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A note on an interesting association of the crab *Platypodiella picta* (A. MILNE-EDWARDS 1869) and species of Zoantharia [1)]

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2 plates

In the framework of the CANCAP-Project, a long-term oceanographic collecting program performed by the Rijksmuseum van Natuurlijke Historie (DEN HARTOG & LAVALEYE 1981:1-2), extensive shore collections were made from 1976 onwards on most of the Macaronesian Islands. During the collecting trips, a very ornamental crab, *Platypodiella picta* (A.MILNE EDWARDS, 1869) was found on three occasions by the senior author. In addition the species was collected on the coast of Senegal. In all cases it was found associated with species of Zoantharia. The detailed data on these occurrences are as follows:

1. CANCAP-II, Sta. K23, 16-IX-1977, Canary Islands, Gran Canaria, west coast, Agaete, small rocky islet about halfway between the pier of Puerto de las Nievas and the famous rock known as "El Dedo de Dios" (The Finger of God). A single specimen (RMNH Crust.D 35560) obtained from a colony of a beautifully orange-yellow zoanthid, presumably *Parazoanthus axinellae* (O.SCHMIDT, 1862) (RMNH Coel. 14773; see Plate 1 fig. 1a, b) attached under a narrow ledge on a perpendicular rock wall at about 5 meter depth.

2. CANCAP-IV, Sta. K6, 4-V-1980, Canary Islands, Gran Canaria, east coast, Arinaga, rocky intertidal area with boulders, stones and tidal pools, on the protected side of the pier. A single individual (RMNH Crust.D 35561) obtained from a small hole in a stone surrounded by a small colony (about 20 polyps) of *Palythoa canariensis* (HADDON & DUERDEN, 1895).

1) CANCAP-project. Contributions to the zoology, botany and paleontology of the Canarian - Cape Verdean region of the North Atlantic Ocean, no. 35.

3. CANCAP-VI, Sta. K7, 6-VI-1982, Cape Verde Islands, S. Tiago, west coast, Baía de Santa Clara, cliff and rock area between two small sandy-stony beaches, exposed rock flat with deep tidal pools. Common in the tidal pools among an abundantly occurring, unidentified species of *Palythoa*, which formed large encrusting colonies, often covering several square meters of the rock surface (5 specimens preserved, RMNH Crust. D 35562).

4. CANCAP-VI, Senegal Sta. 3, 1-VII-1982, Cape Verde Peninsula, Pointe des Almadies, locality facing lighthouse. Rather protected water among a partly submerged rocky barrier of scattered skerries. Two specimens (RMNH Crust. D 35563) among extensive colonies of *Palythoa dartevellei* PAX, 1951[2]) at a depth of ca. 1-2m.

The colour pattern of the crabs was essentially similar, but the basic colour of the individuals from Gran Canaria differed from that of individuals from the Cape Verde Islands and Senegal. Those from Gran Canaria were characterized by a yellowish carapace with a pattern of irregular, brightly orange to orange-red spots, each spot surrounded by a conspicuous double line, dark brown-red on the interior, purely white on the exterior. The belts on legs and pincers were coloured in the same style. The colours of specimens from the Cape Verde Islands and from Senegal were less vivid. In these specimens the basic colour of the carapace was ochre with reddish-brown spots, surrounded by a less conspicuous, dark brown and whitish double outline.

The find of the first specimen at Puerto de las Nievas, Gran Canaria, was purely accidental. Part of a colony of the orange-yellow *Parazoanthus axinellae* was collected while snorkling and the crab was not observed until the zoanthid was secured in a plastic bag. The second specimen from Arinaga, Gran Canaria, was also collected accidentally when a stone with a rather small colony of *Palythoa canariensis* (HADDEN & DUERDEN, 1895) was taken to be photographed. For this purpose, the colony was put in a small aquarium to cause the polyps to expand. Then, a small, brightly coloured crab, not very well camouflaged among the dirty-brown zoanthids, emerged from a small hole in the centre of the colony. Although, on the basis of these two finds an association between *Platypodiella picta* and species of Zoantharia was suspected to exist, it lasted until the CANCAP-VI expedition to the Cape Verde Islands in 1982 that the possible significance and the apparent non-accidental character of this association was realized. Then, a specimen of *Platypodiella picta* was observed at Baía de Santa Clara, S.Tiago, in a tidal pool with a bottom cover of large, spreading colonies of an as yet unidentified, greyish to greenish-brown species of *Palythoa*. The crab was observed in broad daylight in the act of feeding on top of one of these colonies (Plate 1 figs. 2, 3). With its pincers it cut out of the zoanthids small pieces of tissue, which were subsequently brought to the mouth and eaten. It was not clear where the crab had come from, but several small, slit-like openings were noticed in the surface of the *Palythoa*-carpet. Such slits were especially distinct in places where different colo-

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2) SOURIE (1954: 117 etc., pl. 9 figs. 17, 18) applies the name *Palythoa monodi* PAX for this species, apparently in anticipation of PAX' description of this presumed new species. However, PAX (PAX & MÜLLER, 1956: 431-433 fig. 8) eventually identified SOURIE's material as *P. dartevellei* PAX (1951: 69-70; northern Angola) and applied the name *Palythoa monodi* to a different species (PAX & MÜLLER, 1956: 433-439, figs. 9-12). It may be noted that SOURIE's fig. 17 is identical with fig. 8 of PAX & MÜLLER.

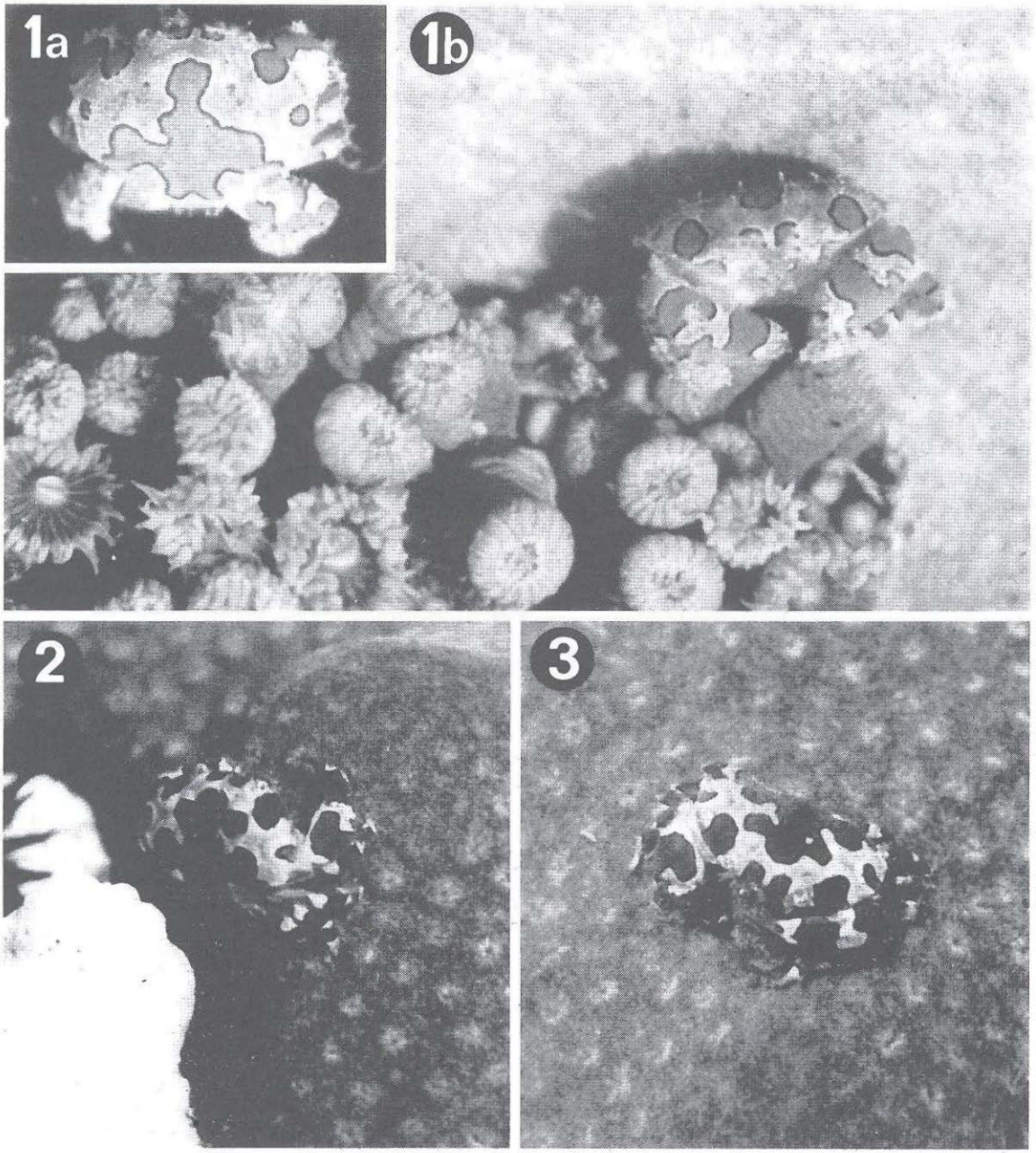


Plate 1 fig. 1-3: *Platypodiella picta*.- 1) A specimen on *Parazoanthus axinellae* (CANCAP-II, sta. K 23, Gran Canaria, Puerto de las Nievas (aquarium photo by M.S.S. LAVALEYE; 2-3) individuals in the act of feeding on *Palythoa* sp. (CANCAP-VI, sta. K 7, Cape Verde Islands, S. Tiago, Baia de Santa Clara).

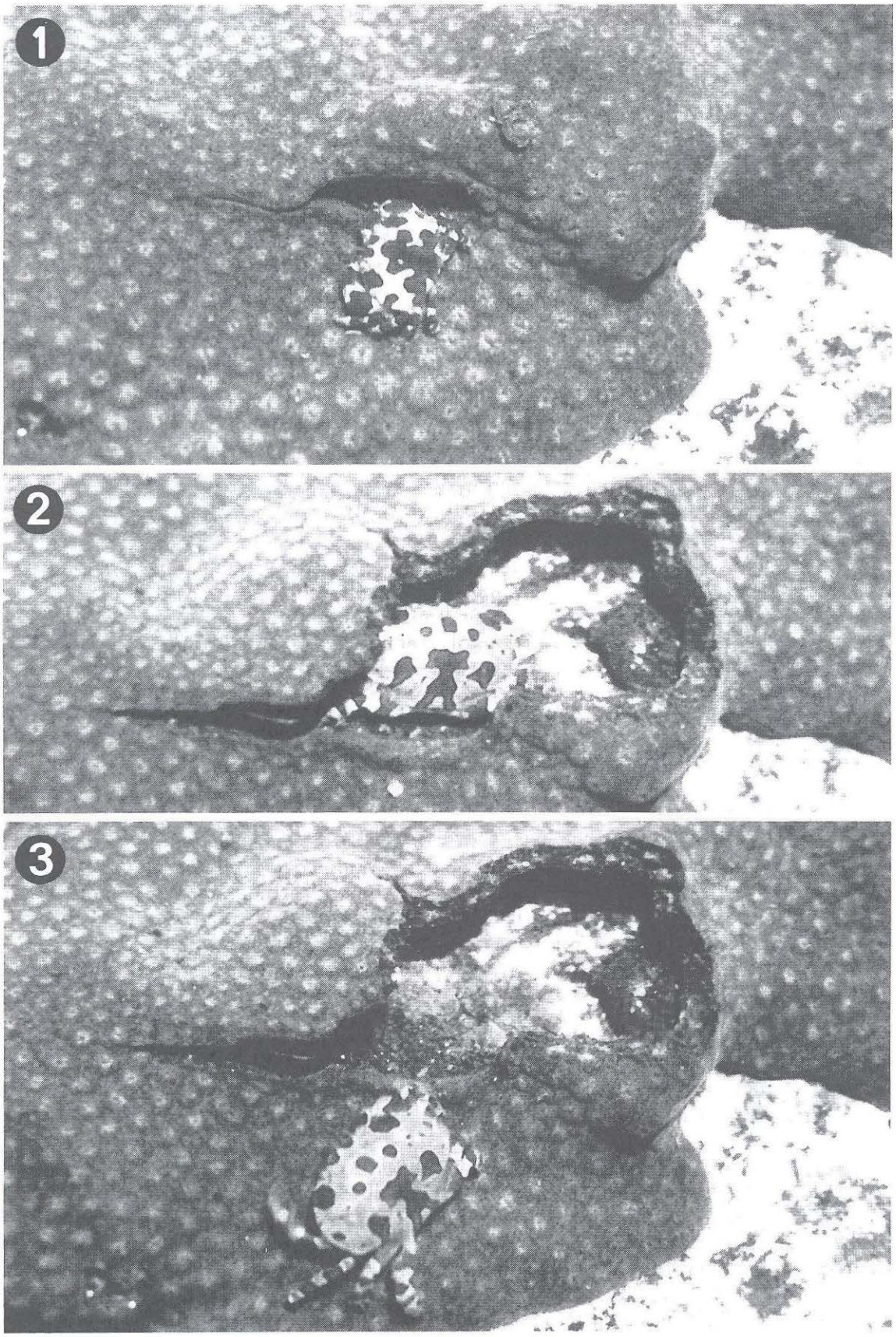
nies (often showing slight differences in colour shade) met. As this species of *Palythoa* (and many others) tends to overgrow the substrate totally, it seems obvious that these holes were caused by interaction of other organisms, possibly by the crab, which, by its presence and/or feeding activities seems well capable to inhibit or deflect normal growth. When the individual was put in front of one of these openings (Plate 2 fig. 1), it accepted this chance to hide and immediately moved in, only to move out a few seconds later, and even more quickly. To find out what had caused this quick withdrawal, the surroundings of the opening were cut away, revealing a considerably larger individual of the same species of crab (Plate 2 figs. 2, 3). Four other holes were subsequently opened in the same way and three of these also appeared to shelter a specimen of *Platypodiella picta*. The crab must have been very common in this locality.

Immediately after the expedition to the Cape Verde Islands, a visit was paid to the Cape Verde Peninsula, Senegal. In this area a species of *Palythoa*, viz. *P.dartevellei*, rather similar to, but specifically distinct from the Cape Verde Islands species, was found in several localities, intertidally as well as subtidally in shallow water. One of the localities where it occurs in great abundance is Pointe des Almadies at the very tip of the Cape Verde Peninsula. Bearing in mind the observations and experiences described above, this locality seemed to provide a very suitable habitat for *Platypodiella picta* and efforts to collect the species by cutting away pieces of *Palythoa* soon proved successful.

It is obvious from the above that the zoanthids offer shelter and food to the crabs. The true nature of this association, however, remains to be ascertained. So far, a symbiotic relation of the two organisms has not been suggested in the literature. Considering the possibility of such a relation, it seems clear that the crab is not very host-specific, for in each of the four occurrences listed, a different species of Zoantharia (belonging to two genera) was involved. This, however, is no reason to disregard the idea of a symbiotic relation, for many are the examples of symbiotic crustaceans which are little host-specific.

Apart from the records here presented, one other case of the associated occurrence of *Platypodiella picta* and zoanthids has ever been recorded in the literature: MONOD (1956: 300) and ROSSIGNOL (1957: 11) reported the species "dans des colonies de *Palythoa* sur les rochers decouvrant à maree basse" at Pointe Indienne, near Pointe Noire, Congo. All the other published records are very little detailed, based mostly on preserved material not collected by the authors involved, who simply mention the crab as littoral and sublittoral, from 10-30m, 0-6m and 16m deep (A.MILNE EDWARDS & BOUVIER 1900: 102; MONOD 1956: 300, 301; LONGHURST 1958: 88; FOREST & GUINOT 1966: 79, 80), from the "hypobiose detriticole" (SOURIE 1954: 254, 257), "plage" (MONOD 1956: 300), "shelly sand" (LONGHURST 1958: 88), "occasional on rocky shores" (GAULD 1960: 70) "côte rocheuse", "roches, coraux" (FOREST & GUINOT 1966: 79), "Sandgrund in 28m Tiefe", "Felsgrund mit Geröll, 0,5 - 2m Tiefe, unter Steinen" (TÜRKAY 1982:

Plate 2 fig. 1-3: *Platypodiella picta*.- 1) Individual put in front of opening in carpet-like cover of *Palythoa* sp. The crab initially moves in but rapidly moves out again; 2) removal of the surroundings of the opening reveals a cavity occupied by a second, considerably larger individual; 3) the individual subsequently leaves its shelter. All CANCAP-VI, sta. K 7, Cape Verde Islands, S. Tiago, Baia de Santa Clara.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119). These various records might suggest that *Platypodiella picta* is not over-particular in the choice of its habitat. Therefore it is remarkable that not a single additional, non-associated individual of the crab was found during the various CANCAP-expeditions, when many localities and a variety of habitats were examined and sampled by parties including several experienced collectors. The majority of the records of the crab listed above, however, certainly do not quite exclude the possibility of associated occurrence of the crab and Zoantharia. It may further be stressed that this association may easily escape a collector who does not especially look for it, as the crab tends to hide among or under the zoanthids. So the crab may be collected together with these, without initially being noted. When it is found later on, when the samples are sorted, there may be several reasons why a special relation between the two is not suspected. In this connection it may be noted that the crabs collected by the senior author on Gran Canaria were discovered purely accidentally, the collector primarily being attracted by the zoanthids. It was only after having made the link between the two organisms, that the association, when especially looked for, was found also in the Cape Verde Islands and Senegal. How easy it is to overlook a clear-cut association may further be exemplified by the case of the symbiosis between the Mediterranean shrimp *Periclimenes amethysteus* (RISSO, 1827) and sea anemones [*Aiptasia mutabilis* (GRAVENHORST, 1831), *Anemonia sulcata* (PENNANT, 1877)], discovered about 150 years after the publication of the original description of the shrimp (SVOBODA & SVOBODA 1975: 345).

Platypodiella picta is a subtropical and tropical shallow water species so far known from the Canary and the Cape Verde Islands and from several localities on the African mainland between Senegal and Zaire (MANNING & HOLTHUIS 1981: 155).

The fact that the crab was found associated with *Palythoa* in four out of five cases in which an association with a zoanthid was established, may simply be correlated with the fact that along eastern Atlantic tropical rocky shores *Palythoa* is by far the most common species of Zoantharia, both as regards species-number and biomass (the biomass moreover, definitely exceeds that of any other group of sessile coelenterates). The genus seems to be totally absent from the mediterranean, the Atlantic coast of southern Europe, Madeira and the Azores, its northern limit of distribution in the eastern Atlantic being formed by the Canaries, where two species occur, one of which, *Palythoa canariensis*, is not rare. It is interesting to note that this limit happens to coincide with the northernmost records of *Platypodiella picta*. In the southern direction, the genus *Palythoa* occurs at least up to northern Angola (8°S), while the crab has been found as far south as Congo (5°S). The southern limit of the range of the genus *Palythoa* in the eastern Atlantic undoubtedly lies somewhere between northern Angola and the tropic of Capricorn, but no data are available from that area. As far south as Lüderitz Bay (26.5°S) intertidal Zoantharia appear to be entirely absent (PAX 1952: 61), to show up again in South Africa (CARLGREN 1938: 139-143).

Thus, *Platypodiella picta* has only been found within the area of distribution of *Palythoa* (and other shallow water or intertidal *Zoantharia* associated with zooxanthellae). Although this does not necessarily implicate a causal relation (many other tropical marine organisms have a similar distribution), it does certainly not contradict the possibility of such a relation.

Altogether it may be concluded that there are two possibilities:

1. A truly symbiotic relationship exists between *Platypodiella picta* and species of *Zoantharia*, notably *Palythoa*, but has been overlooked so far.

2. The association of *Platypodiella picta* and *Zoantharia* is not a true symbiosis, and the crab may occupy any suitable cavity, whether in or outside a zoanthid colony, and may feed upon (many) other matters besides *Zoantharia*.

A closely related species of *Platypodiella picta*, viz. *P.spectabilis* (HERBST) occurs in the tropical western Atlantic. Of this species also, hardly anything is known about ecology and habits: our own observations in the Netherlands Antilles (1956-1957, 1971-1973) give no indication of associated occurrence with zoanthids or other coelenterates, although it should be stressed that at the time of these observations we were not alert on the possible existence of such a relation. In Piscadera Bay, Curaçao, we found the species between stones and coral rubble in very shallow water, especially among *Halimeda* spec. In Aruba too, numerous large individuals of the crab were found in clumps of *Halimeda* which formed little islets in an otherwise bare lagoon with a purely sandy bottom.

Mr. P.V. VAN DER VLUGT of The Hague (in litt. 26-VII-1976, 27-I-1983; VAN DER VLUGT 1978: 34) informed us that he collected an individual of *Platypodiella spectabilis* at Caracas Bay, Curaçao, at a depth of ca. 10m between scattered corals on a rather bare spot. He kept the crab for several months in an aquarium and observed that it regularly fed on the tentacles of the actinian *Bartholomea annulata* (LESUEUR, 1817). One specimen of *Bartholomea* was totally destroyed in this way and perished. In how far this behaviour of the crab (which died about two weeks after the observations were made) was natural or induced by the circumstances of captivity cannot be properly judged, but it shows at least that sea anemones were accepted as food. In the light of the observations presented above on *Platypodiella picta*, this way of feeding could be habitual, and it may be noted that crabs collected by us among *Halimeda* etc., may have been feeding upon small, inconspicuous actinians as e.g. *Bunodeopis antilliensis* (DUERDEN, 1897) and juvenile aiptasids.

New observations on the habits and habitat of *Platypodiella picta* and *P.spectabibilis* are most desirable.

Summary:

The authors report on an association between the crab *Platypodiella picta* and zoantharians. The observations have been made in shallow water and in the littoral zone of Gran Canaria (Canary Islands), S.Tiago (Cape Verde Islands) and Senegal.

Zusammenfassung:

Die Autoren berichten über eine Lebensgemeinschaft zwischen der Krabbe *Platypodiella picta* und Zoantharien. Die Beobachtungen wurden in untiefem Wasser und im Litoral Gran Canarias (Kanarische Inseln), S. Tiagos (Kapverdische Inseln) und des Senegals gemacht.

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