, and has erected a new genus, *Coralliope* Guinot, with the former as type, to receive the two species. At the same time the genus *Microcassiope* Guinot (1967: 358) was erected with the eastern Atlantic *Xanthodes rufopunctatus* A. Milne Edwards, 1869, as type and the eastern Pacific *Micropanope xantusii* Stimpson, 1871, as a second species. It should be noted that as constituted neither of these new genera is represented in the western Atlantic, and that both are frequently, although not exclusively, found in corals.

BIOGEOGRAPHY AND ECOLOGY

The physical similarity of the situation in which the *Globopilumnus* species occur, the single West American species in the Galápagos Islands and the adjacent

Panamic region from Cape San Lucas, Baja California, to La Plata Island, Ecuador (Garth, 1948: 45), and the two West African species in the islands of Principe, S. Thomé, and Annobon and the adjacent Gulf of Guinea region from Senegal to Angola (Monod, 1956: 230, 234), suggests an ecological parallel as well. For not only are both island groups located exactly on the equator, but both regions come alternately under the influence of a cool, northerly directed current and a warm, southerly directed current (the Humboldt and El Niño currents in the case of the Galápagos; the Benguela and Guinea currents in the case of the Gulf of Guinea islands), which unite to form a westerly directed South Equatorial current in both instances. Such analogous oceanographic and meteorological situations, half a world removed, might be expected to elicit convergent evolution from dissimilar inhabitants; the *Globopilumnus* species, however, represent a homogeneous genetic stock. It would seem more likely that the West African species are linked with the West American by the Indian Ocean and western Pacific species of *Globopilumnus* (see Guinot, 1959); however, if this were the case one would expect *G. xantusii* to be more closely related to *G. calmani* (Red Sea, Persian Gulf, Aldabra Island, China Sea) than to *G. stridulans*.

A second possibility remains, however, in the frequency with which the *Globopilumnus* species, as also the other species mentioned, are found in association with coral (Guinot & Dumortier, 1960: 139). In the case of *G. xantusii* in the Galápagos Islands this coral was *Pocillopora* in five out of eight collections, ordinary intertidal collecting without mention of coral in two collections, and shallow dredging in one collection. It is a well known fact that of the common coral commensals the otherwise pan-tropical *Trapezia* species, *T. ferruginea* and *T. digitalis*, while found on the west coast of America, are excluded from the Caribbean and western Atlantic, as are also the coral genera that they inhabit [1]). Thus, while the *Globopilumnus* species are not considered obligate commensals of corals, since they are also found in situations where coral is not immediately present, it is quite possible that they have ecological requirements similar to those of certain corals, and that in areas in which these corals are absent, they find it difficult to maintain themselves.

Conclusion

It is therefore postulated that the close relationship that exists between these eastern Pacific species of Xanthidae and their eastern Atlantic counterparts is the result of extinction of the western Atlantic representative of the genus or species-group, along with that portion of the supporting coral fauna that ceased to exist in the West Indian region following the late Miocene (Durham & Allison, 1960: 67) closure of the Panama Portal by the Isthmus of Panama. It therefore

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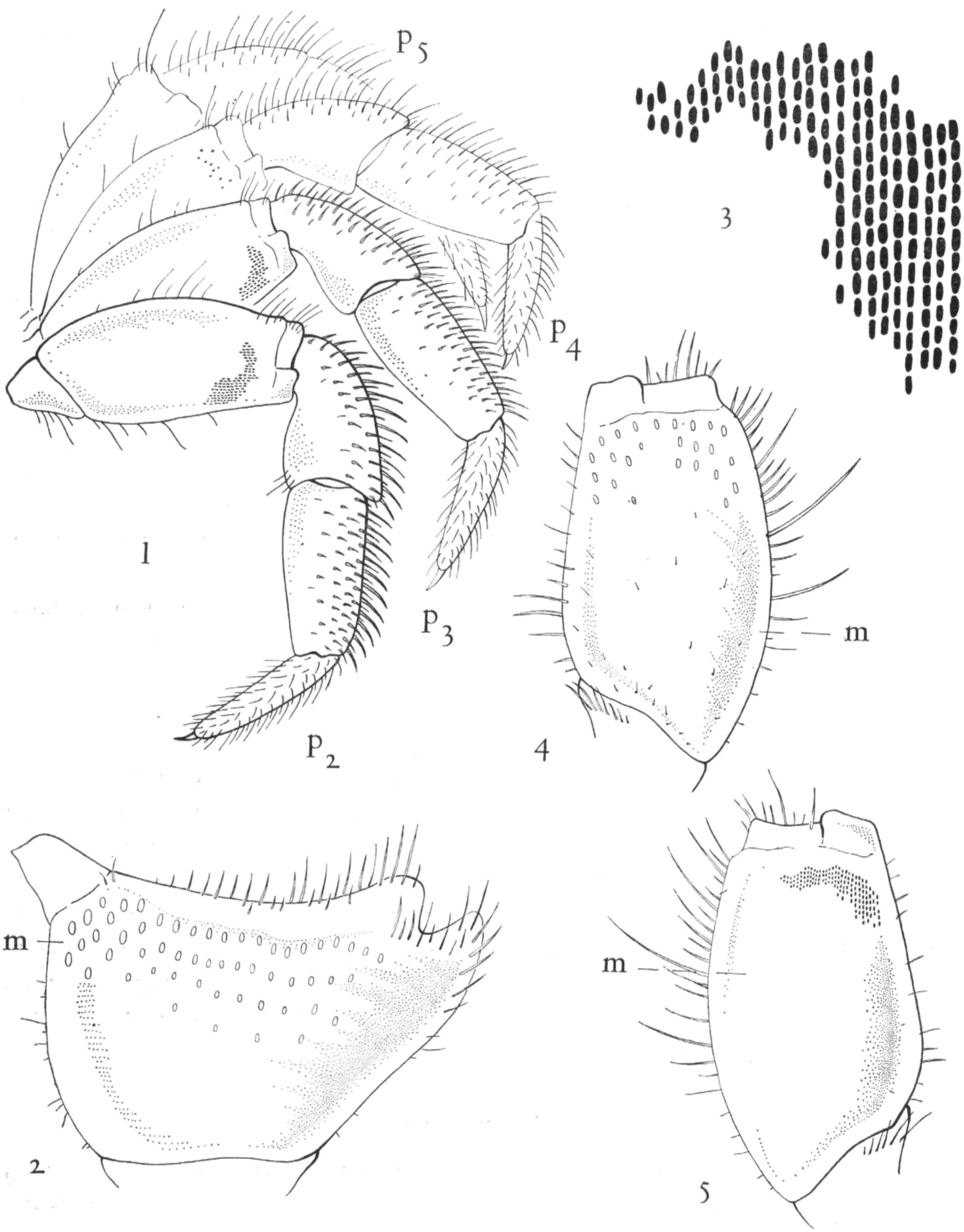
1) According to Vaughan (1919: 222), the coral genera *Stylophora* and *Pocillopora* of the family Seriatoporidae have been absent from the West Indian region since the Miocene and persist only in the Indo-Pacific.



Figs. 1-5. *Globopilumnus xantusii* (Stimpson). 1, walking legs of the left side showing the corneous granulations on the inner surface of the merus of p2, p3, and p4, × 5. 2, outer surface of the merus of the cheliped (p1) (plectrum), × 7.5. 3, stridulatory area of the inner surface of the merus of the first walking leg (p2), enlarged. 4, outer surface of the merus of the first walking leg (p2) (plectrum), × 7.5. 5, inner surface of the merus of the second walking leg (p3) (stridulating part), × 7.5. Figures arranged for comparison with *G. stridulans* Monod (Guinot & Dumortier, 1960, fig. 20). Drawings by Isolda Wisshaupt.

follows that the most closely related species to a tropical West American coral-inhabiting species of crab (or shrimp) is to be looked for, not on the American east coast, from which it has been eliminated by the same conditions that have depauperized the West Indian coral fauna, but on the tropical West African coast, where oceanographic and meteorological conditions similar to those of the Bay of Panama, broadly delimited, prevail. That the presumably extinct crab species have not so far been found as fossils may be explained by their fragility, as compared with the corals with which they were associated, plus the fact that the fossil crabs of tropical America are largely unknown. In fact, since the appearance of two important works on the Tertiary decapods of the Panama region (Rathbun, 1918) and of the West Indies (Rathbun, 1919), only one Tertiary xanthid has been reported from the Central American-West Indian region (Rathbun, 1937).

RÉSUMÉ

Il est démontré que le crabe ouest-américain *Pilumnus xantusii* Stimpson, 1860, transféré ici au genre *Globopilumnus* Balss, 1933, possède un appareil stridulant semblable à celui de l'espèce ouest-africaine *G. stridulans* Monod, 1956. Puisqu'il n'y a aucun représentant du genre dans l'Atlantique occidental, *G. stridulans* se montre en outre être l'espèce la plus voisine de *G. xantusii.* Il est démontré qu'une telle distribution discontinue est attribuable aux situations écologiques comparables qui existent sur les côtes occidentales de l'Amérique et de l'Afrique. Il est admis que *Globopilumnus* et des autres genres coralligènes existaient autrefois dans la région caraïbe, mais qu'ils ont disparus avec l'extinction d'une partie de la faune coralligène des Antilles après l'émersion de l'Isthme de Panama pendant le Miocène supérieur.

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