

Decapod and Stomatopod
Crustacea from Ascension Island,
South Atlantic Ocean

Raymond B. Manning
and
Fenner A. Chace, Jr.

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ABSTRACT

Manning, Raymond B., and Fenner A. Chace, Jr. Decapod and Stomatopod Crustacea from Ascension Island, South Atlantic Ocean. *Smithsonian Contributions to Zoology*, number 503, 91 pages, 47 figures, 4 tables 1990.—Seventy four species of decapods and two species of stomatopods are recorded from Ascension Island. Of the decapods, 22 (30%) are amphi-Atlantic, 14 (19%) are endemic to the island, 19 (26%) occur in the central and western Atlantic only, and 14 (19%) are known only from the central and eastern Atlantic. Two new genera are recognized, *Laleonectes*, type species *Portunus vocans* A. Milne Edwards, and *Tetrasquilla*, type species *Lysiosquilla mccullochae* Schmitt. Ten new species are described: *Typton ascensionis*, *Gnathophyllum ascensione*, *Salmoneus setosus*, *Salmoneus teres*, *Processa packeri*, *Microprosthemina inornatum*, *Odontozona anaphorae*, *Clibanarius rosewateri*, *Mursia mcdowellii*, and *Cataleptodius olsoni*. Seven of the nine known shallow-water pantropical species of decapods and the only pantropical stomatopod are found at Ascension. *Dardanus imperator*, *Euryozius sanguineus*, *Gecarcinus lagostoma*, and *Pachygrapsus loveridgei*, are central Atlantic island species, known almost exclusively from Ascension or from Ascension and St. Helena. The percent of amphi-Atlantic fauna is about the same on Ascension (30%) and St. Helena (29%), but the percent of eastern Atlantic fauna (26% vs. 19%) and Indo-West Pacific fauna (23% vs. 16%) are higher at St. Helena; the component of western Atlantic fauna (26% vs. 14%) and endemic species (19% vs. 9%) are higher at Ascension.

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Raymond B. Manning and Fenner A. Chace, Jr.

Introduction

Ascension Island is an isolated oceanic island in the South Atlantic (Figure 1), situated about 150 kilometers west of the crest of the mid-Atlantic Ridge at 7°57'S, 14°22'W. Entirely volcanic, the island is small, with an area of about 97 square kilometers. Ascension is relatively young, probably of Pleistocene origin; J.D. Bell, who visited Ascension in 1964 with the Oxford University Geological Expedition (Atkins, et al., 1964), suggested (in litt.) an approximate age of 1.0 to 1.5 million years for the island. Ascension lies about 2200 kilometers east of Brazil and more than 3000 kilometers west of the African coast. The nearest land is the island of St. Helena, almost 1300 kilometers to the south.

The island, discovered in 1501, has been visited by numerous scientific expeditions, including the French *Astrolabe* in 1829, Charles Darwin and the *Beagle* in 1836 (Darwin, 1871), the *Challenger* in 1876 (Miers, 1886; Moseley, 1892—earlier edition published in 1879; Wyville Thomson, 1878, first published in 1877), the U.S. Eclipse Expedition in 1890 (Benedict, 1893; Rathbun, 1900), the *Gazelle* in 1874 (Studer, 1883, 1889), the German Plankton-Expedition der Humboldt-Stiftung in 1889 (Ortmann, 1893), the German Süd-Polar Expedition in 1903 (Lenz and Strunck, 1914), the *Scotia* of the Scottish National Antarctic Expedition in 1904 (Stebbing, 1914), the *Discovery* in 1925, and the German *Meteor* in 1926 (for background and references to early expeditions see Wüst, 1960; references given above are to papers on decapods resulting from the expeditions mentioned).

Historical background on Ascension has been given in the handbook on the island prepared by John E. Packer (1968, 1974), in Stonehouse's (1960) account of the British Ornitholo-

gists' Union Centenary Expedition to the island, and by Hart-Davis (1972) in a book on the island.

As we noted in our account of *Procaris ascensionis* and *Typhlatya rogersi* from inland marine pools on Ascension (Chace and Manning, 1972:1), our interest in the decapods and stomatopods of Ascension began when Storrs L. Olson, then a graduate student at Johns Hopkins University, visited Ascension in June 1970. He returned with a small collection including 16 species of decapods and two species of stomatopods, most from a sandy bottom tide pool at McArthur Point. The collection also included material of an undescribed *Typhlatya* from salt water pools inland of Shelly Beach that was sent by Douglas S. Rogers, then an employee of Pan American Airways and Curator of the Fort Hayes Museum, Ascension Historical Society. We received additional collections from the inland pools from Rogers through Blake Lorenz, National Aeronautics and Space Administration, with the help of the District of Columbia Police Department, who recovered the samples after they were stolen from Mr. Lorenz's automobile. These latter collections included material of the new *Typhlatya* and of a second remarkable species that lacked chelae. These two shrimps were described by us in 1972.

These collections were so interesting that we decided to collaborate on a study of the decapods and stomatopods of Ascension. One of us (R.B.M.) visited Ascension for 10 days in May 1971. The general collections of marine invertebrates made then led to a second expedition in July 1976 by four curators from the Department of Invertebrate Zoology, National Museum of Natural History: Meredith L. Jones, Raymond B. Manning, David L. Pawson, and Joseph Rosewater, accompanied by Anthony L. Provenzano, Jr., Old Dominion University. Several papers on other invertebrates taken during the 1971 and 1976 expeditions have been published, including reports on ostracods (Maddocks, 1975), marine mollusks (Rosewater, 1975), and echinoderms (Pawson, 1978), and bopyrid isopods taken on Ascension were mentioned by

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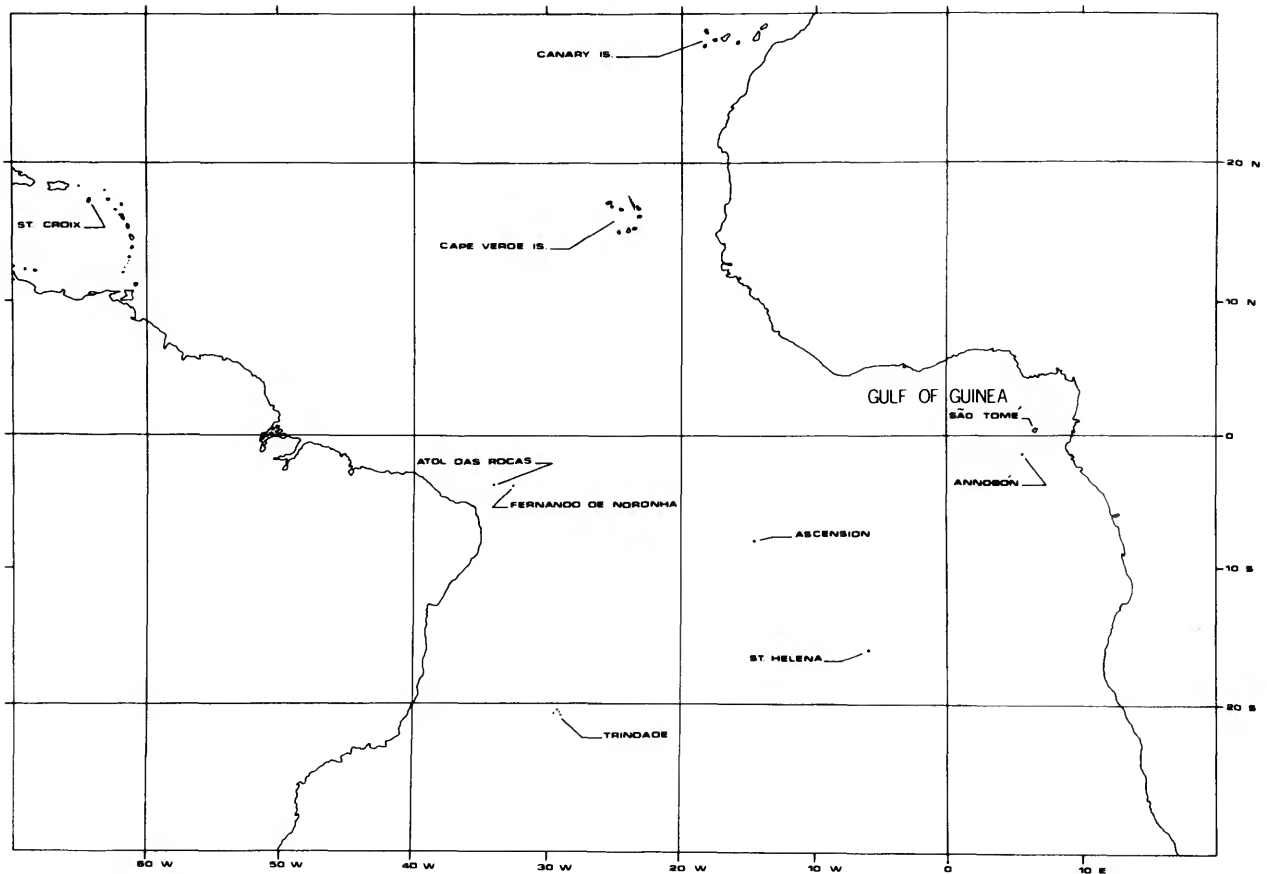


FIGURE 1.—Central Atlantic Ocean, showing location of Ascension Island. (From Pawson, 1978, fig. 2.)

Markham (1978).

Material taken during the two Smithsonian expeditions has been supplemented by specimens from other sources, particularly the collections made by staff members of the Grice Marine Biological Laboratory, College of Charleston, in July and August 1980 (only part of those collections are included in this report), and a collection made by members of the Operation Origin expedition to Ascension in 1985, sponsored by Oxford University, England. Of special interest were collections made by Kenneth Jourdan and Marion MacDowell and sent to us from Ascension. Wesley U. Vickrey collected there in 1963 and 1964, and Storrs L. Olson made additional collections in 1971. Arthur Loveridge also provided some collections from Ascension. Wherever possible, we have re-examined specimens from Ascension reported in the literature.

Collections available to us include 74 species of decapods and two species of stomatopods. Two species were described by us in 1972, and 10 additional species are named herein.

PREVIOUS ACCOUNTS OF ASCENSION DECAPODA AND STOMATOPODA

Excluding species taken by the Smithsonian expeditions to Ascension, only 18 species of decapods and no stomatopods had been recorded previously from Ascension.

Although the larger crustaceans of Ascension have received little attention from carcinologists, several species have long been known to occur there. Land crabs on Ascension were mentioned by William Dampier in "A Voyage to New Holland ... in the Year 1699" (Spencer, 1981:252). Two species from Ascension were known to Linnaeus, *Grapsus adscensionis* and *Euryzoius sanguineus*. Apparently the material was supplied to Linnaeus by students who visited the island, including Per Osbeck and J.C. Odhelius. The latter's thesis, *Chinensia Lagerstroemiana*, was published by Linnaeus in 1754; Odhelius described *Cancer retusus*, a species of *Grapsus*, in that work (Holthuis, 1977b:145). Linnaeus named *Cancer grapsus* in 1758 and in 1771 named *Cancer sanguineus*, both based, at

least in part, on material from Ascension. Osbeck (1757, 1765, 1771) named *Cancer adscensionis* from the island. In 1785 Herbst repeated the record for *Cancer sanguineus*. Numerous authors have repeated these records from Linnaeus without adding new material or information.

Charles Darwin visited the island in 1836 and included observations on the land crab in his *Journal and Remarks* (first published in 1839 and reprinted as *Journal of Researches...* in 1845 and in numerous later editions; the edition available to us is that of 1871; see Holthuis, Edwards, and Lubbock, 1980:49 for dates of publication of Darwin's journal). The Ascension land crab, *Gecarcinus lagostoma*, was described in 1837 by H. Milne Edwards, who gave "l'Australasie" as the type locality. The material was given to Milne Edwards by Quoy and Gaimard, who studied the mollusks taken by the *Astrolabe*, which visited Ascension in 1829.

White (1847) listed *Remipes scutellatus* (= *Hippa testudinaria*) from Ascension, and Drew (1876) commented on the biology of *Gecarcinus lagostoma*. Miers (1878) repeated the record of *Remipes scutellatus*.

Miers (1881b) reported on decapods collected on Ascension by T. Conry, a surgeon then stationed on the island, as follows:

Miers' Name	Current Name
<i>Leiolophus planissimus</i>	<i>Percnon gibbesi</i>
<i>Pachygrapsus transversus</i>	<i>Pachygrapsus loveridgei</i>
<i>Petrolisthes armatus</i>	<i>Petrolisthes marginatus</i>
<i>Pseudozius Mellissi</i> nov.	<i>Euryozius sanguineus</i>
<i>Xanthodes melanodactylus</i>	<i>Nannocassiope melanodactylus</i>

Studer (1883) named four species taken by the *Gazelle* when it sampled around the island:

Studer's Name	Current Name
<i>Grapsus pictus</i> var. <i>ocellatus</i> nov.	<i>Grapsus adscensionis</i>
<i>Lambrus verrucosus</i> nov.	<i>Parthenope verrucosa</i>
<i>Notopus</i> (<i>Raninoides</i> ?) <i>atlanticus</i> nov.	<i>Ranilia constricta</i>
<i>Osachila Stimpsonii</i> nov.	<i>Osachila stimpsonii</i>

Studer (1889:50), in the narrative of the *Gazelle* expedition, listed 10 species that had been recorded from Ascension, omitting only the species of *Hippa* recorded by White (1847) and Miers (1878):

Studer's Name	Current Name
<i>Lambrus verrucosus</i>	<i>Parthenope verrucosa</i>
<i>Pseudozius Mellisii</i>	<i>Euryozius sanguineus</i>
<i>Xanthodes melanodactylus</i>	<i>Nannocassiope melanodactylus</i>
<i>Pachygrapsus transversus</i>	<i>Pachygrapsus loveridgei</i>
<i>Leiolophus planissimus</i>	<i>Percnon gibbesi</i>
<i>Gecarcinus lagostoma</i>	<i>Gecarcinus lagostoma</i>
<i>Grapsus maculatus</i>	<i>Grapsus adscensionis</i>
<i>Osachila Stimpsoni</i>	<i>Osachila stimpsonii</i>
<i>Raninoides atlanticus</i>	<i>Ranilia constricta</i>
<i>Petrolisthes armatus</i>	<i>Petrolisthes marginatus</i>

The *Challenger* Expedition stopped at Ascension in 1876 and collected three species, reported by Miers (1886) as *Gecarcinus lagostoma*?, *Grapsus maculatus* (= *G. adscen-*

ionis), and *Pseudozius bouvieri* va. *mellisii* (= *Euryozius sanguineus*). Land crabs were mentioned by both Wyville Thomson (1878) and Moseley (1892) in their narrative accounts of the *Challenger* Expedition.

Materials taken by the U.S. Eclipse Expedition to West Africa were reported by Benedict (1893) and later Rathbun (1900, 1918, 1930). The species seen by Benedict included:

Benedict's Name	Current Name
<i>Actaea rufopunctata</i>	<i>Paractaea rufopunctata africana</i>
<i>Gecarcinus lagostoma</i>	<i>Gecarcinus lagostoma</i>
<i>Grapsus maculatus</i>	<i>Grapsus adscensionis</i>
<i>Remipes scutellatus</i>	<i>Hippa testudinaria</i>

Rathbun subsequently published other records for three species taken by the expedition but not included by Benedict: *Xanthias melanodactylus* (= *Nannocassiope melanodactylus*) (1900), *Grapsus grapsus* (= *Grapsus adscensionis*), and *Gecarcinus lagostoma* (1918), and *Portunus vocans* (= *Laeonectes vocans*) (1930).

Five species were taken by the Plankton-Expedition der Humboldt-Stiftung (Ortmann, 1893):

Ortmann's Name	Current Name
<i>Alpheus ascensionis</i> nov.	<i>Alpheus paracrinatus</i>
<i>Gecarcinus lagostoma</i>	same
<i>Grapsus grapsus</i>	<i>Grapsus adscensionis</i>
<i>Pagurus imperator</i>	<i>Dardanus imperator</i>
<i>Xantho melanodactylus</i>	<i>Nannocassiope melanodactylus</i>

Ortmann (1893:52, 53) also recorded a glaucothoe and an unnamed dromiid from Ascension.

Three species were taken by the German Südpolar Expedition (Lenz and Strunck, 1914): *Gecarcinus lagostoma*, *Grapsus grapsus* (= *Grapsus adscensionis*), and *Panulirus echinatus*. We have not included in our account below the record of *Nematocarcinus ensifer* var. *exilis* (Bate, 1888) in 2000 meters near Ascension at 12°11'S, 6°16'W (Lenz and Strunck, 1914:330).

The *Scotia* of the Scottish National Antarctic Expedition visited Ascension in 1904 and collected six species, reported by Stebbing (1914):

Stebbing's Name	Current Name
<i>Eupagurus modicellus</i> nov.	<i>Sympagurus dimorphus</i>
<i>Gecarcinus lagostoma</i>	same
<i>Grapsus grapsus</i>	<i>Grapsus adscensionis</i>
<i>Lambrus verrucosus</i>	<i>Parthenope verrucosa</i>
<i>Latreillia elegans</i>	<i>Latreillia manningi</i>
<i>Pagurus calidus</i>	<i>Dardanus imperator</i>

Station data are somewhat garbled in Stebbing's account, for he recorded six species from sta 507, as follows: *Lambrus verrucosus*, off Pyramid Point, 40 fathoms (p. 262); *Grapsus maculatus* (p. 265); *Gecarcinus lagostoma*, in 5-18 fathoms (p. 269); *Latreillia elegans*, off Pyramid Point, 45 fathoms (p. 273); *Pagurus calidus*, Clarence Bay (p. 276); and *Eupagurus modicellus*, off Pyramid Point, 40 fathoms (p. 277). The records for the *Grapsus* and the *Gecarcinus*, neither of which

live subtidally, are obviously in error, and it seems likely that all of the other specimens were taken at sta 507, off Pyramid Point, in 40 fathoms. In the narrative of the *Scotia* Expedition, Wilton, Pirie, and Brown (1908:81) noted that on June 10 [1904] they trawled in 40 fathoms off Pyramid Point at 7°36'S, 14°33'W, and secured a very rich haul. They mentioned no other stations from Ascension. The land crab also was mentioned in the narrative of the expedition. Apparently shore collections made during the trawling station received the only station number assigned at Ascension, 507.

Since 1914 there have been few records published that included Ascension decapods. Stonehouse (1960), Packer (1968, 1974), Graham (1969), Hart-Davis (1972), Olson (1973), and Marx (1975) all mentioned land crabs in their accounts. Stonehouse (1960) also mentioned the occurrence of *Grapsus*, and Packer (1968:25; 1974:19) knew of the populations of shrimps in the inland tide pools of Shelly Beach. *Panulirus echinatus* from Ascension was mentioned by Phinizy (1969), Marx (1975), Lubbock (1980), and Holthuis, Edwards, and Lubbock (1980). Gore (1974) mentioned that *Petrolisthes marginatus* occurred there, and Holthuis and Manning (1970) reported that the *Hippa* from Ascension could be identified with the West Atlantic *H. testudinaria*. Price and John (1980) reported both *Procaris ascensionis* and *Typhlatya rogersi* in their survey of inshore organisms and communities on Ascension. Williams (1982) reidentified *Latreillia elegans* from Ascension as *L. manningi*, and Manning and Holthuis (1981) studied *Euryozius sanguineus* and *Ranilia constricta* from Ascension. Felgenhauer and Abele (1983) and Abele and Felgenhauer (1985, 1986) reported on the morphology and relationships of *Procaris ascensionis*, based on collections they made at the type locality.

Balss (1922:108) listed the decapods from Ascension then known to him, a total of 16 species, as follows:

Balss' Name	Current Name
<i>Alpheus ascensionis</i>	<i>Alpheus paracrinatus</i>
<i>Panulirus guttatus</i>	<i>Panulirus echinatus</i>
<i>Petrolisthes armatus</i>	<i>Petrolisthes marginatus</i>
<i>Pagurus calidus</i>	<i>Dardanus imperator</i>
<i>Eupagurus modicellus</i>	<i>Sympagurus dimorphus</i>
<i>Remipes cubensis</i>	<i>Hippa testudinaria</i>
<i>Xanthias melanodactyla</i>	<i>Nannocassiope melanodactylus</i>
<i>Pseudozius bouvieri</i>	<i>Euryozius sanguineus</i>
<i>Grapsus grapsus</i>	<i>Grapsus adscensionis</i>
<i>Gecarcinus lagostoma</i>	<i>Percnon gibbesi</i>
<i>Percnon planissimum</i>	<i>Percnon gibbesi</i>
<i>Pagurus imperator</i>	<i>Dardanus imperator</i>
<i>Latreillia elegans</i>	<i>Latreillia manningi</i>
<i>Lambrus verrucosus</i>	<i>Parthenope verrucosa</i>
<i>Osachila stimpsoni</i>	<i>Ranilia constricta</i>
<i>Notopus (Raninoides) atlanticus</i>	<i>Ranilia constricta</i>

Two of these, *Pagurus calidus* and *P. imperator*, were based on the same species, *Dardanus imperator*, so Balss knew of only 15 species from the island; he overlooked the earlier records for *Paractaea rufopunctata africana* and *Petrolisthes*

marginatus. In 1930 Rathbun recorded *Portunus vocans* (= *Laeonectes vocans*) from the island.

Decapods collected during the Smithsonian surveys have been reported in several papers. We (Chace and Manning, 1972) described *Procaris ascensionis* and *Typhlatya rogersi* and reported *Grapsus grapsus* (= *G. adscensionis*) from Ascension, and Provenzano (1978) reported on the biology of *Procaris ascensionis*. Chace (1972) remarked that *Lysmata moorei* was found on Ascension. That a *Corallianassa* occurred on Ascension was reported by de Saint Laurent and Le Loeuff (1979), and Reaka and Manning (1987) reported that the stomatopod *Heterosquilloides mccullochae* (= *Tetrasquilla mccullochae*) was found there. Kropp and Manning (1987) studied the Atlantic gall crabs, and reported that both West Atlantic species, *Opecarcinus hypostegus* and *Troglocarcinus corallicola* occurred on Ascension.

In summary, the following 18 species were known from Ascension prior to this study:

<i>Alpheus paracrinatus</i>	<i>Osachila stimpsonii</i>
<i>Dardanus imperator</i>	<i>Pachygrapsus loveridgei</i>
<i>Euryozius sanguineus</i>	<i>Panulirus echinatus</i>
<i>Gecarcinus lagostoma</i>	<i>Paractaea rufopunctata africana</i>
<i>Grapsus adscensionis</i>	<i>Parthenope verrucosa</i>
<i>Hippa testudinaria</i>	<i>Percnon gibbesi</i>
<i>Laeonectes vocans</i>	<i>Petrolisthes marginatus</i>
<i>Latreillia manningi</i>	<i>Ranilia constricta</i>
<i>Nannocassiope melanodactylus</i>	<i>Sympagurus dimorphus</i>

Of the 18 species known from Ascension prior to the Smithsonian expeditions, only one is a shrimp (29 are reported here), one is a lobster, and 16 are anomuran and brachyuran crabs (we report 34); only eight of the 16 previously recorded crabs were taken in littoral or supralittoral habitats. The Smithsonian expeditions added 47 species to the known shallow water fauna, and a total of 58 decapods and stomatopods are newly recorded from the island.

SHORE HABITATS ON ASCENSION

The relatively low number of species of decapods found at Ascension certainly is a reflection of a variety of factors. First of all, its relatively young geological age (for oceanic islands; see Briggs, 1966) has played a role in providing a relatively short time for colonization to occur. Second, its isolation, compared to that of Bermuda and the Cape Verde Islands, has contributed to the paucity of the fauna. A third factor has to be the limited habitats available there—there are no lagoons, estuaries, grass beds, mangroves, or coral reefs on the island. Price and John (1978:118) concluded that on Ascension “the primary facet presented by the intertidal and sublittoral fringe on Ascension was still that of stark bare rock, sometimes abutting or adjoining clean sand.”

Another factor is the strong tidal surge, supplemented by rollers, enormous waves that assault the island periodically. Finally, the most common fish on Ascension, the blackfish,

Melichthys niger (Bloch), deters colonization by grazing clean all surfaces that it can reach. Day (1983:597) studied the effects of benthic algae in coral reef habitats and concluded that in areas with algal growth the presence of herbivorous fishes increased the potential for damage to sessile animals: "herbivory effectively 'weeded out' sessile animals from algal lawns." Grazing blackfish on Ascension have certainly played a large role in limiting the colonization and growth of sessile algae and invertebrates on open rock faces.

Lubbock (1980:299) recognized only three habitats on the island, sand beaches, rock, and rubble, mostly made up of coralline algal cobbles. Price and John (1980:251) recognized six categories of habitats, several of them subcategories of rocky shore habitats. In both articles the authors commented on the deleterious effects of the Ascension blackfish on shallow water habitats.

The Smithsonian expeditions found habitats to be as suggested by Lubbock; in the intertidal areas, rock is the common substratum, and algal growth is very limited; barnacles and solitary corals are very rare. Along the coasts the majority of intertidal rocky areas are covered by a layer of calcareous algae, which has effectively cemented all rubble into a uniform surface. Price and John (1978:111) remarked that "Erect calcareous and non-calcareous seaweeds are restricted in full growth to areas not exploitable by black-fish for feeding." Stands of algae and colonies of sabellariid worms are limited to crevices where tidal flow runs off, to blowholes, and to isolated tide pools where blackfish cannot penetrate.

Vermeij (1972) commented on the important role played by habitat in the distribution patterns of species, and noted that little attention had been devoted to this topic. He suggested that physically rigorous environments appeared to be used by species characterized by limited geographic distribution. There is no question that limited habitats on Ascension have played a role in limiting the decapods that have colonized it, but Vermeij's other observations do not hold for the decapods of Ascension. There physically rigorous environments are characteristic of the intertidal and shallow subtidal areas, but 74% of the species occurring on Ascension have broad distribution patterns, occurring somewhere else in the Atlantic.

The beaches on Ascension are high energy beaches made up of very coarse sand (Figure 2a,b). Only *Hippa testudinaria* was found to live in the sand, although *Grapsus* were seen roaming over the open beaches at night.

Isolated sandy-bottom tide pools, with a rim of protective rock often inhabited by dense stands of oysters, *Saccostrea cucullata* (Born), were found to be the most productive habitats. The tide pool at McArthur Point (Figure 2d) yielded no less than 30 species of decapods, and pools at English Bay (Figure 2e) and Shelly Beach (Figure 2f) each yielded more than 20 species.

A shallow, intertidal flat south of Collyer Point (Figure 2g), characterized by the presence of many sea urchins of the genus *Echinometra* in shallow excavations in the surface coralline

algae (Figure 2h), provided material of *Percnon* and *Gnathophyllum*, found associated with the urchins. Specimens of *Plagusia* were most common at the edge of that flat.

At Shelly Beach, the substrate is composed largely of loose cobbles of coralline algae, suggesting the presence of an extensive sublittoral habitat there similar to that described from the islands of the Gulf of Guinea by Voss (1966:49, fig. 14) and Forest (1959:17), who remarked: "Les formations les plus caractéristiques du plateau littoral, autour des trois îles [Principe, São Tomé, and Annobon], sont constituées par des algues calcaires agglomérées en boules (pl. 2, fig. 3) qui sont libres sur les fonds et qui arborent une abondante faune d'endobioetes..." The area offshore of Shelly Beach might prove to be a rich source of decapods. Lubbock (1980:299) noted that rubble beds in 15-50 meters depth "harboured a distinctive fauna."

The only place that corals were found to be abundant on the island was the coral pool inland of Shelly Beach, the type locality of *Procaris ascensionis* where *Typhlatya rogersi* also was collected. The substrate in that pool is dominated by colonies of the alga *Valonia* and beds of the solitary coral *Favia*. Although no other decapods were seen in the coral pool, a formalin wash of coralline algae crusts from the pool yielded specimens of *Alpheus dentipes*, *Cataleptodius olsoni*, *Clibanarius rosewateri*, *Lysmata moorei*, and *Pachygrapsus love-ridgei*. A formalin wash of echinoids from the pool yielded *Clibanarius rosewateri*. These are also the most abundant decapods on the island, other than *Grapsus ascensionis*, which was not collected at the coral pool by the Smithsonian expeditions but which was observed there by Manning in 1971 and by L.G. Abele and B. Felgenhauer (personal communication).

One of the characteristics shared by many of the decapods on Ascension is their small size, and this certainly is a reflection of the kinds of habitats available to them, namely coralline algae clumps, sabellariid beds, and oyster-lined tide pools. The larger specimen of *Typton ascensionis*, for example, has a carapace length of 1.0 mm, the largest *Clibanarius rosewateri* has a shield length of 2.4 mm, and the largest *Cataleptodius olsoni* has a carapace length of 5.0 mm. On the other hand, material of *Lysmata moorei* is unusually large and robust for the species.

FORMAT CONSIDERATIONS

Synonymies are limited to citations of the original description, the more important of subsequent citations where additional references may be found, and references to the occurrence of species at Ascension and on St. Helena (Chace, 1966), St. Paul's Rocks (Holthuis, Edwards, and Lubbock, 1980), and Fernando de Noronha (Fausto Filho, 1974).

Major collecting sites are shown in Figure 3. We have adopted spellings of localities from the U.S. Board on Geographic Names gazetteer on Ascension. Some localities have local names and are not included in the gazetteer; these





FIGURE 3.—Map of Ascension Island, showing principal collecting sites. (From Pawson, 1978, fig. 1.)

include Archer Point (north shore), British Pol (midway between North Point and Pyramid Point), Cable and Wireless Beach (south of Collyer Point), Guano Jetty, Kettle Cove, Klinka Bay, Ladies Loo (all north shore), Pan Am Beach (South West Bay), Powerhouse Cove (north shore), and Turtle Shell Beach (= Clarke's Beach, northern edge of South West Bay).

As all of the Smithsonian collections were made in littoral or shallow sublittoral habitats, data from those collections are limited to station number and locality, except for those species taken at the coral pool at Shelly Beach. A complete list of collecting stations, together with a list of species taken at each station, in the "Appendix".

Most of the specimens reported here are in the collections of the National Museum of Natural History, Smithsonian Institution. Other repositories are identified by acronym before the number of specimens in each entry under "Material." No acronym is given for material in the Smithsonian collections, except for holotypes of new species.

In the "Material" sections, measurements in millimeters are given in square brackets following the number of specimens. The measurements are: postorbital carapace length for macrurans, shield length for hermit crabs, and carapace length, measured on the midline, for crabs. In this section, as well as in that on size, the numbers and size ranges of ovigerous females are included in the female totals as well as separately.

FIGURE 2 (opposite).—Some habitats on Ascension Island: *a, b*, sand beach at North East Bay; *c*, rocky shore at North East Bay; *d*, protected tide pool at McArthur Point; *e*, English Bay; *f*, Shelly Beach; *g, h*, area south of Collyer Point.

ABBREVIATIONS AND REPOSITORIES

We use the following abbreviations:

cb	carapace breadth
cl	carapace length
cm	centimeter(s)
fm	fathom(s)
m	meter(s)
mm	millimeter(s)
sl	shield length
tl	total length

Repositories include:

BMNH	The Natural History Museum (formerly British Museum (Natural History)), London
GMBL	Grice Marine Biological Laboratory, Charleston
RSM	Royal Scottish Museum, Edinburgh
SMF	Forschungsinstitut Senckenberg, Frankfurt
ZMB	Zoological Museum, Berlin
USNM	National Museum of Natural History (formerly the United States National Museum), Smithsonian Institution, Washington

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Lilly K. Manning prepared figures 24, 27, 31, 33, 42, and 46, copied all of the figures reproduced from the literature, and made backup copies of all of the figures. Figure 21 was prepared by Carolyn Gast.

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DECAPODA

Family PENAELIDAE

Metapenaeopsis gerardoi Pérez Farfante, 1971

Metapenaeopsis gerardoi Pérez Farfante, 1971:20, figs. 11, 12, 13c.

MATERIAL.—*Grice Marine Biological Laboratory Collection*: Sta 80-54, off North Point, 20-25 m: 3 males, 10 females (GMBL).

SIZE.—Not measured.

HABITAT.—Collected with rotenone in 20-25 meters.

REMARKS.—We are indebted to Isabel Pérez Farfante for the identification of these specimens.

DISTRIBUTION.—Florida Keys, West Indies, and Caribbean coasts of Central and South America; now from Ascension Island; usually found in shallow water but recorded from a depth of at least 229 meters.

Family PROCARIDIDAE

Procaris ascensionis Chace and Manning, 1972

Procaris ascensionis Chace and Manning, 1972:6, figs. 4-9.—Provenzano, 1978:170.—Price and John 1980:263, 278.—Abele and Felgenhauer, 1985:15.

MATERIAL.—*Smithsonian 1976 Collection*: Sta 5B-76, Shelly Beach: 1 specimen [9.3].

Other Collections: Shelly Beach, R.M. Hannay (Ascension Island Historical Society), 9 Apr 1972: 7 specimens (BMNH 1973:129).

Types: The type series from the coral pool back of Shelly Beach is itemized in Chace and Manning (1972:6).

SIZE.—Carapace length of only specimen measured, 9.3 mm.

REMARKS.—Provenzano (1978) maintained *P. ascensionis* in aquaria as long as 10 months; they fed upon larval *Artemia*, *Crangon*, and *Palaemonetes* by contact capture in a feeding basket formed by the nonchelate pereopods. The same author subsequently observed the species at the type locality on Ascension and concluded that they must subsist naturally on the countless *Typhlatya rogersi* that shared the habitat with them there.

Abele and Felgenhauer (1985) also studied these shrimps at the type locality and in aquaria. They discovered that *P. ascensionis* was abundant in unlit caves beneath but connected with the surface pool and that they fed voraciously on the gammarid amphipod *Melita* as well as *Typhlatya*, but that their stomach contents contained equal parts of animal and plant fragments, such as filamentous algae and benthic diatoms.

We (Chace and Manning, 1972) originally assigned *Procaris* to a distinct primitive superfamily of the Caridea. Felgenhauer and Abele (1983) and Abele and Felgenhauer (1986) decided, from cladistic analysis, that the genus may constitute a separate major taxon, the Procarididea, allied to but distinct from the Caridea, both of which are different from the Penaeidea and the Stenopodidea. Kensley and Williams (1986:429) decided, after limited cladistic examination, to treat the group as a superfamily of the Caridea rather than to accept the new category level proposed by Felgenhauer and Abele. Felgenhauer, Abele, and Kim (1988:333, abstract) also assigned the procaridids to the Caridea after the discovery that the genital apertures correspond closely to those of members of that infraorder and that the eggs are attached to the pleopods, presumably until the time of hatching. We are still inclined to believe that the procaridids are referable to the Caridea but that the penaeoidean characters displayed by them and the tack-like spermatozoa frequently found in all three groups suggest that the abandonment of the category Natantia may prove to be premature, at least until procaridid larval stages become known.

DISTRIBUTION.—*Procaris ascensionis* is thus far known from the coral pool on Ascension, but two species that are barely distinguishable from it, *P. chacei* Hart and Manning, 1986, and *P. hawaiiiana* Holthuis, 1973, have been described from anchialine situations at Bermuda and Hawaii, respectively, and a generically distinct species, *Vetericaris chaceorum* Kensley and Williams, 1986, was found sharing a Hawaiian laval tube with *P. hawaiiiana*.

Family ATYIDAE

Typhlatya rogersi Chace and Manning, 1972

Typhlatya rogersi Chace and Manning, 1972:14, figs. 10, 11.
Typhlatys rogersi.—Price and John, 1980:263, 278.

MATERIAL.—*Smithsonian 1976 Collection*: Sta 5B-76, Shelly Beach, coral pool: 2 males [2.8–3.0], 19 females [2.5–3.4], 68 juveniles [1.7–2.4].—Sta 5C-76, Shelly Beach, marl pool: 1 male [3.6], 8 females [2.6–4.3], 12 juveniles [1.8–2.4].

Other Collections: McDowell (1981), Shelly Beach, marl pool: 13 males [2.8–3.8], 88 females [2.5–4.9], 2 juveniles [2.2–2.4].—McDowell (1981), Shelly Beach, coral pool: 98 males, [2.6–3.3], 288 females [2.7–3.9], 54 juveniles [1.7–2.4].—Shelly Beach, R.M. Hannay (Ascension Island Historical Society), 9 Apr 1972: 20 specimens (BMNH 1973:128). (The appendix masculina is often in such close contact with the appendix interna as to be indistinguishable in this species; the proportion of males cited is therefore probably too small.)

Types: See Chace and Manning (1972:14) for enumeration of type series from marl and coral pools back of Shelly Beach.

SIZE.—Carapace lengths of males, 2.5–4.2 mm; of females, 2.5–4.9 mm; of juveniles, 1.6–2.4 mm.

HABITAT.—See Chace and Manning (1972:2).

DISTRIBUTION.—Known only from the marl and coral pools back of Shelly Beach. The nine species of *Typhlatya* currently recognized are known from Ascension to the Galapagos Islands. Five of them, like most members of the family Atyidae, are known from subterranean fresh water, and two occur occasionally in brackish water. Only *T. rogersi* and *T. iliffei* Hart and Manning, 1981, from Bermuda are known from fully saline, anchialine pools.

Family RHYNCHOCINETIDAE

Rhynchocinetes rigens Gordon, 1936

Rhynchocinetes rigens Gordon, 1936:76, figs. 1–4, 5e.—Manning, 1961:1, figs. 1, 2.

MATERIAL.—*Grice Marine Biological Laboratory Collection*: Sta 80-71, Pyramid Point, 10 m: 5 males, 13 juveniles (GMBL).

SIZE.—Not measured.

DISTRIBUTION.—Known previously from the Azores and Madeira in the eastern Atlantic and represented in the Smithsonian collections from Bermuda, Florida Keys, Gulf of Mexico to Barbuda and the Caribbean coast of Colombia, and Brazil in the western Atlantic; now from Ascension in the central Atlantic; reported from localities in the Pacific by Fujino (1975) and Tiefenbacher (1976); littoral and sublittoral.

Family PALAEMONIDAE

Brachycarpus biunguiculatus (Lucas, 1846)

Palaemon biunguiculatus Lucas, 1846:45, pl. 4: fig. e.
Brachycarpus savignyi Bate, 1888:795, pl. 129: fig. 4.
Brachycarpus biunguiculatus.—Chace, 1966:625.

MATERIAL.—*Manning 1971 Collection*: Sta ASC-9, McArthur Point: 1 male [5.1].—Sta ASC-15, English Bay: 1 male [8.3].—Sta ASC-16, Shelly Beach: 1 male [6.8].—Sta ASC-21, English Bay: 2 females [3.1–3.4].—Sta ASC-22, McArthur Point: 1 male [3.9], 1 female [3.2].

Smithsonian 1976 Collection: ASC Sta 8, McArthur Point: 1 male [8.2].

Grice Marine Biological Laboratory Collection: Sta 80-43, English Bay, 0–1 m: 2 males (GMBL).

Operation Origin: Site 31, Spire Rock, 10 m: 1 ovig. female [10.0].

Other Collections: Olson (1970); McArthur Point, sandy bottom tide pool: 2 males [7.8–10.5].—Jourdan (1977), Long Beach: 1 male [8.6].—Castro (1978), McArthur Point: 1 ovig. female [14.3].—Ascension Island, T. Conry: 1 male [6.5] (BMNH 82.1).

SIZE.—Carapace lengths of males, 3.9–10.5 mm; of females, 3.1–14.3 mm; of ovigerous females, 10.0–14.3 mm.

COLOR.—Notes made by Operation Origin personnel indicate that their specimen was orange with black eyes and the

chelae were ochre with darker rings.

HABITAT.—Most of the specimens listed above were collected from tide pools.

DISTRIBUTION.—Pan-tropical and subtropical; eastern Atlantic from the Mediterranean and off West Africa; central Atlantic from Ascension; western Atlantic from Bermuda to Curaçao; Clipperton Island, eastern Pacific (Chace, 1962); Indo-West Pacific from Hawaii to Red Sea; littoral and sublittoral.

***Pontonia pinnophylax* (Otto, 1821)**

Palaemon pinnophylax Otto, 1821:12.

Pontonia pinnophylax.—Chace, 1966:626, fig. 1.

MATERIAL.—*Grice Marine Biological Laboratory Collection*: Sta 80-71, Pyramid Point, 10 m: 1 male, 1 ovig. female (GMBL).

Operation Origin: Site 15, Lady's Loo, in hooked *Pinna* shell, 6 m: 1 female [6.3].—Site 21?, "China" Wreck, off Georgetown, in live *Pinna* shell, 10 m: 1 female [9.5].

Other Collections: Vickrey (1963), South West Bay, in "*Atrina rigida*," 9 m: 1 male [8.3], 1 female with remains of hatched eggs [9.8].—Dennis, English Bay, 18-27 m: 1 male [13.3], 1 ovig. female [10.8].—Olson (1971), from "pen shells": 4 males [9.9-10.5], 3 females [9.9-12.0], 1 ovig [11.1].

SIZE.—Carapace lengths of males, 8.3-13.3 mm; of females, 6.3-12.0 mm; of ovigerous females, 10.8-11.1 mm.

HABITAT.—Probably all of the Ascension specimens occurred in *Pinna rudis* Linnaeus, the only pen shell recorded thus far from that Island according to Rosewater (1975), in depths of 9-27 meters.

DISTRIBUTION.—Mediterranean Sea and western Africa as far south as northern Angola, Azores; central Atlantic from St. Helena and Ascension; commensal in bivalve mollusks of the genus *Pinna*.

***Typton ascensionis*, new species**

FIGURE 4

MATERIAL.—*Smithsonian 1976 Collection*: Sta 1C-76, McArthur Point: 1 female [1.0] (holotype, USNM 221890).—Sta 3C-76, English Bay: 1 female [0.8].

DESCRIPTION.—Rostrum (Figure 4b) simple, spinelike, not nearly reaching anteriorly to level of cornea, deepest near midlength, ventral margin forming obtuse, rounded angle. Carapace smooth, armed only with blunt antennal tooth (Figure 4a,b) situated at ventral orbital angle and not reaching level of tip of rostrum; anterolateral margin rounded, not noticeably produced anteriorly.

Abdomen with pleura of 5 anterior somites broadly rounded. Sixth somite longer than 5th and more than 1/2 as long as telson, armed with long sharp spine either side of base of telson and



FIGURE 4.—*Typton ascensionis*, new species, female holotype, carapace length 1.0 mm: a, carapace and anterior appendages, right aspect; b, same, without appendages; c, anterior part of carapace and eyes, dorsal aspect; d, telson and uropods, dorsal aspect; e, right antennule, dorsal aspect; f, right antenna, ventral aspect; g, right 1st maxilla, distal endite and palp; h, right 2nd maxilla; i, right 1st maxilliped; j, right 2nd maxilliped; k, right 3rd maxilliped; l, right 1st pereopod; m, right 2nd pereopod; n, same, reverse aspect of fingers; o, left 2nd pereopod; p, same, reverse aspect of fingers; q, right 3rd pereopod; r, same, dactyl; s, same, distal end; t, right 4th pereopod; u, same, dactyl; v, right 5th pereopod; w, same, dactyl.

with acute tooth at posterolateral angle of pleuron. Telson (Figure 4d) nearly $\frac{2}{3}$ as broad as long; posterior pair of dorsolateral spines arising very slightly posterior to midlength, anterior pair at about $\frac{1}{10}$ of length from anterior margin; lateral pair of terminal spines small but distinct, intermediate pair longer and stouter than mesial pair.

Eyes reaching about to level of distal end of basal segment of antennular peduncle; cornea much shorter and slightly narrower than eyestalk.

Antennular peduncle (Figure 4e) with short, acute stylocerite falling considerably short of midlength of basal segment. Second segment slightly shorter than 3rd. Dorsolateral flagellum with both branches fused for 2 joints; free part of shorter branch vestigial.

Antennular scale (Figure 4f) reduced to indistinct oval lappet. Antennal peduncle reaching nearly to level of end of antennular peduncle.

Mandible (disintegrated after extraction) with incisor process vestigial and unarmed. Other mouthparts as illustrated (Figure 4g-k). Second maxilla large, endite not cleft, scaphognathite long and rather narrow. All maxillipeds with exopods. Second maxilliped with well-developed exopod and simple, ovate epipod. Third maxilliped short and stout; exopod barely overreaching antepenultimate segment.

First pereopod (Figure 4l) with fingers fully $\frac{3}{4}$ as long as palm, carpus nearly $\frac{1}{2}$ as broad as long, shorter than either chela or merus. Second pereopods dissimilar and unequal. Major 2nd pereopod (Figure 4n) less than $\frac{1}{2}$ as long as palm, forming hook twisted into plane nearly at right angle to that of palm; carpus rather deeply triangular, about $\frac{1}{2}$ as long as palm; merus fully $\frac{1}{2}$ as long as carpus, armed with 3 teeth on flexor margin; ischium shorter than carpus, armed with 1 tooth near distal end of flexor margin. Minor 2nd pereopod (Figure 4o) with fingers about $\frac{2}{3}$ as long as palm, movable finger armed with blunt tooth near proximal end of opposable margin, fixed finger with extensor surface (Figure 4p) forming deep flange bearing subtriangular proximal tooth and concealing most of flexed movable finger; carpus much shorter than palm; merus about $\frac{2}{3}$ as long as carpus, armed with 1 tooth near proximal end of flexor margin; ischium about as long as carpus. Third pereopod (Figure 4q) with dactyl (Figure 4r,s) less than $\frac{1}{2}$ as long as propodus, accessory tooth sufficiently large to form bifid tip; propodus stout, tapered, bearing 1 or 2 small spines on flexor margin in addition to distal pair; carpus fully as long as propodus; merus nearly as long as carpus. Fourth pereopod (Figure 4t,u) similar to but slightly more slender than 3rd. Fifth pereopod (Figure 4v) considerably more slender than 3rd or 4th; dactyl (Figure 4w) about $\frac{1}{3}$ as long as propodus; propodus with subparallel margins; carpus about $\frac{2}{3}$ as long as propodus; merus subequal to propodus; ischium shorter than carpus.

Lateral branch of uropod (Figure 4d) with lateral margin convex throughout, unarmed except for distal tooth and movable spine mesial thereto.

SIZE.—Carapace length of female, holotype, 1.0 mm; of

female paratype, 0.8 mm.

HABITAT.—The holotype was extracted from a clump of coralline algae and the paratype was associated with rocks, both along the shoreline.

REMARKS.—These tiny specimens seem to belong to a distinct species that differs from all other species of *Typton*, except *T. tortugae* McClendon, 1911, *T. bawii* Bruce, 1972, and *T. australis* Bruce, 1973, in the lobate, rather than spinose, antennal tooth. They differ from those three species in lacking a well-developed incisor process on the mandible, the first maxilliped with the caridean lobe less produced, and the first pereopod with the carpus and chela less elongate.

ETYMOLOGY.—The specific name may serve as a reminder of the site of the original discovery of the species.

Family GNATHOPHYLLIDAE

Gnathophyllum ascensione, new species

FIGURES 5, 6, 8

MATERIAL.—*Manning 1971 Collection*: Sta ASC-22, McArthur Point: 7 males [1.2-1.7], 7 females [1.2-1.6].—Sta ASC-23, McArthur Point: 1 male [1.1], 1 ovig. female [1.9].—Sta ASC-25, south of Collyer Point: 1 male [1.4], 3 females [1.3-2.0], 2 ovig. [1.9-2.0].

Smithsonian 1976 Collection: Sta 5A-76, Shelly Beach: 1 ovig. female [2.2].—Sta 6A-76, south of Collyer Point: 1 ovig. female [2.3].—Sta 9C-76, North East Bay: 3 males [2.0-2.1], 5 females [1.6-2.1], 4 ovig. [1.8-2.1] (1 male is holotype, USNM 221888).

DESCRIPTION.—Rostrum (Figure 6a) rarely overreaching basal segment of antennular peduncle, armed dorsally with 4-6, usually 5 teeth, all on rostrum anterior to level of posterior apex of orbit, and ventrally with or without single denticle. Orbit not incised into distinct posterodorsal sinus, provided with blunt projection at anteroventral angle. Antennal spine strong, arising from carapace slightly posterior to anterior margin. Anterolateral angle of carapace rounded and produced anteriorly well beyond antennal spine.

Abdomen smooth, pleura of all somites rounded. Telson (Figure 6b) fully $1\frac{1}{4}$ times as long as 6th somite, nearly $1\frac{3}{4}$ times as long as wide; anterior pair of lateral spines arising near midlength of telson, posterior pair slightly nearer to posterior apex of telson than to anterior pair; posterior margin produced to sharp point, armed with 3 pairs of spines, intermediate pair 2 or 3 times as long as lateral and mesial pairs, latter slender, seta-like.

Eye (Figure 6c) with cornea rounded or obscurely produced into papilla.

Antennular peduncle (Figure 6d) with basal segment very broad, stylocerite reaching about to level of junction with 2nd segment, distolateral angle armed with strong spine overreaching 2nd segment, ventromesial margin armed with tooth at about midlength; dorsolateral flagellum with fused basal

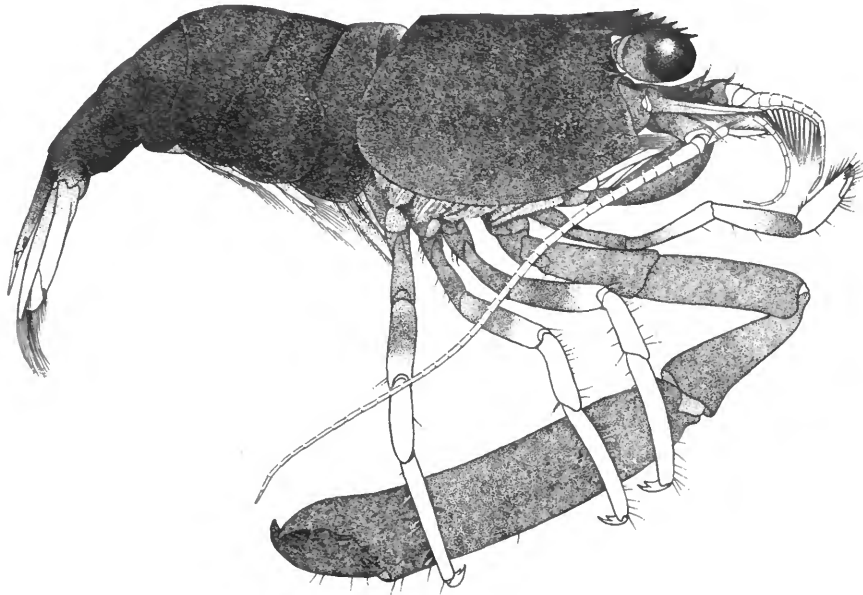


FIGURE 5.—*Gnathophyllum ascensione*, new species, male holotype, indicating color pattern.

portion of 4 or 5 articles.

Antennal scale (Figure 6e) overreaching antennular peduncle, nearly twice as long as wide, lateral margin nearly straight, terminating in strong distal tooth reaching nearly to level of distal margin of blade.

Mandibles (Figure 6f-h) very small, unequal, without any vestige of incisor process; molar process of right mandible with slender distal process considerably overreaching clusters of stout setae. Other mouthparts as illustrated (Figure 6i-r).

First pereopod (Figure 6s) overreaching antennal scale by length of chela and $\frac{4}{5}$ of carpus. Second pereopod overreaching antennal scale by lengths of chela, carpus, and $\frac{1}{3}$ of merus, fingers strongly dentate in mature males (Figure 6t). Third to 5th pereopods robust, 3rd (Figure 6u,v) overreaching antennal scale by length of dactyl and at least $\frac{4}{5}$ of propodus, merus 3-4 times as long as wide.

Endopod of 1st pleopod of male (Figure 6w,x) narrowly triangular, armed with 4-8 denticles on mesial margin. Appendix masculina on 2nd pleopod of male (Figure 6y,z) considerably shorter than appendix interna and armed with 8-14 long spines on lateral, mesial, and distal margins.

Uropods (Figure 6b) with lateral branch slightly convex laterally, with movable spine mesial to stout distal tooth.

SIZE.—Carapace length of male holotype, 2.0 mm; of paratypes, males, 1.1-2.1 mm; females, 1.2-2.3 mm; ovigerous females 1.8-2.3 mm.

COLOR.—Typically, entire carapace and abdomen blackish, fading somewhat on posterior $\frac{1}{2}$ of telson; eyestalks quite dark,

as are 1st and 2nd segments of antennular peduncle, antennal peduncle except for most of antennal scale, all but 2 distal segments of 3rd maxilliped, proximal segments nearly to midlength of merus and distal $\frac{1}{3}$ of carpus of 1st pereopod, all of 2nd pereopod, proximal segments to midlength of merus of 3 posterior pereopods, and extreme proximal part of uropod; all other areas colorless (see "Remarks").

HABITAT.—All 30 specimens of this species were found in tide pools. The holotype and seven specimens associated with it were observed dispersing from beneath specimens of the echinoid *Echinometra* when Pro-Noxfish poison was introduced into the pool.

REMARKS.—It was the uniformly dark color of the series of specimens collected in tide pools at McArthur Point and south of Collyer Point that first suggested the possibility that the Ascension species might be distinct from *G. americanum* Guérin-Méneville, 1856, the highly variable species that occurs in the western Atlantic, the Canary Islands, and in the Indo-Pacific region from the Red Sea and South Africa to the Tuamotu Archipelago. Comparison of the series of Ascension specimens with those of *G. americanum* from both the western Atlantic and the Pacific islands tends to confirm this possibility, even though the single ovigerous female from Shelly Beach displayed somewhat indistinct bands on the carapace and three abdominal somites much like those of *G. americanum* (see Holthuis, 1949:245, fig. 5a; and Manning, 1963a:59, fig. 5).

Gnathophyllum ascensione seems to be a smaller species

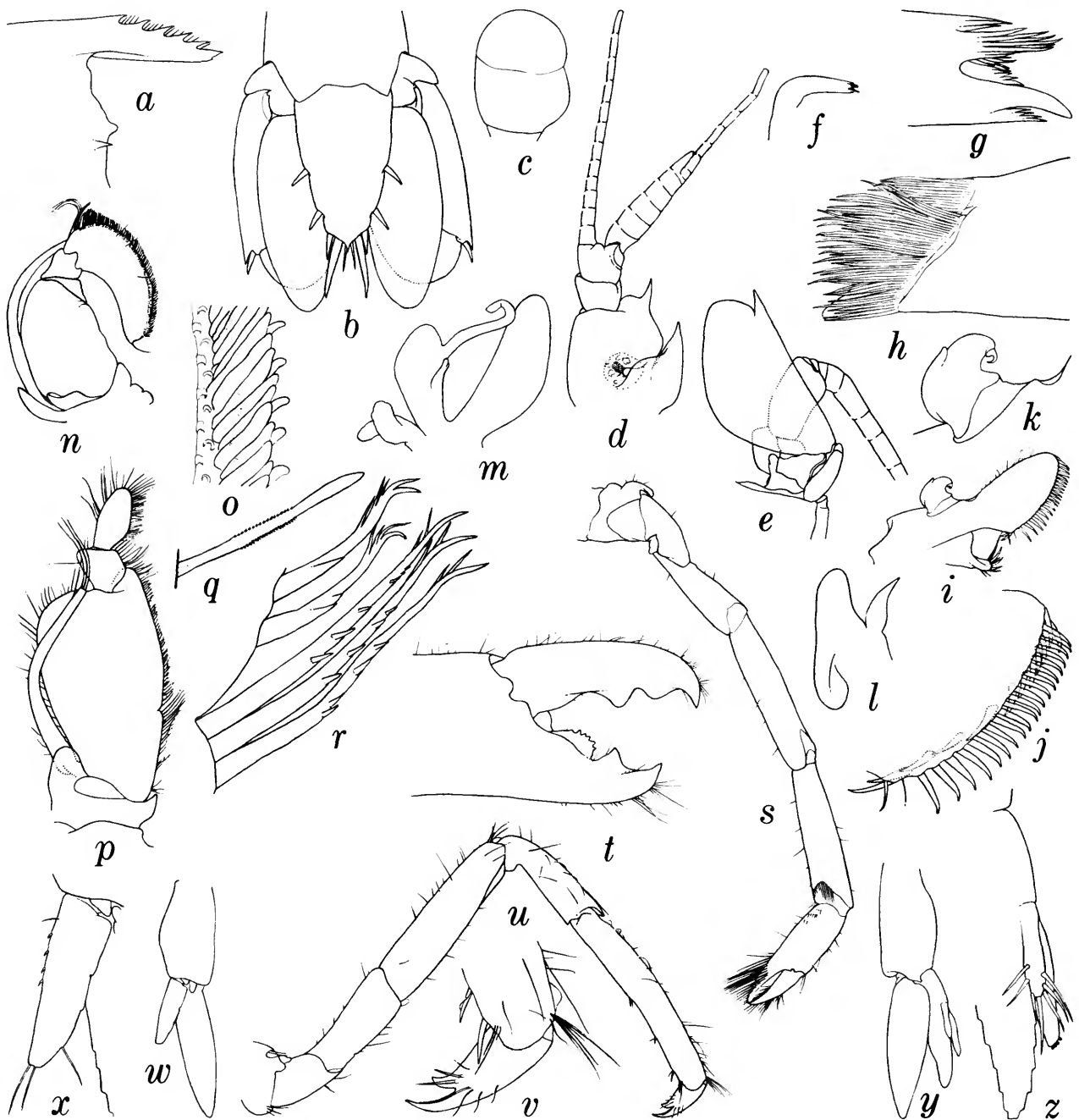


FIGURE 6.—*Gnathophyllum ascensione*, new species, male holotype, carapace length 2.0 mm: a, rostrum, right aspect; b, telson and uropods, dorsal aspect; c, right eye, ventral aspect; d, right antennule, dorsal aspect; e, right antennal peduncle, dorsal aspect; f, right mandible; g, same, distal end; h, left mandible, distal end; i, right 1st maxilla; j, same, margin of endite; k, same, palp; l, right 2nd maxilla; m, right 1st maxilliped; n, right 2nd maxilliped; o, same, part of extensor margin of distal segment; p, right 3rd maxilliped; q, same, seta from mesial margin of distal segment; r, same, setae near notch in mesial margin of antepenultimate segment; s, right 1st pereopod; t, right 2nd pereopod, fingers; u, right 3rd pereopod; v, same, dactyl; w, right 1st pleopod; x, same, endopod; y, right 2nd pleopod; z, same, appendices masculina and interna.

than *G. americanum*, ovigerous females of the former having carapace lengths of 1.8 to 2.3 mm compared with 2.3 to 4.4 mm in the latter species. The orbit is not incised as noticeably posteriorly in *G. ascensione* (compare with Figure 7a). The cornea is usually less distinctly papillate (compare with Figure 7b). There seem to be fewer fused articles in the proximal part of the antennular flagellum of *G. ascensione*, but this difference is not apparent when specimens of similar size are compared. The distolateral tooth of the antennal scale is often larger and reaches farther distally in the Ascension specimens than in any of those available of *G. americanum* (compare with Figure 7c). The right mandible seems to be relatively smaller, more slender, and to have a more projecting molar tooth in the Ascension population (compare with Figure 7e). The walking legs are nearly as long but more robust in *G. ascensione* than in *G. americanum* (Figure 8), the merus having a length-width ratio of 2.9–4.0 in the former and 3.2–6.5 in the latter.

Gnathophyllum ascensione may eventually prove to be of no more than subspecific rank, but it seems best to treat the Ascension population as a full species for the time being.

ETYMOLOGY.—The remote island home of this possibly unique population of bumblebee shrimps is reflected in the specific name.

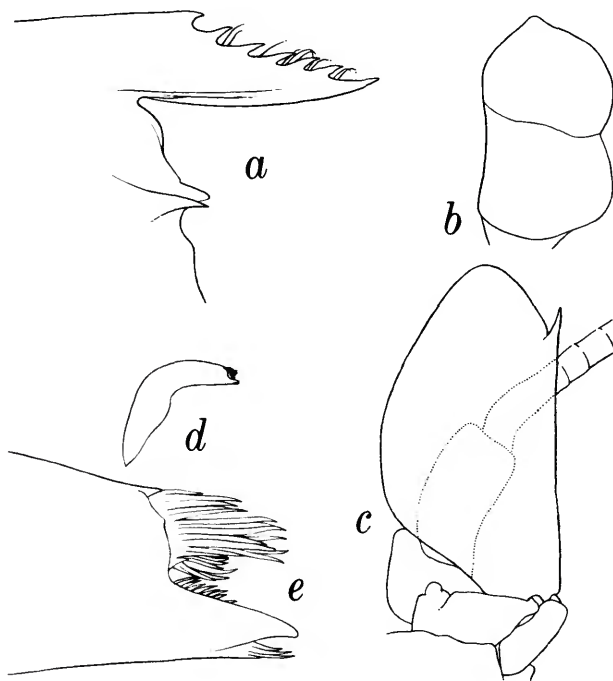


FIGURE 7.—*Gnathophyllum americanum*, a-c, male from Key West, Florida, carapace length 3.2 mm; d,e, male from Quintana Roo, Mexico, carapace length 1.9 mm: a, rostrum, right aspect; b, right eye, ventral aspect; c, right antennal peduncle, dorsal aspect; d, right mandible; e, same, distal end.

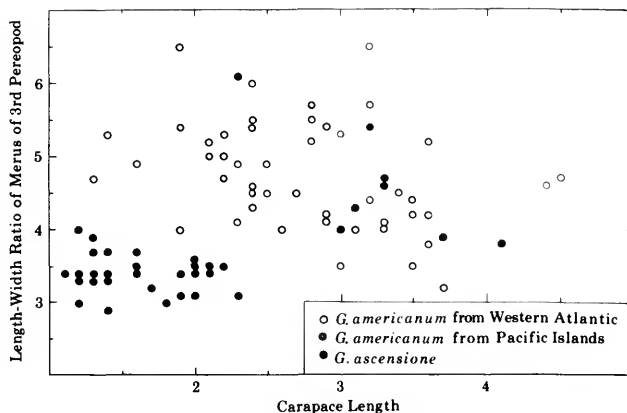


FIGURE 8.—Relationship of stoutness of 3rd pereopod in *Gnathophyllum americanum* and *G. ascensione*, new species.

Family ALPHEIDAE

Alpheus bouvieri A. Milne Edwards, 1878

Alpheus bouvieri A. Milne Edwards, 1878:231.—Crosnier and Forest, 1966:273, fig. 22.—Fausto Filho, 1974:5.

MATERIAL.—*Manning 1971 Collection*: Sta ASC-13, Georgetown: 2 males [2.5–2.7].—Sta ASC-18, Shelly Beach: 2 females [2.1–2.2].—Sta ASC-23, McArthur Point: 3 females [2.2–2.8].

Smithsonian 1976 Collection: Sta 5A-76, Shelly Beach: 3 males [2.7–3.2], 2 females [2.9–4.0].—Sta 6A-76, south of Collyer Point: 1 male [3.5], 1 ovig. female [4.3].

SIZE.—Carapace lengths of males, 2.5–3.5 mm; of females, 2.1–4.3 mm; of ovigerous female, 4.3 mm.

HABITAT.—Two of the specimens listed above were found in algal mats on intertidal rocks; the remaining 12 specimens occurred in tide pools.

DISTRIBUTION.—Eastern Atlantic from the Cape Verde Islands and Guinea to São Tomé and Congo; central Atlantic from Ascension; western Atlantic from Bermuda and eastern Florida to Tobago and Fernando de Noronha; eastern Pacific, including Clipperton Island (Chace, 1962); intertidal.

Alpheus crockeri (Armstrong, 1941) ?

Crangon crockeri Armstrong, 1941:8, figs. 2, 3.

Alpheus crockeri.—Crosnier and Forest, 1966:225, figs. 4, 5.

MATERIAL.—*Other Collections*: Jourdan (1976), English Bay: 1 ovig. female [7.8].

SIZE.—Carapace length of single ovigerous female, 7.8 mm.

HABITAT.—Found under a rock in 6 meters.

REMARKS.—This unique specimen lacks both the first and second pairs of pereopods but it seems to agree in all other characters with *A. crockeri*.

DISTRIBUTION.—Known previously from the islands of São Tomé and Annobon in the eastern Atlantic and from Reunion Island to Hawaii in the Indo-West Pacific; now from Ascension Island in the central Atlantic.

Alpheus dentipes Guérin-Méneville, 1832

Alpheus dentipes Guérin-Méneville, 1832:39; 1835, pl. 27: fig. 3.—Crosnier and Forest, 1966:221, fig. 3.

MATERIAL.—*Manning 1971 Collection*: Sta ASC-5, North East Bay: 1 female [2.0].—Sta ASC-11, English Bay: 3 males [2.5–3.3], 6 females [1.9–3.0], 2 ovig. [2.8–3.0].—Sta ASC-12, McArthur Point: 8 males [2.6–5.4], 21 females [1.9–5.5], 8 ovig. [1.9–5.5], 1 juvenile [1.7].—Sta ASC-15, English Bay: 8 males [2.7–4.4], 8 females [1.9–5.0], 5 ovig. [2.0–5.0].—Sta ASC-21, English Bay: 12 males [2.1–7.7], 22 females [1.9–7.7], 10 ovig. [2.1–6.4].—Sta ASC-22, McArthur Point: 4 males [2.1–2.9], 12 females [1.9–2.9], 8 ovig. [1.9–2.9].—Sta ASC-23, McArthur Point: 2 males [2.1–3.0], 7 ovig. females [2.6–3.0].—Sta ASC-25, south of Collyer Point: 1 female [1.9].

Smithsonian 1976 Collection: Sta 1B-76, McArthur Point: 2 males [6.1–7.6], 5 females [4.6–8.0], 1 ovig. [4.6].—Sta 1C-76, McArthur Point: 5 males [3.3–5.6], 9 females [2.8–7.9], 7 ovig. [2.8–5.3].—Sta 3C-76, English Bay: 4 males [4.9–6.6], 6 females [3.0–6.6], 5 ovig. [3.0–6.6], 1 juvenile [1.4].—Sta 3D-76, English Bay: 3 males [3.3–6.0], 1 ovig. female [5.9].—Sta 5A-76, Shelly Beach: 1 male [3.5], 1 female [2.1], 1 juvenile [1.8].—Sta 5D-76, Shelly Beach, coral pool: 1 male [3.2].—Sta 6A-76, south of Collyer Point: 3 males [4.3–6.7], 3 ovig. females [4.3–5.9].—Sta 8-76, McArthur Point: 13 males [2.4–6.5], 15 females [2.0–7.3], 8 ovig. [2.8–7.3].—Sta 9C-76, North East Bay: 1 male [5.4], 3 females [2.6–5.5], 2 ovig. [4.3–5.5].

Operation Origin: Site 12, Catherine Point, from underside of small boulder embedded in sand, 15 m: 1 female [5.7].—Site 31, Spire Rock, beneath a stone, 11 m: 1 female [5.1].

Other Collections: Olson (1970), McArthur Point, sandy bottom tide pool: 3 males [3.3–6.9], 9 ovig. females [3.3–7.2].

SIZE.—Carapace lengths of males, 2.1–7.7 mm; of females, 1.9–8.0 mm; of ovigerous females, 1.9–7.3 mm; of juveniles, 1.4–1.8 mm.

COLOR.—Notes accompanying the two Operation Origin shrimps indicate that one was translucent, with a dark grey carapace with white spectacle-like markings. The other had a dark green/brown carapace and pinky-red abdomen, with two light blue “wings” as markings on anterior dorsal of carapace.

HABITAT.—Most of the specimens listed above were found in tide pools, but the species also occurred in association with rocks and in or under coralline alga clumps and overcrusts, as well as in depths of 11 and 15 meters. This species also was collected in the coral pool, the habitat of *Procaris ascensionis*.

REMARKS.—The 206 specimens of this species collected at 20 different sites suggest that *A. dentipes* may be the most

abundant shrimp on Ascension.

DISTRIBUTION.—Known previously from the Mediterranean and Black seas, and in the Atlantic from Portugal to Guinea, Azores, Cape Verde Islands, and Annobon; now from Ascension; intertidal to 73 meters.

Alpheus holthuisi Ribeiro, 1964

Alpheus holthuisi Ribeiro, 1964:1, figs. 1–11.—Crosnier and Forest, 1966:280, fig. 24.

MATERIAL.—*Grice Marine Biological Laboratory Collection*: Sta 80-68, Pyramid Point, 27 m: 1 ovig. female (GMBL).

SIZE.—Not measured.

HABITAT.—The single specimen examined was collected at a depth of 27 meters.

DISTRIBUTION.—Known previously from the islands of Cape Verde, São Tomé, and Principe; intertidal to 40 meters.

Alpheus macrocheles (Hailstone, 1835)

Hippolyte macrocheles Hailstone, 1835:395.

Alpheus macrocheles.—Crosnier and Forest, 1966:218, fig. 2a-d.—Chace, 1966:627, fig. 2.

MATERIAL.—*Manning 1971 Collection*: Sta ASC-9, McArthur Point: 1 female [3.1].—Sta ASC-22, McArthur Point: 7 females [1.9–3.1].

Smithsonian 1976 Collection: Sta 8-76, McArthur Point: 4 males [3.8–9.7], 2 females [2.1–6.3].

Grice Marine Biological Laboratory Collection: Sta 80-75, Hummock Point, 25 m: 1 ovig. female.

Operation Origin: Site 12, Catherine Point, under a boulder, 13–15 m: 1 female [7.5].

Other Collections: Olson (1970), McArthur Point, sandy bottom tide pool: 1 male [7.5], 1 ovig. female [8.9].—Jourdan (1976), English Bay: 1 male [9.7], 2 females [2.1–6.3].—Jourdan (1977), Pan Am Beach: 1 ovig. female [11.3].

SIZE.—Carapace lengths of males, 3.8–9.7 mm; of females, 1.9–8.9 mm; of ovigerous females, 8.9–11.3 mm.

COLOR.—The Operation Origin specimen was red with yellow antennae, a transparent carapace, and a banded tail. The female from sta ASC-9 was bright red in life.

HABITAT.—Most specimens of this species were found in tide pools with clean sand bottoms at McArthur Point, but the Operation Origin specimen was found under a boulder in 13–15 meters.

REMARKS.—This species differs most noticeably from its western Atlantic counterpart, *A. amblyonyx* Chace, 1972, in the much more pronounced shoulder on the ventral margin of the minor chela.

DISTRIBUTION.—Known previously from the eastern Atlantic and the Mediterranean Sea from the southern coasts of the British Isles to the Cape Verde Islands and Gabon; central Atlantic from St. Helena and now from Ascension; intertidal to 50 meters and, exceptionally, to 185 meters.

Alpheus paracrinitus Miers, 1881

Alpheus paracrinitus Miers, 1881a:365, pl. 16: fig. 6.—Crosnier and Forest, 1966:253, fig. 15.

Alpheus ascensionis Ortmann, 1893:45.

MATERIAL.—*Manning 1971 Collection*: Sta ASC-11, English Bay: 3 females [1.7–3.3], 2 ovig. [2.8–3.3], 1? [3.4].—Sta ASC-15, English Bay: 3 males [3.8–5.2], 2 females [2.2–4.8].—Sta ASC-21, English Bay: 1 female [1.8].—Sta ASC-22, McArthur Point: 1 male [2.6].—Sta ASC-23, McArthur Point: 2 females [2.7–5.7], 1 ovig. [5.7].

Smithsonian 1976 Collection: Sta 3A-76, English Bay: 1 male [5.0], 1 ovig. female [5.7].—Sta 3D-76, English Bay: 2 males [3.0–3.8], 1 ovig. female [3.8].—Sta 5A-76, Shelly Beach: 6 males [3.8–5.0], 6 females [3.0–5.8], 3 ovig. [3.0–5.8].—Sta 8-76, McArthur Point: 1 male [4.4], 3 ovig. females [2.8–5.0].

Other Collections: Olson (1970), McArthur Point, sandy bottom tide pool: 2 ovig. females [3.8–6.2].

SIZE.—Carapace lengths of males, 2.6–5.2 mm; of females, 1.7–6.2 mm; of ovigerous females, 2.8–6.2 mm.

HABITAT.—All specimens listed probably were found in tide pools.

REMARKS.—Previously recorded from Ascension in 20 meters by Ortmann (1893).

DISTRIBUTION.—Pan-tropical; eastern Atlantic from Senegal to Angola; central Atlantic from Ascension; western Atlantic from Bermuda and northeastern Gulf of Mexico to Tobago; eastern Pacific from Clipperton Island (Chace, 1962); widely distributed in central Pacific and Indian Oceans; to a depth of 20 meters.

Automate dolichognatha De Man, 1888

Automate dolichognatha De Man, 1888:529, pl. 22: fig. 5.—Chace, 1988:64.

Automate gardineri.—Chace, 1972:74, fig. 23.

MATERIAL.—*Manning 1971 Collection*: Sta ASC-15, English Bay: 2 females [1.2–2.2].

Smithsonian 1976 Collection: Sta 3A-76, English Bay: 1 ovig. female [3.6].—Sta 5A-76, Shelly Beach: 1 female [1.9].

Other Collections: Olson (1970), McArthur Point, sandy bottom tide pool: 1 ovig. female [5.8].

SIZE.—Carapace lengths of females, 1.2–5.8 mm; of ovigerous females, 3.6–5.8 mm.

HABITAT.—All five specimens were taken from tide pools.

REMARKS.—The discovery of *A. dolichognatha* at Ascension tends to reinforce the suggestion of Chace (1972:74) that the species may prove to be pan-tropical and that the name *A. dolichognatha* may take precedence over *A. talismani* Coutière, 1902, from the eastern Atlantic.

DISTRIBUTION.—Pan-tropical, except for eastern Atlantic (see above); central Atlantic from Ascension; western Atlantic from North Carolina, Yucatan, and Antilles; eastern Pacific from Mexico to the Galapagos (Wicksten, 1981, synonymized

A. haightae Boone, 1931, from the eastern Pacific with this species); Indo-West Pacific from Samoa to the Red Sea; intertidal to shallow sublittoral.

Metalpheus paragracilis (Coutière, 1897)

Alpheus paragracilis Coutière, 1897b:304.—Chace, 1966:627; 1972:78.

Metalpheus paragracilis.—D.M. and A.H. Banner, 1982:282, fig. 86.

MATERIAL.—*Manning 1971 Collection*: Sta ASC-11, English Bay: 1 male [2.5], 3 females [2.0–3.1], 2 ovig. [2.3–3.1], 1 juvenile [1.5].—Sta ASC-12, McArthur Point: 10 males [1.7–3.8], 12 females [1.7–3.8], 5 ovig. [2.5–3.8], 3 juveniles [1.6].—Sta ASC-13, Georgetown: 1 male [2.0], 2 ovig. females [2.9–3.0].—Sta ASC-15, English Bay: 7 males [2.4–3.9], 6 females [1.9–3.3], 1 ovig. [2.9], 13 juveniles [1.4–1.6].—Sta ASC-21, English Bay: 3 males [2.0–3.8], 7 females [1.7–3.5], 2 ovig. [3.1–3.5], 3 juveniles [1.5–1.6].—Sta ASC-22, McArthur Point: 11 males [1.7–3.6], 10 females [1.7–2.8], 4 ovig. [2.7–2.8], 4 juveniles [1.4–1.6].—Sta ASC-23, McArthur Point: 2 males [2.1–2.8], 4 females [2.0–3.0], 3 ovig. [2.6–3.0].

Smithsonian 1976 Collection: Sta 1B-76, McArthur Point: 2 females [2.7–4.2], 1 ovig. [4.2].—Sta 3D-76, English Bay: 1 male [3.6], 1 ovig. female [3.9].—Sta 5A-76, Shelly Beach: 2 males [3.2–3.3].—Sta 8-76, McArthur Point: 2 males [2.7–3.3], 5 ovig. females [2.3–3.5].—Sta 9C-76, North East Bay: 2 ovig. females [2.2].

Operation Origin: Site 7, Portland Point in *Lithothamnion* ball, 25 m: 1 female [2.4].

Other Collections: Olson (1970), McArthur Point, sandy bottom tide pool: 7 males [2.3–3.7], 2 females [1.8].

SIZE.—Carapace lengths of males, 1.7–3.9 mm; of females, 1.7–4.2 mm; of ovigerous females, 2.2–4.2 mm; of juveniles, 1.4–1.6 mm.

HABITAT.—Most of the specimens listed above were found in tide pools, but some were associated with intertidal rocks, especially in algal mats, and the specimen taken by Operation Origin was found in a *Lithothamnion* "ball" in 25 meters.

REMARKS.—It will be noted that this was one of the commoner shrimps at Ascension, having been taken at no less than 14 collecting sites.

DISTRIBUTION.—Indo-West Pacific region from the Red Sea and Madagascar to Hawaii. The only previous record from the Atlantic was from St. Helena (Chace, 1966:627), now from Ascension; littoral and sublittoral.

Metalpheus rostratipes (Pocock, 1890)

Alpheus rostratipes Pocock, 1890:522.—Crosnier and Forest, 1966:246, figs. 12–14.

Metalpheus rostratipes.—Chace, 1972:78.

Alpheus ? rostratipes.—Fausto Filho, 1974:5.

MATERIAL.—*Manning 1971 Collection*: Sta ASC-13, Georgetown: 1 male [2.0].—Sta ASC-25, south of Collyer Point: 1

juvenile [1.5].

Smithsonian 1976 Collection: Sta 1B-76, McArthur Point: 1 male [2.9], 2 females [4.1–4.3], 1 ovig. [4.1].—Sta 1C-76, McArthur Point: 19 males [2.0–4.8], 28 females [2.2–4.8], 13 ovig. [2.6–4.8], 1 juvenile [1.6].—Sta 3C-76, English Bay: 3 males [3.3–4.0], 4 females [2.3–3.9], 3 ovig. [3.0–3.9], 1 juvenile [1.6].—Sta 6B-76, south of Collyer Point: 1 female [2.0].—Sta 9C-76, North East Bay: 1 male [2.2].

Other Collections: Olson (1970), McArthur Point, sandy bottom tide pool: 2 males [3.5–4.0], 1 female [3.6].

SIZE.—Carapace lengths of males, 2.0–4.8 mm; of females, 2.0–4.8 mm; of ovigerous females, 2.6–4.8 mm; of juveniles, 1.5–1.6 mm.

HABITAT.—Although a few of the specimens listed above were apparently collected in tide pools, most were found among exposed intertidal rocks, and by far the largest lot—from sta 1C-76—was taken from clumps of coralline algae.

REMARKS.—The two species of *Metalpheus* that occur at Ascension show great superficial resemblance, but *M. rostratipes* can be distinguished easily from *M. paragracilis* by not having the antennal scale overreaching the antennular peduncle; the ventral margin of the major chela entire, without a pronounced shoulder; the merus of the 3rd pereopod unarmed at the distal end of the flexor margin, rather than bearing an acute tooth; and the pleopods highly modified, the appendix masculina being completely fused with the endopod of the second pleopod in males, and the appendix interna reaching to or beyond the end of the endopod of the posterior pleopods. It is possible that these differences, especially the form of the second pleopod of the male, may eventually prove to be of generic significance.

DISTRIBUTION.—Pantropical; eastern Atlantic from Bay of Biafra; central Atlantic from Ascension; western Atlantic from Puerto Rico and Yucatan to Fernando de Noronha; eastern Pacific from Clipperton (Chace, 1962, as *Alpheus clippertoni*); widely distributed in the Indo-West Pacific; littoral and sublittoral.

Neopalpheopsis euryone (De Man, 1910)

Alpheopsis? Euryone De Man, 1910:308.

Alpheopsis hummelincki Schmitt, 1936:364, pl. 11: fig. 1.

Neopalpheopsis euryone.—D.M. and A.H. Banner, 1985:36.

MATERIAL.—*Smithsonian 1976 Collection*: Sta 5A-76, Shelly Beach: 2 ovig. females [6.3–7.3].—Sta 8-76, McArthur Point: 1 male [5.8].

Grice Marine Biological Laboratory Collection: Sta 80-54, off North Point, 20–25 m: 1 female [6.5].

SIZE.—Carapace length of male, 5.8 mm; of females, 6.3–7.3 mm; of ovigerous females 6.3–7.3 mm.

HABITAT.—The three specimens from the Smithsonian 1976 collection were obtained by poisoning tide pools, the one collected by the GMBL expedition was taken with rotenone in

a depth of 20–25 meters.

REMARKS.—All four of the Ascension specimens have lost the two anterior pairs of chelipeds, but there is little doubt that they belong to the presumably monotypic genus *Neopalpheopsis*.

It is quite possible, as suggested by the Banners (1985), that *Parabetaeus culliereti* Coutière, 1896, is a valid earlier name, based on a deformed specimen of this species. The telson of Coutière's specimen from Tahiti, illustrated in his 1899 monograph (fig. 390), appears to be narrower than usually found in *Neopalpheopsis*, but the Banners (1985:37) noted considerable variability in this character.

DISTRIBUTION.—Pantropical; Indo-West Pacific from the Philippines, Indonesia, and Hawaii; eastern Pacific from the Galapagos Islands and the Gulf of California; previously recorded from the Atlantic only from Bonaire and Bermuda (we have also seen a specimen collected by Wolfgang Sterrer at Bermuda), and now Ascension. This shrimp seems to be especially rare on continental shores, the only mainland locality apparently being Bahía Concepcion, Baja California (Wicksten, 1983:40).

Salmoneus setosus, new species

FIGURE 9

MATERIAL.—*Manning 1971 Collection*: Sta ASC-12, South West Bay: 3 specimens [1.6–2.0] (1 is holotype, USNM 221892).—Sta ASC-15, English Bay: 1 specimen [1.2].—Sta ASC-21, English Bay: 1 specimen [1.6].

DESCRIPTION.—Body sparsely and rather irregularly covered with stout setae or slender spinules. Rostrum overreaching 2nd segment of antennular peduncle, narrowly triangular with nearly straight lateral margins in dorsal view (Figure 9b), and with faint median dorsal carina extending from apex to near base of rostrum. Supra-ocular teeth prominent, fully $\frac{1}{3}$ as long as rostrum, trending mesiad near tips and separated from rostrum by broadly rounded sinus. Branchiostegal margin of carapace (Figure 9a) rounded, slightly produced anteriorly forming broad sinus in anterior margin at base of antenna. Faint lateral suture extending posteriad horizontally for about $\frac{1}{3}$ of length of carapace from anterior margin near dorsal limit of basal antennal segment.

Abdomen with pleura of 5 anterior somites rounded, but those of 4th and 5th (Figure 9c) with minute denticle forming posteroventral angle. Telson (Figure 9d), not including terminal spines, about $\frac{1}{3}$ again as long as 6th somite, more than $\frac{1}{2}$ as wide as long, armed in posterior $\frac{1}{2}$ with 2 pairs of dorsolateral spines and 2 pairs of terminal spines flanking shallow sinus in posterior margin beset with 3 pairs of plumose setae overreaching longer, mesial pair of terminal spines (Figure 9e).

Eye concealed from both dorsal and lateral view.

Antennular peduncle (Figure 9f) short and broad, stylocerite

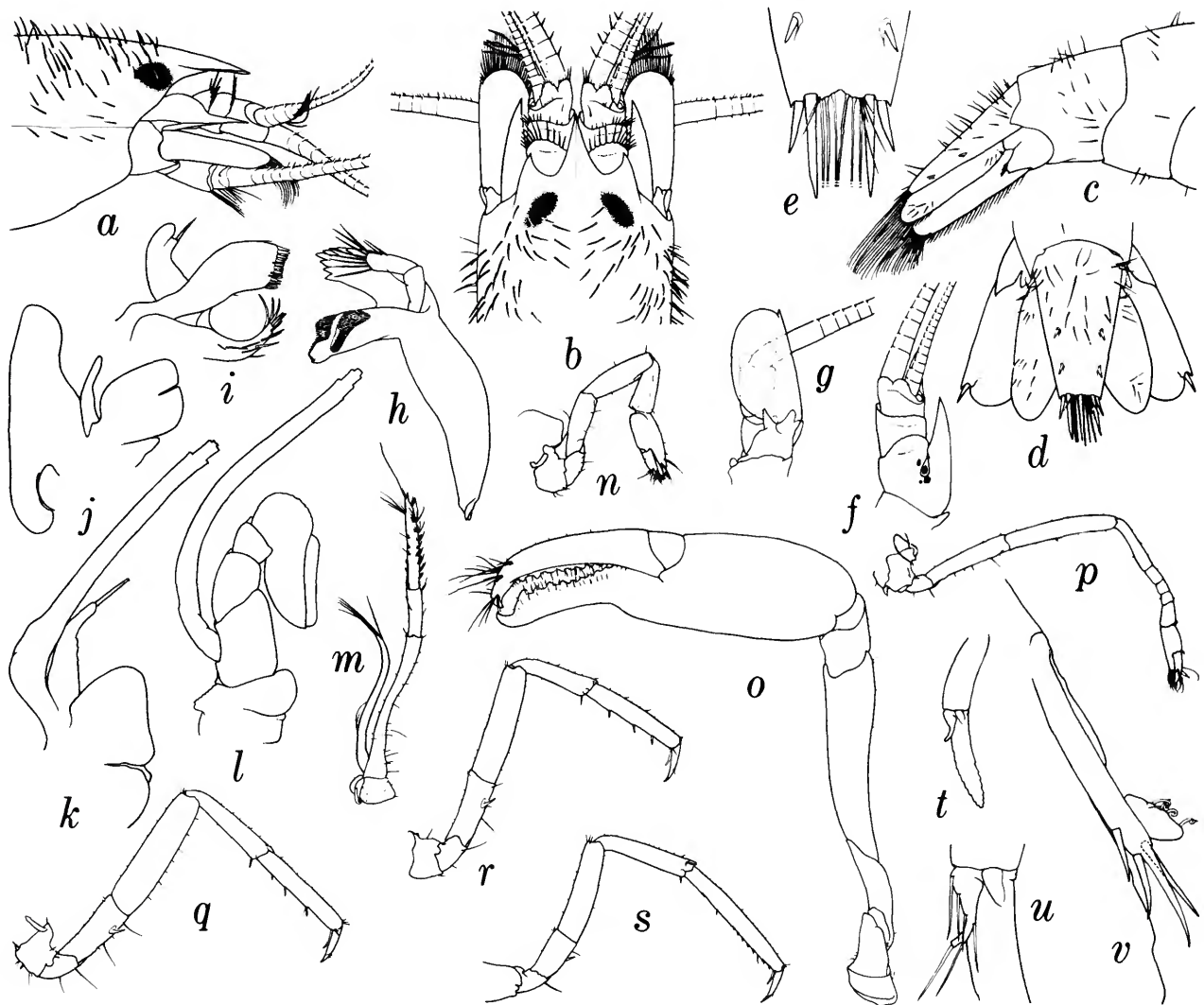


FIGURE 9.—*Salmones setosus*, new species, male holotype, carapace length 2.0 mm: a, carapace and anterior appendages, right aspect; b, same, dorsal aspect; c, posterior abdomen, right aspect; d, telson and uropods, dorsal aspect; e, telson, posterior margin; f, right antennule, dorsal aspect; g, right antenna, dorsal aspect; h, right mandible; i, right 1st maxilla; j, right 2nd maxilla; k, right 1st maxilliped; l, right 2nd maxilliped; m, right 3rd maxilliped; n, right 1st pereopod; o, left 1st pereopod; p, right 2nd pereopod; q, right 3rd pereopod; r, right 4th pereopod; s, right 5th pereopod; t, right 1st pleopod; u, same, endopod; v, right appendices masculina and interna.

reaching beyond midlength of 3rd segment; dorsolateral flagellum with branches fused for 2 articles, accessory branch composed of 3 articles.

Antennal scale (Figure 9g) more than $1\frac{3}{4}$ times as long as wide, expanded distal portion of blade slightly overreaching distolateral tooth. Antennal peduncle extending to distal $\frac{1}{3}$ of scale.

Mouthparts as figured (Figure 9h-m). Incisor process of

right mandible armed with 8 teeth. Exopods of 1st and 2nd maxillipeds with margins subparallel nearly to distal ends. Third maxilliped overreaching antennal scale by about $\frac{1}{2}$ length of distal segment.

All but 5th pereopods with epipods. Major 1st pereopod (Figure 9o) overreaching antennal scale by lengths of chela, carpus, and extreme distal end of merus; chela subcylindrical with semblance of groove in proximal part of flexor surface of

palm and distinct constriction near base of nonopposable margin of fixed finger; fingers armed on proximal $\frac{4}{5}$ of opposable margins with 9 or 10 rounded teeth, distal 4th, or slightly less, unarmed. Minor 1st pereopod (Figure 9n) slightly overreaching antennal peduncle but falling well short of distal margin of scale; chela fully $1\frac{1}{3}$ times as long as carpus, slightly shorter than merus, and subequal to ischium. Second pereopod (Figure 9p) overreaching antennal scale by lengths of chela and four distal articles of carpus, with chela about $\frac{1}{2}$ as long as carpus, proximal article of carpus distinctly shorter than 4 distal articles, merus slightly shorter than carpus and nearly $\frac{1}{4}$ again as long as ischium. Third pereopod (Figure 9q) overreaching antennal scale by length of dactyl and nearly $\frac{1}{2}$ of propodus, dactyl fully $\frac{2}{5}$ as long as propodus, carpus subequal to propodus, merus more than $1\frac{1}{4}$ times as long as carpus and $1\frac{3}{5}$ times as long as ischium; ischium with movable spine. Fourth pereopod (Figure 9r) slightly overreaching antennal scale, dactyl less than $\frac{1}{2}$ as long as propodus, carpus about $\frac{4}{5}$ as long as propodus, merus about $1\frac{1}{3}$ times as long as carpus and nearer $1\frac{1}{2}$ times as long as ischium; ischium with movable spine. Fifth pereopod (Figure 9s) reaching nearly as far as 4th, dactyl less than $\frac{1}{3}$ as long as propodus, carpus and merus subequal, about $\frac{3}{4}$ as long as propodus and 2 times as long as ischium; ischium with movable spine.

First pleopod (Figure 9t) with endopod (Figure 9u) curving mesiad and armed with 6 long spines. "Appendix masculina" (Figure 9v) subcylindrical, nearly as long as appendix interna, armed with 4 stout distal and subdistal spines.

Uropod (Figure 9d) with mesial branch slightly overreaching lateral branch, lateral branch with strong spine inserted mesial to distolateral tooth.

SIZE.—Carapace length of holotype, 2.0 mm; of paratypes, 1.2–1.6 mm.

HABITAT.—All five specimens were living in tide pools, probably among algae.

REMARKS.—Probably most species of *Salmoneus* have inconspicuous hairs on the body, but these setae are so coarse in *S. setosus* as to suggest spinules. The species also seems to differ in other characters from each of the 14 species of *Salmoneus* currently recognized in the genus. From *S. arubae* (Schmitt, 1936), still known only from the unique type specimen from the Dutch West Indies, *S. setosus* is distinguished by the more narrowly acute rostrum and much larger supra-ocular teeth; the shorter and stouter carpus of the minor first pereopod; the shorter proximal article of the carpus of the second pereopod; and the movable spines on the ischium of the third pereopod. From *S. babai* Miyake and Miya, 1966, from the Ryukyu Islands, it also differs in having the rostrum slightly narrower and the supra-ocular teeth somewhat larger; the mesial concavity in the posterior margin of the telson much less distinct; the movable finger of the major first pereopod not greatly overreaching the fixed finger and armed with more than four teeth on the opposable margin; the carpus of the minor first pereopod proportionately shorter; and the dactyl of the third

pereopod slightly longer and much more slender. From *S. breviostris* (Edmondson, 1930) from the Indo-West Pacific region, it is distinguished by the much shorter dorsal rostral carina; less prominent mesial notch in the posterior margin of the telson; and less slender carpus of the minor first pereopod. From *S. bruni* Banner and Banner, 1966, from the Gulf of Thailand, it differs in the larger supra-ocular teeth; the anterior pair of dorsolateral spines arising posterior to the midlength of the telson; the eyes completely concealed from dorsal view; a shorter and stouter antennular peduncle; the major first pereopod with the opposable margins of the fingers dentate for nearly their entire lengths, rather than unarmed in the distal half; the minor first pereopod more robust, the chela distinctly longer than the carpus; and the third pereopod with the dactyl less than half as long as the propodus and with a movable spine on the ischium. From *S. cavicola* Felder and Manning, 1986, from the Indian River lagoon, Florida, it disagrees in lacking a subdistal ventral tooth on the rostrum, much longer supra-ocular teeth, unexposed eyes, and more robust antennular peduncle and walking legs. From the Indo-Pacific *S. cristatus* (Coutière, 1897), *S. setosus* may be separated by the shorter dorsal carina of the rostrum, the absence of carinae extending posteriorly from the lateral margins of the rostrum, and the much more prominent supra-ocular teeth; the shorter carpus of the minor first pereopod; the shorter proximal article in the carpus of the second pereopod; and the proportionately shorter carpus of the third pereopod. It may be distinguished from *S. gracilipes* Miya, 1972, from southern Japan and the Ryukyus, by the much larger supra-ocular teeth, the absence of a distinct median sinus in the posterior margin of the telson, and the shorter carpus of the minor first cheliped. It differs from *S. hilarulus* (De Man, 1910), from Indonesia, in the broader and more prominent supra-ocular teeth; the less distinct posteromesial notch in the telson; the shorter and stouter antennular peduncle; and the longer dactyl of the third pereopod. From the West African *S. jarli* (Holthuis, 1951), it is distinguished by the more triangular rostrum, less distinct and shorter median rostral carina, and much more prominent supra-ocular teeth; by the shorter and stouter antennular peduncle; by the shorter proximal article of the carpus of the second pereopod; and by the much shorter dactyl of the third pereopod. It has larger supra-ocular teeth than does *S. mauiensis* (Edmondson, 1930) from Hawaii; the posteromesial emargination of the telson is less prominent; and the carpus of the minor first pereopod is shorter. It differs from *S. ortmanni* (Rankin, 1898) from the western Atlantic in the narrower rostrum and larger and more remote supra-ocular teeth; the less expanded palm of the major first pereopod; the proportionately shorter carpus of the minor first pereopod; and the dactyl of the third pereopod less, rather than more, than one-half as long as the propodus. From *S. rostratus* Barnard, 1962, from Madagascar, it is distinguished by the broader and ventrally unarmed rostrum and larger supra-ocular teeth; the complete concealment of the eyes from dorsal view; the much shorter and stouter antennular peduncle;

the presence of opposable teeth on the distal half of the fingers of the major first pereopod; the shorter first article of the carpus of the second pereopod; and the dactyl of the third pereopod less than one-half as long as the propodus. It differs from *S. serratidigitus* (Coutière, 1896) (see D.M. and A.H. Banner, 1981:58, figs. 7a-g, 8) from the Red Sea, in the larger supra-ocular teeth and the much shorter carpus of the minor first pereopod. Its distinctness from *S. tafaongae* Banner and Banner, 1966, from Samoa, is indicated by the complete concealment of the eyes from dorsal view; the much shorter and stouter antennular peduncle; the shorter carpus of the minor first pereopod; and the proportionately shorter dactyl of the third pereopod. It is easily differentiated from *S. tricristatus* Banner, 1959, from the Caroline Islands, by the absence of carinae extending onto the carapace from the rostrum and by the supra-ocular teeth; the shallow, rather than deep, posteromesial sinus on the telson; the shorter carpus of the minor first pereopod; the shorter proximal article of the carpus of the second pereopod; and the proportionately shorter dactyls of the third pereopod.

Christoffersen (1982:95) was apparently the first to notice the presence of an "appendix masculina" in both sexes of *Salmoneus ortmanni* (Rankin, 1898), after that unusual condition was embarrassingly overlooked in that species by Chace (1972:79), and Carvacho (1989) has raised the likelihood that the phenomenon may be diagnostic of the genus.

ETYMOLOGY.—The specific name was suggested by the rather prominent, if sparse, supplement of coarse integumentary setae (bristles).

Salmoneus teres, new species

FIGURE 10

MATERIAL.—*Manning 1971 Collection*: Sta ASC-23, South West Bay: 1 ovig. female [2.8] (holotype, USNM 221889).

DESCRIPTION.—Integument bare except for few scattered very fine setae visible only with optimum illumination. Rostrum reaching about to level of distal margin of 2nd segment of antennular peduncle, broadly triangular with sinuous margins in dorsal view (Figure 10b), without indication of median dorsal carina. Supra-ocular teeth small, little more than $\frac{1}{6}$ as long as rostrum, directed anteriorly and narrowly separated from base of rostrum. Branchiostegal margin of carapace rounded (Figure 10a), not produced to form sinus in anterior margin. Very faint lateral suture extending posteriorly and slightly dorsad for nearly $\frac{1}{2}$ of length of carapace from anterior margin near center of basal antennal segment.

Abdomen with pleura of 3 anterior somites rounded, 4th with nearly rectangular posteroventral angle, 5th produced posteroventrally into minute tooth (Figure 10c). Telson (Figure 10d), not including terminal spines, nearly $\frac{1}{2}$ again as long as 6th somite, slightly less than $\frac{1}{2}$ as wide as long, armed with 2 pairs of dorsolateral spines, 1 at midlength and 1 at $\frac{3}{4}$

length from base, and with 2 pairs of terminal spines flanking, together with 2 pairs of mesial setae, very small and inconspicuous posteromesial notch (Figure 10e).

Eyes concealed from both dorsal and lateral view.

Antennular peduncle (Figure 10f) robust, stylocerite reaching level of tip of rostrum; dorsolateral flagellum with branches fused for about 3 articles, accessory branch apparently composed of 4 articles.

Antennal scale (Figure 10g) not quite twice as long as wide, distal portion of blade far overreaching distolateral tooth. Antennal peduncle reaching little beyond midlength of scale.

Mouthparts as figured (Figure 10h-m). Incisor process of mandible armed with 8 teeth. Exopods of maxillipeds with margins tapering slightly to distal ends. Third maxilliped only slightly overreaching antennal scale.

All but 5th pereopods with epipods. Major 1st pereopod (Figure 10n) overreaching antennal scale by lengths of chela and carpus; chela subcylindrical, without distinct grooves but with constriction near base of nonopposable margin of fixed finger; fingers (Figure 10o) armed on proximal $\frac{5}{6}$ of opposable margins with 12 or 13 rounded teeth. Minor 1st pereopod missing. Second pereopod (Figure 10p) overreaching antennal scale by lengths of chela and slightly more than 4 distal articles of carpus, with chela about $\frac{1}{3}$ as long as carpus, proximal article of carpus slightly longer than 4 distal articles, merus and ischium subequal, about $\frac{3}{4}$ as long as carpus; ischium with movable spine. Third pereopod (Figure 10q) overreaching antennal scale by length of dactyl and about $\frac{2}{3}$ of propodus, dactyl slightly less than $\frac{1}{2}$ as long as propodus, carpus slightly longer than propodus, merus $1\frac{1}{4}$ times as long as carpus and $1\frac{2}{3}$ times as long as ischium; ischium apparently without movable spine. Fourth pereopod (Figure 10r) overreaching antennal scale by about length of dactyl, dactyl less than $\frac{1}{2}$ as long as propodus, carpus slightly more than $\frac{4}{5}$ as long as propodus, merus $1\frac{2}{5}$ times as long as carpus and more than $1\frac{1}{2}$ times as long as ischium; ischium without movable spine. Fifth pereopod (Figure 10s) reaching about as far as 4th, dactyl about $\frac{1}{3}$ as long as propodus, carpus and merus subequal, more than $\frac{3}{4}$ as long as propodus and more than twice as long as ischium; ischium without movable spine.

Eggs nearly ready to hatch, about 25 in number, measuring nearly 0.6 mm in major diameter.

SIZE.—Unique holotype with carapace length to base of rostrum of 2.8 mm.

HABITAT.—Tidepool.

REMARKS.—This species differs noticeably from *S. setosus* in the virtual obliteration of tegumental setae on the body; the broader and sinuously outlined rostrum without trace of a median dorsal carina and smaller supra-ocular teeth; the more angulate pleura of the fourth and fifth abdominal somites; the somewhat narrower telson with only two, rather than three, pairs of plumose setae between the spines of the posterior margin; the proportionately longer proximal article of the carpus of the second pereopod and the greater length of the

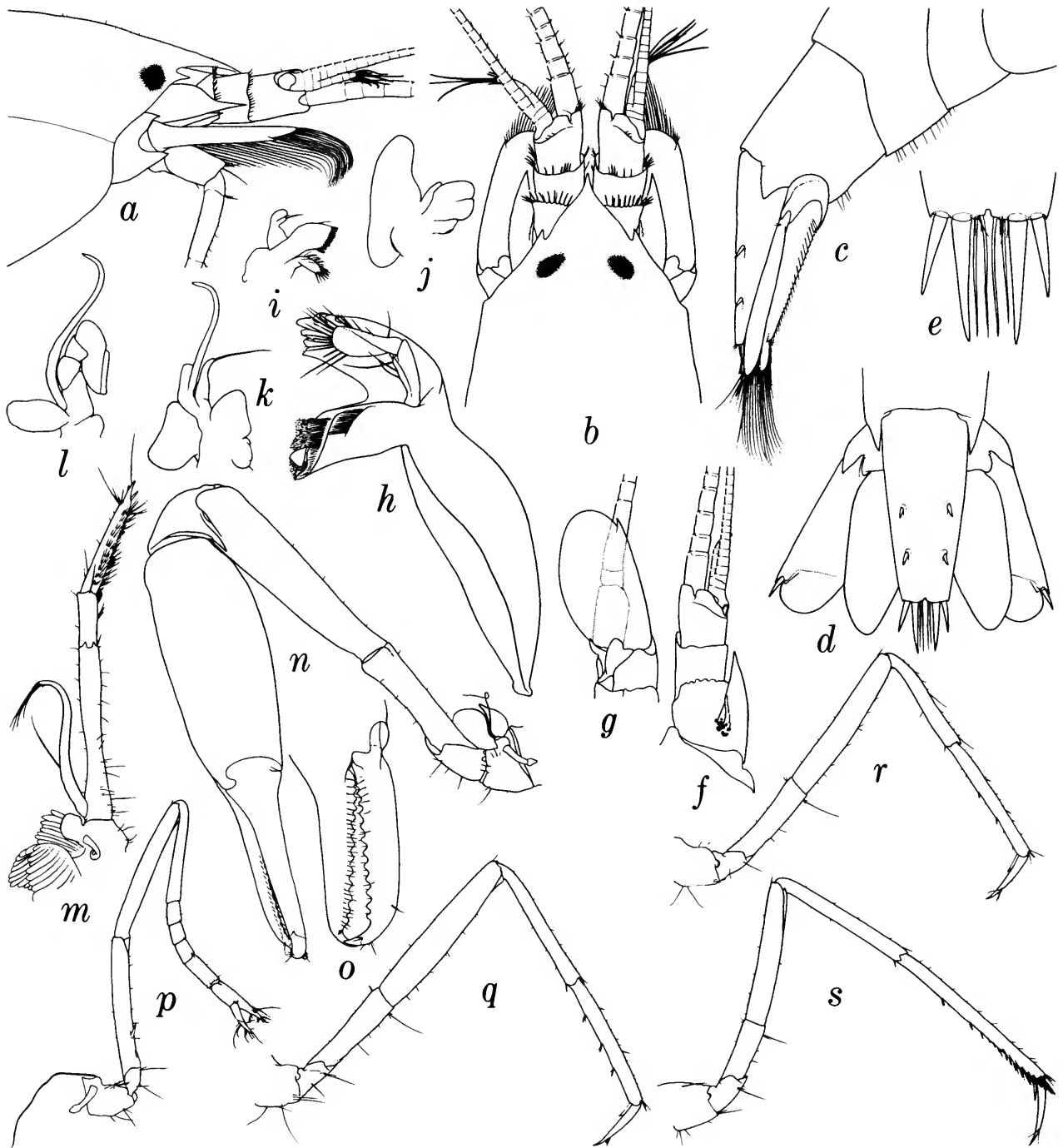


FIGURE 10.—*Salmones teres*, new species, ovigerous female holotype, carapace length 2.8 mm: *a*, carapace and anterior appendages, right aspect; *b*, same, dorsal aspect; *c*, posterior abdomen, right aspect; *d*, telson and uropods, dorsal aspect; *e*, telson, posterior margin; *f*, right antennule, dorsal aspect; *g*, right antenna, dorsal aspect; *h*, right mandible; *i*, right 1st maxilla; *j*, right 2nd maxilla; *k*, right 1st maxilliped; *l*, right 2nd maxilliped; *m*, right 3rd maxilliped; *n*, left 1st pereopod; *o*, same, fingers; *p*, right 2nd pereopod; *q*, right 3rd pereopod; *r*, right 4th pereopod; *s*, right 5th pereopod.

entire carpus; and the more slender posterior pereopods without ischial spines.

Salmoneus teres differs from *S. arubae* (Schmitt, 1936), from the West Indies, in having the rostrum more acuminate anteriorly in dorsal view; the pleuron of the fourth abdominal somite subrectangular rather than rounded; the telson with a small posteromesial notch; the blade of the antennal scale far overreaching the distolateral tooth; and the three posterior pereopods more slender, especially the dactyls. It is distinguished from the Japanese *S. babai* Miyake and Miya, 1966, in having the rostrum not "cutlass shape" in lateral view; the telson with an inconspicuous posteromesial notch rather than a broad sinus; the blade of the antennal scale more produced; the movable finger of the major first pereopod not far overreaching the fixed finger and armed with three times as many teeth on the opposable margin; and the three posterior pereopods much more slender and without ischial spines. From the Indo-West Pacific *S. brevisrostris* (Edmondson, 1930), it is separated by the absence of a median dorsal carina on the rostrum and the posteromesial notch involving much less than one-third of the posterior margin of the telson. From *S. bruni* Banner and Banner, 1966, from the Gulf of Thailand, it differs in having the rostrum not arched in lateral view; the telson with a small posteromesial notch; the eyes completely concealed from dorsal view; the antennular segments much more robust; the blade of the antennal scale more produced distally; and the fingers of the major first pereopod dentate over most of their lengths, rather than only in the proximal half of the opposable margins. From *S. cavicola* Felder and Manning, 1986, from the Indian River lagoon, Florida, it differs in lacking a subdistal ventral tooth on the rostrum, in having a slight sinus in the posterior margin of the telson, a much more robust antennular peduncle, the blade of the antennal scale far overreaching the distolateral tooth, and the proximal carpal article of the second pereopod fully as long as, rather than shorter than, the three distal articles. From the Indo-West Pacific *S. cristatus* (Coutière, 1897), it disagrees in the absence of median and lateral carinae on the anterior part of the carapace and in the more strongly produced blade of the antennal scale. It resembles the Japanese *S. gracilipes* Miya, 1972, but it may be separated from that species by the absence of a weak median dorsal carina on the rostrum, the eyes completely concealed from dorsal view, a more robust antennular peduncle, and the failure of the distolateral tooth of the antennal scale to attain the level of the distal margin of the blade. It may be differentiated from the Indonesian *S. hilarulus* (De Man, 1910) by the broader and noncarinate rostrum; the less distinct posteromesial notch in the telson; and the much longer dactyl and the absence of ischial spines on the third pereopod. From the West African *S. jarli* (Holthuis, 1951), it is also distinguished by the broader and noncarinate rostrum; the telson with a small posteromesial notch rather than an uninterrupted posterior margin; the more robust antennular segments; the more produced blade of the antennal scale; and the dentate, rather than unarmed, fingers of

the major first pereopod. It may be separated from the Hawaiian *S. mauiensis* (Edmondson, 1930) by the sinuous lateral margins and noncarinate dorsal surface of the rostrum and by the minute, rather than broadly rounded, sinus in the posterior margin of the telson. As mentioned above, *S. teres* is similar in many respects to *S. ortmanni* (Rankin, 1898) from the western Atlantic, but it lacks a median dorsal carina on the rostrum; the blade of the antennal scale is more strongly produced; and the chela of the major first pereopod is much less expanded along the flexor margin of the palm. It may be separated from *S. rostratus* Barnard, 1962, from Madagascar, by the much broader, noncarinate, and ventrally unarmed rostrum; the concealment of the eyes from dorsal view; the more strongly produced blade of the antennal scale; and the continuation of the dentition on the fingers of the major first pereopod well onto the distal half of the opposable margins. From *S. serratidigitus* (Coutière, 1896) from the Red Sea, it disagrees in the broader, noncarinate rostrum; the less broadly rounded posteromesial notch in the telson; and the absence of a deep excavation in the palm of the major first pereopod for the reception of the merus. It is distinguished from the Samoan *S. tafaongae* Banner and Banner, 1966, by the much broader rostrum; the concealment of the eyes from dorsal view; the more robust antennular segments; and the unarmed ischium of the third pereopod. From *S. tricristatus* Banner, 1959, from the Caroline Islands, it differs in the broader, sinuously margined, and noncarinate rostrum; the smaller supra-ocular teeth without supporting carinae; the less prominent posteromesial cleft in the telson; and the more produced blade of the antennal scale.

ETYMOLOGY.—The specific name "*teres*" has been adopted from the Latin to describe the nearly bare, smooth, noncarinate, subcylindrical carapace, in contrast with that of the preceding species.

Synalpheus fritzmülleri Coutière, 1909

Synalpheus fritzmülleri Coutière, 1909:35, fig. 18.

Synalpheus fritzmülleri.—Chace, 1966:629.—Holthuis, Edwards, and Lubbock, 1980:30.

MATERIAL.—*Manning 1971 Collection*: Sta ASC-21, English Bay: 4 specimens [1.6–3.0].—Sta ASC-22, McArthur Point: 1 ovig. female [4.2].

Smithsonian 1976 Collection: Sta 1C-76, McArthur Point: 2 specimens [3.3, 4.2].—ASC Sta 3C, English Bay: 1 specimen [2.2].—Sta 3D-76, English Bay: 3 specimens [3.1–3.8].—Sta 8-76, McArthur Point: 1 specimen [4.6].

SIZE.—Carapace lengths, 1.6–4.6 mm; of ovigerous female, 4.2 mm.

HABITAT.—The Ascension specimens were found in tide pools and also associated with rocks and coralline alga clumps in shallow water.

DISTRIBUTION.—Common in tropical and subtropical waters of the western Atlantic from North Carolina and Bermuda to Estado de Santa Catarina, Brazil; also recorded from St. Paul's

Rocks, St. Helena Island, and now Ascension Island; eastern Pacific from Baja California, Mexico; to a depth of 50 meters.

Family HIPPOLYTIDAE

Lyismata grabhami (Gordon, 1935)

Hippolysmata grabhami Gordon, 1935:319, figs. 10, 11.

Lyismata grabhami.—Harrison, 1977:60 [color photo].—Criales, 1979:573, figs. 3, 4.

Lyismata amboinensis.—Holthuis, Edwards, and Lubbock, 1980:31 [not *L. amboinensis* (De Man, 1888)].

MATERIAL.—*Grice Marine Biological Laboratory Collection*: Sta 80-45, English Bay, 20 m: 1 ovig. female (GMBL).

Other Collections: Jourdan (1977), Ascension Island: 1 female [9.9].—McDowell (through L.G. Abele), Ascension Island: 1 male [8.5], 1 ovig. female [13.3], 1 specimen [10.9].

SIZE.—Postorbital carapace length of male, 8.5 mm; of females, 9.9–13.3 mm; of ovigerous female, 13.3 mm.

REMARKS.—Although Atlantic and Indo-West Pacific populations of this fish-cleaning shrimp—coveted by marine aquarists—seem to be morphologically indistinguishable (Hayashi, 1975), they are readily differentiated by color pattern, as called to our attention several years ago by A.J. Provenzano, Jr. In the Atlantic species, *L. grabhami*, the middorsal white stripe varies little in width from the rostrum to the end of the telson, and the basal segment and lateral branch of the uropod are outlined laterally by a continuous white line (Harrison, 1977). In the Indo-Pacific species, *L. amboinensis* (De Man, 1888), on the other hand, the median stripe is abruptly expanded into a broad white band near the posterior limit of the sixth abdominal somite and interrupted on the anterior third of the telson, while the lateral branch of the uropod is marked with two prominent lateral white spots situated proximally and distally (Benchley, 1986:454, lower color photo). We have not seen Ascension specimens in which the color pattern is still apparent, but Gordon's illustration of the holotype of *L. grabhami* from Madeira (1935:320, fig. 10) depicts the pattern that is known in the western Atlantic and suggests that it may be characteristic of the entire Atlantic population.

DISTRIBUTION.—Previously known from Madeira and the western Atlantic from Bermuda and the northeastern Gulf of Mexico to northern South America, including St. Paul's Rocks; now from Ascension; to a depth of 55 meters.

Lyismata intermedia (Kingsley, 1878)

Hippolysmata intermedia Kingsley, 1878:90.

Lyismata intermedia.—Wicksten, 1983:28.

MATERIAL.—*Grice Marine Biological Laboratory Collection*: Sta 80-20, English Bay, 5–7 m: 1 male (GMBL).—Sta 80-28, Porpoise Point, 11–12 m: 1 male (GMBL).

SIZE.—Not measured.

HABITAT.—Depth 5–12 meters.

REMARKS.—The best illustrations purported to be of this species are those published by Sivertsen (1933:5, pl. 2: figs. 9–15) from the single ovigerous female reported by that author from the Galapagos Islands. In that specimen, the pterygostomian projection was apparently blunt rather than acutely dentate as is typical of *L. intermedia*.

We have re-examined the specimen recorded by Rathbun (1901:116) from Faial, Azores, and can report that it seems to be correctly identified; it is a large female with a postorbital carapace length of 8.7 mm.

DISTRIBUTION.—Azores; central Atlantic from Ascension; western Atlantic from Bermuda and South Carolina to Rio Grande do Norte, Brazil; eastern Pacific from Gulf of California to Peru; sublittoral to 22 meters.

Lyismata moorei (Rathbun, 1901)

Hippolysmata moorei Rathbun, 1901:115, fig. 23.

Lyismata moorei.—Chace, 1972:128.

MATERIAL.—*Manning 1971 Collection*: Sta ASC-9, McArthur Point: 33 males [2.6–5.8], 15 females [1.8–7.8], 12 ovig. [5.8–7.8].—Sta ASC-16, Shelly Beach: 2 males [4.3–5.1].—Sta ASC-18, Shelly Beach: 11 males [2.2–6.0], 4 females [5.4–7.1], 3 ovig. [6.0–7.1].—Sta ASC-22, McArthur Point: 80 males [2.2–5.7], 20 females [2.2–7.4], 9 ovig. [5.8–7.4], 28 juveniles [2.0–2.1].—Sta ASC-23, McArthur Point: 1 male [3.5].

Smithsonian 1976 Collection: Sta 5D-76, Shelly Beach, coral pool: 1 female [2.2].—Sta 8-76, McArthur Point: 7 males [3.3–4.6].

Grice Marine Biological Laboratory Collection: Sta 80-28, Porpoise Point, 11–12 m: 2 males, 5 ovig. females (GMBL).

Other Collections: Olson (1970), McArthur Point, sandy bottom tide pool: 21 males [2.6–5.9], 14 females [5.3–8.1], 12 ovig. [5.3–8.1].—Jourdan (1977), Pan Am Beach: 1 ovig. female [5.2].—Castro (1978), McArthur Point: 1 male [3.8].

SIZE.—Postorbital carapace lengths of males, 2.2–6.0 mm; of females, 1.8–8.1 mm; of ovigerous females, 5.2–8.1 mm; of juveniles, 2.0–2.1 mm.

HABITAT.—Most of the 192 specimens collected at Ascension were found in tide pools. One female was taken in the coral pool behind Shelly Beach.

REMARKS.—The abundance of *L. moorei* in Ascension tide pools in 1970 and 1971 was surprising in view of the apparent scarcity of the species elsewhere. It seemed to be less prevalent in 1976. Can it be that sporadic abundance is characteristic of this species? The original type series from Playa de Ponce, Puerto Rico, contained 14 specimens, but only four additional specimens have come to our attention from the entire western Atlantic since that lot was collected in 1899.

Chace (1972:128) noted that this species was found on Ascension.

DISTRIBUTION.—Known elsewhere only from Bermuda, Puerto Rico, Isla de Providencia, and Estado da Paraiba, Brazil,

in the western Atlantic, and from Gabon, West Africa.

***Thor manningi* Chace, 1972**

Thor manningi Chace, 1972:137, figs. 59–61.

MATERIAL.—*Manning 1971 Collection*: Sta ASC-22, McArthur Point: 1 juvenile [0.9] (identification tentative).

Grice Marine Biological Laboratory Collection: Sta 80-50, North Point, 18 m: 1 ovig. female (GMBL).

Other Collections: Olson (1970), McArthur Point, sandy bottom tide pool: 1 ovig. female [1.6].

SIZE.—Carapace lengths of measured specimens, of ovigerous female, 1.6 mm; of juvenile, 0.9 mm.

HABITAT.—Tide pool and in 18 meters.

REMARKS.—An excellent analysis of a Puerto Rico population of this partially protandric shrimp was reported by Bauer (1986).

DISTRIBUTION.—Known previously from the western Atlantic from Bermuda and North Carolina to Alagoas, Brazil, and in the eastern Pacific from Islas Tres Marias, Mexico; now from Ascension; common in grass flats to a depth of 44 meters.

Family PROCESSIDAE

***Processa packeri*, new species**

FIGURE 11

MATERIAL.—*Manning 1971 Collection*: Sta ASC-12, South West Bay: 5 males [1.2–1.4], 1 female [1.2] (largest male is holotype, USNM 221891).—Sta ASC-22, South West Bay: 1 male [1.6], 2 females [1.9–2.2], 1 ovig. [2.2].—Sta ASC-23, South West Bay: 1 male [1.6], 3 females [1.6–2.5], 1 ovig. [2.5].—Sta ASC-25, Collyer Point: 1 female [1.1].

Operation Origin: Site 7, Portland Point, in *Lithothamnion* ball, 25 m: 1 ovig. female [1.8].

Other Collections: Olson (1970), McArthur Point, sandy bottom tide pool: 1 male [1.2].

DESCRIPTION.—Body comparatively short and stocky for genus. Rostrum slightly variable in length but very short, triangular, and little attenuated in dorsal view (Figure 11a), falling far short of midlength of eyestalks; minutely and unequally bidentate in lateral view (Figure 11c) with long seta inserted posterior to notch. Anterior margin of carapace (Figure 11b) armed with minute and inconspicuous antennal spine, otherwise convexly sloping into ventral margin.

Abdomen with pleura rounded, except for sharp tooth anteroventral to posterolateral angle of pleuron of 5th somite (Figure 11d). Sixth somite somewhat less than twice as long as 5th, with acute posterolateral tooth; lobe above articulation of uropod roughly semi-hexagonal, unarmed. Abdominal sternites unarmed in both male and female. Telson (Figure 11e), not including terminal spines, about $1\frac{4}{5}$ times as long as 6th somite, nearly 3 times as long as wide, armed with 2 pairs of dorsolateral spines, anterior pair arising well within anterior $\frac{1}{3}$ of telson, posterior pair midway between anterior pair and

posteromedian projection; posterior margin (Figure 11f) armed with 2 pairs of stout spines and pair of robust plumose setae or spines flanking median projection.

Eye (Figure 11a) very large, cornea nearly 4 times as wide as antennal scale; eyestalk conspicuously swollen toward midline of animal.

Antennular peduncle (Figure 11g) with basal segment more than twice as long as combined lengths of 2 distal segments. Stylocerite subtruncate distally, armed with tooth at distolateral angle.

Antennal scale (Figure 11h) not overreaching antennular peduncle, about 6 times as long as wide; distolateral spine not nearly reaching level of distal margin of blade. Antennal peduncle overreaching 2nd segment of antennular peduncle.

Mouthparts as figured (Figure 11i–m), except 1st maxilla, lost during dissection. Third maxilliped well developed, overreaching antennal scale by slightly more than lengths of 2 distal segments; distal segment distinctly longer than penultimate, lateral margin armed with 5 strong spines on median $\frac{1}{3}$ of length, row of minute denticles on distal $\frac{1}{3}$; penultimate segment nearly twice as long as distal; exopod well developed.

Right pereopod of 1st pair (Figure 11n) overreaching antennal scale by $\frac{3}{4}$ of length of chela; fingers about $\frac{4}{5}$ as long as palm. Left 1st pereopod (Figure 11o) with simple dactyl and overreaching antennal scale by about $\frac{2}{3}$ of propodus. Second pereopods unequal. Right member of pair (Figure 11p) longer, overreaching antennal scale by lengths of chela, carpus, and $\frac{3}{4}$ of merus; fingers distinctly shorter than palm; carpus about 7 times as long as chela, composed of about 23 articles (proximal articles indistinct); merus slightly more than $\frac{1}{2}$ as long as carpus, composed of about 10 indistinct articles; ischium longer than merus. Left 2nd pereopod (Figure 11q) overreaching antennal scale by lengths of chela, carpus, and $\frac{2}{5}$ of merus; fingers noticeably shorter than palm; carpus slightly more than 4 times as long as chela, composed of about 12 articles; merus about $\frac{3}{5}$ as long as carpus, composed of 6 articles; ischium nearly $1\frac{1}{5}$ times as long as merus. Third pereopod (Figure 11r) overreaching antennal scale by lengths of dactyl, propodus, and $\frac{3}{4}$ of carpus; dactyl simple, not noticeably slender; propodus $2\frac{4}{5}$ times as long as dactyl, unarmed; carpus nearly $1\frac{1}{4}$ times as long as propodus; merus slightly shorter than carpus, unarmed; ischium less than $\frac{2}{3}$ as long as merus, unarmed. Fourth pereopod (Figure 11s) overreaching antennal scale by lengths of dactyl, propodus, and nearly entire carpus; dactyl simple, moderately slender; propodus about 3 times as long as dactyl, unarmed; carpus $1\frac{1}{5}$ times as long as propodus; merus barely longer than propodus, unarmed; ischium slightly more than $\frac{3}{5}$ length of merus, unarmed. Fifth pereopod (Figure 11t) overreaching antennal scale by lengths of dactyl and propodus; dactyl simple, slender; propodus fully 3 times as long as dactyl, armed with 4 long slender spines on flexor margin; carpus about $\frac{3}{4}$ as long as propodus; merus nearly as long as propodus, unarmed; ischium $\frac{3}{5}$ as long as merus, unarmed.

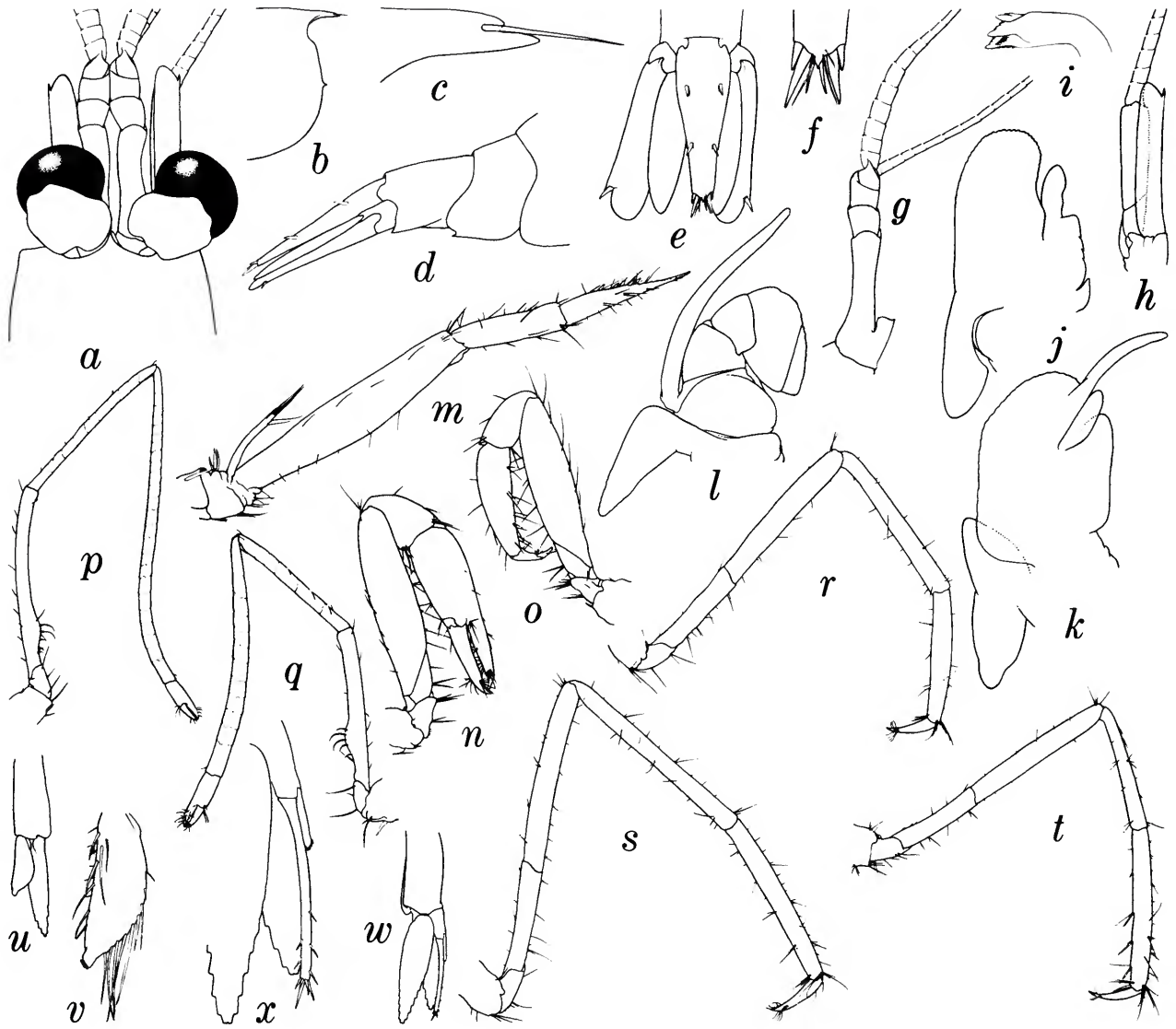


FIGURE 11.—*Processa packeri*, new species, male holotype, carapace length 1.4 mm: *a*, carapace and anterior appendages, dorsal aspect; *b*, anterior margin of carapace, right aspect; *c*, rostrum, right aspect; *d*, posterior abdomen, right aspect; *e*, telson and uropods, dorsal aspect; *f*, telson, posterior margin; *g*, right antennule, dorsal aspect; *h*, right antenna, dorsal aspect; *i*, right mandible; *j*, right 2nd maxilla; *k*, right 1st maxilliped; *l*, right 2nd maxilliped; *m*, right 3rd maxilliped; *n*, right 1st pereopod; *o*, left 1st pereopod; *p*, right 2nd pereopod; *q*, left 2nd pereopod; *r*, right 3rd pereopod; *s*, right 4th pereopod; *t*, right 5th pereopod; *u*, right 1st pleopod; *v*, same, endopod; *w*, right 2nd pleopod; *x*, same, appendices masculina and interna.

First pleopod of male (Figure 11*u*) with endopod (Figure 11*v*) tapering to narrow retinacular distal projection. Second pleopod of male (Figure 11*w*) with appendix masculina (Figure 11*x*) overreaching endopod, armed with 3 mesial, 2 lateral, and 5 distal spines. Uropods (Figure 11*e*) not greatly overreaching telson, lateral branch with rather prominent spine mesial to

acute distolateral angle.

Undeveloped eggs measuring 0.36–0.38 mm in major diameter.

SIZE.—Holotype, male, with postorbital carapace length of 1.4 mm. Paratypes, carapace lengths of males, 1.2–1.6 mm; of females, 1.1–2.5 mm; of ovigerous females, 1.8–2.5 mm.

HABITAT.—All but one of the 16 specimens were found in tide pools; the ovigerous female taken by Operation Origin was collected in a *Lithothamnion* ball in 25 meters.

REMARKS.—Of the 47 species and four subspecies of *Processa* currently recognized (nearly half of them described during the last score of years), only one—*P. hawaiiensis* (Dana, 1852(a)), which ranges from eastern Africa to Clipperton Island in the eastern Pacific—has the rostrum in the adult not overreaching the midlength of the eyestalks. *Processa packeri* is very similar to *P. hawaiiensis* but it can be distinguished by an obscurely notched, rather than simple, rostrum; the stylocerite of the antennular peduncle subtruncate and bearing a small distolateral tooth, rather than sloping posterolaterally and unarmed; and, perhaps most importantly, the exopod of the third maxilliped fully one-fourth as long as the antepenultimate segment, rather than vestigial.

ETYMOLOGY.—It is a pleasure to name this species for John E. Packer in recognition of his profound knowledge and appreciation of the flora and fauna of Ascension Island and of his "Ascension Handbook," which imparts to every visitor a little of the romance associated with this superficially barren and desolate bit of laval rock.

Family STENOPODIDAE

Microprosthema inornatum, new species

FIGURES 12, 13

MATERIAL.—*Grice Marine Biological Laboratory Collection*: Sta 80-50, off North Point, 18 m: 1 male [2.0] (holotype, USNM 221894).

DESCRIPTION.—Rostrum (Figure 12a,c) reaching about as far as distal margin of anteriorly extended eyes, not overreaching penultimate segment of antennular peduncle, armed dorsally with 7 irregularly spaced teeth on rostrum proper, anterior to posterior orbital margin, and ventrally with 1 small tooth slightly in advance of anteriormost dorsal tooth. Carapace (Figure 12a-c) unarmed except for antennal spine, 2 or 3 large spines on anterior margin nearer pterygostomian angle, 1 postorbital spine, 1 small spine on hepatic region, and 4 or 5 spines immediately posterior to cervical groove on each side of midline. Postrostral carina unarmed behind level of orbital margin but extending posteriorly as far as cervical groove.

Abdomen (Figure 12d) smooth, dorsally unarmed, and without distinct median carina. Tergum of 3rd somite projecting posteriorly as broadly obtuse median extension nearly as far as posterior margin of 4th somite. Pleuron of 1st somite sharply acute, without marginal spines; pleura of 2nd, 3rd, 4th, and 5th somites bluntly acute, that of 2nd with small tooth on anterior margin, those of 3rd and 4th with similar tooth on both anterior and posterior margins, that of 5th without marginal teeth; pleuron of 6th somite broadly rounded. Telson (Figure 12e) nearly twice as long as 6th somite, fully $1\frac{2}{3}$ times as long as wide, deeply sulcate mesially, armed with pair of strong lateral

teeth near midlength, 3 small teeth on convex posterior margin, and 4 subequally spaced dorsal teeth on each ridge flanking median sulcus.

Eye (Figures 12b, c) with cornea considerably narrower than eyestalk, apparently imploded in holotype, eyestalk armed with 2 posterodorsal spines overreaching juncture with cornea.

Antennular peduncle (Figure 12f,g) with basal segment bearing subquadrate flap projecting distomesiad from dorso-lateral part of distal margin and small spine near distomesial angle of ventral surface. Stylocerite hook-like, not reaching level of anterior margin of basal segment.

Antennal scale (Figure 12f,h) about $2\frac{1}{2}$ times as long as wide, lateral margin armed with 4 subequal teeth in distal $\frac{1}{2}$ in addition to distolateral spine.

Mouthparts as illustrated (Figure 12i-n).

First pereopod (Figure 13a,b) overreaching antennal scale by about length of fingers, unarmed but with setiferous organ on distal part of carpus and proximal part of propodus, fingers noticeably longer than palm, pectinate on opposable margins. Second pereopod (Figure 13c,d) overreaching antennal scale by length of chela and about $\frac{2}{3}$ of carpus, unarmed except for pectinate opposable margins of fingers, latter distinctly longer than palm. Third pereopods slightly unequal and dissimilar. Left member of pair (Figure 13e, f) overreaching antennal scale by lengths of chela, carpus, and about $\frac{1}{4}$ of merus; movable finger armed with 1 tooth on extensor margin; propodus with 8 teeth on extensor margin, including distal 1 at articulation with movable finger, and 7 on flexor margin; carpus with 6 teeth on extensor and 2 on flexor margin; merus with 3, each, on extensor and flexor margins; ischium with subdistal tooth on extensor margin. Right member of pair (Figure 13g,h) also overreaching antennal scale by lengths of chela, carpus, and about $\frac{1}{4}$ of merus, but chela sensibly larger than left one; movable finger armed with 8 teeth on extensor margin; propodus with 13 small teeth on extensor margin, including distal 1 at articulation with movable finger, and about 14 on flexor margin; carpus with 6 teeth on extensor and 4 on flexor margin; merus with 4 teeth on extensor and 7 on flexor margin; ischium with subdistal tooth on extensor margin. Detached (probably left 4th) pereopod (Figure 13i) with dactyl (Figure 13j) terminating in rather long terminal spines; propodus indistinctly subdivided into 3 parts and bearing 16 spinules on flexor margin; carpus even more obscurely divided into 6 parts and unarmed, like merus and ischium. Fifth pereopod (Figure 13k) similar to 4th but shorter, largely because propodus no more than $\frac{2}{3}$ as long as preceding pereopod and bearing only 10 spinules.

First and 2nd pleopods as illustrated (Figure 13l,m). Abdominal sterna armed with mesial spine on each somite.

Uropods (Figure 12e) with lateral branch armed with 5 or 6 small lateral teeth, including distal 1, mesial branch with 2 much larger lateral teeth, 1 at about midlength, 1 intermediate between 1st and proximal end of branch.

SIZE.—Unique male, holotype, with postorbital carapace

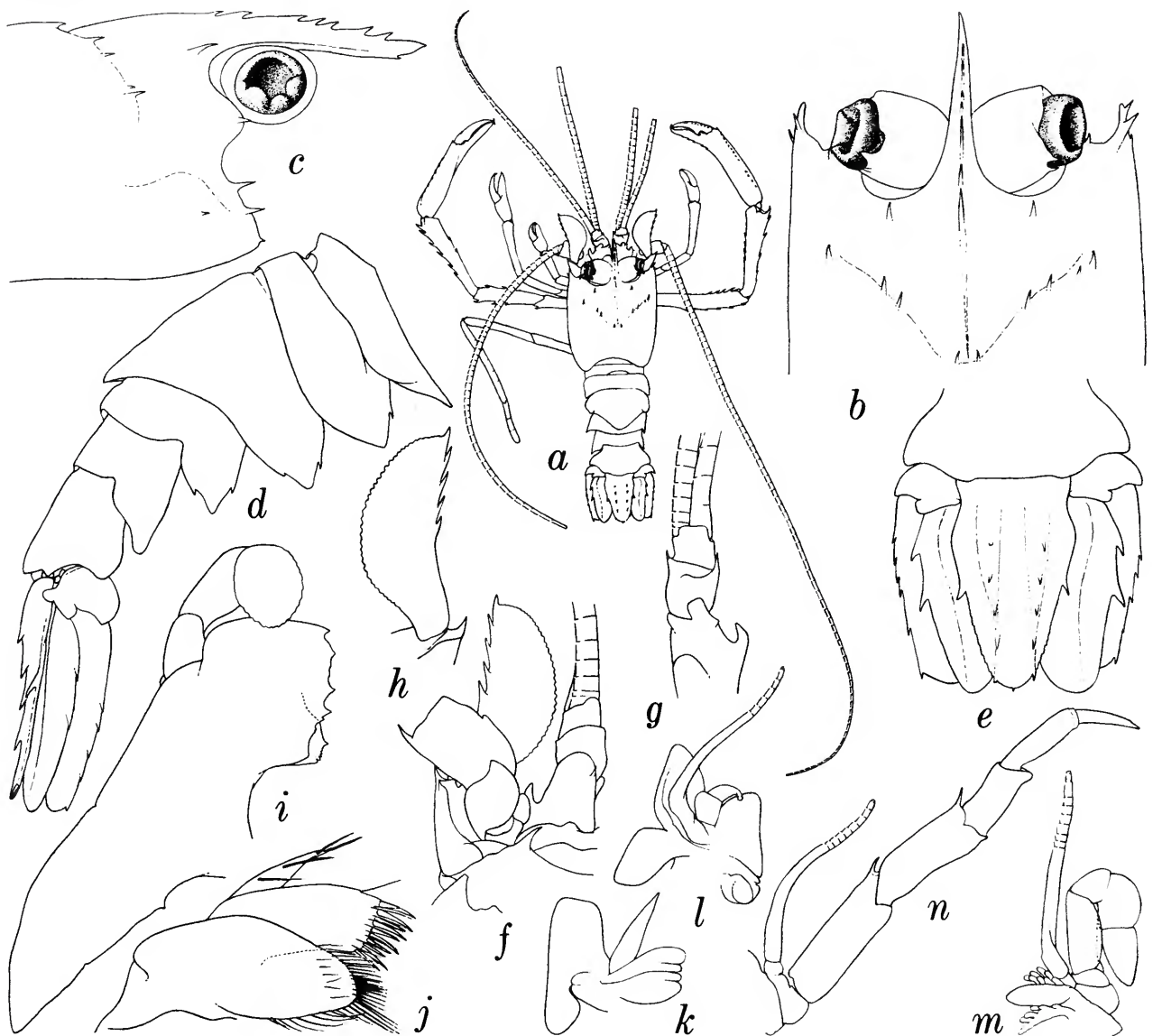


FIGURE 12.—*Microprosthema inornatum*, new species, male holotype, carapace length 2.0 mm: *a*, dorsal aspect; *b*, anterior carapace and eyes, dorsal aspect; *c*, same, right aspect; *d*, abdomen, right aspect; *e*, telson and uropods, dorsal aspect; *f*, right antennule and antenna, ventral aspect; *g*, right antennule, dorsal aspect; *h*, right antennular scale, dorsal aspect; *i*, right mandible; *j*, right 1st maxilla; *k*, right 2nd maxilla; *l*, right 1st maxilliped; *m*, right 2nd maxilliped; *n*, right 3rd maxilliped, posteroventral aspect.

length of 2.0 mm.

HABITAT.—The single specimen was taken at a poison station in 18 meters of water.

REMARKS.—This species clearly displays a scale (“Schuppe”), mentioned by Richters (1880:167) as a characteristic feature of *Stenopusculus*, on the basal segment of the

antennular peduncle. Viewed from a dorsomesial aspect, this scale considerably resembles those illustrated by Richters (1880, pl. 18: figs. 25, 27) in his *S. plumicornis* and *S. crassimanus*. Holthuis (1946:48, pl. 3: fig. h) was unable to detect such a scale in material that he identified as *Microprosthema validum* Stimpson, 1860, *M. semilaeve* (Von



FIGURE 13.—*Microprosthema inornatum*, new species, male holotype, carapace length 2.0 mm: *a*, left 1st pereopod; *b*, same, fingers; *c*, left 2nd pereopod; *d*, same, fingers; *e*, left 3rd pereopod; *f*, same, fingers; *g*, right 3rd pereopod; *h*, same, fingers; *i*, detached (left 4th ?) pereopod; *j*, same, dactyl; *k*, left 5th pereopod; *l*, right 1st pleopod; *m*, right 2nd pleopod.

Martens, 1872), and *M. scabricaudatum* (Richters, 1880), but specimens of the first two species available to us have a somewhat less obvious scale in this position, and Richters (1880, pl. 18: fig. 32) indicated that the scale in *S. scabricaudatus* is triangular rather than subquadrate. It is apparent, then, that Holthuis was justified in recognizing the synonymy of *Stenopusculus* and *Microprosthema* first sug-

gested by Balss (1915) and that any subsequently proposed dichotomy of the genus must be based on characters other than the antennular scale.

ETYMOLOGY.—The Ascension species is dubbed "*inornatus*" (= unadorned) because it seems to differ from those previously described by its comparatively smooth carapacial integument.

Odontozona anaphorae, new species

FIGURES 14, 15

MATERIAL.—Grice Marine Biological Laboratory Collection: Sta 80-57, off North Point, 10 m: 1 male [4.0] (holotype, USNM 221886).

DESCRIPTION.—Rostrum (Figures 14a-c) reaching about as

far as distal end of antennular peduncle, armed dorsally with 5 teeth, posteriormost situated posterior to hind margin of orbit, and ventrally with 3 small teeth, posteriormost opposite anteriormost dorsal tooth. Carapace not especially compressed, with prominent antennal and branchiostegal spines, smaller pterygostomian tooth, and scattered and often inconspicuous spines elsewhere, larger ones anterior to and immediately

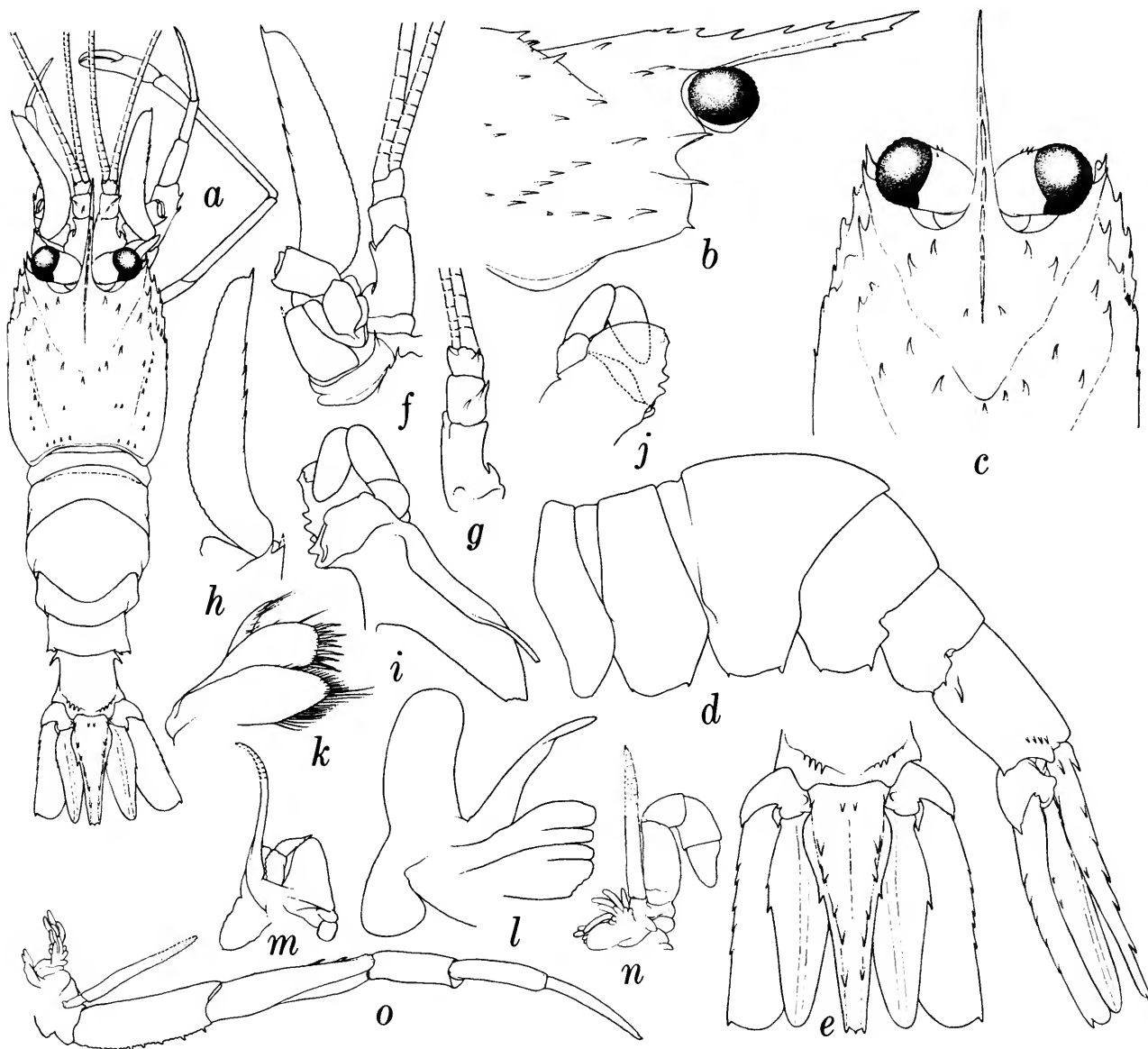


FIGURE 14.—*Odontozona anaphorae*, new species, male holotype, carapace length 4.0 mm: a, dorsal aspect; b, anterior carapace and eyes, right aspect; c, same, dorsal aspect; d, abdomen, left aspect; e, telson and uropods, dorsal aspect; f, right antennule and antenna, ventral aspect; g, right antennule, dorsal aspect; h, right antennal scale, dorsal aspect; i, right mandible; j, same, extensor aspect; k, right 1st maxilla; l, right 2nd maxilla; m, right 1st maxilliped; n, right 2nd maxilliped; o, right 3rd maxilliped.

posterior to cervical groove, none arranged in close-set transverse rows (Figure 14*b,c*). Postrostral carina extending posteriorly beyond midlength of gastric region but not as far as cervical groove.

Abdomen (Figure 14*a,d*) smooth, dorsally unarmed except on 6th somite, and without median carina. Tergum of 3rd somite forming broadly rounded cap over anterior part of 4th somite and causing distinct and permanent bend in abdomen. Pleuron of 1st somite narrowly rounded, with trace of marginal denticle; pleura of 2nd to 5th somites armed with tooth or denticle at either end of ventral margin; 6th somite with strong lateral spine near anterior end, oblique dorsolateral row of 4 or 5 spines near posterior margin, and with sharply acute posterolateral angle. Telson (Figure 14*e*) nearly twice as long as 6th somite, fully $2\frac{2}{3}$ times as long as wide, deeply sulcate mesially, armed with paired lateral teeth at extreme anterior end near midlength, rather strong tooth at each posterolateral angle and smaller mesial tooth on posterior margin, paired submedian teeth near anterior end, and 5 strong dorsal teeth on each ridge flanking mesial sulcus.

Eye (Figure 14*c*) with cornea slightly broader than eyestalk, latter armed with 3 or 4 minute spinules on anteromesial surface near cornea but without transverse series overreaching juncture with cornea.

Antennular peduncle (Figure 14*f,g*) with basal segment unarmed dorsally and ventrally; stylocerite short, hooked, narrowly separated from proximal part of basal segment; 2nd segment armed with oblique row of 3 distinct dorsolateral spines; 3rd segment with single dorsolateral spine at juncture with lateral flagellum; flagella subequal, more than 12 times as long as carapace.

Antennal scale (Figure 14*h*) about $\frac{49}{10}$ times as long as wide, lateral margin strongly concave, armed with 5 or 6 rather closely appressed teeth in addition to distolateral spine.

Mouthparts as illustrated (Figure 14*i-o*). Third maxilliped with 1 or 2 teeth on lateral surface of distal $\frac{1}{2}$ of merus, otherwise unarmed.

Anterior pair of pereopods missing. Second pereopod (Figures 14*a*, 15*a*) overreaching antennal scale by length of chela and about $\frac{2}{3}$ of carpus; fingers slightly shorter than palm, pectinate on opposable margins. Third pereopod (based on detached appendage, Figure 15*b,c*) slender, chela with palm unarmed, fingers slightly reflexed, about $\frac{3}{5}$ as long as palm, armed with triangular tooth at midlength of fixed finger closing laterad to and not reflected in movable finger, and rounded lobe at proximal end fitting deep, semicircular sinus in movable finger; carpus longer than chela, armed with 6 spines, each, on opposite surfaces; merus shorter than chela, armed with 5 spines, each, on opposite margins and 1 spine near base of distal $\frac{1}{3}$ between aforementioned rows; ischium $\frac{2}{3}$ as long as merus, armed with 1 subdistal spine. Fourth pereopod (based on detached pair, Figure 15*d,e*), with dactyl biunguiculate, tooth on flexor margin rather short and stout; propodus

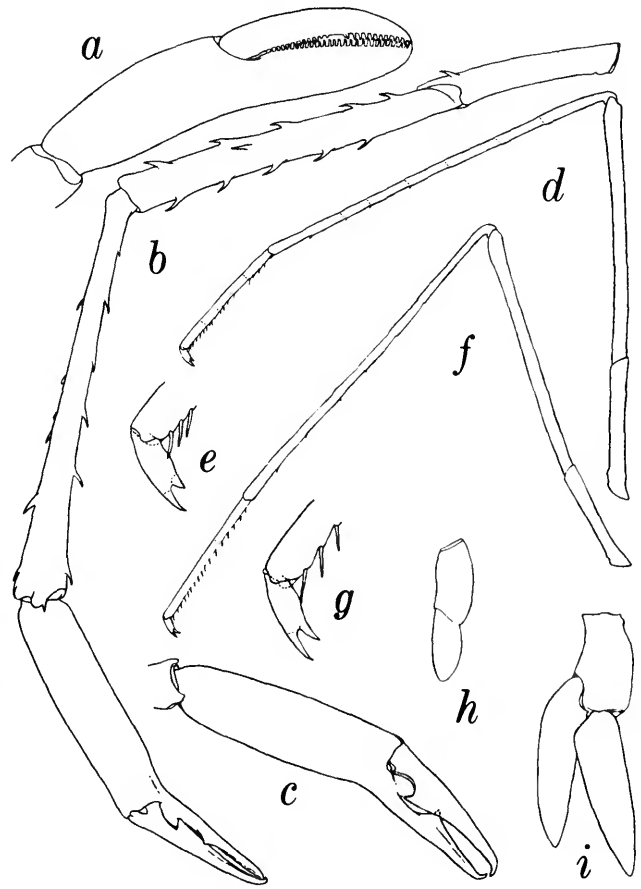


FIGURE 15.—*Odontozona anaphorae*, new species, male holotype, carapace length 4.0 mm: *a*, chela of right 2nd pereopod; *b*, detached (right 3rd ?) pereopod; *c*, same, chela; *d*, detached (4th ?) pereopod; *e*, same, dactyl; *f*, detached (5th ?) pereopod; *g*, same, dactyl; *h*, left 1st pleopod; *i*, left 2nd pleopod.

indistinctly subdivided into 5 parts and bearing about 22 spinules on flexor margin; carpus about $\frac{2}{5}$ times as long as propodus and obscurely subdivided into 7 parts; merus about $\frac{2}{3}$ as long as propodus; ischium more than $\frac{1}{2}$ as long as merus. Fifth pereopod (based on detached appendage, Figure 15*f,g*) similar to 4th but propodus longer and carpus, merus, and ischium slightly shorter.

First and 2nd pleopods as illustrated (Figures 15*h,i*). Fourth, 5th, and 6th abdominal somites with mesial ventral spine on sternum.

Uropods (Figure 14*e*) with lateral branch armed with 6 appressed lateral marginal teeth, including distal one, mesial branch with 1 or 2 lateral teeth and 2 submedian carinae, mesial one bearing 4 or 5 long, slender spines or stout setae on distal one half.

SIZE.—Unique male, holotype, with carapace length of 4.0 mm.

HABITAT.—The single specimen was taken at a poison station in 10 meters of water.

REMARKS.—*Odontozona anaphorae* apparently differs from the still inadequately described *O. edwardsi* (Bouvier, 1908), from off the northwest coast of Africa, in having the carpus of the fourth and fifth pereopods subdivided into seven rather than four parts and in its occurrence in only 10 meters as opposed to depths of 640 and 1150 meters. It is distinguished from *O. ensifera* (Dana, 1852(a)), the type species from Indonesia and the Fiji Islands, by the absence of a postcervical groove and of transverse rows of spines on the carapace, no transverse row of spinules on the eyestalk at the juncture with the cornea, the antennal scale more noticeably concave laterally, and by the absence of spines on the margins of the palm of the third pereopod. It superficially resembles *O. libertae* Gore, 1981, from the Florida Keys but it lacks transverse rows of spinules on the posterior half of the carapace and spinules on the eyestalk at the juncture with the cornea; it has the second antennular segment armed dorsolaterally but lacks ventral or ventrolateral spines on most of the segments of the third maxilliped, as well as a double row of spines on the palm of the third pereopod. It is distinguished from *O. rubra* Wicksten, 1982, by the absence of transverse spinulose cinctures on the carapace, of both transverse and longitudinal grooves on the abdominal somites, of strong spines on the eyestalks, and of spines on the chela of the third pereopod. From both *O. sculpticaudata* Holthuis, 1946, from Indonesia, and *O. spinosissima* Kensley, 1981(b), from South Africa, *O. anaphorae* may be separated by the far less spinulose carapace and by having the spines not aligned transversely, by the absence of elaborate series of grooves and ridges on the abdomen, and by the absence of spinules on the eyestalk at the juncture with the cornea. It disagrees with *O. spongicola* (Alcock and Anderson, 1899) from the Indian Ocean in having relatively few spines scattered over the carapace rather than concentrated in a transverse row behind the cervical groove and a second, shorter row on the frontal region, and in having the eyes pigmented and the eyestalk without a row of spinules at the juncture with the cornea. Finally, *O. anaphorae* seems to be related to the Cuban *O. striata* Goy, 1981, in the general arrangement of the spination on the carapace and on the sixth abdominal somite, the dorsolateral spines on the second antennular segment, and the unarmed palm of the third pereopod. It differs in the less prominent and less distinctly aligned spines on the posterior half of the carapace, the much less apparent spinules on the eyestalk, the more markedly concave and less strongly dentate lateral margin of the antennal scale, the less spinose third maxilliped, and the larger and differently arranged teeth on the opposable margins of the fingers of the third pereopod.

ETYMOLOGY.—The name is adapted from "anaphora," the Greek word for "ascension."

Stenopus hispidus (Olivier, 1811)

Palaemon hispidus Olivier, 1811:666.

Stenopus hispidus.—Holthuis, 1946:12, pl. 1.—Fausto Filho, 1974:6.

MATERIAL.—*Grice Marine Biological Laboratory Collection*: Sta 80-45, English Bay, 20 m: 2 males (GMBL).

Other Collections: McDowell (1986), English Bay, 50 ft (15 m): 1 male [11.9], 1 ovig. female [12.8].

SIZE.—Postorbital carapace length of only male measured, 11.9 mm; of ovigerous female, 12.8 mm.

HABITAT.—These specimens were found in depths of 15 and 20 meters.

DISTRIBUTION.—Pantropical; previously known in the tropical western Atlantic from Bermuda and south Florida to Fernando de Noronha; central Atlantic from Ascension Island; eastern Pacific from Taboga Island, Panama (Goy, 1987); and tropical Indo-West Pacific to Hawaii and Tuamotu Archipelago; to a depth of 210 meters.

Family ENOPLOMETOPIIDAE

Enoplometopus (Hoplometopus) antillensis Lütken, 1865

Enoplometopus antillensis Lütken, 1865:265.—Chace, 1966:634.—Debelius, 1986:13 [lower right color illustration].—Manning and Camp, 1989:412, figs. 1-4.

MATERIAL.—*Grice Marine Biological Laboratory Collection*: Sta 80-75, Hummock Point, 25 m: 1 male (GMBL).

Operation Origin: Site 29, South East Head, underneath boulder, 25 m: 1 juvenile [10.8].

Other Collections: Jourdan (1977), Ascension Island, cave in 12 m: 2 males [39.0-43.8].—McDowell (1981), off South West Point: 2 males [25.0-28.0], 1 ovig. female [25.7].—McDowell (1982), English Bay: 1 postlarva [6.8].—McDowell (1986), Ladies Loo: 1 male [35.2]; English Bay: 1 male [29.3].

SIZE.—Carapace lengths of males, 25.0-43.8 mm; of ovigerous female, 25.7 mm; of juvenile, 10.8 mm; of postlarva, 6.8 mm.

HABITAT.—The Ascension specimens were found in depths of 12 to 25 meters.

DISTRIBUTION.—Western Atlantic from Bermuda and south-eastern Florida to northeastern Brazil, eastern Atlantic from Madeira and the Gulf of Guinea; central Atlantic from St. Helena and Ascension; to a depth of 201 meters.

Family AXIIDAE

Axiopsis serratifrons (A. Milne Edwards, 1873)

FIGURES 16, 17

Axia serratifrons A. Milne Edwards, 1873:87 [11 of separate], pl. 2: fig. 6. *Axiopsis (Axiopsis) serratifrons*.—Kensley, 1981a:1253, figs. 1-5.

MATERIAL.—*Manning 1971 Collection*: Sta ASC-15, English Bay: 1 male [16.0].—Sta ASC-25, Collyer Point: 1

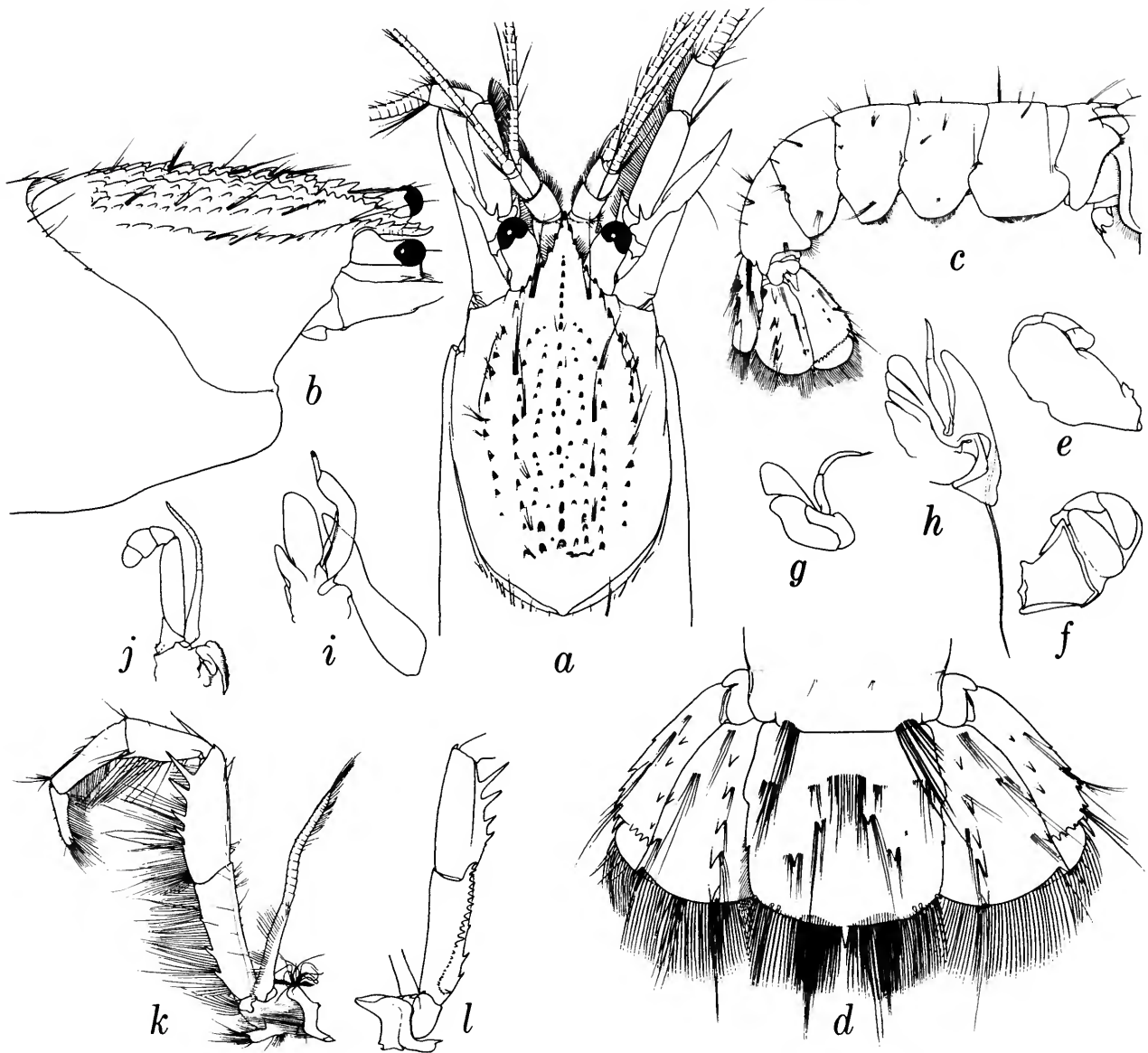


FIGURE 16.—*Axiopsis serratifrons*, male, carapace length 16.0 mm: *a*, anterior carapace and appendages, dorsal aspect; *b*, same, dorsolateral aspect; *c*, abdomen, right aspect; *d*, telson and uropods, dorsal aspect; *e*, left mandible, extensor aspect; *f*, same, flexor aspect; *g*, left 1st maxilla; *h*, left 2nd maxilla; *i*, left 1st maxilliped; *j*, left 2nd maxilliped; *k*, left 3rd maxilliped; *l*, same, reverse aspect of ischium and merus.

postlarva [2.2].

Grice Marine Biological Laboratory Collection: Sta 80-41, English Bay, 0-1 m: 2 males, 2 females (1 ovig.) (GMBL).

Operation Origin: Site 19, Powerhouse Cove, found under a stone, 8 m: 1 female [12.7].

SIZE.—Carapace lengths of measured specimens, of male, 16.0 mm; of female, 12.7 mm; of postlarva, 2.2 mm.

HABITAT.—The GMBL specimens were found in less than one meter, the Operation Origin female under a stone in eight meters, and the male from sta ASC-15 taken in English Bay was living in a burrow in rock, together with several other axiids, presumably of the same species, found in the same tide pool.

REMARKS.—The Ascension population was at first believed



FIGURE 17.—*Axiopsis serratifrons*, male, carapace length 16.0 mm: a, left 1st pereopod; b, right 1st pereopod; c, left 2nd pereopod; d, left 3rd pereopod; e, left 4th pereopod; f, left 5th pereopod; g, same, dactyl and grooming projection; h, left 2nd pleopod; i, same, appendices interna and masculina.

to represent a species distinct from *A. serratifrons*, based on the male collected in 1971. However, Brian Kensley, who has studied material from various parts of the world, informs us that the linearity of tubercles between the median and submedian dorsal rows on the carapace varies with locality, the pitting of the integument on the carapace tends to become more apparent with age, the marginal teeth on the abdominal pleura are occasionally, if rarely, absent, and the smooth, elongate, major

chela of the Ascension male may have resulted from regeneration. Dr. Kensley suspects that "this is a widespread species, with isolated populations, e.g., Ascension, showing more consistent differences due to the limited gene pool." Perhaps the accumulation of more extensive collections will eventually reveal the existence of valid subspecies, or even species, but currently available evidence is insufficient to support such a conclusion.

DISTRIBUTION.—Red Sea and western Indian Ocean to Indonesia and eastward to Hawaii; previously known from the Atlantic only from the western part: Bermuda, Florida, and Belize; now from the central Atlantic at Ascension Island.

Family CALLIANASSIDAE

Corallianassa hartmeyeri (Schmitt, 1935)

FIGURES 18, 19

Callianassa hartmeyeri Schmitt, 1935:3, 4.

Callichirus.—De Saint Laurent and Le Loeuff, 1979:56.

Callichirus sp. aff. *placidus*.—De Saint Laurent and Le Loeuff, 1979:97.

Corallianassa hartmeyeri.—Manning, 1988:884, figs. 1, 2.

MATERIAL.—Manning 1971 Collection: Sta ASC-22, McArthur Point: 1 female [6.7].

Smithsonian 1976 Collection: Sta 5A-76, Shelly Beach: 1 male [4.4], 3 females [3.8–5.6].—Sta 8-76, McArthur Point: 1 male [4.8].

Grice Marine Biological Laboratory Collection: Sta 80-41, English Bay, 0–1 m: 6 males, 4 females (GMBL).

Other Collections: Jourdan (1976), English Bay: 1 female [6.9].

SIZE.—Of measured specimens, carapace lengths of males, 4.4 and 4.8 mm; of females, 3.8–6.9 mm.

COLOR.—Carapace and abdomen largely white, with some scattered light orange markings; chelipeds mottled with darker orange and white.

HABITAT.—Most specimens were taken in less than one meter of water, usually burrowing in sand in shallow tide pools, but the specimen collected by Jourdan in English Bay was found under a stone in nine meters.

REMARKS.—Inasmuch as *C. hartmeyeri* has been known previously only from the unique holotype from Jamaica, it is impossible to determine whether the probably minor differences between the Ascension specimens and the type specimen (see Manning, 1988, fig. 2) are of more than varietal significance. The second abdominal somite seems longer than the sixth somite (Figure 18*b,c*), rather than subequal to the latter (Manning, 1988, fig. 2*g,h*), but the anterior margin of that somite is obscure in all of the Ascension specimens. Secondly, the distal extension of the eyestalk does not appear to overreach the cornea in the Ascension specimens (Figures 18*a*, 19*b*), whereas it distinctly does so in the Jamaican specimen (Manning, 1988, fig. 2*b*). Finally, the carpus of the major cheliped is from 0.51 to 0.57 as long as the palm in the Ascension series, compared with barely 0.50 in the type (Manning, 1988, fig. 2*c*). As no other differences could be detected between the Ascension specimens and the Jamaican holotype, it seems best to consider the two populations conspecific until additional western Atlantic material of *C. hartmeyeri* becomes available.

An additional cephalothorax of a female *Corallianassa*, with

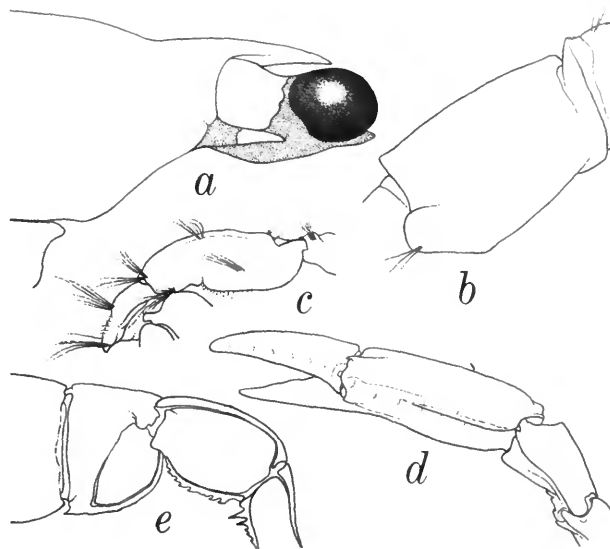


FIGURE 18.—*Corallianassa hartmeyeri*, female, carapace length 6.7 mm: *a*, anterior carapace and eyes, right aspect; *b*, 2nd abdominal somite, right aspect; *c*, 6th abdominal somite and telson, right aspect; *d*, right 1st (major) cheliped, chela and carpus (denuded), dorsal aspect; *e*, same, merus and carpus, flexor surface.

a carapace length of 14.7 mm, and two detached major chelipeds were collected at sta 3A-76 in English Bay by A.J. Provenzano, Jr., in 1976. These specimens differ from the remainder of the Ascension series in having the lateral frontal spines completely fused to the carapace without a membranous interspace, the distal extension of the eyestalk extending far beyond the cornea, and the carpus of the major cheliped longer (0.63 and 0.67 as long as the palm) and armed ventrally with a series of five strong teeth proximal to the distal tooth. It seems unlikely that these manifest differences could be attributable to age, but the absence of the abdomen forestalls a definitive conclusion about the specimens.

The senior author was able to compare the illustrations presented herewith in Figure 18 with another species of *Corallianassa*, the syntypes in the Paris Museum of *Callianassa (Callichirus) coutierei* Nobili, 1904, from the Gulf of Aden. That species resembles *C. hartmeyeri* in having the dorsal ridge on the palm of the major chela not extending to the distal end of that segment, but the palm is much wider in *C. coutierei*, the carpus displays a field of granules ventrodistally, and the merus and ischium of both the major and minor chelipeds are more strongly spinose ventrally.

De Saint Laurent and Le Loeuff (1979:56, 97) referred to the occurrence of this species on Ascension.

DISTRIBUTION.—Known previously only from the unique holotype from Jamaica, now from Ascension.

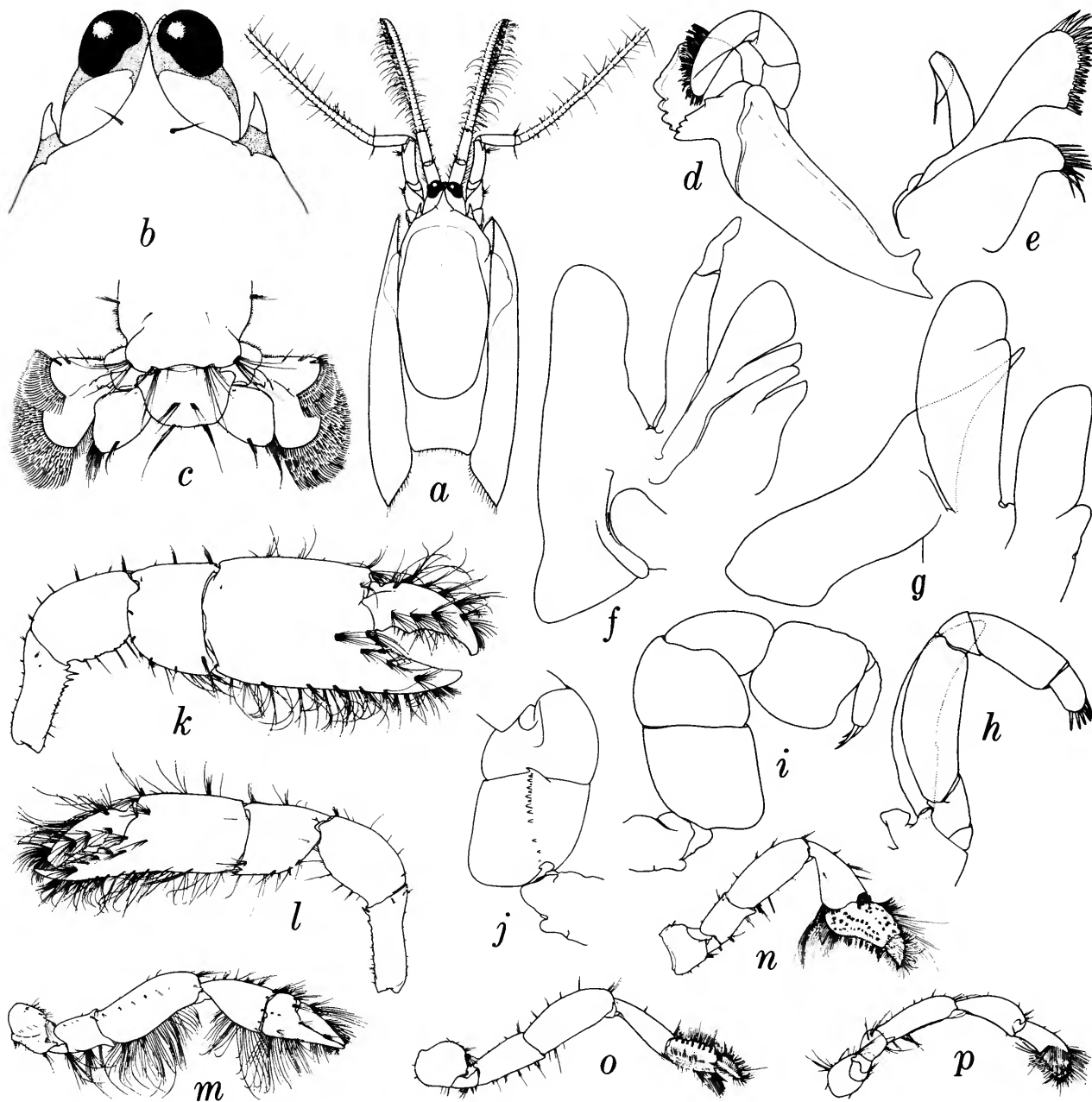


FIGURE 19.—*Corallianassa hartmeyeri*, female, carapace length 6.7 mm: a, carapace and anterior appendages, dorsal aspect; b, frontal region and eyes, dorsal aspect; c, telson and uropods, dorsal aspect; d, right mandible; e, right 1st maxilla; f, right 2nd maxilla; g, right 1st maxilliped; h, right 2nd maxilliped; i, right 3rd maxilliped; j, same, reverse aspect of ischium and merus; k, right 1st pereopod; l, left 1st pereopod; m, right 2nd pereopod; n, right 3rd pereopod; o, right 4th pereopod; p, right 5th pereopod.

Family PALINURIDAE

Panulirus echinatus Smith, 1869

Panulirus echinatus Smith, 1869b:20, 39.—Chace, 1966:629, figs. 3, 4, pls. 1, 2.—Fausto Filho, 1974:7.—Holthuis, Edwards, and Lubbock, 1980:32, fig. 2 [map].—Lubbock, 1980:285.—Vianna, 1986:25, figs. 1–4.—Williams, 1986:20, fig. 47.

Panulirus guttatus.—Lenz and Strunck, 1914:291, 339 [not *Panulirus guttatus* (Latreille, 1804)].

spiny lobsters.—Phinizy, 1969:27.—Marx, 1975:39.

MATERIAL.—*Smithsonian 1976 Collection*: Sta 3-76, English Bay: 1 dry specimen.—Sta 7-76, off Collyer Point: 1 male [85.5].—McArthur Point, found on shore, A.J. Provenzano, Jr., 13 Jul 1976: 1 dry puerulus stage [9.5].

Other Collections: Ascension Island, R.M. Hannay (Ascension Historical Society): 1 ovig. female [74.5] (BMNH).

SIZE.—Carapace length of male, 85.5 mm; of ovigerous female, 74.5 mm; of puerulus stage, 9.5 mm. These specimens are considerably smaller than the male, cl 190 mm (tl 390 mm), recorded by Holthuis, Edwards, and Lubbock (1980:37) from the Cape Verde Islands and of the female, tl 380 mm, recorded from Ascension by the same authors.

COLOR.—Carapace and abdomen reddish-brown, conspicuously marked with whitish spots, overall appearance speckled; walking legs longitudinally striped with reddish-brown and white; uropods very dark, almost black, outlined in white.

REMARKS.—This species was reported from Ascension by Lenz and Strunck (1914), Phinizy (1969), Marx (1975), Lubbock (1980), and Holthuis, Edwards, and Lubbock (1980).

DISTRIBUTION.—The easternmost Brazilian states of Ceará, Rio Grande do Norte, and Pernambuco; Brazilian islands Fernando de Noronha, Atol das Rocas, and Ilha da Trindade; western Atlantic islands of St. Paul's Rocks; central Atlantic from Ascension and St. Helena; and the Canaries and Cape Verdes in the eastern Atlantic; 0–35 meters. (If the specimen illustrated by Seba (1761:54, pl. 21: fig. 5) as *Squilla*, *Crangon*, *Americana*, *altera* and selected by Holthuis (1959a:126) as the lectotype of *Panulirus guttatus* really came from Suriname, which may be questionable, it represents the easternmost locality for that species, rather than the Barbados population assigned that significance by Holthuis, Edwards, and Lubbock (1980:35), thereby reducing the gap between the geographic ranges of that species and *P. echinatus*.)

Family SCYLLARIDAE

Scyllarides delfosi Holthuis, 1960

Scyllarides americanus.—Holthuis, 1959a:127, pl. 3: fig. 2 [not *S. americanus* Verrill, 1922].

Scyllarides delfosi Holthuis, 1960:153.

Scyllarides herklotsii.—Chace, 1966:630, fig. 5 [not *Scyllarus Herklotsii* Herklots, 1851].

MATERIAL.—*Other Collections*: McDowell (1985), English Bay: 1 young male [28.0].

SIZE.—The lone male specimen has a postorbital carapace length of 28.0 mm.

HABITAT.—The single specimen was found among rocks at a depth of 18 meters.

REMARKS.—The Ascension specimen has the carapace more deeply sculptured than does a female paratype of *S. delfosi* from off Guyana, with a postorbital carapace length of about 49 mm, with which it was compared. It has been identified with that species, however, because of the possibly diagnostic color pattern described by Holthuis (1959a:128) and visible in both the paratype and the Ascension specimen: a trapezoidal quadrangle of four red spots on the cardiac region and a mesial subcircular red spot, flanked by a pair of somewhat subtriangular spots on the first abdominal somite.

DISTRIBUTION.—Previously known from off Guyana, Suriname, Brazil, and St. Helena, and now from Ascension; to a depth of at least 75 meters.

Family DIOGENIDAE

Calcinus tubularis (Linnaeus, 1767)

Cancer tubularis Linnaeus, 1767:1050.—Holthuis, 1977a:59.

Pagurus ornatus Roux, 1830: unnumbered page [109], pl. 43.

Calcinus ornatus.—Forest, 1961:220.

Calcinus tubularis.—Holthuis, 1977a:59.

MATERIAL.—*Manning 1971 Collection*: Sta ASC-15, English Bay: 1 male [4.0], 1 ovig. female [4.9].

Operation Origin: Site 0, English Bay, 7 m: 1 male [2.5].—Site 1, Guano Jetty, 3 m: 1 female [2.4].—Site 6, White Rock, 10 m: 1 juvenile [1.0].

Other Collections: Jourdan (1976), English Bay, under rocks, 20 ft (6 m): 1 male [2.6].

SIZE.—Shield lengths of males, 2.5–4.0 mm; of females, 2.4–4.9 mm; of ovigerous female, 4.9 mm; of juvenile, 1.0 mm.

COLOR.—According to notes accompanying the specimen from Operation Origin Site 1, the color in life is: carapace pink; walking legs orange/apricot with orange tones, dark red at joints; chelae dark red at base with white spots; pincers white with orange spots; antennae white with dark red bands; antennules with base dark red, rest light purple with pink hairs.

In preservative, walking legs with propodi striped reddish and white, dactyli with red and white bands, red bands comprised of spots.

HABITAT.—In tide pool on rocky shore and subtidally, at 3–10 meters.

REMARKS.—Until 1977 this species was known as *Calcinus ornatus* (Roux).

The characteristic red stripes on the propodi of the walking legs are visible even in preserved specimens.

DISTRIBUTION.—Mediterranean, off West Africa, and now from Ascension Island; littoral and sublittoral.

Clibanarius rosewateri, new species

FIGURE 20

Clibanarius sp.—Markham, 1978:103.

MATERIAL.—*Manning 1971 Collection*: Sta ASC-5, North East Bay: 24 specimens [0.9–2.1], 6 ovig. females [1.2–1.6].—Sta ASC-8, English Bay: 1 specimen [0.8].—Sta ASC-12, McArthur Point: 71 specimens [0.5–1.1], 2 ovig. females [0.9].—Sta ASC-13, Georgetown: 3 specimens [0.5–0.6].—Sta ASC-14, south of Collyer Point: 1 specimen [0.8].—Sta ASC-15, English Bay: 128 specimens [0.5–1.4], 23 ovig. females [0.8–1.1].—Sta ASC-18, Shelly Beach: 2 specimens [0.9–2.0].—Sta ASC-21, English Bay: 102 specimens [0.4–1.7], 9 ovig. females [0.9–1.0].—Sta ASC-22, McArthur Point: 5 specimens [0.9–1.9].—Sta ASC-23, McArthur Point: 2 specimens [1.0–2.0], 1 ovig. female [1.0].—Sta ASC-25, south of Collyer Point: 38 specimens [0.6–1.3], 1 ovig. female [0.9].

Smithsonian 1976 Collection: Sta 1B-76, McArthur Point: 12 specimens [0.5–1.8], 3 ovig. females [0.9–1.0].—Sta 3A-76, English Bay: 8 specimens [0.5–1.4].—Sta 3B-76, English Bay: 9 specimens [all ~0.5].—Sta 3C-76, English Bay: 3 specimens [0.7–1.0].—Sta 5A-76, Shelly Beach: 21 specimens [0.5–2.2], 1 ovig. female [0.9].—Sta 5D-76, Shelly Beach, coral pool: 3 specimens [0.9–1.7], 1 ovig. female [1.8].—Sta 5E-76, Shelly Beach, coral pool: 2 specimens [0.5–0.7].—Sta 6B-76, south of Collyer Point: 20 specimens [0.5–2.2], 6 ovig. females [0.8–1.0].—Sta 9C-76, North East Bay: 1 male [2.4] (holotype, USNM 221895).

Operation Origin: Site 4, Klinka Bay, rock pool: 1 specimen [1.4].—Site 19, Powerhouse Cave, shore: 1 specimen [2.0].

DESCRIPTION.—Size very small, maximum sl 2.4 mm in adults.

Chelipeds subequal, right sometimes slightly larger, surface with coarse, light-tipped tubercles and scattered, long setae. Fingers spoon-tipped, longer and lighter in color than palm.

Walking legs each with dactylus shorter than respective propodus, surface variously punctate and setose, lacking longitudinal stripes on propodi, propodi with distal light spot on both faces.

Shield longer than broad, with rostrum extending beyond low lateral projections.

Eyestalks long and slender, left slightly longer, extending about to end of antennular peduncles. Ophthalmic acicles serrate. Antennal peduncles extending about to cornea.

SIZE.—Very small, shield lengths of all specimens, 0.4–2.4 mm; of ovigerous females, 0.8–1.8 mm.

COLOR.—In life, reddish brown to brown; eyestalks and antennae orange; chelipeds brownish with white or blue tubercles, punctae orange; proximal $\frac{2}{3}$ of outer surface of propodi of walking legs orange, with distinct distal blue spot; dactyli orange dorsally, white ventrally.

In preservative, dark pigment fades to orange; blue spot on propodus fades to white; fingers and dactyli may be entirely

white.

HABITAT.—Intertidal and shallow subtidal, in almost all shore habitats on Ascension. Specimens were even collected in the coral pool habitat of *Procaris ascensionis*, some being taken in formalin washes of algae (sta 5D-76) and echinoids (sta 5E-76) from the coral pool.

REMARKS.—This diminutive species differs from both *C. tricolor* (Gibbes, 1850), from the western Atlantic, and *C. chapini* Schmitt, 1926, from West Africa (which Forest and De Saint Laurent, 1967:103, treat as subspecies), in being much smaller and in its color pattern. The shield length of *C. ascensionis* apparently does not exceed 2.4 mm, whereas Provenzano (1959:366) studied material of *C. tricolor* with sl 6–9 mm, and Schmitt (1926:49) reported that the male holotype of *C. chapini* has a cl of 5.1 mm. In both *C. tricolor* and *C. chapini* the dark color on the chelae extends to the tips of the fingers; in *C. ascensionis* the fingers are lighter than the palm. In *C. chapini* the P3 propodus is dark dorsally, light ventrally, and in *C. tricolor* the propodi and dactyli are light, with the articulation between them dark. Neither of those species has the distinctive distal blue spot on the propodus that is characteristic of *C. ascensionis*.

M. de Saint Laurent (in litt.) pointed out that Forest and De Saint Laurent (1967:103) reversed the distinctive features of *C. chapini* and *C. tricolor* in their Table 2. The two species headings should be transposed.

Several samples, e.g., those from stations ASC-12, ASC-15, ASC-21, and 6B-76, also included glaucothoe larvae, and many specimens, including the holotype, were parasitized by bopyrid isopods. Markham (1978) identified bopyrids from this species as *Asymmetrione clibanarii* Markham, 1975, a species originally reported as infesting *Clibanarius tricolor*.

ETYMOLOGY.—We dedicate this species to our late colleague and friend, Joseph Rosewater, former curator of mollusks at the National Museum of Natural History and participant in the 1976 expedition to Ascension.

Dardanus imperator (Miers, 1881)

FIGURE 21c

Pagurus imperator Miers, 1881a:275, 375.—Ortmann, 1893:52.

Pagurus calidus.—Stebbing, 1914:255, 276 [not *Pagurus calidus* Risso, 1816].

Dardanus imperator.—Chace, 1966:634.—Biffar and Provenzano, 1972:790, figs. 1C, 2C, 3C, 4C.

MATERIAL.—*Smithsonian 1976 Collection*: Sta 7-76, off Collyer Point: 1 female [8.5].

Operation Origin: Site 5, Bates Point, in *Strombus* shell, 30 m: 1 female [12.3].—Site 12, Catherine Point, on top of bedrock outcrop, 16 m: 1 ovig. female [7.7].

Other Collections: Vickrey (1964), Ascension Island: 1 male [6.0].—Jourdan (1976), Ascension Island, diving: 1 female [8.5].—Jourdan (1976), English Bay, under rock, 20 ft (6 m): 1 female [7.5].—McDowell (1986), Hummock Point, 60 ft (18 m): 1 male [9.5].—McDowell (1986), Ladies Loo, 50–60 ft

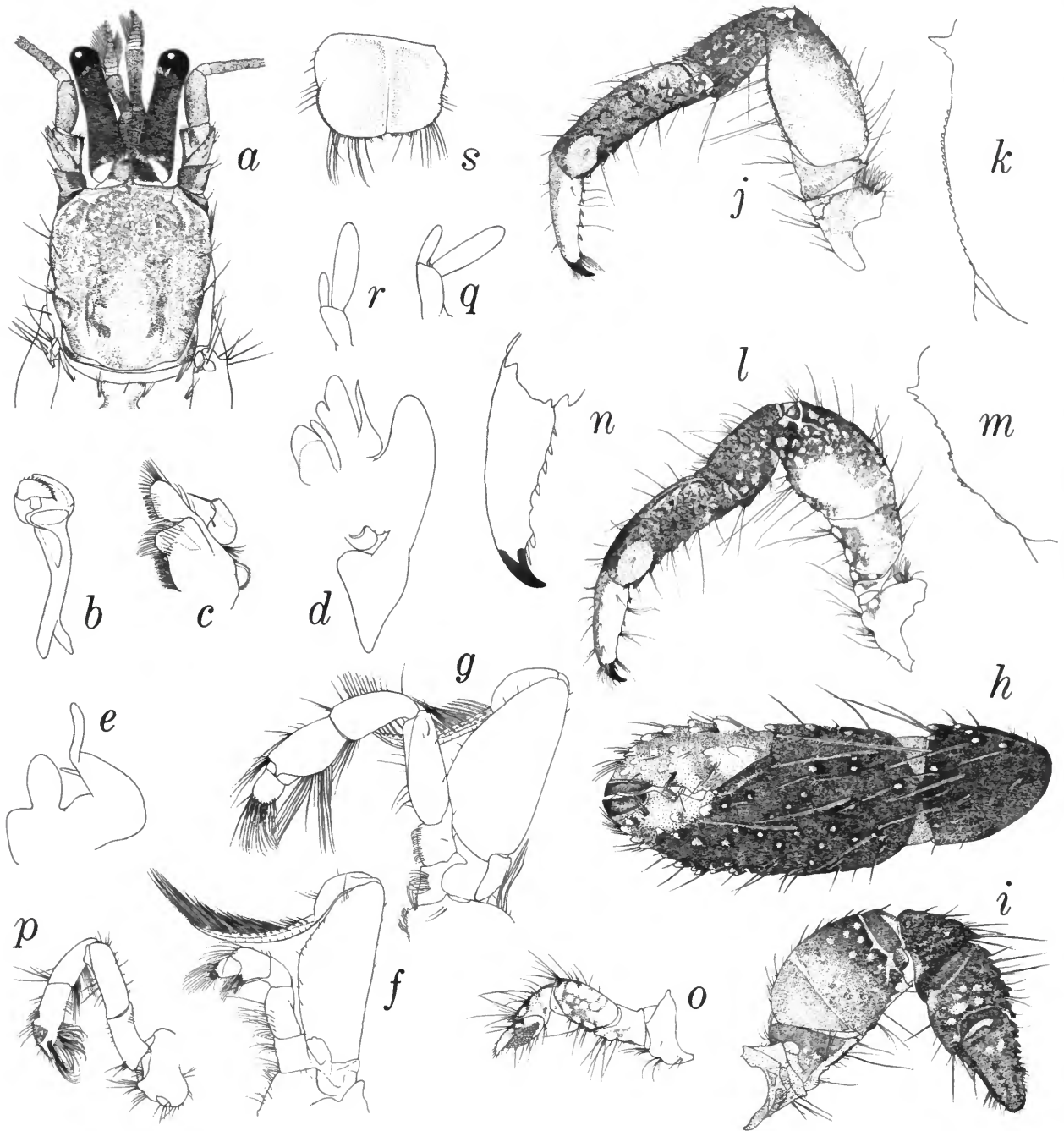


FIGURE 20.—*Clibanarius rosewateri*, new species, male paratype, shield length 2.1 mm: *a*, shield and anterior appendages; *b*, left mandible, dorsal aspect; *c*, left 1st maxilla; *d*, left 2nd maxilla; *e*, left 1st maxilliped; *f*, left 2nd pereopod; *g*, left 3rd maxilliped; *h*, left chela and carpus, extensor aspect; *i*, same, mesial aspect; *j*, left 2nd pereopod; *k*, flexor margin of merus of left 2nd pereopod; *l*, left 3rd pereopod; *m*, flexor margin of merus of left 3rd pereopod; *n*, dactylus of left 3rd pereopod; *o*, left 4th pereopod; *p*, left 5th pereopod; *q*, left 1st pleopod; *r*, left 2nd pleopod; *s*, telson, dorsal aspect. (Color pattern from male holotype, shield length 2.4 mm.)

(15–18 m): 1 male [10.5].—Clarence Bay, Scottish National Antarctic Expedition, 1902–1904, in *Strombus*: 2 males [13.0–14.6] (RSM).

SIZE.—Shield lengths of males, 6.0–14.6 mm; of females, 7.5–12.3 mm; of ovigerous female, 7.7 mm.

COLOR.—The eystalks are conspicuously banded, purple proximally shading to red distally, then white, with distal red spot on stalk extending into cornea. Chelipeds with distal part of merus and all of carpus purple; spines of carpus tan or orange, some red setae with white tips present; inner surface of carpus with reticulated pattern of red lines on white background; palm yellow-orange, tubercles on outer surface red, often with white tips; inner face of palm purple dorsally, reticulated red pattern extending onto fingers, latter with reticulated red pattern on outer face also. Walking legs, except second on left side, conspicuously banded; merus light

proximally, orange toward middle, paler distally; carpus light purple proximally and distally on each side of central orange ring; propodus purple proximal to orange ring, then distally with purple above, yellow-orange below; dactyl with four bands, two orange, two white, distalmost orange band broadest; legs with numerous red setae with white tips. Second left leg with merus and carpus as in other legs; outer surface of propodus and dactylus with scarlet tubercles on middle ridge, tipped with white in one specimen, dorsal line of tubercles orange, ventral line lighter, upper and lower lines of tubercles connected to middle row by orange line. Ventral surface of thorax largely white, with red reticulated pattern at bases of legs.

Even in preserved specimens, the walking legs are banded reddish, orange, or purple and white. The tubercles of the claw are reddish, often with white tips. The legs all have many

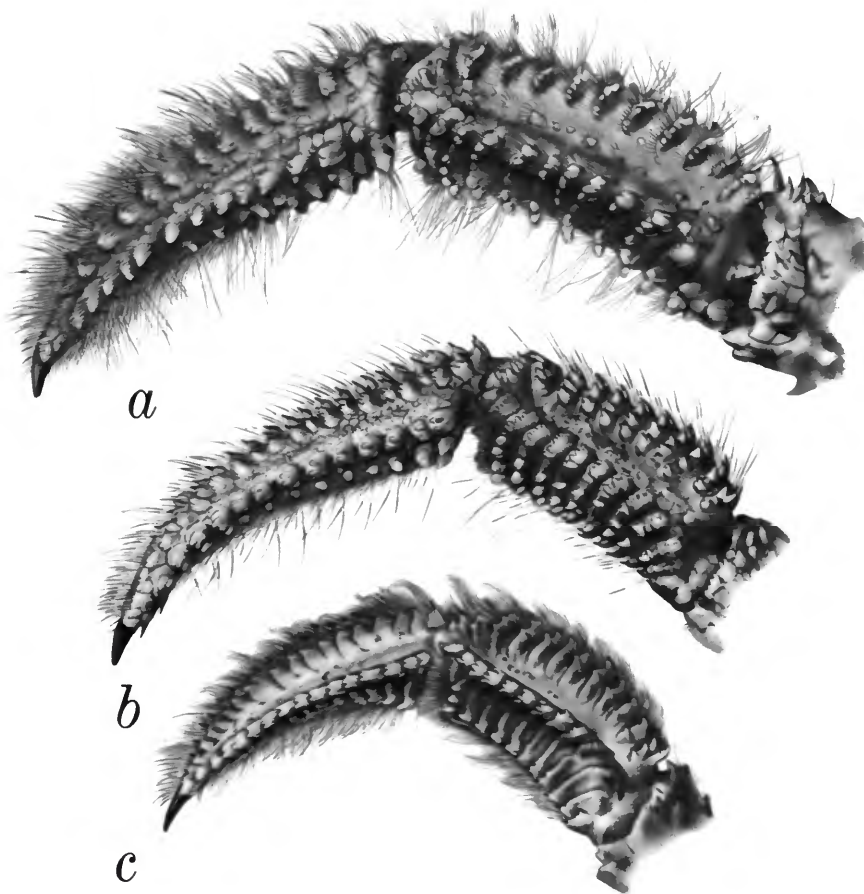


FIGURE 21.—Left third legs (diagnostic legs) of: *a*, *Dardanus venosus*, female, shield length 21.3 mm, Bermuda; *b*, *Dardanus venosus*, male, shield length 14.4 mm, Carrie Bow Cay, Belize; *c*, *Dardanus imperator*, ovigerous female, shield length 12.9 mm, James Bay, St. Helena. (By Carolyn Gast.)

reddish setae with white tips.

HABITAT.—Sublittoral, in 6 to 30 meters.

REMARKS.—Ortmann (1893) reported this species from Ascension and also recorded (1893:52) a *Glaucothoë rostrata* taken at the same station, in 20 meters. Stebbing (1914) also recorded this species from Ascension, as *Pagurus calidus*; we examined Stebbing's material and found it to be a *D. imperator*. Although Stebbing listed *P. calidus* on p. 276 as having been taken from Clarence Bay in *Strombus*, he also stated that it was taken at sta 507, which is off Pyramid Point (see "Introduction").

Although Markham and McDermott (1981:1271) included *Dardanus imperator* in their list of decapods from Bermuda, the species is not known to occur there. It apparently is restricted to the south Atlantic islands of Ascension and St. Helena.

It seems to us that the perspective is not clear in the figure of the third left leg of *D. imperator* given by Biffar and Provenzano (1972, fig. 4C), for there the cross ridges on the propodus appear to be convex in cross-section, whereas they are distinctly concave in material available to us. For that reason we have re-illustrated the third left leg of a specimen of *D. imperator* from St. Helena, along with the third left leg of two different specimens of *D. venosus* (H. Milne Edwards, 1848) (Figure 21).

DISTRIBUTION.—Known only from Ascension and Saint Helena islands; sublittoral, to a depth of at least 30 meters.

Family PARAPAGURIDAE

Sympagurus dimorphus (Studer, 1883)

FIGURE 22

Eupagurus dimorphus Studer, 1883:24, figs. 11, 12.

Eupagurus modicellus Stebbing, 1914:255, 277, pl. 26D.

Parapagurus dimorphus.—Forest and De Saint Laurent, 1967:115, pl. 1: figs. 5, 6.—De Saint Laurent, 1972:108.

Sympagurus dimorphus.—Lemaitre, 1989:71, pls. 36–38, 40E–H.

MATERIAL.—None.

REMARKS.—We believe that *Eupagurus modicellus* Stebbing, originally described from Ascension, is a juvenile specimen of *Sympagurus dimorphus* (Studer), a species that is widespread in the South Atlantic. The rounded rostrum, simple eye scales, and the very unequal chelipeds of *E. modicellus* all are features of *S. dimorphus*. Stebbing specifically mentioned and figured (Figure 22) the long ridge on the upper, inner border of the palm and the serrate dorsal margin of the movable finger, both characteristic of *S. dimorphus*. The relatively long and slender eyes are probably attributable to the size of Stebbing's specimen, sl 2.5 mm; it is certainly a juvenile.

Although the specimen studied by Stebbing was taken in relatively shallow water, 73 meters, Forest and De Saint Laurent (1967:116) reported that *S. dimorphus* was known to occur in depths between 70 and 600 meters.



FIGURE 22.—*Sympagurus dimorphus* (Studer), holotype of *Eupagurus modicellus*, shield length 2.5 mm: a, front and right anterior appendages; b, 1st maxilliped; c, 3rd maxilliped; d, right 1st pereopod; e, left 1st pereopod; f, dactylus of 2nd pereopod; g, 4th pereopod; h, 5th pereopod. (From Stebbing, 1914, pl. 26: fig. D.)

The type of *E. modicellus* could not be located at the Royal Scottish Museum (S. Chambers, in litt.).

We reproduce here Stebbing's original figure of this species (Figure 22).

DISTRIBUTION.—Known from scattered localities in the southern hemisphere, including South America, Tristan da Cunha, Namibia (Macpherson, 1983), South Africa, and Ascension, in depths between 70 and 600 meters.

Family PORCELLANIDAE

Petrolisthes marginatus Stimpson, 1859

Petrolisthes marginatus Stimpson, 1859:74.—Gore, 1982:17; 1983:91, fig. 1.

Porcellana Cessacii A. Milne Edwards, 1878:229.

Petrolisthes armatus.—Miers, 1881b:432.—Fausto Filho, 1974:8. [Not *Petrolisthes armatus* (Gibbes, 1850).]

Petrolisthes cessacii.—Chace, 1956:14, fig. 4.

MATERIAL.—*Manning 1971 Collection*: Sta ASC-13, Georgetown: 2 juveniles [2.6–3.1].—Sta ASC-22, McArthur Point: 1 juvenile [3.1].

Smithsonian 1976 Collection: Sta 1B-76, McArthur Point: 1 male [10.2], 1 ovig. female [10.0].—Sta 1C-76, McArthur Point: 6 males [4.4–8.0], 5 females [3.8–12.6], 2 ovig. [7.2–12.6], 3 juveniles [2.4–3.6].

Operation Origin: Site 0, English Bay, from inside of boulder, 3–4 m: 1 male [6.3].

Other Collections: Ascension Island, T. Conry: 1 male [4.2] (BMNH 81.27).—Jourdan (1976), off Collyer Point, diving: 1 female [10.0].—Olson (1970), McArthur Point, sandy bottom tide pool: 1 male [8.7].

SIZE.—Carapace lengths of males, 4.2–10.2 mm; of females, 3.8–12.6 mm; of ovigerous females, 7.2–12.6 mm; of juveniles, 2.4–3.6 mm.

COLOR.—Mottled brick red, with eystalks, articulating membranes and dactyls of walking legs scarlet; ventral surface uniformly scarlet.

HABITAT.—Intertidal, in algal mats or sabellariid worm colonies around boulders on exposed shores, and in rocks, oysters, and coralline algae clumps rimming a protected tide pool.

REMARKS.—Gore (1982; 1983) showed that *Petrolisthes cessorii* (A. Milne Edwards, 1878) was a junior synonym of *P. marginatus* Stimpson, 1859.

According to Gore (1974:711), Janet Haig examined material from Fernando de Noronha reported by Pocock (1890) as *P. marginatus* and found it to be correctly identified. Fausto Filho's (1974:8) record of *Petrolisthes armatus* from Fernando de Noronha is based on Pocock's record.

In discussing the distribution of this species in his account of its synonym, *P. cessorii*, Gore (1974:711) remarked "It would seem ... that *P. cessorii* has been in the western Atlantic since at least 1890 [based on Pocock's account], but was not actually recorded as such in publication until 1970 [Coelho's record of *P. cessorii*]." We know of no evidence that this species is a recent immigrant into the western Atlantic.

This species was reported from Ascension by Miers (1881b) and Gore (1974).

DISTRIBUTION.—Amphi-Atlantic; West Africa from the Cape Verde Islands to Annobon; western Atlantic, from the Caribbean to Brazil, including Fernando de Noronha; central Atlantic from Ascension; littoral and sublittoral.

Family HIPPIDAE

Hippa testudinaria (Herbst, 1791)

FIGURE 23a

Cancer testudinarius Herbst, 1791:8, pl. 22: fig. 4.

Remipes scutellatus.—White, 1847:57 [part].—Miers, 1878:314, 319 [part].—Benedict, 1893:539. [Not *Hippa scutellata* Fabricius, 1793.]

Hippa testudinaria.—Holthuis and Manning, 1970:251.

Hippa cubensis.—Fausto Filho, 1974:10.

MATERIAL.—*Manning 1971 Collection:* Sta ASC-3, McArthur Point: 7 males [13.0–15.6], 9 females [10.6–24.6], 7 ovig. [17.6–24.6].—Sta ASC-5, North East Bay: 6 males [10.2–15.1], 1 ovig. female [13.9].—Sta ASC-12, McArthur Point: 4 males [14.5–16.0], 7 females [11.6–22.2], 3 ovig. [16.8–21.3].

Smithsonian 1976 Collection: Sta 1D-76, McArthur Point: 13 males [13.1–15.8], 8 females [11.6–22.5], 1 ovig. [20.0].—Sta 9A-76, North East Bay: 5 males [12.8–14.2], 6 females

[12.7–19.4], 5 ovig. [16.9–19.4].

Operation Origin: Site 8, South West Bay: 1 male [13.4].

Other Collections: Ascension Island, U.S. Eclipse Expedition to West Africa, 1889–1890, Wm. Harvey Brown: 1 male [15.8], 1 female [19.6].—Ascension Island, Admiralty, H.M.S. *Chanticleer*: 1 male [15.8], 3 ovig. females [17.5–21.9] (BMNH 149c-e).—Ascension Island, from intertidal zone, almost on the breakers, R.A. Davies, Oct 1965: 1 dry specimen [15.7] (BMNH 1965.12.7.2).—Ascension Island, Mr. Hannay (Fort Hayes Museum): 3 males [13.3–14.5], 3 females [14.7–22.2], 2 ovig. [14.7–21.1] (BMNH 1973:130).—Vickrey (1964), South West Bay: 1 male [14.3], 7 females [14.6–20.4], 6 ovig. [15.3–20.4].—Georgetown Bay, May 1961: 1 male [14.6], 2 females [16.9–19.4].—Near Georgetown: 1 dry female [20.0].—Jourdan (1977), Long Beach: 2 females [17.9–25.5], 1 ovig. [25.5].

SIZE.—Carapace lengths of males, 10.2–16.0 mm; of females, 10.6–25.5 mm; of ovigerous females, 13.9–25.5 mm.

HABITAT.—Burrowing intertidally on open sand beaches.

REMARKS.—Until recently, this species was known as *Hippa cubensis* (De Saussure, 1857). Haig (1970) pointed out that the name *Cancer testudinarius*, applied by Herbst (1791) to a species from Martinique, was the oldest available name for the only western Atlantic species of *Hippa*.

As suggested by Holthuis and Manning (1970), all records of *Hippa* from Ascension are based on *H. testudinaria* rather than on the West African *Hippa carcineutes* Holthuis and Manning, 1970.

The main difference between this species and *H. carcineutes* is that the shorter ramus of the antennular flagellum comprises four or less segments in *H. testudinaria* (Figure 23a), five to eight segments in *H. carcineutes* (Figure 23b). The distribution of the number of segments in our material from Ascension is as follows: 2-2 (4) [2 segments on each side in each of 4 specimens], 2-3 (12), 3-3 (48), 3-4 (13), and 4-4 (4). There is no indication that the number of segments varies with sex or size.

This species has been recorded from Ascension by White (1847), Miers (1878), Benedict (1893), and Holthuis and Manning (1970).

DISTRIBUTION.—Western Atlantic, from Bermuda and Florida to Brazil; central Atlantic from Ascension Island; on sand beaches, in surf zone.

Family DROMIIDAE

Dromia erythropus (Edwards, 1771)

FIGURE 24a

Cancer erythropus Edwards, 1771:29.

Dromia erythropus.—Rathbun, 1937:31, fig. 11, pl. 6: figs. 1, 2.—Chace, 1966:635 [part].—Forest, 1974:80, figs. 1b, 2, 3c, 4g, l-n, 5, pl. 1: fig. 3, pl. 3: fig. 3, pl. 5: fig. 5.

MATERIAL.—*Other Collections:* McDowell (1981), off English Bay, ~60 ft. (18 m): 1 male [30.4].—McDowell

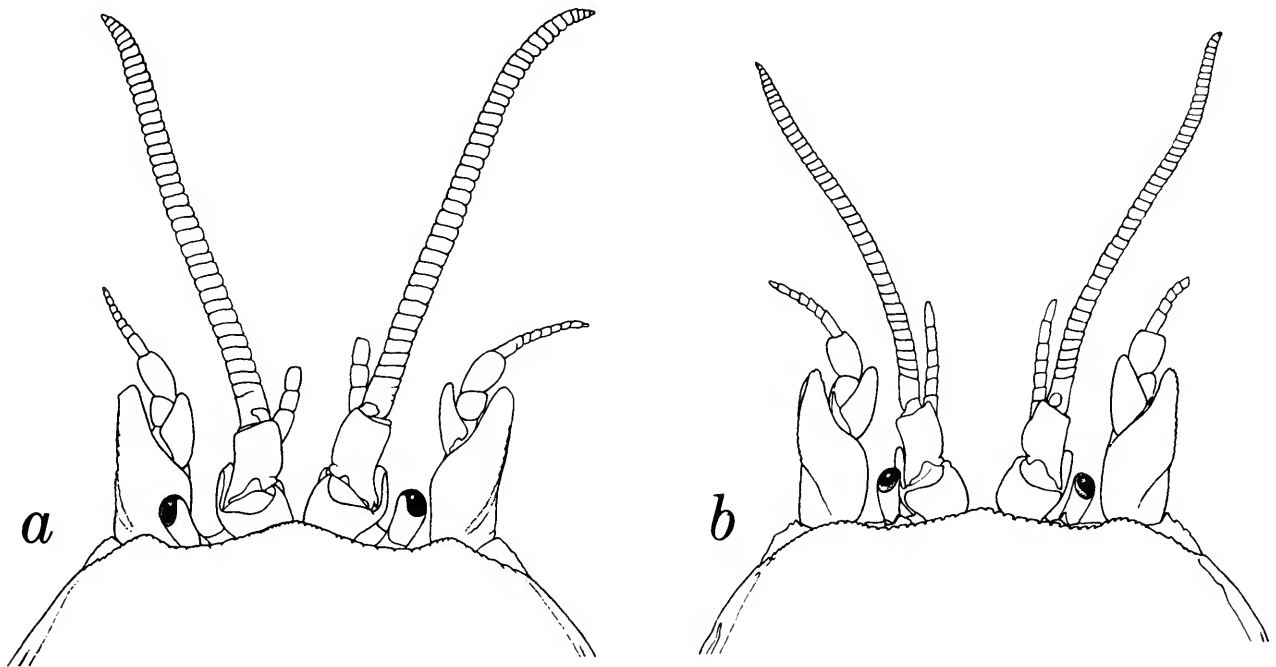


FIGURE 23.—Front and anterior appendages of: *a*, *Hippa testudinaria*, ovigerous female, denuded, carapace length 16.7 mm, Ascension Island; *b*, *Hippa carcineutes*, ovigerous female, paratype, carapace length 16.1 mm, Nigeria.

(1986), English Bay, in cave, lots of sponge in cave, night, scuba: 1 ovig. female [56.0].

SIZE.—Carapace length of male, 30.4 mm; of ovigerous female, 56.0 mm.

HABITAT.—Sublittoral.

REMARKS.—This is one of three species of *Dromia* that occurs on Ascension and St. Helena. This species differs from *D. marmorea* in that the distance from the first anterolateral tooth of the carapace to the second anterolateral tooth is less than that from the second to the third and much less than the distance from the third to the fourth tooth; in *D. marmorea* these intervals are subequal. *Dromia erythropus* agrees with *D. marmorea* and differs from *D. personata* in having the accessory tooth set between the second and third teeth, not on the posterior slope of the second tooth.

The small female, cl 14.5, reported from Rupert Bay, St. Helena by Chace (1966) is referable to *D. erythropus*.

This species has not been recorded previously from Ascension.

DISTRIBUTION.—Western Atlantic from Bermuda and Florida to Brazil, and Ascension and Saint Helena islands in the central Atlantic; littoral and sublittoral.

Dromia marmorea Forest, 1974

FIGURE 24b

Dromia marmorea Forest, 1974:79, figs. 1c, 2, 3b, 4d-f, j, k, 5, pl. 1: figs. 2, 4, pl. 3: fig. 2, pl. 4: fig. 7, pl. 5: figs. 3, 4, pl. 8: figs. 3, 4.—Manning and Holthuis, 1981:11.

MATERIAL.—*Operation Origin*: Site 8, South West Bay, 1+m: cast of 1 female [23.0].

Other Collections: McDowell (1986), English Bay, cave, lots of sponge in cave, night, scuba: 1 male [58.9].

SIZE.—Carapace length of male, 58.9 mm; of female, 23.0 mm.

HABITAT.—Littoral and sublittoral.

REMARKS.—As pointed out by Manning and Holthuis (1981:12), in this species the distances between the first and second, second and third, and third and fourth anterolateral teeth of the carapace are subequal. This will distinguish this species from both *D. erythropus* and *D. personata*.

Forest (1974) reported this species from St. Helena and there is a small female, cl 22 mm, from James Bay, St. Helena, in the Smithsonian Institution collections.

DISTRIBUTION.—Eastern Atlantic from off West Africa between the Azores and Cabinda, and central Atlantic from

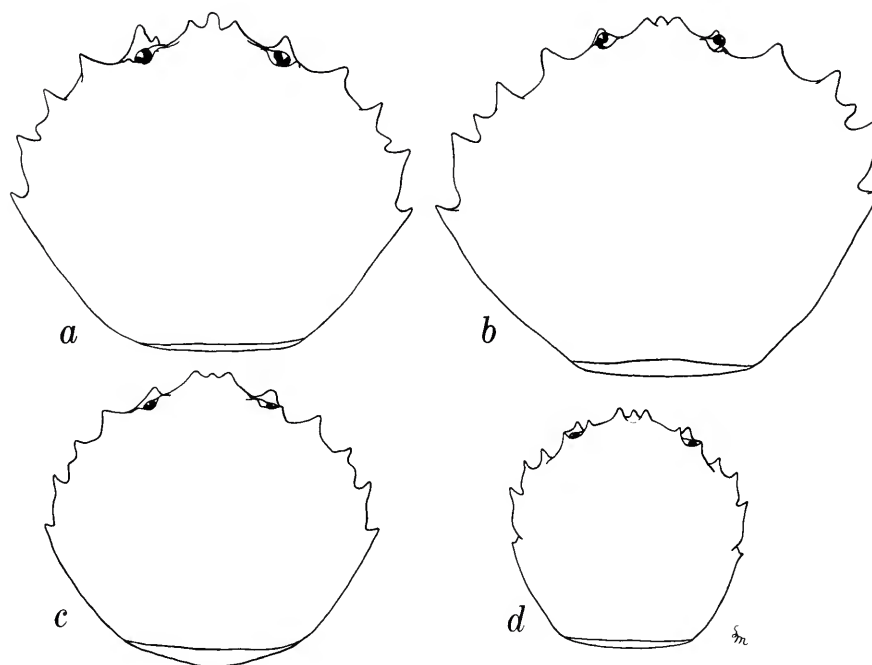


FIGURE 24.—Outline of carapace of: *a*, *Dromia erythropus*, male, carapace length 30.4 mm; *b*, *Dromia marmorea*, male, carapace length 58.9 mm; *c*, *Dromia personata*, female, carapace length 25.2 mm; *d*, *Dromidia antillensis*, male, carapace length 20.9 mm.

Ascension and St. Helena islands; littoral and sublittoral, usually in 50 meters or less.

Dromia personata (Linnaeus, 1758)

FIGURE 24c

Cancer personatus Linnaeus, 1758:628.

Dromia erythropus.—Chace, 1966:635 [part], fig. 6.

Dromia personata.—Forest, 1974:76, figs. 1a, 3a, 4a-c, h, i, 5, 6a, pl. 1: fig. 1, pl. 3: fig. 1, pl. 4: fig. 6, pl. 5: figs. 1, 2, pl. 7: figs. 1, 3, pl. 8: figs. 1, 2.

MATERIAL.—*Smithsonian 1976 Collection*: Sta 5A, North East Bay: 1 female [25.2].

Operation Origin: Site 8, South West Bay, 1+ m: 1 female [23.0].

SIZE.—Carapace lengths of females, 23.0–25.2 mm.

COLOR.—Uniform light orange, fingers reddish.

HABITAT.—Littoral, in about one meter and in isolated tide pools in back of open shore.

REMARKS.—Our specimens from Ascension both have the accessory tooth appressed to the posterior slope of the second anterolateral tooth, and differ from both *D. erythropus* and *D. marmorea* in the position of the accessory tooth.

We identify the specimen from off Jamestown figured by

Chace (1966, fig. 6) with this species. There are also two specimens from James Bay, St. Helena, in the collections of the Smithsonian Institution.

DISTRIBUTION.—Eastern Atlantic from southern North Sea to Spanish Sahara, including the Mediterranean, and central Atlantic from Ascension and St. Helena islands; littoral and sublittoral, usually in less than 100 meters.

Dromidia antillensis Stimpson, 1859

FIGURE 24d

Dromidia Antillensis Stimpson, 1859:71.

Dromidia antillensis.—Williams, 1984:255, fig. 187.

MATERIAL.—*Operation Origin*: Site 28, Archer Point, 10 m, sponge and crab from under stone: 1 juvenile [7.9].

Other Collections: McDowell (1986), English Bay, night, scuba: 1 male [20.9].

SIZE.—Carapace length of male, 20.9 mm; of juvenile, 7.9 mm.

HABITAT.—Sublittoral, to at least 10 meters.

REMARKS.—Forest (1974:89) recorded this species from St. Helena, and commented that three species of dromiids occurred there, *Dromia marmorea* from the east Atlantic, *Dromidia*

antillensis from the west Atlantic, and *Petalomera wilsoni* (Fulton and Grant, 1902) from the Indo-West Pacific. Actually, there are no less than five dromiids on St. Helena, the four reported here from Ascension and *P. wilsoni*.

There is also a male, cl 13.2 mm, and a female, cl 15.8 mm, of *Dromidia antillensis* from St. Helena in the Smithsonian Institution collections.

Ortmann (1893:53) reported a dromiid from Ascension in 120 meters but did not name it. He suggested that it might represent an undescribed species. We cannot assign it with certainty to any of the four dromiids reported here from Ascension, but as *D. antillensis* lives at greater depths (to 311 meters; see Williams, 1984:256) than any of the species of *Dromia* found here, Ortmann's material may well belong to this species.

DISTRIBUTION.—Western Atlantic from Bermuda and North Carolina to Brazil; central Atlantic from Ascension and St. Helena Islands; shore to 311 meters.

Family LATREILLIIDAE

Latreillia manningi Williams, 1982

Latreillia elegans.—Stebbing, 1914:255, 273 [not *L. elegans* Roux, 1830].
Latreillia manningi Williams, 1982:233, figs. 1b, c, 2a–e, 3a, 8; 1984:262, fig. 194.

MATERIAL.—*Other Collections*: Scottish National Antarctic Expedition, *Scotia* Sta 507, Pyramid Point, 45 fm (82 m), 10 Jun 1904: 2 males [7.2–10.0] (RSM).

SIZE.—Carapace lengths of males, 7.2–10.0 mm.

REMARKS.—This species was reported from Ascension by both Stebbing (1914) and Williams (1982).

DISTRIBUTION.—Western Atlantic from off Massachusetts to Cuba and Venezuela; central Atlantic from Ascension Island; 82–474 meters.

Family RANINIDAE

Ranilia constricta (A. Milne Edwards, 1880)

FIGURE 25

Raninops constrictus A. Milne Edwards, 1880:35.
Notopus (Raninoides?) atlanticus Studer, 1883:17, pl. 1: fig. 5a, b.
Raninoides atlanticus.—Studer, 1889:48, 50, pl. 24: fig. 7.
Ranilia atlantica.—Monod, 1956:47, 631, figs. 17, 18.—Williams, 1984:265, fig. 196.
Ranilia constricta.—Manning and Holthuis, 1981:7, figs. 1, 2.

MATERIAL.—*Other Collections*: Ascension Island, 60 fm (110 m), *Gazelle*, syntypes of *N. atlanticus* Studer: 1 male [18.6], 1 female [14.0] (ZMB 4560).

SIZE.—Carapace length of male, 18.6 mm; of female, 14.0 mm.

REMARKS.—Manning and Holthuis (1981) synonymized *Ranilia atlantica* with *R. constricta*.

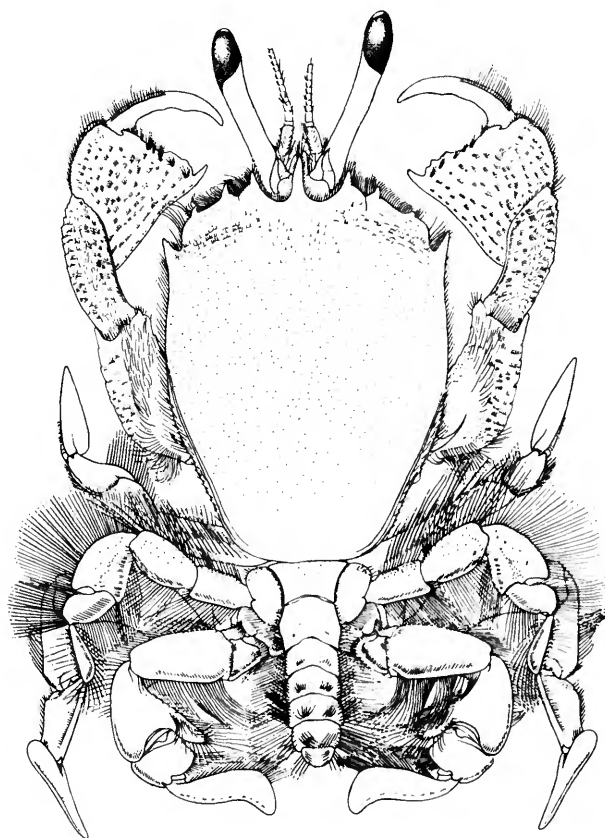


FIGURE 25.—*Ranilia constricta*, male syntype of *Notopus atlanticus*, carapace length 18.6 mm.

This is the species referred to by Schmitt (1956:451) and by Chace and Barnish (1976:105) in their accounts of swarms of raninid postlarvae washing up on the beaches of St. Lucia, West Indies, in windrows. Kidd and Rice (1986:679) reported a swarm of raninid megalopas at Barbados in 1975.

In 1987 another swarm of larvae washed ashore at Barbados, and Julia A. Horrocks, Bellairs Research Institute of McGill University, forwarded to one of us (R.B.M.) a cast of a young crab that had molted from a megalopa. The young crab was identifiable as *Ranilia constricta*.

This species has been recorded from Ascension by Studer (1883, 1889) and Manning and Holthuis (1981).

There are two lots of this species from St. Helena in the collections of The Natural History Museum, London.

DISTRIBUTION.—Amphi-Atlantic; West African coast from Sierra Leone to Annobon Island; western Atlantic from Florida to Brazil; central Atlantic from Ascension; shallow water to 365 meters.

Family CALAPPIDAE

Calappa galloides Stimpson, 1859

Calappa galloides.—Stimpson, 1859:71.

Calappa gallus.—Rathbun, 1937:214, pl. 65: figs. 1, 2.—Monod, 1956:100, figs. 115, 116.—Fausto Filho, 1974:10.—Manning and Holthuis, 1981:51. [Not *Calappa gallus* (Herbst, 1803).]

MATERIAL.—Grice Marine Biological Laboratory Collection: Sta 80-68, off Pyramid Point, 27 m: 1 juvenile [6.5].

Other Collections: McDowell (1980), offshore of Georgetown pierhead, 400–500 ft (122–152 m): 1 juvenile [13.9].

SIZE.—Carapace length of juveniles, 6.5–13.9 mm.

HABITAT.—Sublittoral, in 27 and 122–152 meters.

REMARKS.—We assign Atlantic specimens formerly identified with *Calappa gallus* (Herbst, 1803) to this species, described by Stimpson in 1859. Stimpson's (1859:71) original account of this species is as follows: "Very closely allied to *C. gallus* of the Pacific, but is less convex, and less strongly tuberculated. The front or rostrum is distinctly quadridentate." Rathbun (1937:214) considered *C. galloides* to be a synonym of *C. gallus*.

The front does not appear to be different in members of the two species, but the other differences mentioned by Stimpson are characteristic of *C. galloides*. In addition to the other characters mentioned by Stimpson, material of the two species can be distinguished by the relative width of the carapace. In *C. gallus*, the carapace length is equal to the carapace width ahead of the clypeiform expansion; in *C. galloides* the carapace length is less than the width ahead of the clypeiform expansion. This distinction holds for all specimens with carapace lengths larger than 25 mm. Monod's figure of this species (1956, fig. 115) clearly shows the carapace proportions in *C. galloides*.

Also, the telson appears to be different in the two species. In *C. galloides*, the telson of the males has distinctly concave sides extending to a slender, elongate apex; the sides are straighter in *C. gallus* and the apex is shorter. In the female of *C. galloides*, the sides of the telson are more inflated basally.

There also may be a size difference in the two species. The largest specimen of *C. galloides* in the Smithsonian collections is a male, cl 54 mm, cb 78 mm; Monod (1956:100) reported a male from West Africa with cl 59 mm, cb 83 mm. The largest *C. gallus* in the Smithsonian collections is a male, cl 40 mm, cb 55 mm; Sakai (1976:130) studied a specimen with cl 41 mm, cb 54 mm.

The female from St. Helena identified with *C. gallus* by Chace (1966:636) proves to be identifiable with *C. bicornis* Miers, 1884, an Indo-West Pacific species not previously recorded from the Atlantic. *Calappa bicornis* was considered to be distinct from *C. gallus* by Rathbun (1911:197) but later was synonymized with *C. gallus* by her (1937:214). It is recognized as a distinct species by Sakai (1976:132).

This species has not been recorded previously from Ascension. It was taken together with *Atelecyclus rotundatus*

and *Mursia mcdowellii*.

DISTRIBUTION.—Amphi-Atlantic; West Africa, from the Cape Verde Islands to Angola; western Atlantic from Bermuda and Florida to Brazil, including Fernando de Noronha; central Atlantic from Ascension; shore to 220 meters.

Mursia mcdowellii, new species

FIGURES 26, 27

MATERIAL.—Other Collections: McDowell (1980), offshore of Georgetown pierhead, bottom net, 400–500 ft (122–152 m): 1 male [38.0] (holotype, USNM 221893).

DESCRIPTION.—Carapace coarsely and conspicuously granulate, surface granules coarser and larger anteriorly, with few scattered larger granules on surface anterior to lateral spines, larger granules not arranged in rows; 2 rounded tubercles in midline. Front trilobed, median spine slender and longer than laterals, set below and ahead of laterals. Antero-lateral margin a tuberculate ridge. Lateral spine short, about $\frac{1}{5}$ cl, directed laterally. Posterior margin of carapace trilobed, median lobe lower, more obtuse than laterals.

Cheliped coarsely granulate, surface covered with small granules, fewer large granules also present. Merus with 3 distal spines, lateralmost largest. Palm with 1 proximal projection on lower carina, latter entire proximally, interrupted distally; upper surface of palm with 7 erect spines.

Distal 3 segments of walking legs carinate, carpus with more than 1 carina and distal dorsal spine.

SIZE.—Carapace length of male, 38.0 mm.

HABITAT.—Sublittoral, on dead coral, in 122–152 meters.

REMARKS.—The coarsely granulate carapace and chelipeds, short lateral spine, and cheliped with a three-spined merus and a single spine on the lower surface of the palm, will distinguish this species from all known species of *Mursia*. This species

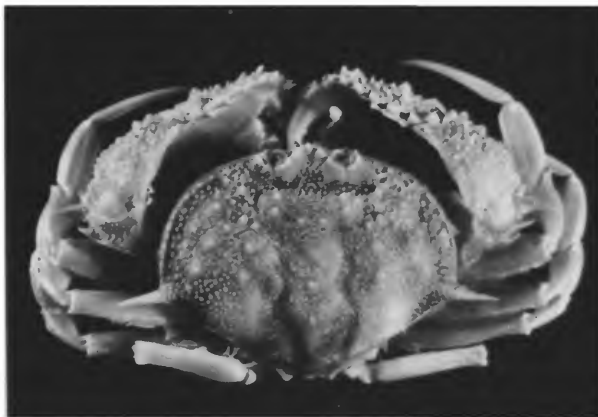


FIGURE 26.—*Mursia mcdowellii*, new species, male holotype, carapace length 38.0 mm.

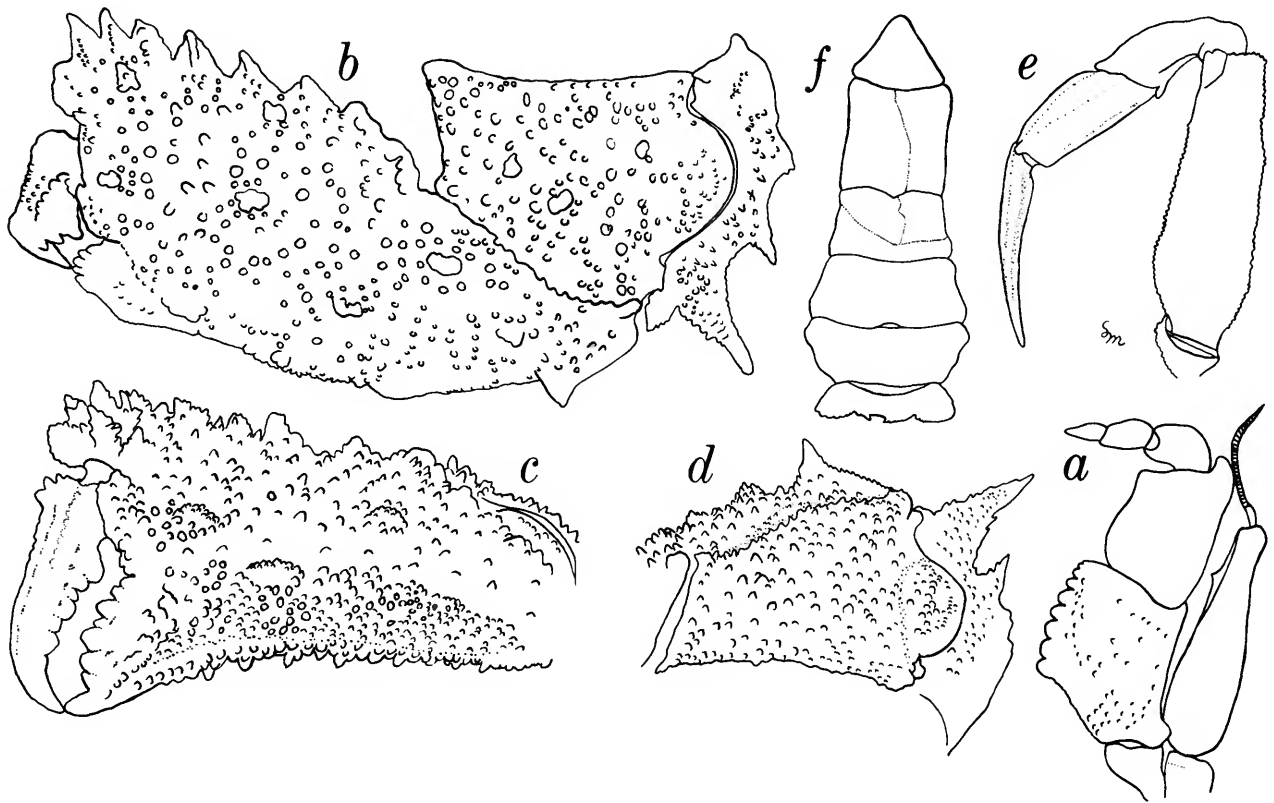


FIGURE 27.—*Mursia mcdowelli*, new species, male holotype, carapace length 38.0 mm: a, 3rd maxilliped; b, cheliped, oblique dorsal view; c, chela; d, carpus of chela; e, 5th pereopod; f, abdomen.

resembles the west American *M. gaudichaudii* (H. Milne Edwards, 1837) in that the carapace is noticeably granulate, but that species differs in having the larger tubercles of the carapace organized into 9 rows, only two spines on the arm, and the palm much smoother, with the lower ridge uninterrupted.

Mursia mcdowelli is readily distinguished from the two species of the genus known from South Africa (Barnard, 1950; Kensley, 1981c). It differs from *M. armata* De Haan, 1837, in having a much shorter lateral spine on the carapace, one-fifth rather than more than one-half of the carapace length, and from *M. cristimanus* De Haan, 1837, in having the posterior border of the carapace trilobed, rather than evenly rounded, in having three teeth rather than two on the merus, and one rather than two teeth on the palm of the cheliped.

So far as we can determine, only one other species, *M. cristimanus*, has been recorded from the South Atlantic. Doflein (1900:136) recorded it from St. Helena without comment or details of his material, and Macpherson (1983) recorded it from Namibia. Doflein's material from St. Helena may well belong to the species described here. The possibility also exists that Doflein's material came from St. Helena Bay,

South Africa, a locality within the known range of *M. cristimanus*.

The holotype was taken together with *Atelecyclus rotundatus* and *Calappa galloides*.

ETYMOLOGY.—We dedicate this species to Marion McDowell, whose interest in the marine fauna of Ascension materially added to the species from that island available to us for this study.

Osachila stimpsonii Studer, 1883

FIGURE 28

Osachila Stimpsonii Studer, 1883:16, pl. 1: fig. 4; 1889:48, 50, pl. 24: fig. 4.

MATERIAL.—*Other Collections*: Ascension Island, 60 fm (110 m), on coral (corallinengrund), *Gazelle*: 2 males [13.4–14.3], 2 females [9.9–11.3], 1 ovig. [11.3] (ZMB 4558).

DESCRIPTION.—Carapace octagonal, length more than $\frac{3}{4}$ width, with 6 large protuberances dorsally, paired metagastric, 1 mesogastric, paired mesobranchial, and 1 cardiac; protuberances and dorsal surface finely eroded. Front bilobed, with

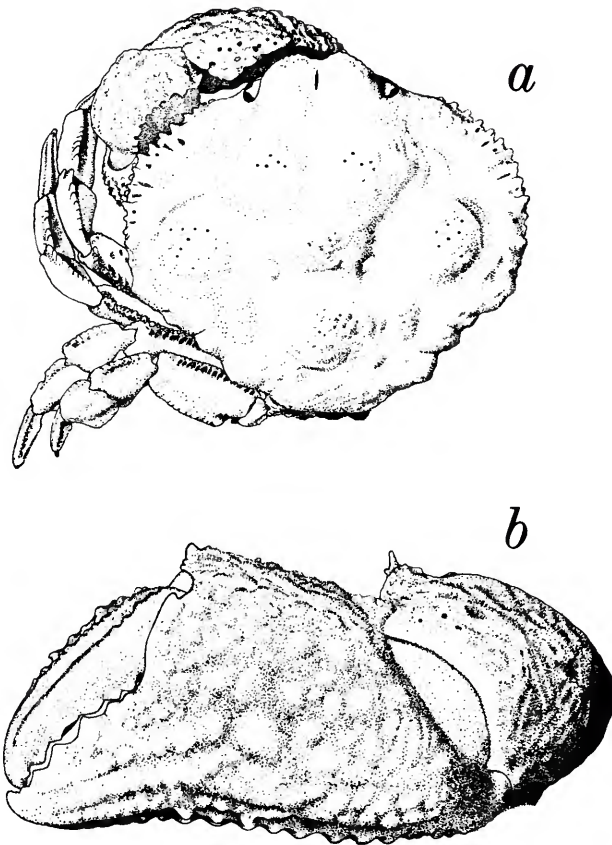


FIGURE 28.—*Osachila stimpsonii*, male syntype, carapace length 13.4 mm: a, dorsal view; b, left chela.

deep median incision. Anterolateral margin distinctly tuberculate. Posterolateral margin shorter than anterolateral, bearing 4 low lobes, all indistinct.

Chelipeds short and stout, chelae tuberculate on outer surface. Dorsal and ventral margins rough.

Walking legs short and stout, dorsal margins irregularly carinate, propodus of fifth leg higher than long (measured dorsally).

SIZE.—Carapace lengths of males, 13.4–14.3 mm; of females, 9.9–11.3 mm; of ovigerous female, 11.3 mm.

HABITAT.—Sublittoral, in 60 fathoms (110 meters) on coral (Studer, 1883).

REMARKS.—This species can be distinguished easily from the three western Atlantic species. It resembles *O. tuberosa* Stimpson, 1871(a) and *O. semilaevis* Rathbun, 1916 and differs from *O. antillensis* Rathbun, 1916 in having a relatively smooth carapace, not eroded all over. It differs from *O. tuberosa* and resembles *O. semilevis* in having the posterolateral margin of the carapace shorter than the anterolateral and

in having tubercles rather than reticulations on the outer surface of the palm. It differs from *O. semilevis* in numerous features: the carapace is less smooth, with shallower depressions and lower protuberances, the front is less prominent, the chela lacks dorsal projections or teeth, and the propodus of the fifth leg is higher.

DISTRIBUTION.—Known only from off Ascension in 110 meters (Studer, 1883; 1889).

Family MAJIDAE

Acanthonyx sanctaehelena Chace, 1966

Acanthonyx sanctaehelena Chace, 1966:648, figs. 12, 13e-h.

MATERIAL.—*Manning 1971 Collection*: Sta ASC-12, South West Bay: 4 males [2.1–3.9], 2 ovig. females [3.5–3.7].—Sta ASC-13, Georgetown: 6 males [5.3–6.9], 1 female [3.3].—Sta ASC-15, English Bay: 1 male [2.5], 1 female [3.2], 3 juveniles [1.7–2.0].—Sta ASC-21, English Bay: 1 male [4.9], 3 females [3.1–3.8], 2 ovig. [3.1–3.8].—Sta ASC-23, South West Bay: 1 male [4.3].

Smithsonian 1976 Collection: Sta 1B-76, McArthur Point: 1 ovig. female [3.6].

SIZE.—Carapace lengths of males, 2.1–6.9 mm; of females, 3.1–3.8 mm; of ovigerous females, 3.1–3.8 mm; of juveniles, 1.7–2.0 mm. These specimens are considerably smaller than those reported by Chace (1966) from Saint Helena, which ranged to 18 mm in carapace length.

HABITAT.—On Ascension this species was collected by using a formalin wash of calcareous algae on rocks, and of green algal clumps, colonies of filamentous green algae, *Padina*, and *Sargassum* found intertidally on rocks.

DISTRIBUTION.—Known only from Saint Helena and Ascension islands; littoral and sublittoral.

Apiomithrax violaceus (A. Milne Edwards, 1867)

Micropisa violacea A. Milne Edwards, 1867:33, pl. 21: figs. 1, 2.—Rathbun, 1925:303, fig. 100, pls. 101, 241: figs. 5–8.

Apiomithrax violaceus.—Monod, 1956:502, figs. 682–691.

MATERIAL.—*Operation Origin*: Site 0, English Bay, from underside of a boulder, 3–4 m: 1 juvenile [8.4].—Site 31, Spire Rock, from under a stone, 10 m: 1 ovig. female [13.5].

Other Collections: Ascension Island, found on beach, Ascension Historical Society: 1 male [24.8].—Ascension Island: 1 female [29.5] (BMNH 84-31).—Jourdan (1976), English Bay, 20–40 ft (3–6 m): 1 female [28.8].

SIZE.—Carapace length of male, 24.8 mm; of females, 13.5–29.9 mm; of ovigerous female, 13.5 mm; of juvenile, 8.4 mm.

HABITAT.—Sublittoral, in 3 to 10 meters.

REMARKS.—This species has not been recorded previously from Ascension.

DISTRIBUTION.—Amphi-Atlantic; West Africa from Cabo

Blanco to Angola; western Atlantic from Brazil; central Atlantic from Ascension; sublittoral, usually in 35 meters or less.

Family PARTHENOPIDAE

Parthenope verrucosa Studer, 1883

FIGURE 29

Lambrus verrucosus Studer, 1883:9, pl. 1: fig. 2a, b; 1889:48, 50, pl. 24: fig. 2.—Stebbing, 1914:254, 261.

MATERIAL.—*Other Collections:* Ascension Island, 60 fm (110 m), on sand with coral, *Gazelle*, syntypes of *Lambrus verrucosus* Studer: 2 males [15.4–16.9] (ZMB 4730).—Scottish National Antarctic Expedition, off Pyramid Point, 40 fm (73 m), trawl, *Scotia*, 10 Jun 1904: 1 female [19.5] (RSM).

DESCRIPTION.—Carapace subtriangular, 1.1 times broader than long, anterolateral margin slightly concave, longer than posterolateral. Deep depressions separating branchial from cardiac and hepatic regions. Rostrum narrow, with 2 pairs of lateral tubercles, anterior largest. Preorbital lobe with 2 prominent tubercles, posterior ventral, with smaller intervening tubercle. Upper margin of orbit with strong tubercle anteriorly. Gastric region with large, rounded, median tubercle, preceded anteriorly by pair of smaller tubercles; several other rounded tubercles on gastric region. Urogastric region with 1 major, rounded tubercle in midline, 2 smaller tubercles sometimes present on each side. Cardiac region with 2 large, rounded tubercles in midline. Intestinal region with small, sharp tubercle in midline and 2 sharper lateral tubercles. Hepatic projection angular, sharp, in smaller specimen, more rounded on larger. At

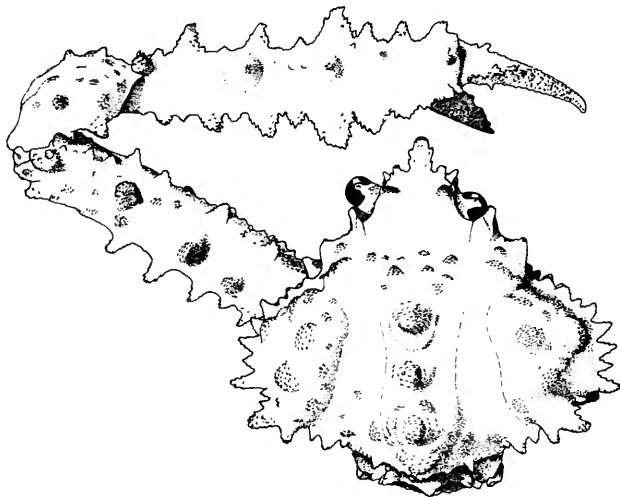


FIGURE 29.—*Parthenope verrucosa*, male syntype, carapace length 16.9 mm, dorsal aspect.

least 1 tubercle present on depression between hepatic and branchial regions. Latter with 4 major rounded tubercles dorsally, 1 large bifid spine posteriorly, and curved row of 7 sharp spines ventrally, posteriormost largest; 2 spines present posterolaterally on each side between branchial and intestinal regions.

Chelipeds slender, 2.5–2.7 times as long as carapace. Merus with 2 rounded dorsal projections, an irregular row of spines and tubercles anteriorly and posteriorly, 2 major spines on each surface, and a row of smaller tubercles ventrally. Carpus with 2 large spines, 1 inner, 1 outer, surface irregular or knobby, lacking erect spinules. Propodus triangular in cross-section, with 2 large, rounded knobs dorsally, proximal larger, a row of 5 or 6 large and some smaller projections laterally and mesially, mesial projections very serrate, and row of low tubercles ventrally. Chelae tuberculate, dactyl with erect spines proximally on dorsal surface. Tips of fingers light.

Walking legs with strong, erect tubercles dorsally, smaller tubercles ventrally. Dactyli of walking legs longer than propodi, surface covered with low tomentum except at tip.

Second abdominal somite with 3 low conical tubercles, visible in dorsal view, third to fifth somites with median swelling.

SIZE.—Carapace lengths of males, 15.4–16.9 mm; of female, 19.5 mm.

HABITAT.—Sublittoral, in 40 fathoms (73 meters) and on sand with coral in 60 fathoms (110 meters).

REMARKS.—*Parthenope verrucosa* is similar to the West African *P. notialis* Manning and Holthuis, 1981, but can be distinguished by several features. In *P. verrucosa* the projections on the posterior margin of the second abdominal somite are much lower and less conspicuous, there are fewer dorsal tubercles on the carapace, and the larger dorsal tubercles of the carapace are broadly rounded, whereas they are sharp in *P. notialis*. The large, rounded dorsal tubercles and projections on the chelipeds and carapace will distinguish *P. verrucosa* from all Atlantic species of *Parthenope* with a tuberculate carapace and long chelipeds.

This species has been recorded from Ascension by Studer (1883; 1889) and Stebbing (1914).

DISTRIBUTION.—Known only from Ascension in 73–110 meters.

Family ATELECYCLIDAE

Atelecyclus rotundatus (Olivi, 1792)

FIGURES 30,31

Cancer rotundatus Olivi, 1792: pl. 2: fig. 2.

Atelecyclus rotundatus.—Christiansen, 1969:37, fig. 13, map 7.—Manning and Holthuis, 1981:68.

MATERIAL.—*Other Collections:* McDowell (1980), offshore of Georgetown pierhead, bottom net, 400–500 ft (122–152 m):



FIGURE 30.—*Atelecyclus rotundatus*, male, carapace length 40.6 mm.

1 male [40.6].

SIZE.—Carapace length of male, 40.6 mm.

REMARKS.—The granulation of the carapace, especially posteriorly, is much stronger and many more of the tubercles on the chelipeds are produced into erect spines than in a specimen from the North Sea available for comparison.

According to notes made by Marion McDowell, the bottom where this species was collected was "extremely dead, only dead coral was retrieved, and very few live specimens." It was collected together with *Calappa galloides* and *Mursia mcdowelli*.

This species has not been recorded previously from Ascension.

DISTRIBUTION.—Eastern Atlantic from Scandinavia to South Africa; now from central Atlantic from Ascension; shallow water to 200–300 meters.

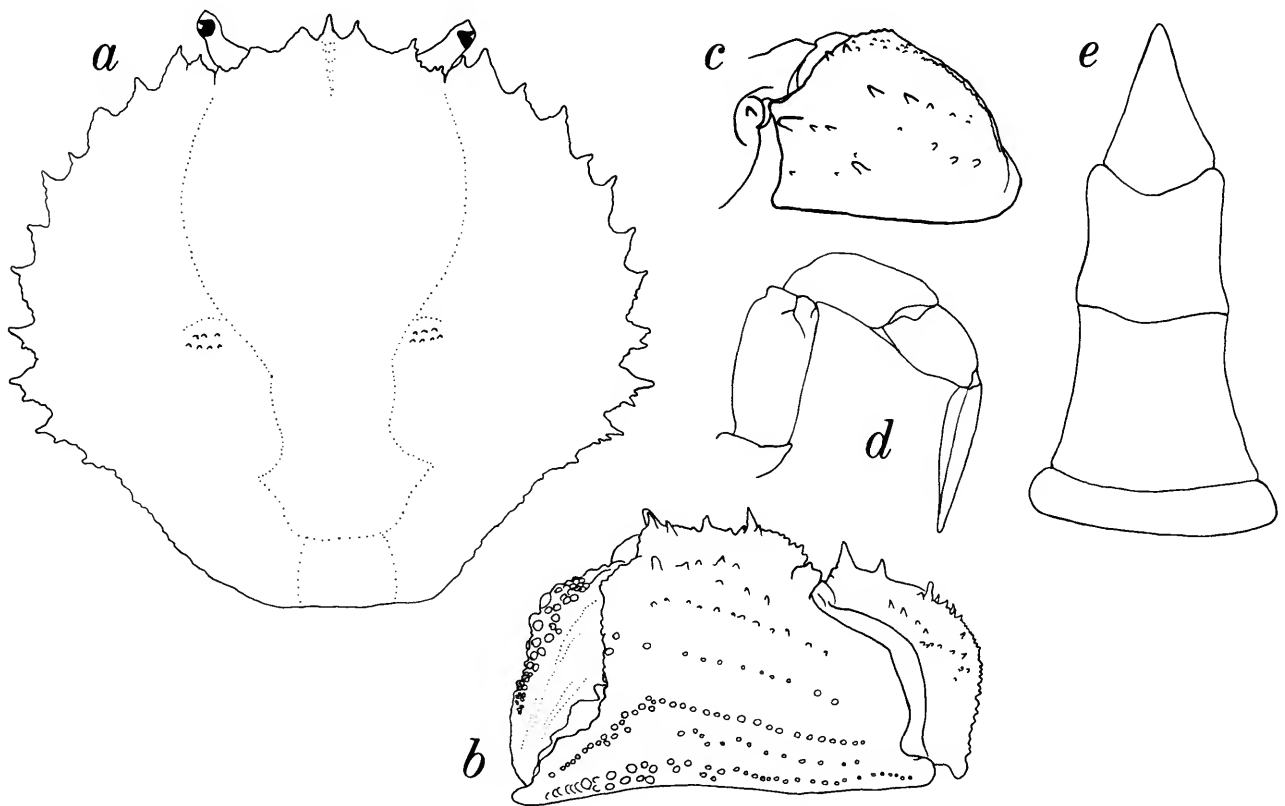


FIGURE 31.—*Atelecyclus rotundatus*, male, carapace length 40.6 mm: *a*, outline of carapace, dorsal view; *b*, chela; *c*, carpus of chela; *d*, 5th pereopod; *e*, abdomen.

Family PORTUNIDAE

Laleonectes, new genus

DIAGNOSIS.—Portunid crabs with 6 frontal teeth, including the inner orbital lobe, and 9 anterolateral teeth, posterior largest. Interantennular projection low, not visible in dorsal view. Gastric region of carapace with 4 large tubercles in transverse row. Pterygostomial region of carapace with stridulating ridge, extending across suborbital margin. Posterolateral angle of carapace with distinct recurved spine. Merus of cheliped with stridulating ridge dorsally, 1 distal posterior spine; palm of chela prismatic. Walking legs long and slender; merus with distal ventral spine; dactylus of fifth leg ovate, spiniform distally. Male abdomen of 5 segments, 3–5 fused. Male pleopod thick proximally, slender and curved distally.

TYPE SPECIES.—*Neptunus vocans* A. Milne Edwards, 1878.

ETYMOLOGY.—From the Greek, *laleo*, talk, and *nectes*, swimmer. The gender is masculine.

REMARKS.—We recognize here a new genus for two species formerly placed in *Portunus*, *Neptunus vocans* A. Milne Edwards, 1878, from the eastern Atlantic, and the Indo-West Pacific *Neptunus nipponensis* Sakai, 1938, originally described from Japan with its synonym *Portunus oahuensis* Edmondson, 1954, originally described from Hawaii.

Laleonectes can be distinguished from all members of *Portunus* sensu lato by the presence of a stridulating ridge on the pterygostomial region of the carapace.

Laleonectes vocans (A. Milne Edwards, 1878),
new combination

FIGURES 32,33

Neptunus vocans A. Milne Edwards, 1878:225.—Monod, 1956:194, figs. 222, 223.

Portunus vocans.—Rathbun, 1930:60, figs. 8, 9, pl. 25.—Manning and Holthuis, 1981:107.

MATERIAL.—*Other Collections*: U.S. Eclipse Expedition to West Africa, 1889–1890, Wm. Harvey Brown, Ascension, 20–30 fm (37–58 m), 25 Mar 1890: 2 juveniles [5.9–6.2].—Jourdan (1976), off Collyer Point, 20 ft (6 m), diving: 1 female [17.0].—Long Beach, 23 Jan 1977: 1 female [16.6].

SIZE.—Carapace lengths of females, 16.6–17.0 mm; of juveniles, 5.9–6.2 mm. The largest Atlantic specimen is the holotype of *Neptunus vocans*, with a carapace length of 22 mm.

COLOR.—The following notes were made from a live specimen: Background color of carapace light, tan or orange, smaller surface tubercles and granules red, larger tubercles white. Gastric region with pair of submedian red spots. Intestinal region with rectangular red patch extending anteriorly onto cardiac region. Remainder of surface mottled with red, lateral spine with red band. Chelipeds orange, with red and white granules, banded with red on carpus, propodus, and fingers, latter with 2 bands. Walking legs prominently banded

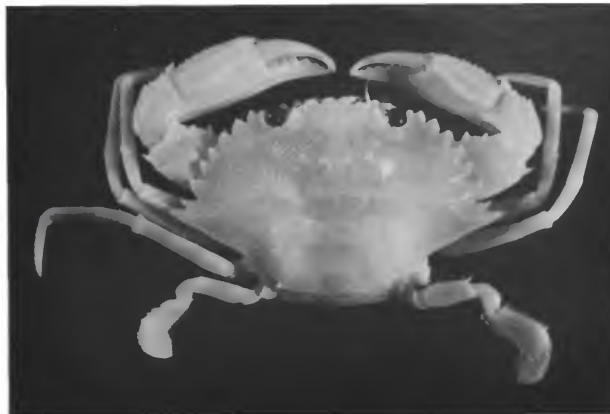


FIGURE 32.—*Laleonectes vocans*, female, carapace length 17.0 mm.

with red: second and third legs with 2 bands on merus, propodus, and dactylus, 1 on carpus; fourth leg with 3 bands on merus, 1 each on carpus and propodus, and 2 on dactylus; fifth leg with 1 band each on merus, carpus, and propodus.

HABITAT.—Sublittoral, between 6 and 58 meters.

REMARKS.—A search of the literature for references to *Portunus vocans* led us to the summary of stridulation in crabs by Guinot-Dumortier and Dumortier (1960:120, 121), who noted that *Portunus vocans* had been reported from Hawaii by Edmondson (1935). In 1954, Edmondson named *Portunus oahuensis*, based on the same specimen, a male, cl 6 mm. Edmondson remarked that the presence of a stridulating apparatus had in part led him to identify his specimen with *Portunus vocans*, the only other member of the genus *Portunus* known to have a stridulating apparatus. Earlier, Sakai (1938) had named another species with a stridulating ridge as *Neptunus nipponensis*, based on a male, cl 31 mm, from Japan.

We have compared our specimens of *L. vocans* from Ascension, as well as other specimens in the Smithsonian Institution collections (from Belize and six localities in the Antilles), including those reported by Rathbun, 1930, and a male from Kapingamarangi Atoll, Pacific Ocean, with the accounts of *P. nipponensis* and *P. oahuensis* as well as with specimens from the Pacific. We can find no major differences in morphology, but Atlantic specimens have two spines and a tubercle on the merus of the cheliped, whereas Pacific specimens have three spines. There is also a difference in size. The largest Atlantic specimen is 22 mm long, whereas the largest specimen from the Indo-West Pacific is a male, cl 39.2 mm, from Reunion Island (Crosnier and Thomassin, 1975). A large series from Atlantic and Pacific localities might show that the two species are conspecific.

Sakai (1939:396) listed six differences between *P. nipponensis* and *P. vocans*, as follows:

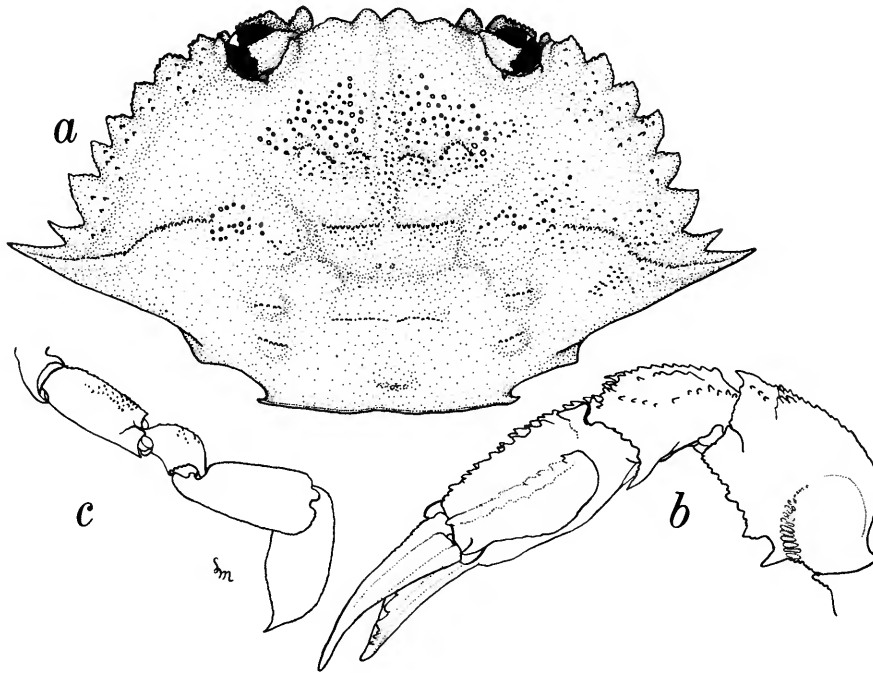


FIGURE 33.—*Laleonectes vocans*, female, carapace length 17.0 mm: *a*, carapace; *b*, cheliped, dorsal view; *c*, 5th pereopod.

1. "The carapace with its antero-lateral borders not so broadened posteriorly." In Sakai's figure (1939, fig. 6) the anterolateral border of the carapace forms an arc with its center on the cardiac region, as in our large female from Ascension, in Rathbun's figured specimen (1930, fig. 8), and in the type of *Neptunus vocans*, figured by A. Milne Edwards and Bouvier (1900, pl. 14: fig. 6) (reproduced in Rathbun, 1930, pl. 25: fig. 3).

2. "The antero-lateral teeth are basally very broad and not so acuminate as in that species [*vocans*]." The seventh and eighth teeth are sharp in the specimen from Reunion Island figured by Crosnier and Thomassin (1975, fig. 5c). As shown by Edmondson (1954, fig. 7a) for *P. oahuensis* and by Rathbun (1930, fig. 8) for *P. vocans*, the anterolateral teeth are sharper in smaller specimens. In general, the second through the fourth teeth are blunter than the fifth through the eighth.

3. "The cardiac region is not distinctly ridged." The ridges are shown by Sakai (1939, fig. 6) in his second account of *P. nipponensis*. Edmondson (1935:26) reported that the type of *P. oahuensis* had "an elevated ridge extending transversely across the cardiac region with a tubercle at either end." The ridges also are shown by Serène (1971, fig. A) in a specimen from Borneo and by Crosnier and Thomassin (1975, fig. 5c) in a specimen from Reunion Island; both of these latter specimens had been identified with *P. nipponensis*.

4. "The epibranchial ridges are more strongly curved forwards." These ridges are more strongly curved in Sakai's figure (1939, fig. 6) than shown in the figures given by Monod (1956, fig. 222) or Rathbun (1930, fig. 8), but they are less curved than in the figures given by Serène (1971, fig. A) and Crosnier and Thomassin (1975, fig. 5c). They appear to be more curved in our larger specimens than in our smaller ones; the ridges in our smaller specimens resemble those shown by Edmondson (1954, fig. 20a) for the type of *P. oahuensis*.

5. "The arm has three spines on anterior border instead of two." All of our specimens have two spines and a tubercle on the arm, as described by Rathbun (1930:61) and as figured by Edmondson (1954, fig. 7d) for a juvenile and Serène (1971, fig. C) for a female 24 mm long. The distalmost tubercle on Serène's specimen is larger than that in Atlantic specimens.

6. "Each stria of the stridulating organ of the arm is interrupted in the middle instead of being entire." It is interrupted in all of our specimens. Sakai (1938) reported 22-26 striae on the carapace of the type of *Neptunus nipponensis*, and Rathbun (1930) observed 24 in her Atlantic specimens. Our specimens from Ascension have 24.

Only one of the differences originally pointed out by Sakai can be used to separate the Indo-West Pacific and the Atlantic populations, the presence of three spines on the merus of the cheliped in the Indo-West Pacific population, two spines and a

tubercle in the Atlantic population. Material from all areas share the four large tubercles on the gastric region and the spined posterolateral angles of the carapace.

Although Stephenson (1972a:41; 1972b:137) commented that *Portunus nipponensis* was the only Indo-West Pacific species of *Portunus* to have a stridulating ridge on the ventral surface of the carapace, Edmondson (1935, fig. 7b; 1954, fig. 20b) clearly showed the ridge in his specimen from Hawaii, and Stephenson and Campbell (1959:90) and Stephenson (1972a:15) used this character to distinguish *P. oahuensis* in their key.

There is a striking similarity between the color pattern shown by Sakai (1976, pl. 119: fig. 3) for a specimens from Japan and that shown by our material from Ascension. The pattern appears to be identical, with the legs banded with red, the carapace marked with red spots, and the paired round spots on the cardiac region.

We believe that *Neptunus nipponensis* Sakai, 1938 and *Portunus oahuensis* Edmondson, 1954 are synonyms. Sakai (1938), Serène (1971), and Crosnier and Thomassin (1975) already have suggested that *P. oahuensis* is a synonym of *P. nipponensis*. In Edmondson's first account of the species (1935) he identified his material as *Portunus vocans*, and the specimen reported by Serène (1971) was originally identified as *Portunus vocans*, possibly by M.W.F. Tweedie.

Our larger specimens from Ascension have shorter lateral spines on the carapace than is found in other specimens from the Atlantic. On the larger Ascension specimens, the length of the lateral spine of the carapace is less than the width of the two adjacent teeth. In our western Atlantic specimens, the length of the lateral spine is equal to or just less than the width of the three adjacent teeth.

The length of the lateral spine in the type is exaggerated in the figure of the type given by A. Milne Edwards and Bouvier (1900, pl. 14: figs. 6, 7), where it is shown to be as long as the width of four adjacent spines. The carapace of the type was figured by Monod (1956, figs. 222, 223), and the lateral spine is shorter than the width of three adjacent spines.

This species was reported from Ascension by Rathbun (1930).

DISTRIBUTION.—Amphi-Atlantic; western Atlantic from localities between Cuba, Mexico, and the Caribbean; eastern Atlantic from Madeira, the Cape Verde Islands, São Tomé, and Annobon; and central Atlantic from Ascension; in depths to 309 meters.

In the Indo-Pacific *Laeonectes nipponensis* is known from Japan (Sakai, 1938, 1939, 1976), Hawaii (Edmondson, 1935, 1954), Borneo (Serène, 1971), Indonesia (Stephenson, 1972b), Reunion Island (Crosnier and Thomassin, 1975); in depths to 250 meters.

Portunus anceps (De Saussure, 1857)

FIGURE 34

Lupea anceps De Saussure, 1857:502.

Portunus (Portunus) anceps.—Williams, 1984:387, fig. 302.

MATERIAL.—*Manning 1971 Collection*: Sta ASC-22, McArthur Point: 1 male [8.0].

Smithsonian 1976 Collection: Sta 8-76, McArthur Point: 2 males [10.5–11.7], 1 ovig. female [11.4].

Other Collections: Ascension Island: 1 dry female [12.0] (BMNH).—Olson (1970), McArthur Point, sandy bottom tide pool: 2 males [7.3–10.7], 1 female [10.1].

COLOR.—Background color off-white, carapace with some brown mottling; lateral spine of carapace with brown spot at midlength; cheliped with brown spot dorsally at distal two-thirds, smaller spot distally; carpus, propodus, and basal third of dactylus of cheliped each with brown spot; merus, carpus, and propodus of walking legs with brown spot near midlength; distal segment of fifth leg white.

SIZE.—Carapace lengths of males, 7.3–11.7 mm; of females, 10.1–12.0 mm; of ovigerous female, 11.4 mm.

HABITAT.—In protected tide pool with coarse sand bottom.

REMARKS.—These specimens agree in all important respects with other material of this species in the Smithsonian Institution collections. The Ascension specimens appear to be smoother dorsally, with the gastric ridges and the regions of the carapace less well-marked; the submedian frontal teeth are comparatively larger.

This species has not been recorded previously from Ascension.

DISTRIBUTION.—Western Atlantic from Bermuda and North Carolina to Brazil; central Atlantic from Ascension; usually in shallow water, to 20 meters.

Family GONEPLACIDAE

Acidops cessacii (A. Milne Edwards, 1878)

Epimelus Cessacii A. Milne Edwards, 1878:227.

Acidops cessaci.—Monod, 1956:359, figs. 469, 470.

Acidops cessacii.—Manning and Holthuis, 1981:165.

MATERIAL.—*Smithsonian 1976 Collection*: Sta 5A-76, Shelly Beach: 5 males [5.4–8.3], 9 females [6.2–12.4], 1 ovig. [12.3].

Grice Marine Biological Laboratory Collection: Sta 80-41, English Bay, tide pool: 1 specimen.

Operation Origin: Site 6, White Rock, from underside of stone, 10 m: 1 male [11.4].

Other Collections: Jourdan (1977), Long Beach: 1 female [11.8].—Jourdan, English Bay, 20–40 ft (6–12 m): 1 female [12.1].—McDowell, Boatwainbird [Bosunbird] Island, under rocks, 30–40 ft (8–12 m): 1 male [13.2], 1 female [11.5].

SIZE.—Carapace lengths of males, 5.4–13.2 mm; of females, 6.2–12.4 mm; of ovigerous female, 12.3 mm.

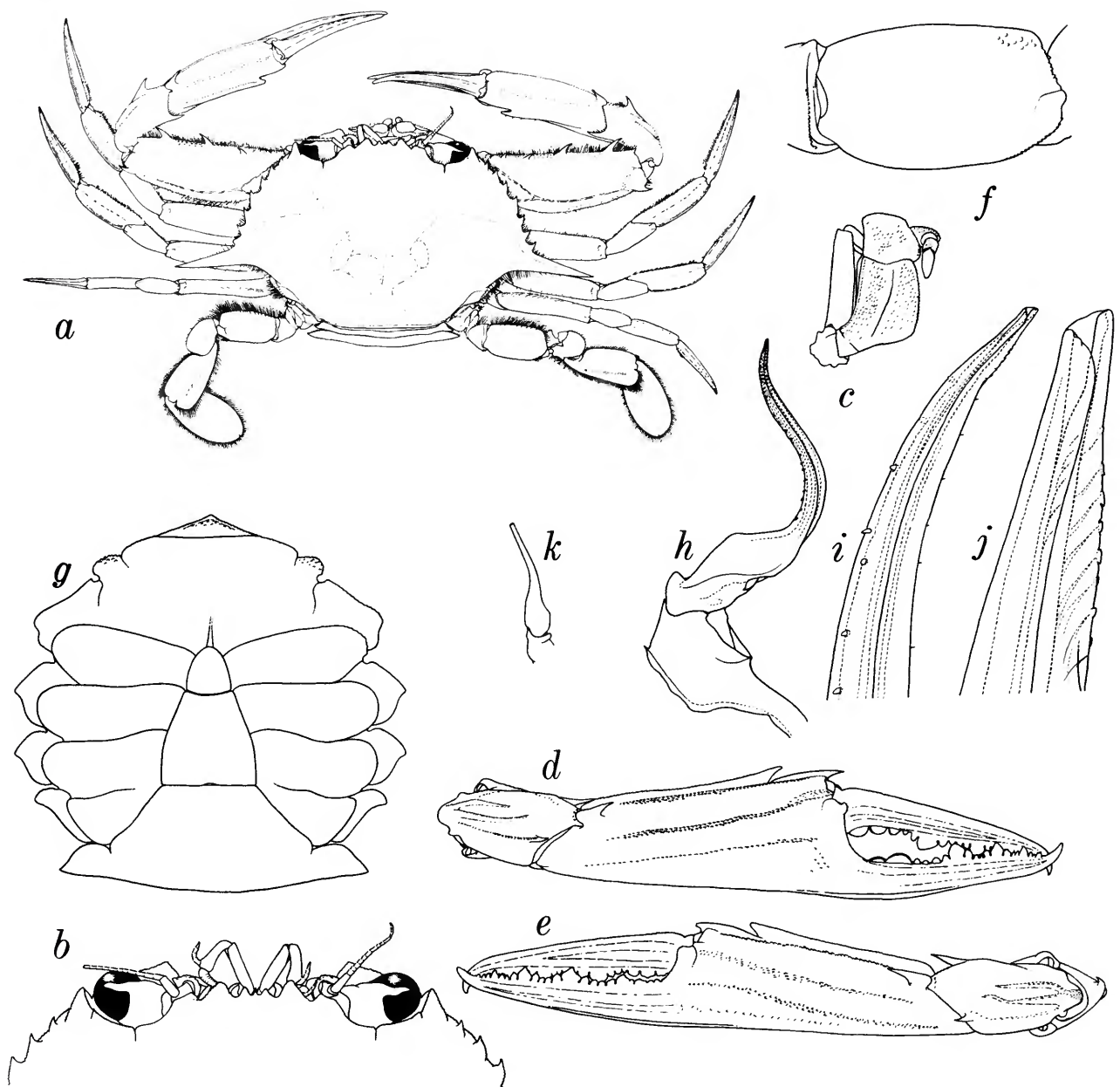


FIGURE 34.—*Portunus anceps*, male, carapace length 10.7 mm: *a*, dorsal view; *b*, front; *c*, 3rd maxilliped; *d*, right 1st pereopod, extensor face; *e*, left 1st pereopod, extensor face; *f*, merus of right 1st pereopod; *g*, sternum and abdomen; *h*, 1st pleopod, posterior view; *i*, apex of 1st pleopod; *j*, apex of 2nd pleopod; *k*, 2nd pleopod, posterior view.

HABITAT.—Intertidal and shallow subtidal, in tide pools or under rocks.

DISTRIBUTION.—West Africa from the Cape Verde Islands,

Senegal, and the offshore islands of the Gulf of Guinea; now from Ascension in the central Atlantic; shore to 10–30 meters.

Family Xanthidae

Cataleptodius olsoni, new species

FIGURE 35

MATERIAL.—*Manning 1971 Collection*: Sta ASC-5, North East Bay: 5 males [2.4–3.6], 8 females [2.8–4.7], 4 ovig. [2.8–4.7].—Sta ASC-8, English Bay: 2 males [3.0–5.0], 3 ovig. females [3.1–4.2] (larger male, cl 5.0, is holotype, USNM 221887).—Sta ASC-11, English Bay: 4 males [2.6–3.8], 7 females [3.0–4.2], 3 ovig. [3.0–3.9], 10 juveniles [1.8–2.4].—Sta ASC-12, McArthur Point: 10 males [2.1–3.2], 5 females [2.3–4.3], 3 ovig. [3.1–3.7], 5 juveniles [1.4–2.1].—Sta ASC-13, Georgetown: 9 males [2.4–3.9], 9 females [2.3–5.0], 3 ovig. [3.5–5.0], 8 juveniles [1.6–2.1].—Sta ASC-14, south of Collyer Point: 1 male [3.2].—Sta ASC-15, English Bay: 4 males [2.6–2.7], 2 females [3.2–3.5], 1 ovig. [3.2], 3 juveniles [1.7–2.2].—Sta ASC-21, English Bay: 2 males [2.8–3.0], 8 females [2.7–3.7], 4 ovig. [3.4–3.7], 5 juveniles [1.8–2.5].

Smithsonian 1976 Collection: Sta 1B-76, McArthur Point: 5 females [3.5–4.0], 1 ovig. [4.5].—Sta 1C-76, McArthur Point: 1 male [2.9], 2 females [2.7–3.2], 5 juveniles [2.2].—Sta 3A-76, English Bay: 1 male [3.2].—Sta 3C-76, English Bay: 3 females [3.3–3.6], 1 juvenile [2.0].—Sta 3D-76, English Bay: 1 male [2.4].—Sta 5A-76, Shelly Beach: 1 female [4.2].—Sta 5D-76, Shelly Beach, coral pool: 2 males [2.6–2.8], 3 females [3.7–4.8], 3 juveniles [1.4–1.8].

Grice Marine Biological Laboratory Collection: Sta 80-27, North East Bay, tide pool: 2 males [3.0–4.3], 1 ovig. female [3.2], 3 juveniles [1.3–2.1].—Sta 80-41, English Bay, tide pool: exuvium of female [3.0].

Operation Origin: Site 9, Kettle Cove, out of *Lithothamnion* nodules, 10 m: 1 male [3.0].

DESCRIPTION.—Carapace (Figure 35a) about 1½ times broader than long in adults, inflated, convex from front to back, completely covered with low granules visible under magnification. Areas of carapace poorly indicated, especially posteriorly, dorsal surface almost smooth in some specimens, grooves very shallow, no distinct ridges present. Front sinuous, incised medially, distinctly double-edged. All 5 anterolateral teeth very low, obtuse, poorly defined, separated by shallow emarginations. Lower margin of orbit (Figure 35b) evenly curved, with low, rounded inner tooth.

Chelipeds (Figure 35c,d) slightly unequal, granulate dorsally and on outer surface of palm, lacking distinct ridges, spines, or pits and grooves. Black color of immovable finger continued backwards on palm. Tips of all fingers spooned (Figure 35f, g).

Abdomen of male (Figure 35e) with segments 3–5 fused. Gonopod as illustrated (Figure 35f, g).

SIZE.—Carapace lengths of males, 2.1–5.0 mm; of females, 2.3–5.0 mm; of ovigerous females, 2.8–5.0 mm; of juveniles, 1.3–2.5 mm.

HABITAT.—Intertidal in tide pools, associated with rocks or

in clumps of coralline algae; also taken in the coral pool at Shelly Beach.

REMARKS.—Guinot (1968:704) established *Cataleptodius* for four American/West African species formerly placed in *Leptodius*, namely: *C. floridanus* (Gibbes, 1850), from both sides of the Atlantic, and three species from the eastern Pacific, *C. occidentalis* (Stimpson, 1871)(b), *C. snodgrassi* (Rathbun, 1902), and *C. taboganus* (Rathbun, 1912). *Cataleptodius olsoni* can be distinguished from all of these species by its much smoother carapace and chelipeds. The carapace in *C. olsoni* has the regions and the anterolateral teeth much less well defined than in any of the other species of the genus. Further, the chelipeds of *C. olsoni* appear to be much smoother than in other species, even though they are completely pebbled with low granules not visible to the naked eye.

The gonopod of *C. olsoni* differs from that of the only other Atlantic species of the genus, *C. floridanus*, in having a short, rounded apical projection extending beyond the subterminal field of spines and long setae.

Cataleptodius olsoni, with a maximum carapace length of 5 mm, is a much smaller species than any of the other species of the genus. Rathbun (1930) reported a male of *C. floridanus* with a carapace length of 22 mm.

ETYMOLOGY.—We dedicate this species to our Smithsonian colleague Storrs L. Olson, whose name we misspelled in our 1972 reports on shrimps from marine pools, and whose collections of crustaceans from Ascension led to this study.

Domecia acanthophora (Schramm, 1867)

Neleus acanthophorus Schramm, 1867:35.

Domecia acanthophora.—Holthuis, Edwards, and Lubbock, 1980:38.

MATERIAL.—*Smithsonian 1976 Collection*: Sta 3D-76, English Bay: 1 female [3.5].

Operation Origin: Site 9, Kettle Cove, from underside of a boulder, 25 m: 1 female [2.6].

SIZE.—Carapace lengths of females, 2.6–3.5 mm.

HABITAT.—Intertidal, in rocks, and from underside of a boulder in 25 meters.

REMARKS.—Our specimens are too small to determine whether they can be identified with the western Atlantic *D. acanthophora acanthophora* (Schramm, 1867) (treated by Williams, 1984:417) or the eastern Atlantic *D. acanthophora africana* Guinot, 1964, treated by Manning and Holthuis (1981:122). Their small size may suggest that they belong to the West African form, which does not exceed 8 mm in width (Guinot, 1964:275).

DISTRIBUTION.—The nominate subspecies is known from Bermuda to Brazil; the West African subspecies is known from the Cape Verde Islands and the offshore islands of the Gulf of Guinea; from shore to 35–55 meters.

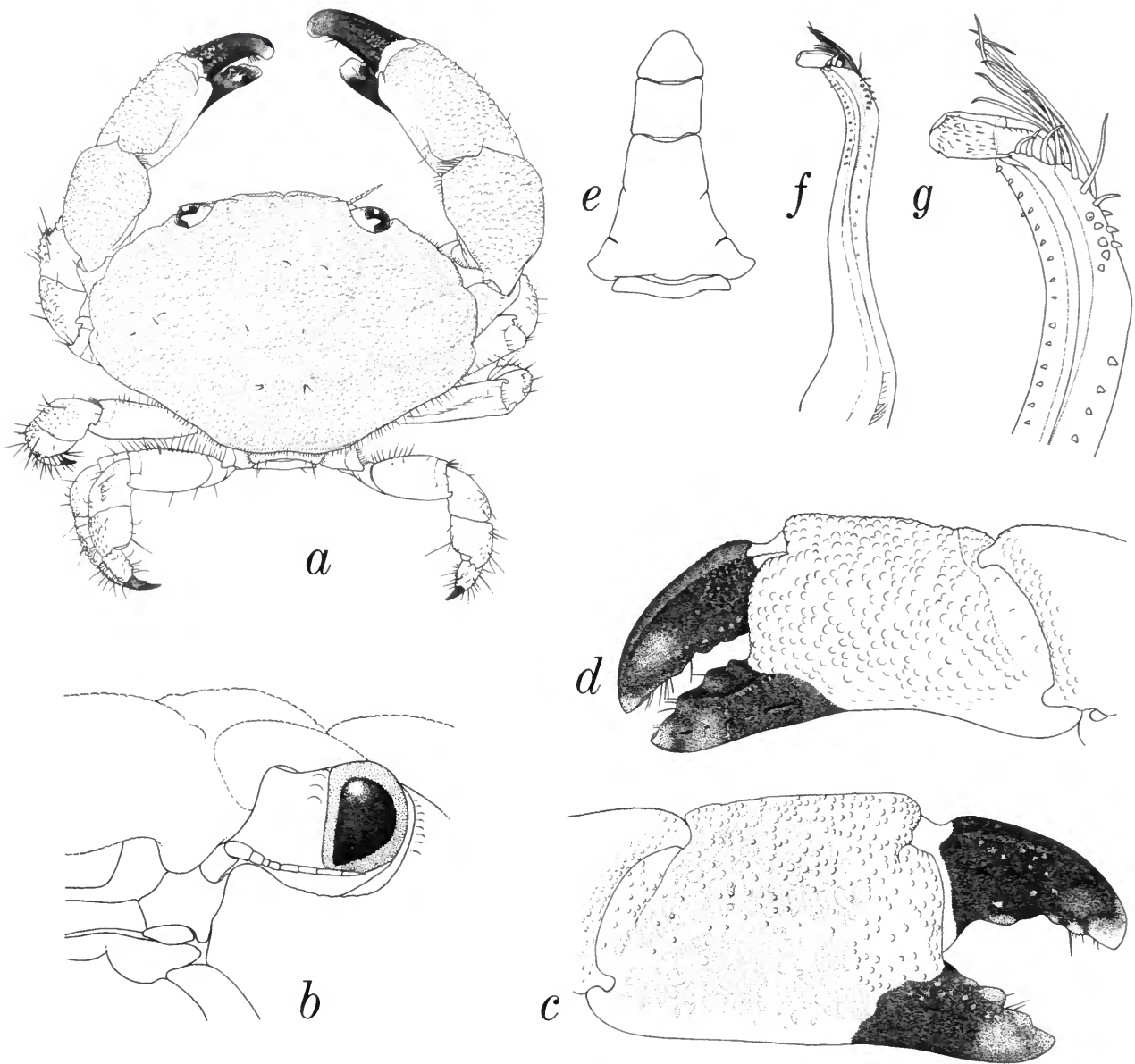


FIGURE 35.—*Cataleptodius olsoni*, new species, male holotype, carapace length 5.0 mm: *a*, dorsal view; *b*, left orbital region, anteroventral aspect; *c*, major 1st pereopod; *d*, minor 1st pereopod; *e*, abdomen; *f*, right 1st pleopod, mesial aspect; *g*, apex of right 1st pleopod.

***Euryozius sanguineus* (Linnaeus, 1771)**

FIGURE 36

Cancer sanguineus Linnaeus, 1771:542.—Herbst, 1785:188.—Fabricius, 1787:318.—Stadius Müller, 1789:345.—Gmelin, 1789[?]:2970; 1790:2970.—Olivier, 1791:159.—Gmelin, 1793:471.—Fabricius,

1793:447.

Cancer Sanguineus.—Turton, 1806:741.

orange-red colored crab.—Melliss, 1875:206, pl. 22: fig. 3.

Pseudozium Mellissi Miers, 1881b:432.

Pseudozium bouvieri var. *mellissii*—Miers, 1886:143, pl. 12: fig. 3.

Pseudozium bouvieri.—Chace, 1966:625, footnote [not *Xantho Bouvieri* A. Milne Edwards, 1869].

Euryozius sanguineus.—Holthuis, Edwards, and Lubbock, 1980:38.—Manning and Holthuis, 1981:124, 129, fig. 27*f-i*.

MATERIAL.—*Smithsonian 1976 Collection*: Sta 7-76, off Collyer Point: 2 males [17.1–28.6].

Operation Origin: Site 9, Kettle Cove, 20 m: exuvium of male [20.9].—Site 11, Pyramid Point, 12 m: exuvium of female [11.0].

Other Collections: Jourdan, English Bay, 20–40 ft (6–12 m): 1 male [25.1].—Jourdan (1976), English Bay, under rocks, 20 ft (6 m): 1 male [6.4].—McDowell (1985), English Bay, under rocks, 60 ft (33 m): 1 male [24.3].—Jourdan (1976), off Collyer Point, diving: 1 male [11.7].—McDowell, Boat-swainbird (Bosunbird), under rock, 30–40 ft (9–12 m): 1 female [23.8].

SIZE.—Carapace lengths of males, 6.4–28.6 mm; of females, 11.0–23.8 mm. Miers (1881b) studied males with carapace lengths of 25 and 35.5 mm.

COLOR.—Uniform orange-red dorsally; walking legs with lighter bands; fingers of chelipeds black.

HABITAT.—Sublittoral, under rocks, in 6 to 33 meters.

REMARKS.—This species was described from Ascension and has been recorded from there by Linnaeus (1771), Miers (1881b, 1886), and Manning and Holthuis (1981), from St.

Helena by Melliss (1875) and Miers (1881b, 1886), and from St. Paul's Rocks by Holthuis, Edwards, and Lubbock (1980).

L.B. Holthuis, who provided all of the early references, has pointed out (in litt.) that all records of *Cancer sanguineus* in the literature, except for those of Fabricius, are based on the 1771 record in Linnaeus. Fabricius saw material in the Banks collection, but did not specifically mention Ascension in his accounts. In 1798 Fabricius omitted the name from his *Supplementum Entomologiae Systematicae*, as did other French authors in subsequent publications (Lamarck, Bosc, Latreille, and H. Milne Edwards); the name disappeared from the literature.

Manning and Holthuis (1981:124, 128) erroneously attributed this species to Linnaeus (1767).

DISTRIBUTION.—Known only from Ascension, St. Helena, and St. Paul's Rocks; subtidal.

Microcassiope minor (Dana, 1852)

Xantho minor Dana, 1852b:169; atlas, 1855, pl. 8: fig. 7.—Türkay, 1986:13, figs. 1–3.

Micropanope rufopunctata.—Monod, 1956:313, figs. 386–392.—Chace, 1966:639, fig. 8.

Microcassiope minor.—Manning and Holthuis, 1981:138, fig. 30.

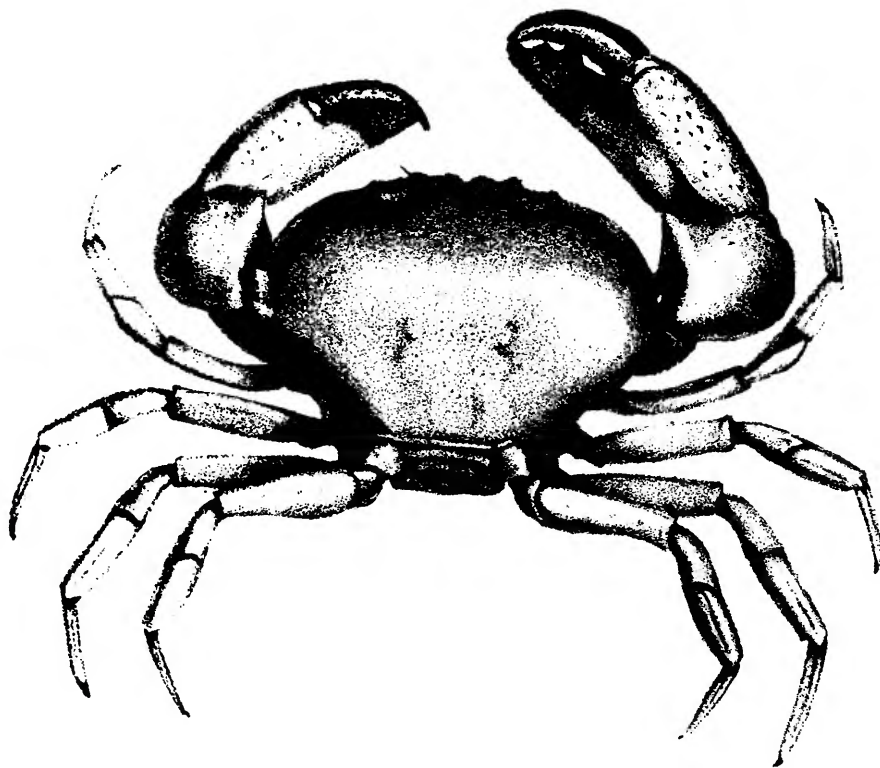


FIGURE 36.—*Euryozius sanguineus*, female, carapace length 25 mm. (From Miers, 1886, pl. 12, fig. 3.)

MATERIAL.—*Manning 1971 Collection*: Sta ASC-8, English Bay: 1 ovig. female [6.4], 2 juveniles [1.1].—Sta ASC-11, English Bay: 1 male [2.6], 3 females [5.2–5.6], 2 ovig. [5.2–5.4], 3 juveniles [1.2–2.1].—Sta ASC-12, McArthur Point: 1 male [5.0], 1 female [3.0], 2 juveniles [1.4–1.6].—Sta ASC-13, Georgetown: 3 males [2.8–3.4], 2 juveniles [1.8–1.9].—Sta ASC-15, English Bay: 2 males [3.4–4.1], 2 females [3.1–3.5], 6 juveniles [1.0–1.5].—Sta ASC-18, Shelly Beach: 1 male [3.9].—Sta ASC-21, English Bay: 1 male [2.7].

Smithsonian 1976 Collection: Sta 1C-76, McArthur Point: 1 male [3.0], 2 females [3.2–3.6].—Sta 3C-76, English Bay: 1 male [4.0], 1 female [4.0].

Grice Marine Biological Laboratory Collection: Sta 80-68, off Pyramid Point, 27 m: 1 ovig. female [2.2].

Other Collections: Ascension, U.S. Eclipse Expedition to West Africa, 1889–1890: 1 juvenile [1.9].—Ascension: 1 dry specimen [4.5] (BMNH 59.118).

SIZE.—Carapace lengths of males, 2.6–5.0 mm; of females, 2.2–6.4 mm; of ovigerous females, 2.2–6.4 mm; of juveniles, 1.0–2.1 mm.

HABITAT.—Intertidal to 27 meters, in coralline and filamentous algae mats, sabellariid worm colonies, and in tide pools.

REMARKS.—This species has not been recorded previously from Ascension.

Türkay (1986) designated a neotype for this species from the Cape Verde Islands.

DISTRIBUTION.—Amphi-Atlantic; eastern Atlantic from western Mediterranean Sea and West Africa from Azores to the Gulf of Guinea; central Atlantic from Ascension and St. Helena islands; western Atlantic from the Bahamas to Venezuela; intertidal to ~220 meters.

Nannocassiope melanodactylus (A. Milne Edwards, 1867)

Xanthodes melanodactylus A. Milne Edwards, 1867:39, pl. 21 bis: figs. 1, 2.—Miers, 1881b:432.

Xantho melanodactylus.—Ortmann, 1893:56.

Xanthias melanodactylus.—Rathbun, 1900:287.

Micropanope melanodactyla.—Monod, 1956:320, figs. 401–405.

Micropanope melanodactylus.—Chace, 1966:637, fig. 7.

Nannocassiope melanodactyla.—Manning and Holthuis, 1981:143.

MATERIAL.—*Operation Origin*: Site 9, Kettle Cove, from under a boulder, 17 m: 1 male [4.1]; from underside of boulder, 8 m: 2 males [4.2–5.1].—Site 11, Pyramid Point, from underside of small stone, 12 m: 1 male [5.0].—Site 12, Catherine Point, in sponge sample, 16 m: 2 males [2.7–3.4].—Site 20, south of White Rock Cove, in rock/lithothamnion sample, 15–20 m: 1 male [2.6].

Other Collections: Ascension: 1 male [3.2] (BMNH 81.27).—U.S. Eclipse Expedition to West Africa, 1889–1890, 25 Mar 1890, 20–30 fm (37–55 m): 1 male [4.9].

SIZE.—Carapace lengths of males, 2.6–5.1 mm.

HABITAT.—Sublittoral, associated with rocks, coralline algae, and sponges, in depths to 55 meters. Ortmann's (1893) specimens were collected in 20, 120, and 240 meters.

REMARKS.—This species has been recorded from Ascension by Miers (1881b), Ortmann (1893), and Rathbun (1900).

DISTRIBUTION.—Eastern Atlantic from the Azores to Angola; central Atlantic from Ascension and St. Helena islands; and eastern Pacific from Baja California, Mexico, Cocos Island, and the Galapagos Islands; intertidal to more than 600 meters.

Panopeus hartii Smith, 1869

FIGURES 37,38

Panopeus Hartii Smith, 1869a:280; 1869b:5,34, pl. 1: fig. 5.

Panopeus hartii.—Rathbun, 1930:355, pl. 164: figs. 1, 2, 5.—Fausto Filho, 1974:13.

MATERIAL.—*Manning 1971 Collection*: Sta ASC-8, English Bay: 1 ovig. female [7.0].—Sta ASC-10, English Bay: 5 males [4.9–7.0], 5 females [4.1–5.7], 3 ovig. [4.1–5.7].—Sta ASC-11, English Bay: 2 males [5.2–8.6], 1 ovig. female [7.5].—Sta ASC-12, McArthur Point: 1 male [5.0], 1 female [3.0].—Sta ASC-15, English Bay: 5 males [3.6–7.0], 2 ovig. females [4.3–5.6], 12 juveniles [1.8–3.0].

Smithsonian 1976 Collection: Sta 3A-76, English Bay: 5 males [2.7–7.0], 4 females [2.6–6.4].—Sta 5A-76, Shelly Beach: 5 males [3.5–6.8], 6 females [4.0–5.7].—Sta 9C-76, North East Bay: 1 female [5.0].

Grice Marine Biological Laboratory Collection: Sta 80-41, English Bay, tide pool: 3 males [3.1–7.5], 3 females [4.0–7.0], 1 ovig. [6.5].—Sta 80-43, English Bay, tide pools: 2 males [4.5–6.3], 1 female [4.0].

SIZE.—Carapace lengths of males, 2.7–8.6 mm; of females, 2.6–7.5 mm; of ovigerous females, 4.1–7.5 mm; of juveniles, 1.8–3.0 mm.

HABITAT.—Intertidal, in tide pools.

REMARKS.—This species, originally described from stone reefs off Brazil, has not been recorded previously from Ascension.

Several specimens had a distinct red spot on the inner surface of the third maxillipeds.

Figures of the gonopods of several other species of *Panopeus* and of members of related genera are given by Martin and Abele (1986) and Williams (1984).

DISTRIBUTION.—Western Atlantic from Florida to Brazil, including Fernando de Noronha; central Atlantic from Ascension; shore.

Paractaea rufopunctata africana Guinot, 1969

FIGURE 39

Actaea rufopunctata.—Benedict, 1893:536.

Actaea rufopunctata nodosa.—Rathbun, 1925:257 [part].

Paractaea rufopunctata forme *africana* Guinot, 1969:251, fig. 26.

Paractaea rufopunctata africana.—Guinot, 1976:250, pl. 16: fig. 5.—Manning and Holthuis, 1981:150.

MATERIAL.—*Smithsonian 1976 Collection*: Sta 1B-76,

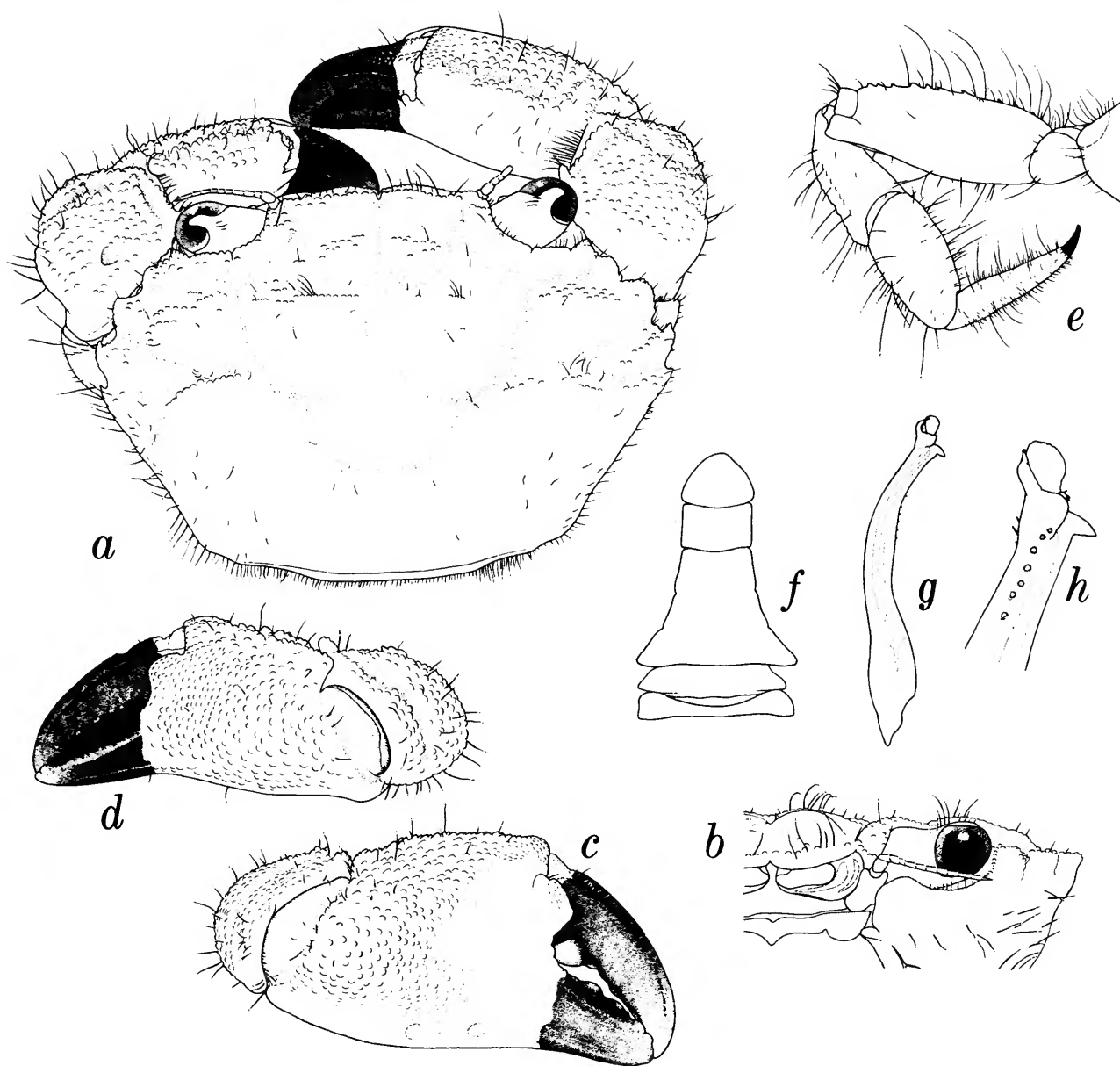


FIGURE 37.—*Panopeus hartii*, *a-e*, ovigerous female, carapace length 4.3 mm; *f-h*, male, carapace length 3.6 mm: *a*, dorsal view; *b*, left orbital region, anteroventral aspect; *c*, chela and carpus of right (major) 1st pereopod; *d*, chela and carpus of left (minor) 1st pereopod; *e*, 4th pereopod; *f*, abdomen; *g*, right 1st pleopod, mesial aspect; *h*, right 1st pleopod, posteromesial aspect.

McArthur Point: 1 male [5.1].—Sta IC-76, McArthur Point: 2 females [10.0–10.3].

Other Collections: U.S. Eclipse Expedition to West Africa, 1889–1890, Ascension Island: 1 male [4.2].—McDowell, British Pol, midway between North Point and Pyramid Point, 60 ft [18 m]: 1 female [9.4].—Jourdan (1976), English Bay,

under rocks, 20 ft [6 m]: 1 male [11.4].

SIZE.—Carapace lengths of males, 4.2–11.4 mm; of females, 9.4–10.3 mm.

COLOR.—Mottled red and whitish, darker in grooves between elevations; walking legs banded; movable finger of chelae brown.

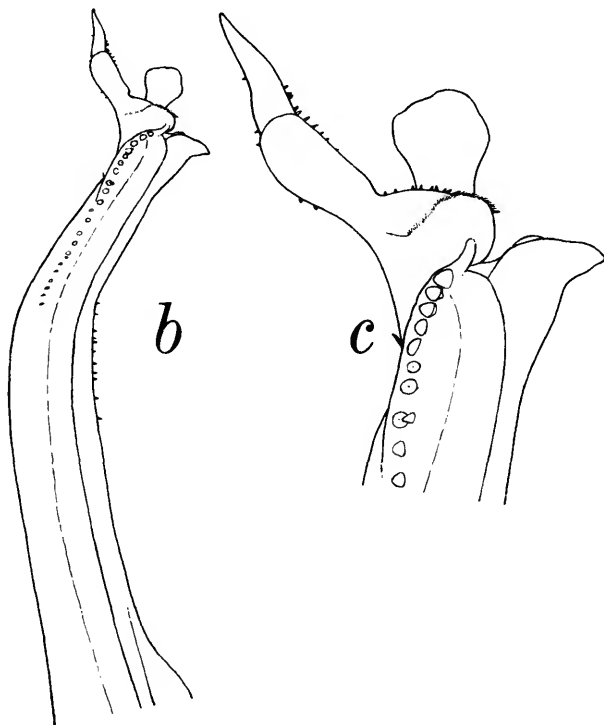
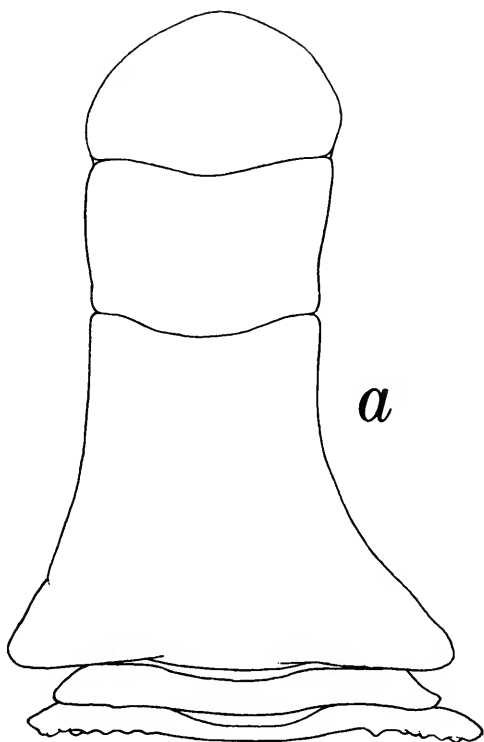


FIGURE 38.—*Panopeus hartii*, male, carapace length 8.6 mm: a, abdomen; b, right 1st pleopod, median aspect; c, apex of right 1st pleopod.



FIGURE 39.—*Paractaea rufopunctata africana*, female, carapace length 10.3 mm.

HABITAT.—In clumps of coralline algae or associated with rocks, shore to 18 meters.

REMARKS.—This species was reported from Ascension by Benedict (1893) and Rathbun (1925).

DISTRIBUTION.—West Africa from Cameroon and the offshore islands of the Gulf of Guinea; central Atlantic from Ascension; shore to about 45 meters.

***Platypodiella picta* (A. Milne Edwards, 1869)**

Lophactaea picta A. Milne Edwards, 1869:410.

Platypodia picta.—Monod, 1956:299, figs. 363–367.

Platypodiella picta.—Manning and Holthuis, 1981:155.

MATERIAL.—*Smithsonian 1976 Collection*: Sta 5A-76, Shelly Beach: 1 male [9.2].

Operation Origin: Site 31, Spire Rock, from zoanthid sample, 7 m: 1 juvenile [2.1].

SIZE.—Carapace length of male, 9.2 mm; of juvenile, 2.1 mm.

COLOR.—Elevations brown and grooves whitish; palm of chela with broad brown spot; walking legs banded with yellow-brown and off-white.

HABITAT.—In tide pools and associated with zoanthids in seven meters.

REMARKS.—The association of this species with zoanthids was reported by den Hartog and Holthuis (1984).

This species has not been recorded previously from Ascension.

DISTRIBUTION.—West Africa from the Canary Islands to the

Congo; central Atlantic from Ascension; littoral and shallow sublittoral, in less than 30 meters.

Xanthodius denticulatus (White, 1848)

FIGURE 40

Xantho denticulatus White, 1848:225.

Xanthodius denticulatus.—Rathbun, 1930:314, pl. 145: fig. 1, pl. 146.—Manning and Holthuis, 1981:157.—Holthuis, Edwards, and Lubbock, 1980:39.

Xantho (Xantho) denticulatus.—Monod, 1956:280, figs. 335–339.

MATERIAL.—Manning 1971 Collection: Sta ASC-10, English Bay: 2 females [5.7–11.0], 1 ovig. [11.0].—Sta ASC-12, McArthur Point: 1 male [5.5], 1 female [9.0], 1 juvenile [4.5].—Sta ASC-15, English Bay: 2 males [11.1–15.8], 2 females [8.4–9.6].—Sta ASC-18, Shelly Beach: 1 female [7.3].—Sta ASC-21, English Bay: 1 male [8.1], 1 juvenile [4.5].—Sta ASC-22, McArthur Point: 1 female [8.4].

Smithsonian 1976 Collection: Sta 1B-76, McArthur Point: 1 female [6.4].—Sta 1C-76, McArthur Point: 1 male [11.5].—Sta 3C-76, English Bay: 1 male [8.5], 1 female [7.5].—Sta 5A-76, Shelly Beach: 9 males [4.8–11.0], 8 females [5.1–12.6].—Sta 8-76, McArthur Point: 1 male [6.8], 1 female [11.0], 1 juvenile [4.5].

Grice Marine Biological Laboratory Collection: Sta 80-40, English Bay, 2–3 m: 3 females [6.2–7.9].

Operation Origin: Site 9, Kettle Cove, found underneath a

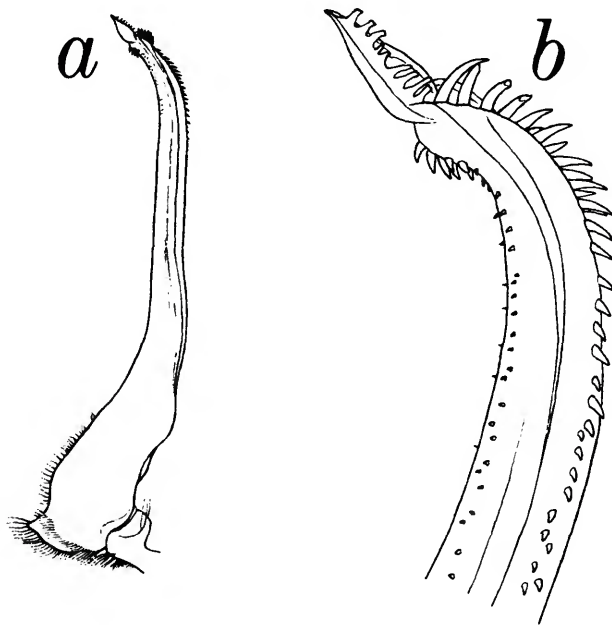


FIGURE 40.—*Xanthodius denticulatus*, male, carapace length 11.5 mm, 1st pleopod: a, posterior aspect; b, posteromesial aspect.

boulder, 17 m: 1 male [12.9].—Site 12, Catherine Point, found under a small boulder, 16 m: 1 male [11.2].

Other Collections: Ascension: 1 male [13.9] (BMNH 82.20).—Olson (1970), McArthur Point, sandy bottom tide pool: 3 females [9.0–10.3].—Jourdan (1976), English Bay, under rocks, 20 ft (6 m): 1 damaged male, 1 ovig. female [10.3].—Jourdan (1977), Long Beach: 1 male [14.2].

SIZE.—Carapace lengths of males, 4.8–15.8 mm; of females, 5.1–12.6 mm; of ovigerous females, 10.3–11.0 mm; of juveniles, 4.5 mm.

COLOR.—Variable, mottled gray and white, with large red spot in center of carapace; walking legs reddish; fingers of chelae black.

HABITAT.—Intertidal, associated with rocks or in clumps of coralline algae, and subtidal to 17 meters.

REMARKS.—This species has not been recorded previously from Ascension.

DISTRIBUTION.—Amphi-Atlantic; eastern Atlantic from Ghana and the offshore islands of the Gulf of Guinea; central Atlantic from Ascension and St. Paul's Rocks; and western Atlantic from the Bermudas and Bahamas to Brazil; intertidal to at least 21 meters.

Family GECARCINIDAE

Gecarcinus lagostoma H. Milne Edwards, 1837

FIGURE 41

Gecarcinus lagostoma H. Milne Edwards, 1837:27.—Ortmann, 1893:58.—Stebbing, 1914:254, 268.—Lenz and Strunck, 1914:285, 339.—Rathbun, 1918:361, figs. 164, 165, pls. 125, 126.—Packer, 1968:59.—Chace and Hobbs, 1969, fig. 67d.—Olson, 1973:6.—Packer, 1974:45.—Fausto Filho, 1974:20.—Fimpel, 1975:173, 177, 178, 183–185, 188, 195–206, 208, 209, 211.—Hartnoll, 1988:23, fig. 2.6.—Wolcott, 1988:68, 70, 83, 85, fig. 3.1.

Land crab [land-crab].—Darwin, 1871:492.—Wyville Thomson, 1878:229.—Moseley, 1892:487.—Wilton, Pirie, and Brown, 1908:80.—Stonehouse, 1960:17, 38, 39, 44, 82, 157, 174, fig. on p. 39.—Graham, 1969, colored fig. on p. 479.—Hart-Davis, 1972:3, 102, 105, 127, 128.

Gecarcinus lagostoma.—Drew, 1876:464.—Benedict, 1893:537.

Gecarcinus lagostoma (?).—Miers, 1886:218, pl. 18: fig. 2.

Telphusa.—Wilton, Pirie, and Brown, 1908, pl. 29: fig. 90.

Gecarcinus (Johngarthia) lagostoma.—Türkay, 1973:96, fig. 18, map 2.

MATERIAL.—Manning 1971 Collection: Sta ASC-4, Green Mountain: 5 males [66.5–75.6], 6 females [47.2–78.2].—Sta ASC-5, North East Bay: 1 male [77.5].—Sta ASC-6, Green Mountain: 1 male [37.7], 1 female [26.3].—Sta ASC-7, Green Mountain: 1 female [21.2].—Sta ASC-20, south of Collyer Point: 1 spent female [42.8], with larvae.

Other Collections: U.S. Eclipse Expedition, 1889–1890, Ascension Island, 21 Mar 1890: 1 male [70.0].—Meteor Expedition, Ascension Island, Henschel, 15 Sep 1926: 1 male [78.2] (SMF).—Ascension Island, Surgeon T. Conry, R.N.: 1 male [21.2], 1 juvenile [11.5] (BMNH 82-20).—Ascension Island, H.M.S. *Challenger*: 2 females [43.4–70.8] (BMNH 84-31).—Ascension Island, J.M. Keilor: 2 males [47.8–48.2]

(BMNH).—Ascension Island, altitude 1500–2300 ft [458–701 m], R. Brown: 5 males [36.8–57.9], 2 females [45.6–47.6] (BMNH 1967.10.4.1-7).—Mars Bay, R.G. Allan, British Ornithological Union, 28 Mar 1959: 1 dry male [36.7].—Sanatorium (at base of Green Mountain), R.G. Allan, British Ornithological Union, 17 May 1959: 1 dry female [38.6].—Green Mountain, A. Loveridge, 31 Aug 1963: 1 male [76.2], 1 female [73.8].—Georgetown, A. Loveridge, 12 May 1963: 12 dry juveniles [all ~3.5].

SIZE.—Carapace lengths of males 21.2–78.2 mm; of females, 21.2–78.2 mm; of spent female, 42.8 mm; of juveniles, ~3.5–11.5 mm.

COLOR.—As noted by both Packer (1968; 1974) and Stonehouse (1960), *Gecarcinus lagostoma* is represented on Ascension by two distinct color phases, one red or purple, the other yellow or orange. In the red phase the frontal, suborbital, and anterolateral margins are conspicuously granulated or tuberculated, whereas in the yellow phase these margins are usually smooth. Also, in the red phase the lateral margins of the front are more divergent and the anterolateral margins are sharper for a longer distance. All of the smaller specimens, including mature males and a spent female, are red, and most of the larger specimens are yellow. One large female, cl 76.7 mm, is in a transitional phase, being predominately yellow with red markings dorsally. Fausto Filho (1974:21) reported that on Fernando de Noronha “The color of the living individuals is dark red, brownish or yellow. The last color is seen more frequently in females.”

HABITAT.—On Ascension Island this species lives at higher elevations, especially on the wooded slopes of Green Mountain, where it was collected at altitudes of 1300–1600 ft (396–488 m) and 2558 ft (780 m). The crab has been observed all over the island, and was even collected on beaches.

Stonehouse (1960:174), in describing Cricket Valley, remarked: “The whole surface of the valley is dotted with land-crab burrows, each with a pile of ash arranged neatly before the entrance.”

Stebbing (1914:268) commented that two specimens were given to the *Scotia* collection by a Mr. Chalmers and that the *Scotia* also took a specimen at sta 507 (5–18 fathoms off Pyramid Point). This is obviously in error.

REMARKS.—Until recently (Türkay, 1970; 1973) this species was considered to have a wide distribution in the Atlantic and the Indo-West Pacific (see Rathbun, 1918). The original description of *G. lagostoma* was based on material donated by Quoy and Gaimard to the Muséum national d'Histoire naturelle, Paris. H. Milne Edwards (1837:27) gave “l'Australasie” as the type locality, but several authors, including Monod (1956), have pointed out that this locality is erroneous. During the voyage of the *Astrolabe*, expedition naturalists collected on Ascension Island in 1829, and several species of mollusks from their collection were described by Quoy and Gaimard (see Rosewater, 1975). Rathbun (1918) also included the Caribbean

island of Trinidad within the range of the species, but her specimen from that locality, correctly identified as *G. lagostoma*, had been mailed to the museum from Trinidad; where it was collected is unknown.

Miers (1886:218) doubtfully identified a small male, cl 32.5 mm, cb 39 mm, from Bermuda with this species. It certainly is a juvenile of *G. lateralis* (Fremenville, 1835). Rathbun (1918:355–356), in her account of *G. lateralis*, did not mention Miers's record, but, curiously, listed Ascension as within the range of *G. lateralis*. Miers's record from Bermuda was listed by Rathbun (1918:362) in her account of *G. lagostoma*, in which she recorded, with doubt, the species from Bermuda, noting (p. 362) “The writer has examined a subfossil specimen of a movable finger from the Bermudas.” In 1970 Türkay (1970: Verbreitungskarte 1) showed several Brazilian mainland localities as well as Caribbean Trinidad for the species. This map with the erroneous localities was reproduced in Hartnoll (1988, fig. 2.6). The mainland Brazilian localities were deleted from Türkay's later account (1973, map 2). *Gecarcinus lagostoma* is now known to occur only on oceanic islands in the south Atlantic.

Gecarcinus lagostoma had been recorded from West Africa by numerous authors (see Monod, 1956, for references). Now the West African *Gecarcinus* is referred to *G. weileri* (Sendler, 1912) (Türkay, 1973; Manning and Holthuis, 1981). Türkay (1973) referred both *G. lagostoma* and *G. weileri* to the subgenus *Johngarthia*.

Miers's (1886, pl. 18: fig. 2) figure of an adult female of this species was based on material from Ascension; it has been reproduced by Stebbing (1893, upper fig. on pl. 2), Zimmer (1927, fig. 218), and Monod (1956, fig. 619a), and is reproduced here as Figure 41. Other figures from Miers have been published by Rathbun (1918, fig. 164) and Monod (1956, fig. 619b–d).

Chace and Hobbs (1969, fig. 67d) figured the male pleopod. Relatively little is known about the biology of this species. Baylis (1915a; 1915b) described an oligochaete worm from the gill chambers of *G. lagostoma* from Ilha Trindade, Brazil, and noted (1915a:14): “The crabs in which the worms occurred were collected ... at 1,500–2,000 feet above sea line” and were “feeding on decaying vegetation and perhaps a certain amount of excreta from sea-birds” and (p. 14, footnote) “It is also worthy of notice that I found specimens of the same worm in individuals of *Gecarcinus lagostoma* collected in South Trinidad (a) by the ‘Discovery’ expedition and (b) by the late Major G.E.H. Barrett-Hamilton's expedition to South Georgia.”

Among the earliest observations on *G. lagostoma* from Ascension were those of Drew (1876:464, 465).

The Land-crab, found on the Island of Ascension, belongs, I believe, to the species *Geocarcinus lagostoma*; it inhabits the mountain-ridges, particularly on the weather-side of the island, owing perhaps to the greater amount of moisture found there. They burrow in holes, and are but seldom seen during the heat of

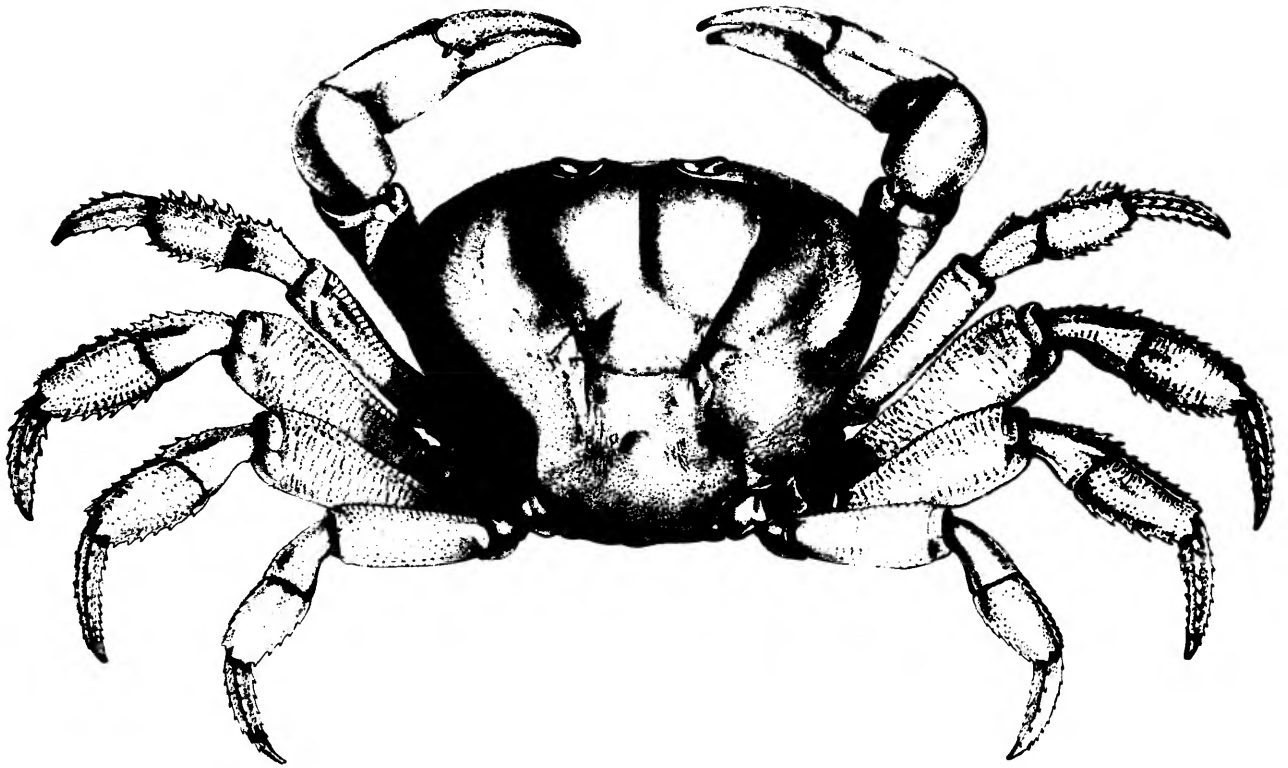


FIGURE 41.—*Gecarcinus lagostoma*, female, carapace length 71 mm. (From Miers, 1886, pl. 18: fig. 2.)

the day, except after dawn and on their return-journey from the sea, when they are easily killed. They commit great ravages on the island, destroying the eggs and young of the various kinds of game, besides the vegetation. The following incident came under my own observation:—While out shooting, a very young rabbit, which I wished to capture alive, crossed my path and retreated into a hole in the rock; at the bottom of the hole, and away from the reach of my arm, was a Land-crab, which, undismayed by my presence, pounced on the unhappy Rabbit and killed it before I could come to its rescue. The earliest records of the island tend to show that the Land-crabs have always been troublesome, as a reward was and is now given for their destruction. I have only observed them going to the sea during the months of February and March. Their journey to the sea is made only at night or towards evening; on their return they come at all times. I do not know at what season they cast their shells; but I am led to think, from the number of old ones I have seen, that it is soon after their return from the sea. They are but seldom eaten on the island, although when properly cooked they form no mean dish; but they are not of nearly so delicate a flavour as the West-Indian Land-Crab.

Darwin (1871:492; original account published in 1839) had reported that “Of native animals, land-crabs and rats swarm in numbers.” Marx (1975:42) commented that the English explorer, William Dampier, whose ship the *Roebuck* sank at Ascension in 1701, and his crew survived on “goat, turtles, land crabs, and sea birds.”

L.B. Holthuis supplied us with a reference to Spencer

(1981:252), who edited a recent reprint of the third edition (1727) of Dampier’s book, in which Dampier mentioned the occurrence of land crabs on the “high mountain” [= Green Mountain].

In the narrative of the *Scotia* voyage, Wilton, Pirie, and Brown (1908) showed a figure of *G. lagostoma* (as *Telphusa*) at an altitude of 2000 feet on Green Mountain (pl. 29: fig. 90), and commented (p. 80) that the land crab “does not appear to be a common animal on the island.”

Apparently the bounty offered for land crabs, rum or 6 pence per hundred for land crab claws, resulted in the destruction of many of them. Hart-Davis (1972:128) reported that:

These incentives produced a prodigious bag, which for 1879 included 66 cats, 7683 rats, 4013 mice and 80,414 land crabs...In January 1887 the Commandant gave the grand total of vermin killed in the past eight years: 580 cats, 70,148 rats, and the phenomenal number of 335,535 land crabs.

Moseley (1892:487), in his narrative of the visit of the *Challenger* to Ascension, reported that:

Land crabs swarm all over this barren and parched volcanic islet. They climb up to the very top of Green Mountain, and the larger ones steal the young rabbits from their holes and devour them. They all go down to the sea in the breeding season.

Moseley (1892:72) also remarked that "as far as I saw, Land-crabs ... are absent from Fernando Noronha."

Hart-Davis (1972:105), also mentioned that:

Crab hunting, too, was a fancied pastime, as Brandreth [Lt. H.R. Brandreth, Royal Engineers] reported. The dogs, he wrote, were specially trained to hunt the land crabs which are similar to those in the West Indies, and burrow high up in the mountain district. They are found crossing the tracks from hole to hole, with their claws bristling with defiance: the dog, when set on them, makes a spring, gives one crunch, and then tosses the mangled carcass away; but an occasional sharp howl indicates an unsuccessful attack, and that the crab has pinned his opponent by the nose. The land crab in the West Indies, after being penned up physicked fattened and dressed with divers condiments, is considered a delicacy. I endeavoured to persuade my friends at Ascension to introduce it among the island delicacies, but in vain.

Wyville Thomson (1878:228,229), in his account of the visit of the *Challenger* to Ascension, commented:

The wild quadrupeds and decapods, which may here be classed together, as their habits and propensities are very similar, are rats and land-crabs; both doing a great deal of damage in the gardens by destroying the roots of vegetables and fruit-trees. The rats kept out of the way during the day, but we often saw the crabs; and we were told to knock them on the head (or whatever answers that purpose) whenever we fell in with them.

John Packer, in his *Ascension Handbook* (1968:59; 1974:45) reported:

The yellow and purple land crabs (*Gecarcinus lagostoma*) were probably one of the very early colonizers of the new island. They return to the sea to breed, and lay eggs in sand or soft ash [??], and one of the puzzles about the Ascension land crabs is the infrequency with which this cycle is observed. In March, 1963, Georgetown was over-run with thousands of the minute young crabs going inland from the beaches, but residents of 12 years or more whom I questioned at the time could not remember seeing the phenomenon before, and I have heard of no subsequent observations. Yet all *Gecarcinids* that have been studied, make annual migrations to the sea which are normally well-known local phenomena, as for example on many of the West Indian islands.

Apparently the invasion of young crabs mentioned by Packer was still underway in May, 1963, when Arthur Loveridge collected at Georgetown and sent to the Smithsonian Institution 12 juveniles, all cl ~3.5 mm. The juveniles lack the characteristic incision on the third maxillipeds.

Fausto Filho (1974:21) also remarked that these crabs return to the sea to spawn, "The fishermen of the Archipelago say that these crabs live on land in holes and they come to the sea only to wet and release the eggs, during the rainy season." He listed 11 beaches where the crabs had been observed spawning.

In describing the activities of the British Ornithologists' Union Centenary Expedition to Ascension, Stonehouse (1960:38) reported:

We met land crabs, too, and were sadly disappointed. They were small, no larger than an ordinary edible crab, with bloated shells and moderately long pincers. Some were of beetroot purple, others yellow or orange, apparently two colour-phases of the same species. They were shy, freezing with pincers erect when alarmed, usually to be found within a short distance of their burrows and ready to scuttle down at the drop of a hat. In rainy weather they promenaded more freely, sometimes appearing at the side of road with arms waving like diminutive but aggressive hitch-hikers. Fringed mandibles [third maxillipeds] suggest a permanently turned-down mouth, giving them a disgruntled, unhappy

expression; they were disagreeable rather than sinister and fell far short of their reputation. The first land crab I met was sitting in a prickly pear bush, sadly munching one of the brilliant red fruits and dribbling juice. I could never take them seriously after that.

Olson (1973:6) found shell fragments of this species in a fumarole near the base of Sisters Peak.

The female, cl 42.8 mm, taken on the beach near Collyer Point (sta ASC-20) apparently was there to spawn. Its larvae were released in a bucket shortly after it was collected.

Fimpel (1975:173) studied the ecology and physiology of this species from Ilha Trindade, and remarked: "It was shown why this species had succeeded in becoming dominant in some land regions of the tropical hemisphere."

L.B. Holthuis (in litt.) observed:

How popular the landcrabs are in Ascension is shown by the fact that they are found (with the legend "Land Crab") on the 1 shilling stamp of 1956 (in a series of 13, the others not crustaceans), and on both stamps (2 p and 16 p) issued in 1973 to commemorate the 25th wedding anniversary of Queen Elisabeth II and Prince Philip. In the 1956 stamp the crab formed the main motive, in the other two it is in the background.

Gecarcinus lagostoma has been recorded from Ascension by Darwin (1871), Drew (1876), Wyville Thomson (1878), Miers (1886), Moseley (1892), Benedict (1893), Ortmann (1893), Wilton, Pirie, and Brown (1908), Stebbing (1914), Lenz and Strunck (1914), Rathbun (1918), Stonehouse (1960), Packer (1968, 1974), Graham (1969), Hart-Davis (1972), Olson (1973), Türkay (1973), and Spencer (1981). There is material of this species in the Smithsonian Institution collections from Ilha Trindade and Fernando de Noronha.

DISTRIBUTION.—*Gecarcinus lagostoma* is now known to occur only on oceanic islands in the South Atlantic, Ascension and three islands off Brazil, Atol das Rocas (Coelho, 1965; Coelho and Ramos, 1972), Fernando de Noronha (Rathbun, 1918; Türkay, 1970; Fausto Filho, 1974), and Ilha Trindade (Baylis, 1915a; 1915b; Türkay, 1970; Coelho and Ramos, 1972; Fimpel, 1975). Terrestrial.

Family GRAPSIDAE

Grapsus adscensionis (Osbeck, 1765)

FIGURE 42f_n

- Cancer retusus* Linnaeus, 1754: [about p. 28], fig. 10 on pl.—Holm, 1957:39.
Cancer Adscensionis Osbeck, 1757:297; 1765:389; 1771:97.—Herbst, 1790:256.
Cancer adscensionis Osbeck, 1757: third [unnumbered] page of register at end of book; 1765: third [unnumbered] page of "Zweites Register" at end of book.
Cancer Grapsus Linnaeus, 1758:630 [part, only the material from "Insula Adscensionis"]; 1759:252, pl. 3: fig. 10; 1760:252, pl. 3: fig. 10; 1767:1048 [part, only the material from "Insula Adscensionis"]; 1788:252, pl. 3: fig. 10.
Cancer ruricola.—Linnaeus, 1759:260, pl. 3: fig. 10; 1760:260, pl. 3: fig. 10; 1788:260, pl. 3: fig. 10. [Not *Cancer ruricola* Linnaeus, 1758 = *Gecarcinus ruricola*.]
Cancer graphicus Houttuyn, 1769:350 [only the material from "het Eiland Adscension"].
Cancer graphus Stadius Müller, 1775:1016 [only the material from "der Insul

Adscension").

Grapsus Webbi H. Milne Edwards, 1853:167.

Grapsus pictus var. *ocellatus* Studer, 1883:14.

Grapsus maculatus.—Miers, 1886:255 [part].—Benedict, 1893:538.—Stebbing, 1914:254, 265. [Not *Grapsus maculatus* H. Milne Edwards, 1853 = *Cancer grapsus* Linnaeus, 1758.]

Grapsus grapsus.—Ortmann, 1893:57.—Lenz and Strunck, 1914:283, 338.—Rathbun, 1918:227, pls. 53, 54 [part].—Chace, 1966:640.—Monod, 1956:407, fig. 561.—Chace and Manning, 1972:3.—Manning and Holthuis, 1981:232. [Not *Grapsus grapsus* (Linnaeus, 1758).]

crabs [*Grapsus maculatus*] Stonehouse, 1960:96, 118, 137, 209.

Grapsus webbi.—Türkyay, 1982:122.

MATERIAL.—Manning 1971 Collection: Sta ASC-3, McArthur Point: 4 males [39.1–49.2], 2 ovig. females [47.2–50.7], 1 juvenile [6.7].—Sta ASC-5, North East Bay: 1 male [55.4].—Sta ASC-11, English Bay: 2 juveniles [8.0–8.5].—Sta ASC-12, McArthur Point: 2 females [28.0–36.6].—Sta ASC-18, Shelly Beach: 4 juveniles [5.0–8.0].—Sta ASC-20, south of Collyer Point: 1 juvenile [4.5].

Smithsonian 1976 Collection: Sta 1B-76, McArthur Point: 1 male [50.9], 1 ovig. female [38.4].—Sta 4, McArthur Point: 24 males [14.7–56.1], 8 females [15.7–54.3], 1 ovig. [41.4].—Sta 5A-76, Shelly Beach: 3 males [9.4–16.3], 2 females [10.7–11.3], 1 juvenile [5.7].—Sta ASC-8, McArthur Point: 1 ovig. female [49.5].

Other Collections: Ascension Island, shore, H.M.S. *Challenger*: 1 male [19.7] (BMNH 84-31).—Ascension Island: 1 dry male [59.1] (BMNH 84-19).—Ascension, *Gazelle*, type of *Grapsus pictus* var. *ocellatus* Studer: 1 ovig. female [54.4] (ZMB 4556).—Deutsche Südpolar Expedition 1901–1903, Ascension Island, 12 Sep 1903: 2 males [15.1–47.9], 1 female [27.7] (ZMB 17924).—U.S. Eclipse Expedition, 1889–1890, Ascension Island: 4 males [17.0–42.1], 4 females [17.7–25.6].—Vickrey (1964), South West Bay: 2 males [17.1–23.2].—Olson (1970), Turtle Shell Beach (= Clarke's Beach), rocky tide pools: 1 female [29.4].

SIZE.—Carapace lengths of males, 9.4–59.1 mm; of females, 10.7–54.4 mm; of ovigerous females, 38.4–54.4 mm; of juveniles, 4.5–8.5 mm.

COLOR.—Red or black, covered with white spots increasing in size posteriorly on carapace; spots on carapace not organized into transverse lines; walking legs spotted; chelae uniform bright red, fingers white distally, spooned tips of fingers dark.

Zeiller (1974, figs. on p. 96) gave colored figures of *Grapsus grapsus* in which there are white lines across the branchial regions and the posterior part of the carapace, and the chelae are dark brown with much less white on the fingers. Chace and Hobbs (1969, fig. 50) also showed that there were lines of white spots across the carapace in *G. grapsus* from Dominica.

HABITAT.—Usually supratidal, in splash zone, on rocks. On Ascension *Grapsus* was seen at night roaming over open sand beaches, much like the ghost crab *Ocypode*.

Stebbing (1914) reported this species from *Scotia* sta 507, a trawling station in 40 fathoms; it is unlikely that it was taken there.

REMARKS.—L.B. Holthuis, who supplied us with all of the early references to this species stated (in litt.):

The first record of this species is certainly by Linnaeus, 1754, in the thesis "Chinensia Lagerstroemiana..." This thesis is also published in Linnaeus' *Amoenitates Academicae*, vol. 4, pt. 61, pp. 230–260, pl. 3 (1759, with other editions in 1760 and 1788). This thesis is based on the collections made in China and on the way to it by C. Tärnström, O. Torén, and especially those by P. Osbeck, as stated in the introduction. In the *Amoenitates* edition of the thesis is mentioned (as only Crustacean) on p. 252: "Cancer (Grapsus)," followed by a diagnosis and a good description; also a reference is made to "Pagurus maculatus, Catesb. car. 2, t. 36." It is also figured, viz. on pl. 3 fig. 10. The figure shows a *Grapsus*. Peculiarly, the explanation of the figures says under no. 10 "10 Cancer ruricola 33" (10 being the number of the figure, 33 the number of the description of "Cancer (Grapsus).") Unfortunately no locality indication is provided. But it is most likely that this species is Osbeck's *Cancer adscensionis* (1) first because Osbeck's material is definitely included in *Chinensia Lagerstroemiana*, (2) that Linnaeus (1758) only referred to *Amoen. Acad.* 4 and to Catesby and gave as locality "Habitat in America [Catesby's material], *Insula Adscensionis* [obviously the *Amoenitates* material]."

Holm (1957:39) in his list of the species described in *Chinensia Lagerstroemiana* indicates that in the original 1754 thesis the species was described under the name *Cancer retusus*, and that Linnaeus later, in *Sys. Nat.* and *Amoenit. Acad.*, changed the name to *Cancer Grapsus*. As I have not seen the 1754 thesis, I cannot confirm nor disprove this; also I do not know the exact pages in the thesis where the name appeared. Holm also indicated that the material was already missing in 1780.

Gmelin, in the 13th edition of Linnaeus' *Systema Naturae* does not mention *Ascension* anymore under *Cancer Grapsus*, neither does Fabricius in his various books. After 1800 the name is evidently quite forgotten.

The names *Cancer graphicus* Houttuyn, 1769 and *Cancer graphus* Stadius Müller, most likely are incorrect subsequent spellings of *Cancer Grapsus*, even though Stadius Müller used *graphus* twice on p. 1016. However, in the general systematic index to the Zoology part of Houttuyn's book (published at the end of the 1773 part 18) as well as in the index to the insects at the end of Stadius Müller's vol. 5, the species is listed as *Cancer Grapsus*. Sherborn (1902, *Index Animalium* 1:435) noted *graphicus* Houttuyn as "err. pro *grapsus*," but did not mention *graphus* Stadius Müller.

I found in the Swedish journal "Svenska Linnésällskapets Arsskrift" (Yearbook of the Swedish Linnaeus Society), vol. 1972–1974 (published in 1978), pp. 75–145, an article by Anne Fox Maule and Carlo Hansen, entitled "Linnés korrespondance med Pehr Osbeck 1750–1753. Med inledning og anmaerkninger" (Linnaeus' correspondence with Pehr Osbeck, 1750–1753. With introduction and annotations). On p. 94–95 there is a letter by Osbeck to Linnaeus, dated Göteborg 26 July 1752, in which he says that he has given to Lägerstroem (director of the Swedish East India Company, through whose influence Osbeck got a post as a pastor on one of his ships) a collection of fishes, birds, insects, deer skull, rocks and plants from "China, Java, Assension." Footnote 1 on p. 95 says that in a letter of 29 July 1752 Lägerstroem wrote that he has sent Osbeck's and Torén's collections to Linnaeus. Göteborg was the seat of the East India Company. All of this ties in nicely with the history of Osbeck's *Cancer adscensionis*.

A comparison of the gonopods and gonopores of material from Ascension with those of specimens from the Gulf of Guinea and the Caribbean (Figure 42) revealed no marked differences in these structures in specimens from the three localities, although the gonopores of females from Ascension appear to be more similar to the gonopores of females from the Gulf of Guinea than those from females from the Caribbean.

All Atlantic populations of *Grapsus* generally have been considered to belong to *Grapsus grapsus* (Linnaeus, 1758), a

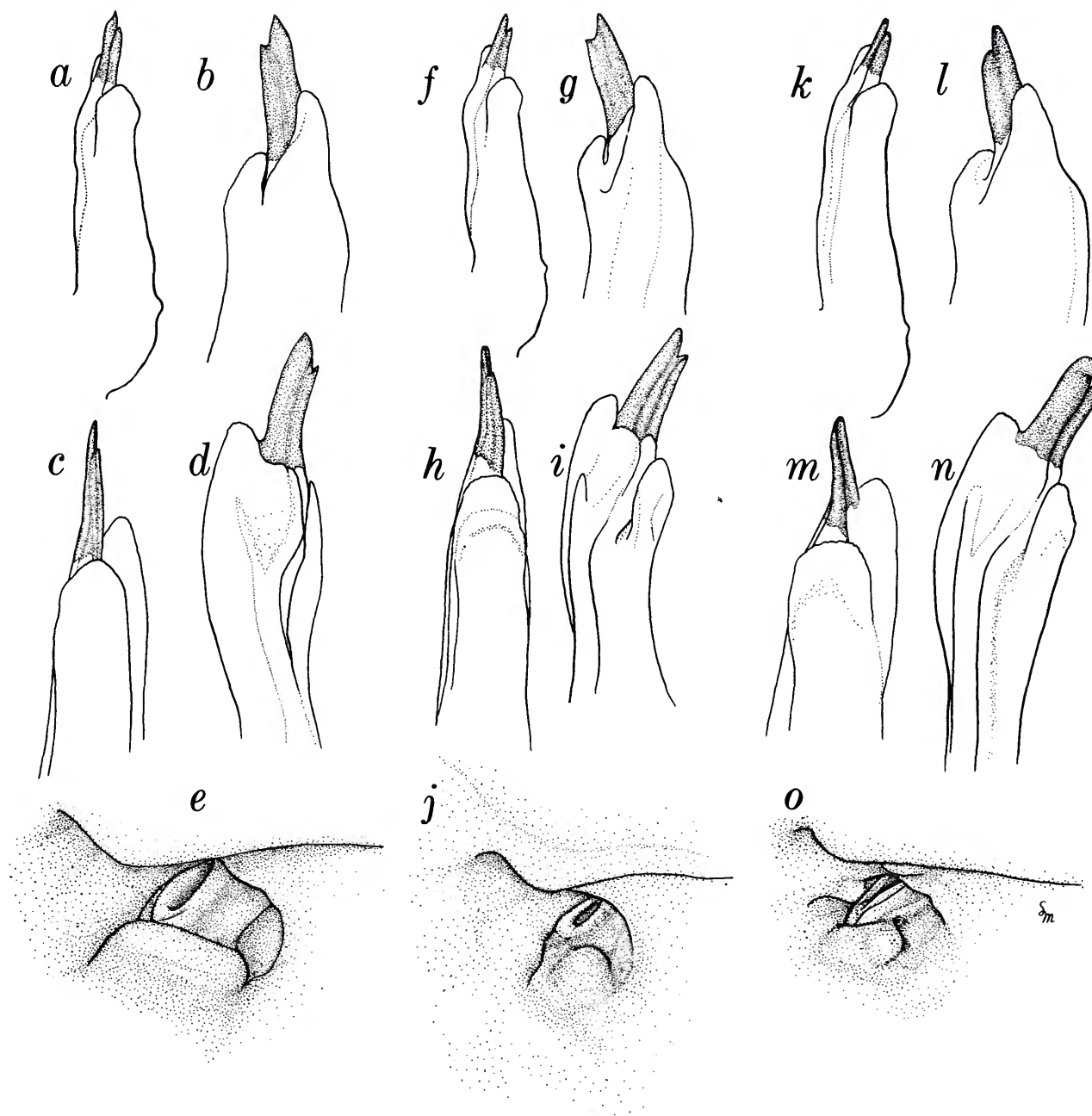


FIGURE 42.—Denuded right gonopods (*a-d, f-i, k-n*), and left gonopores (*e, j, o*) of Atlantic *Grapsus*. *Grapsus grapsus*, Puerto Rico; *a-d*, male, carapace length 57.2 mm, *e*, female, carapace length 51.8 mm: *a*, entire gonopod, denuded; *b-d*, denuded terminal portion in posterior, lateral, and anterior views, respectively; *e*, gonopore. *Grapsus adscensionis*, Ascension Island; *f-i*, male, carapace length 50.9 mm, *j*, ovigerous female, carapace length 38.4 mm: *f*, entire gonopod, denuded; *g-i*, denuded terminal portion in posterior, lateral, and anterior views, respectively; *j*, gonopore. *Grapsus adscensionis*, Senegal; *k-n*, male, carapace length 62.8 mm, *o*, ovigerous female, carapace length 64.9 mm: *k*, entire gonopod, denuded; *l-n*, denuded terminal portion in posterior, anterior, and lateral views, respectively; *o*, gonopore.

species originally described from the Americas and Ascension. The type locality was restricted to the Americas by selection of a lectotype by Holthuis (1977b:145).

Türkay (1982:122) was the first to point out that the east and west Atlantic populations of *Grapsus* were distinct, and he used *Grapsus webbi* H. Milne Edwards, 1853 for the east Atlantic species. As we identify material from both Ascension and St. Helena with the east Atlantic species, the oldest available name for the species is *Cancer adscensionis* Osbeck, 1765, a species described from Ascension. Should the Gulf of Guinea population prove to be distinct from that in the central Atlantic, the name *Grapsus webbi* is available for it.

In his account of the species of *Grapsus* from Madagascar, Crosnier (1965) commented that *Grapsus* was indisputably a difficult genus, and when comparing species of the genus one almost always had to use modifiers like "more" or "less." The Atlantic populations of the genus are no different. Whereas both Atlantic species differ from the Indo-West Pacific *Grapsus tenuicrustatus* (Herbst, 1783) in the characters used by Banerjee (1960), none of these characters can be used to separate the Atlantic species. The only characters, other than color, that we could find were in the tubercles lining the ventral margin of the front. In *G. adscensionis* the tubercles of the front are coarser and fewer than in *G. grapsus*. Material from St. Helena agrees with that from Ascension in having these tubercles relatively large, whereas in specimens from Fernando de Noronha and the Caribbean these tubercles are smaller and more numerous.

Stonehouse (1960:96) reported:

On the rock beside us small red- and green-spotted crabs hung sideways, running forwards, backwards, up or down, in any direction they pleased with enviable facility. I threw a corner of my sandwich on to a ledge, and was surprised to see the crabs gathering, like sparrows in a park, to squabble over the crumbs. They picked delicately, bringing tiny pincers alternately to the complex mouth, menacing each other with squat bodies erect and eyes popping like organ stops.

On Ascension a crab was seen carrying a baby sea turtle across a sand beach at night.

L.B. Holthuis informed us (in litt.) that:

In the 1982 series of stamps commemorating the voyage of the Beagle, the 15c stamp shows an excellent picture of *Grapsus adscensionis*, under the name "Rock crab."

This species has been recorded from Ascension by Linnaeus and his student Osbeck in a variety of 18th century works, and by Studer (1883), Miers (1886), Benedict (1893), Ortmann (1893), Lenz and Strunck (1914), Stebbing (1914), Rathbun (1918), Stonehouse (1960), and Chace and Manning (1972).

DISTRIBUTION.—Eastern Atlantic; and central Atlantic at Ascension and St. Helena islands; splash zone.

Pachygrapsus corrugatus (Von Martens, 1872)

FIGURE 43

Grapsus (*Leptograpsus*) *corrugatus* Von Martens, 1872:107, pl. 4: fig. 8.

Pachygrapsus corrugatus.—Rathbun, 1918:252, pl. 160: fig. 4.—Holthuis, Edwards, and Lubbock, 1980:46.

MATERIAL.—*Manning 1971 Collection*: Sta ASC-13, Georgetown: 1 juvenile [3.2].—Sta ASC-25, south of Collyer Point: 1 male [8.5].

SIZE.—Carapace length of male, 8.5 mm; of juvenile, 3.2 mm.

HABITAT.—Intertidal, in algae. Holthuis, Edwards, and Lubbock (1980:46) reported that at St. Paul's Rocks this species was seen "very occasionally on pink algal encrustations around infrequently flushed rock pools, and occasionally in frequently flushed rock pools. They were not seen elsewhere."

REMARKS.—We provide here a figure (Figure 43) of this rather rare species. It has not been recorded previously from Ascension.

Our larger specimen, an adult male, is considerably smaller than the male, cl 14.8 mm, reported by Manning (1963b) from the Bahamas.

DISTRIBUTION.—Western Atlantic from the Bahamas, Cuba, Puerto Rico, the Virgin Islands, and St. Paul's Rocks; central Atlantic from Ascension; intertidal.

Pachygrapsus loveridgei Chace, 1966

Pachygrapsus transversus.—Miers, 1881b:432 [not *Pachygrapsus transversus* (Gibbes, 1850)].

Pachygrapsus loveridgei Chace, 1966:640, figs. 9, 10.

MATERIAL.—*Manning 1971 Collection*: Sta ASC-3, McArthur Point: 1 male [6.0].—Sta ASC-5, North East Bay: 1 male [3.0], 3 females [3.2–4.8].—Sta ASC-8, English Bay: 2 juveniles [3.1–3.2].—Sta ASC-11, English Bay: 7 females [3.3–6.0].—Sta ASC-12, McArthur Point: 1 male [3.2], 4 females [3.9–4.1], 7 juveniles [1.9–3.3].—Sta ASC-13, Georgetown: 5 males [3.0–4.8], 4 females [3.2–4.5], 2 ovig. [3.2–4.5], 2 juveniles [3.1].—Sta ASC-14, south of Collyer Point: 1 male [3.2].—Sta ASC-16, Shelly Beach: 1 male [4.0], 1 female [3.8].—Sta ASC-18, Shelly Beach: 2 males [3.6–5.0], 3 females [3.4–5.3].—Sta ASC-20, south of Collyer Point: 1 male [6.8].—Sta ASC-21, English Bay: 6 males [3.0–9.8], 1 female [7.6].—Sta ASC-23, McArthur Point: 6 males [3.0–7.5], 7 females [4.3–6.1].

Smithsonian 1976 Collection: Sta 1B-76, McArthur Point: 1 female [3.8].—Sta 1C-76, McArthur Point: 3 males [3.5–4.6], 4 females [3.2–6.3].—Sta 3A-76, English Bay: 1 female [5.7].—Sta 4-76, McArthur Point: 1 male [9.1].—Sta 5A-76, Shelly Beach: 13 males [3.0–7.4], 4 females [3.1–6.9], 1 juvenile [3.1].—Sta 5D-76, Shelly Beach, coral pool: 2 males [3.5–3.6].—Sta 6A-76, south of Collyer Point: 3 males [4.2–4.7], 1 female [3.5].—Sta 6B-76, south of Collyer Point: 1 female [3.5].—Sta 8-76, McArthur Point: 1 male [6.5], 1 female [4.4].—Sta 9C-76, North East Bay: 3 males [3.1–3.2], 1 female [3.8].

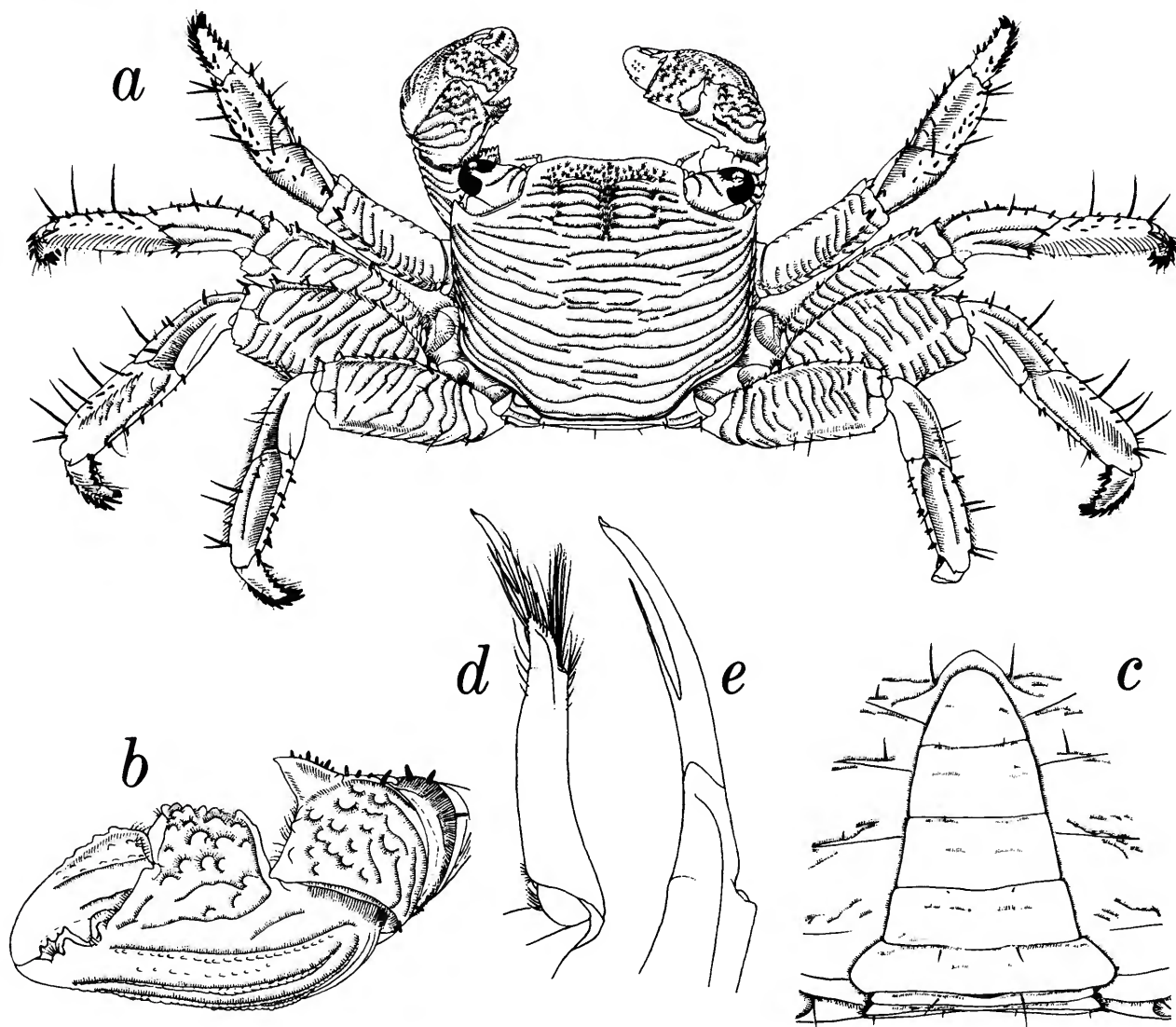


FIGURE 43.—*Pachygrapsus corrugatus*, male, carapace length 8.5 mm: *a*, dorsal view; *b*, left chela and carpus, extensor surface; *c*, abdomen and adjacent sternum; *d*, left 1st pleopod, caudal aspect; *e*, left 1st pleopod, denuded, caudal aspect.

Operation Origin: Site 25, Boatswain Bird Rock, in empty barnacle shell, 7 m [?]: 1 female [3.3].

Other Collections: Ascension Island, T. Conry: 2 males [3.8–5.9], 1 female [3.6] (BMNH 81.27).—Olson (1970), McArthur Point, sandy bottom tide pool: 1 male (4.5), 2 females [4.8–6.6].

SIZE.—Carapace lengths of males, 3.0–9.8 mm; of females, 3.1–7.6 mm; of ovigerous females, 3.2–4.5 mm; of juveniles, 1.9–3.3 mm. These are considerably smaller than the speci-

mens from St. Helena reported by Chace (1966); there the largest male was cl 12.0, the largest female cl 12.4 mm.

HABITAT.—In almost all intertidal habitats on Ascension, including the coral pool inland of Shelly Beach. One specimen was taken in a barnacle at 7 meters.

REMARKS.—This species was reported from Ascension by Miers (1881b).

DISTRIBUTION.—Known only from Ascension and St. Helena; intertidal and shallow subtidal.

Percnon abbreviatum (Dana, 1851)

FIGURE 44

Acanthopus abbreviatus Dana, 1851:252.*Percnon abbreviatum*.—Crosnier, 1965:88, figs. 134, 139, 143, 149.

MATERIAL.—*Manning 1971 Collection*: Sta 21, English Bay: 1 female [11.0].

Smithsonian 1976 Collection: Sta 1B-76, McArthur Point: 1 male [8.0], 1 female [7.0].—Sta 1C-76, McArthur Point: 3 females [7.2–12.6], 1 ovig. [12.6].

Operation Origin: Site 31, Spire Rock, from under a stone, 10 m: 1 female [11.8].

Other Collections: Jourdan (1976), off Collyer Point, –20 ft [6 m]: 1 female [8.3].

SIZE.—Carapace lengths of male, 8.0 mm; of females, 7.0–12.6 mm; of ovigerous female, 12.6.

COLOR.—Mottled dark brown and whitish; cornea red; walking legs conspicuously banded, darker bands brown or reddish.

HABITAT.—Intertidal and shallow sublittoral. Specimens were taken from coralline algae and from a rock wash, both intertidal, and in 6 meters and in 10 meters under a stone.

This is the first Atlantic record for this species, which, so far as we can determine, is the only pantropical brachyuran.

DISTRIBUTION.—Pantropical; Indo-West Pacific from Hawaii, Samoa, Tahiti, and Madagascar; eastern Pacific from

Clipperton Island (Garth, 1965); and now central Atlantic from Ascension; intertidal.

Percnon gibbesi (H. Milne Edwards, 1853)

FIGURE 45

Acanthopus Gibbesi H. Milne Edwards, 1853:180.*Leiolophus planissimus*.—Miers, 1881b:432 [not *Percnon planissimus* (Herbst, 1804)].*Percnon ? gibbesi*.—Fausto Filho, 1974:15.*Percnon planissimus*.—Fausto Filho, 1974:15.*Percnon gibbesi*.—Manning and Holthuis, 1981:238.—Williams, 1984:462, fig. 371.

MATERIAL.—*Manning 1971 Collection*: Sta ASC-8, English Bay: 1 ovig. female [12.3].—Sta ASC-16, Shelly Beach: 1 male [7.6].—Sta ASC-18, Shelly Beach: 1 male [7.0].—Sta ASC-21, English Bay: 1 male [8.8].—Sta ASC-25, south of Collyer Point: 2 females [6.1–6.9 mm].

Smithsonian 1976 Collection: Sta 1B-76, McArthur Point: 1 ovig. female [16.1].—Sta 1C-76, McArthur Point: 3 males [12.5–15.2], 1 female [10.9].—Sta 3C-76, English Bay: 1 ovig. female [16.6].—Sta 5A-76, Shelly Beach: 1 female [9.2].—Sta 6A-76, south of Collyer Point: 1 male [15.0].—Sta 8-76, McArthur Point: 4 males [12.3–23.4], 1 ovig. female [21.7].—Sta 9C-76, North East Bay: 1 male [7.6].

Other Collections: Olson (1970), North East Bay: 1 male

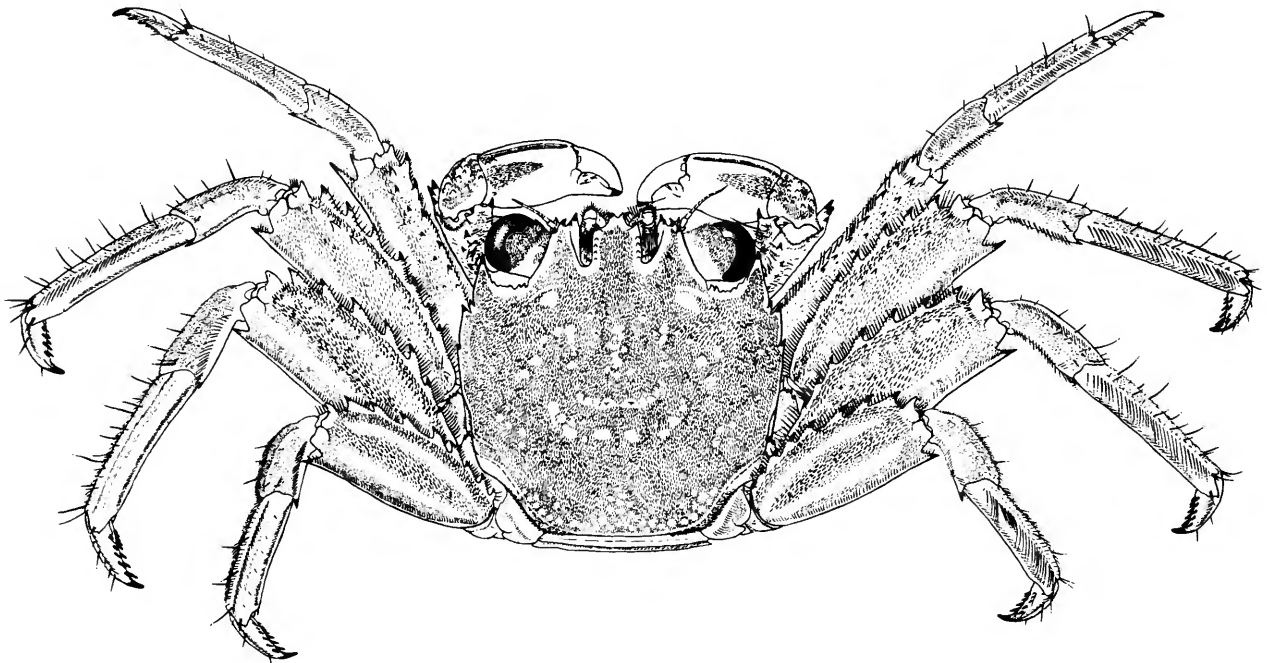
FIGURE 44.—*Percnon abbreviatum*, female, carapace length 11.0 mm.



FIGURE 45.—*Percnon gibbesi*, male, carapace length 14.2 mm, right cheliped.

[10.2].—Olson (1970), McArthur Point, sandy bottom tide pool: 4 males [9.0–11.9], 3 ovig. females [13.1–21.2].—Olson (1970), Turtle Shell Beach (= Clarke's Beach), rocky tide pools: 2 males [8.8–14.2].—Ascension Island, T. Conry: 1 male [13.3], 2 females [5.6–10.0] (BMNH 81-27).

SIZE.—Carapace lengths of males, 7.0–23.4 mm; of females, 5.6–21.7 mm; of ovigerous females, 12.3–21.7 mm.

COLOR.—Mottled light brown, walking legs not conspicuously banded, articulations yellowish.

HABITAT.—Intertidal, associated with *Echinometra* in the flats south of Collyer Point.

REMARKS.—This species was reported from Ascension by Miers (1881b).

DISTRIBUTION.—Both coasts of America and Amphi-Atlantic; western Atlantic from Bermuda and Florida to Brazil; eastern Atlantic from the Azores to Angola; central Atlantic from Ascension; and eastern Pacific from Lower California to Chile, Galapagos; intertidal.

Plagusia depressa (Fabricius, 1775)

Cancer depressus Fabricius, 1775:406.

Plagusia depressa.—Chace, 1966:647.—Fausto Filho, 1974:15.—Holthuis, Edwards, and Lubbock, 1980:46.—Manning and Holthuis, 1981:239.—Williams, 1984:463, fig. 372.

MATERIAL.—Manning 1971 Collection: Sta ASC-24, south of Collyer Point: 5 males [38.1–48.6], 3 females [11.2–36.8], 1 ovig. [36.8].—Sta ASC-25, south of Collyer Point: 5 males [14.4–44.0].

Smithsonian 1976 Collection: Sta 1B-76, McArthur Point: 1 male [41.3].—Sta 6B-76, south of Collyer Point: 1 male [49.7].

SIZE.—Carapace lengths of males, 14.4–49.7 mm; of females, 11.2–36.8 mm; of ovigerous female, 36.8 mm.

COLOR.—Mottled brown, silver, and red, and legs banded with these colors; carpus of chelipeds with reticulated brown lines over silver background; fingers of chela white, extremes of tips dark.

HABITAT.—Intertidal on rocky shore, at water level.

REMARKS.—This species has not been recorded previously from Ascension.

DISTRIBUTION.—Amphi-Atlantic; western Atlantic from Bermuda and North Carolina to Brazil; eastern Atlantic from the Azores and Morocco to Angola; central Atlantic from Ascension and St. Helena; littoral.

Family CRYPTOCHIRIDAE

Opecarcinus hypostegus (Shaw and Hopkins, 1977)

Pseudocryptochirus hypostegus Shaw and Hopkins, 1977:179, figs. 1, 2a, 3a.
Opecarcinus hypostegus.—Kropp and Manning, 1987:10, figs. 5, 6, 9.

MATERIAL.—Manning 1971 Collection: Sta ASC-15, English Bay: 1 female [2.2], 1 carapace [2.0].

SIZE.—Carapace length of female, 2.2 mm.

REMARKS.—Our material was studied by Kropp and Manning (1987) who recorded the species from Ascension.

DISTRIBUTION.—Western Atlantic from Florida and the Gulf of Mexico, to Brazil; central Atlantic from Ascension; to 27 meters.

Troglocarcinus corallicola Verrill, 1908

Troglocarcinus corallicola Verrill, 1908:427, figs. 48, 49, pl. 28: fig. 8.—Kropp and Manning, 1987:14, figs. 7–9.

MATERIAL.—Manning 1971 Collection: Sta ASC-5, North East Bay: 1 male [2.0], 1 ovig. female [2.3].—Sta ASC-18, Shelly Beach: 1 female [3.7].—Sta ASC-23, McArthur Point: 3 females [2.0–4.5], 2 ovig. [2.0–4.5].

Smithsonian 1976 Collection: Sta 1B-76, McArthur Point, on *Favia*: 1 male [2.8], 2 ovig. females [3.8–4.5].—Sta 6B-76, south of Collyer Point: 1 ovig. female [2.5], 1 juvenile [1.5].

Other Collections: South West Bay, 10 ft (3 m), on *Favia*, Nov 1972, Ascension Historical Society Diving Club: 2 males [2.5–2.7], 8 females [2.5–4.8], 2 ovig. [4.0–4.8] (BMNH 1978:52).

SIZE.—Carapace lengths of males, 2.0–2.8 mm; of females, 2.0–4.8 mm; of ovigerous females, 2.0–4.8 mm; of juvenile, 1.5 mm.

HABITAT.—In crypts on *Favia*.

REMARKS.—This material was studied by Kropp and Manning (1987), who reported this species from Ascension.

DISTRIBUTION.—Amphi-Atlantic; western Atlantic from Bermuda and Florida to Brazil; central Atlantic from Ascension, St. Helena, and St. Paul's Rocks; and eastern Atlantic from the Gulf of Guinea; shore to 75 meters.

STOMATOPODA

Family LYSIOSQUILLIDAE

Tetrasquilla, new genus

DIAGNOSIS.—A lysiosquillid of moderate size, 11 to ~70 mm. Cornea bilobed. Antennal protopod with 4 papillae, 2 mesial, 2 ventral. Raptorial claw with 4 teeth on dactylus and 4 movable spines on propodus. Mandibular palp and 5 epipods present. Telson with 3-spined median dorsal projection; posterior and posterolateral surfaces above posterior margin highly sculptured; marginal armature consisting of, on each side of midline, a convex row of small submedian denticles, a movable submedian tooth, and 4 large lateral teeth, inner 2 rounded, separated by an intervening denticle. Uropodal endopod lacking strong proximal fold on outer margin.

TYPE SPECIES.—*Lysiosquilla mccullochae* Schmitt, 1940.

ETYMOLOGY.—From the Greek, *tetra*, four, and the generic name *Squilla*. The name is appropriate as the type species has four papillae on the antennal protopod, four teeth on the dactylus of the raptorial claw, four movable spines on the propodus of the claw, and four primary marginal spines on the telson. Further, we have four specimens in the collections from Ascension.

REMARKS.—*Tetrasquilla* shares several features with *Tectasquilla* Adkison and Hopkins, 1984, containing only *T. lutzae*, including the bilobed eye, presence of four teeth on the dactylus of the claw, and in the ornate telson, but differs from it and all other genera of the Lysiosquillidae (see Manning, 1980:368) in having four papillae on the antennal protopod in combination with four teeth on the dactylus of the raptorial claw. It further differs from *Tectasquilla* in lacking an anterior spine on the rostral plate, a median ventral spine on the telson, and a ventrodiscal spine on the uropodal exopod; *Tectasquilla* has but two primary marginal teeth on the telson.

Although Manning (1969:57) characterized this species as having four intermediate denticles on the telson, the specimens reported here instead have four pairs of primary teeth, separated by intervening denticles, as shown by Manning (1974, fig. 2) for a specimen from Panama.

Tetrasquilla mccullochae (Schmitt, 1940),
new combination

FIGURE 46

Lysiosquilla mccullochae Schmitt, 1940:197, fig. 23.

Heterosquilla (*Heterosquilloides*) *mccullochae*.—Manning, 1969:55, fig. 12.

Lysiosquilla jonesi Shanbhogue, 1971:100, pl. 1.

MATERIAL.—Manning 1971 Collection: Sta ASC-10, English Bay: 1 female [64].

Smithsonian 1976 Collection: Sta 5A-76, Shelly Beach: 1 male [29].

Other Collections: Olson (1970), McArthur Point, sandy

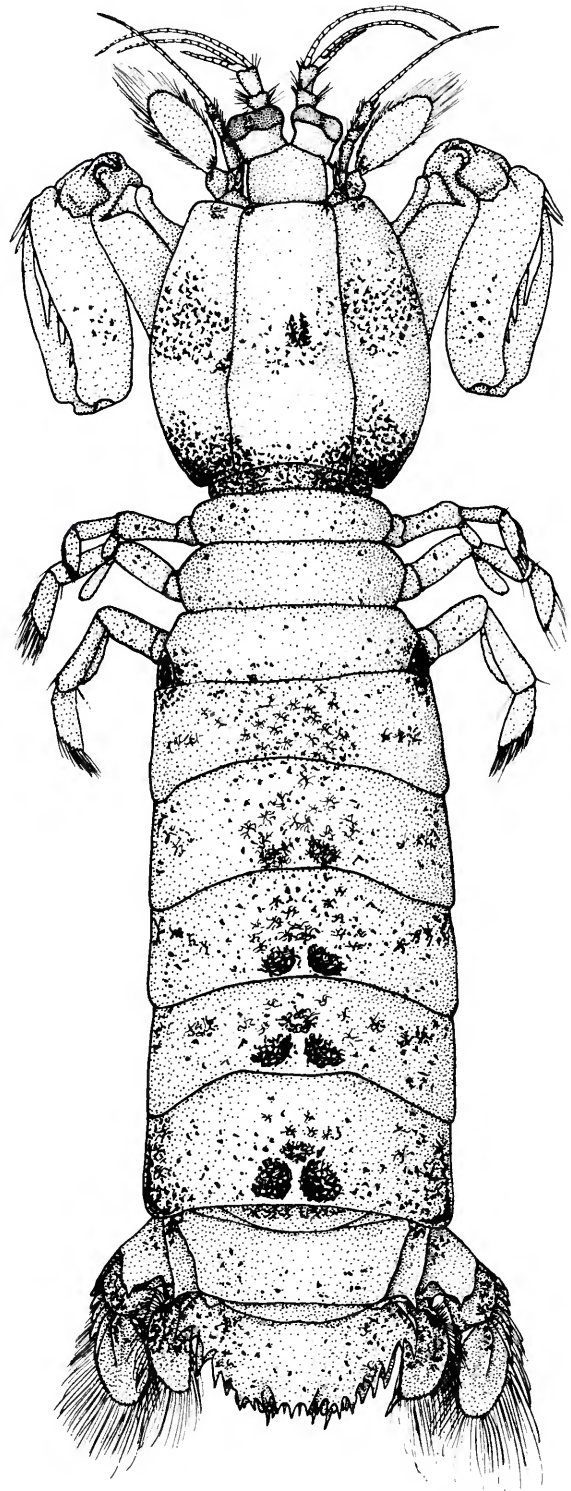


FIGURE 46.—*Tetrasquilla mccullochae*, female, total length 42 mm.

bottom tide pool: 1 male [69], 1 female [42].

SIZE.—Total lengths of males, 29–69 mm; of females, 42–64 mm.

COLOR.—Eyes silver; claws and background on carapace and abdomen silver, abdomen marked with mottled red pigment; paired spots on abdomen black.

HABITAT.—Burrowing in coarse sand in shallow water. The specimen from English Bay was collected by hand in soft, coarse sand in water less than 1 foot deep. No burrow was visible, but activity of the specimen near the surface caused the sand to move vigorously.

REMARKS.—*Lysiosquilla jonesi*, described from the Laccadive Islands, Indian Ocean, by Shanbhogue (1971), is clearly identifiable with this species. Shanbhogue's figure (1971, pl. 1) even shows some of the paired black spots on the abdomen that are characteristic of this species.

Reaka and Manning (1987:15) reported that this species occurred at Ascension.

There is a female of this species, tl 46 mm, from Fernando de Noronha in the Smithsonian Institution collections.

DISTRIBUTION.—Pantropical; eastern Pacific from Gulf of California and Panama (Manning, 1974); western Atlantic from Florida, Puerto Rico, and Fernando de Noronha; central Atlantic from Ascension Island; and Laccadive Islands, Indian Ocean; intertidal to 55 meters.

Family PSEUDOSQUILLIDAE

Pseudosquilla oculata (Brullé, 1837)

Squilla oculata Brullé, 1837: planche unique: fig. 3; 1839:18.

Pseudosquilla oculata.—Manning, 1977:103, figs. 32, 33, 55.

MATERIAL.—*Operation Origin*: Site 0, English Bay, found under a rock, 22 m: 1 female [53].

Other Collections: Jourdan (1976), Ascension Island, from dead *Cymatium* shell, 20 ft (6 m): 1 female [cl 10].—Jourdan (1976), English Bay, under rocks, 20 ft (6 m): 1 female [51].—Jourdan, English Bay, 20–30 ft (6–9 m): 1 male [79], 1 female [96].—McDowell, English Bay, 30–50 ft (9–15 m): 1 female [56].—Olson (1970), McArthur Point, sandy bottom tide pool: 1 female [31].

SIZE.—Total lengths of male, 79 mm; of females, 31–96 mm.

HABITAT.—Littoral, in rocks around tide pool, and sublittoral, to 22 meters; one specimen taken in *Cymatium* shell.

REMARKS.—This species has not been recorded previously from Ascension. Manning (1969:271) reported it from St. Helena.

There is a male of this species, tl 32 mm, from Fernando de Noronha in the Smithsonian Institution collections.

DISTRIBUTION.—Indo-West Pacific from Hawaii to the western Indian Ocean, and amphi-Atlantic, including Ascension and Saint Helena slands; littoral to about 60 meters.

ZOOGEOGRAPHICAL CONSIDERATIONS

With its geographical isolation (Figure 47), almost 1300 kilometers from the nearest land mass, St. Helena, and more than 2200 kilometers from the nearest continental land mass, Brazil, Ascension had to have been colonized chiefly by pelagic larvae, the teleplanic larvae characterized by Scheltema (1968, 1986). As Ascension is a volcanic island, with limited habitats (no grass flats or coral reefs), only some groups could colonize it. Yet, no fewer than 74 species of decapod Crustacea have become established on the island since its emergence in the Pleistocene. Not surprisingly, 59 of the 74 species of decapods found there (80%), occur elsewhere in the Atlantic. Slightly more species are found only in the western Atlantic than in the eastern Atlantic, but larvae from both sides of the Atlantic and the central Atlantic as well have contributed to the Ascension decapod fauna.

Briggs (1974:95) and Pawson (1978:5,6) have discussed the current patterns affecting Ascension, pointing out that it lies in the westward flowing South Equatorial Current, at the northern edge of the South Atlantic Gyre. It must occasionally come under the influence of the eastward flowing Equatorial Countercurrent or the Equatorial Undercurrent (Scheltema, 1971:287, 1977:81; Pawson, 1978:6), so that transport mechanisms exist to carry pelagic larvae to Ascension from both sides of the Atlantic. This is reflected in the faunal composition of the island. Ascension and St. Helena, and especially the latter, also are situated so that they come under the influence of the Benguela Current, flowing northeastward from southern Africa, providing a way for larvae of Indo-West Pacific species that have survived the journey around the Cape of Good Hope

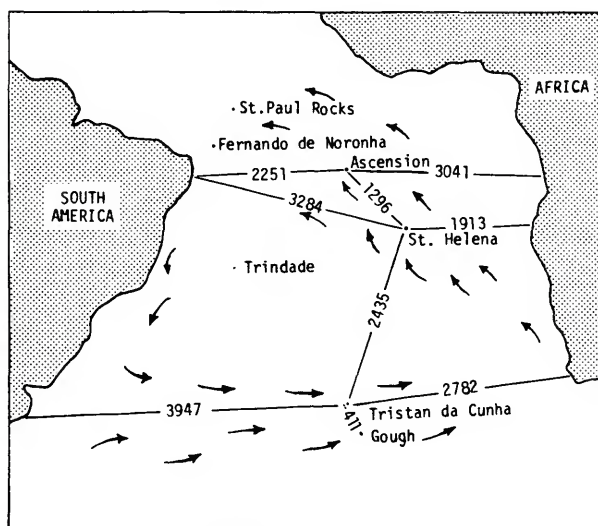


FIGURE 47.—Map of South Atlantic Ocean, showing major islands. Distances are in kilometers. (From Olson, 1973, fig. 1.)

or larvae originating from southwestern Africa to reach these isolated oceanic islands. The unique absence of cyclonic storms in the South Atlantic (Darlington, 1957:18) eliminates that distributional factor from consideration. Both islands also lie in the path of the southeast trade winds, driving surface water from southwest Africa toward the equator (Olson, 1973, fig. 1; Briggs, 1974, fig. 4-1; Edwards and Lubbock, 1983, fig. 1). These factors may account for the number of Indo-West Pacific species found at both Ascension and St. Helena, including the occurrence in the Atlantic of several species otherwise known from the Indo-West Pacific: *Alpheus crockeri* and *Percnon abbreviatum* at Ascension, *Planes marinus*, *Petalomera wilsoni*, *Calappa bicornis*, and *Mursia cristimanus* at St. Helena, and *Metalpheus paragracilis* at both islands.

Scheltema (1971:306; 1977:87) provided estimates of the number of days required for trans-Atlantic drift across the South Atlantic, 60–154 days from the Gulf of Guinea to Brazil in the South Equatorial Current, 96 days from Brazil to the Gulf of Guinea, in the Equatorial Countercurrent. To reach Ascension from each area would take only about half the time, 30–77 days westward, 48 days eastward. Garth (1965:44) quoted C.O'D. Iselin (in litt.) in saying that "it is safe to say that the velocity of ocean currents is about twice that shown on current charts," so it is possible that much less time would be needed for larvae to reach Ascension from either side of the Atlantic.

Hines (1986:449) summarized the average duration in days of larval periods for several crab families, as follows: Grapsidae 39, Majidae 30, Portunidae 45, and Xanthidae 31. Thus the duration of larval life for at least some members of all of these families would allow them to remain in the plankton to colonize Ascension from either side of the Atlantic. Curiously, Hines also found (p. 450) that "among marine species there was no significant relationship between the extent of the range and duration of the zoeal period or duration of the total larval period." This is similar to the finding of Brothers and Thresher (1985), who concluded that in coral reef fishes breadth of distribution may not correlate with duration of pelagic developmental stages.

More specific data has been provided by several authors. Wilson and Gore (1980) reported that the minimum time needed for completion of larval development of *Plagusia depressa* was 60 days, and that this might account for its amphi-Atlantic distribution. Rice and Provenzano (1966) reported that *Dromidia antillensis* required 23–25 days to reach the megalopa stage, and that a megalopa took another 14.5 days to molt. They also noted that Gurney (1924:191) had described a dromiid larva from the central Atlantic [22°06'S, 39°40'W] that closely resembled their larvae of *D. antillensis*. Gurney (1938:296) identified a larva from 3°17'S, 29°57'W in the South Atlantic as an *Enoplometopus*. Rice, Ingle, and Allen (1970) studied the larval development of the Mediterranean *Dromia personata* and found that it reached the megalopa stage 21–28 days after hatching. Laughlin et al.

(1982) found that development to first crab took 28–30 days in *Dromia erythropus*. Knowlton (1973, table 1) characterized *Alpheus dentipes*, *A. macrocheles*, and *Synalpheus fritzmulleri* as species with extended larval development. Thus these species have a larval life adequately long to allow their larvae to be transported long distances.

All of the species mentioned above and an amphi-Atlantic species of *Enoplometopus* occur on Ascension.

That larvae of *Ranilia constricta* periodically appear in swarms (Schmitt, 1956; Chace and Barnish, 1976) may help explain its wide distribution in the Atlantic. Similarly, larvae of the stomatopod *Alima hyalina* Leach also can occur in enormous swarms (material in USNM collections), and it, too, is a widely distributed species.

Certainly species of some genera, especially grapsids, might have reached Ascension by rafting. Dawson (1987:43) noted that "many authors referred to the habit of species of *Plagusia* of clinging to driftwood, floating timbers and ships hulls." Garth (1966:447) also remarked that members of *Plagusia*, *Planes*, and *Pachygrapsus* are "habitually transported by drifting logs or on sea turtles as adults."

THE FAUNA OF ASCENSION AND ST. HELENA

Distribution patterns of Ascension decapods (Table 1) can be summarized and compared with the decapod fauna of St. Helena (Table 2) as follows:

A total of 74 species is known to occur on Ascension (Table 1). Of these, 41 (55%) occur in the western Atlantic, and most of these are common there. Both *Euryzoius sanguineus*, which outside of Ascension and St. Helena is found at St. Paul's Rocks, and *Gecarcinus lagostoma*, which occurs at Fernando de Noronha and Ilha Trindade, off Brazil, and Ascension, are included as western Atlantic species even though both of these are actually central Atlantic island species, the ranges of which do not extend to the continental mainland. Of the 41 species from Ascension also occurring in the western Atlantic, 19 (26% of total) are known only from the central and western Atlantic. In contrast, only 35 species have been reported to occur at St. Helena (Table 2), and 15 of them (43%) occur in the western Atlantic. Of the 15, only 5 (14% of total) occur only in the central and western Atlantic. A larger percentage of Ascension species is found only in the central and western Atlantic.

Of the 74 species found at Ascension, 36 (49%) occur in the eastern Atlantic, and 14 of these (19% of total) are known only from the central and eastern Atlantic. Similarly, 19 of the 35 (54%) of the species known from St. Helena (Table 2) also occur in the eastern Atlantic, but 8 of these (23% of total) are known only from the central and eastern Atlantic. Eastern Atlantic components of the fauna are therefore slightly higher at St. Helena than at Ascension.

Twenty-two of the Ascension species (30%) are amphi-Atlantic, and 15 of these (19% of total) do not occur outside of the Atlantic. Members of the other 8 species, *Rhynchocinetes*

TABLE 1.—Distribution patterns of the 74 species of Ascension decapods (ASC = Ascension only; SH = St. Helena; EA = Eastern Atlantic; WA = Western Atlantic; EP = Eastern Pacific; IWP = Indo-West Pacific).

Ascension Decapods	ASC	SH	EA	WA	EP	IWP
<i>Metapenaeopsis gerardo</i>				+		
<i>Procaris ascensionis</i>	+					
<i>Typhlatya rogersi</i>	+					
<i>Rhynchocinetes rigens</i>			+	+		+
<i>Brachycarpus biunguiculatus</i>		+	+	+	+	+
<i>Pontonia pinnophyllax</i>		+	+			
<i>Typton ascensionis</i>	+					
<i>Gnathophyllum ascensione</i>	+					
<i>Alpheus bouvieri</i>			+	+	+	
<i>Alpheus crockeri</i>			+			+
<i>Alpheus dentipes</i>			+			
<i>Alpheus holthuisi</i>			+			
<i>Alpheus macrocheles</i>		+	+			
<i>Alpheus paracrinitus</i>			+	+	+	+
<i>Automate dolichognatha</i>				+	+	+
<i>Metalpheus paragracilis</i>		+				+
<i>Metalpheus rostratipes</i>			+	+	+	+
<i>Neoalpheopsis euryone</i>				+	+	+
<i>Salmoneus setosus</i>	+					
<i>Salmoneus teres</i>	+					
<i>Synalpheus fritzmulleri</i>		+		+	+	
<i>Lysmata grabhami</i>			+	+		
<i>Lysmata intermedia</i>			+	+	+	
<i>Lysmata moorei</i>			+	+		
<i>Thor manningi</i>				+	+	
<i>Processa packeri</i>	+					
<i>Microprosthema inornatum</i>	+					
<i>Odontozona anaphorae</i>	+					
<i>Stenopus hispidus</i>				+	+	+
<i>Enoplometopus antillensis</i>		+	+	+		
<i>Axiopsis serratifrons</i>				+		+
<i>Corallianassa hartmeyeri</i>				+		
<i>Panulirus echinatus</i>		+	+	+		
<i>Scyllarides delfosi</i>		+		+		
<i>Calcinus tubularis</i>			+			
<i>Clibanarius rosewateri</i>	+					
<i>Dardanus imperator</i>		+				
<i>Sympagurus dimorphus</i>			+	+		+
<i>Petrolisthes marginatus</i>			+	+		
<i>Hippa testudinaria</i>				+		
<i>Dromia erythropus</i>		+		+		
<i>Dromia marmorea</i>		+	+			
<i>Dromia personata</i>		+	+			
<i>Dromidia antillensis</i>		+		+		
<i>Latreillia manningi</i>				+		
<i>Ranilia constricta</i>		+	+	+		
<i>Calappa galloides</i>			+	+		
<i>Mursia mcdowellii</i>	+					
<i>Osachila stimpsonii</i>	+					
<i>Acanthonyx sanctaehelenae</i>		+				
<i>Apiomithrax violaceus</i>			+	+		
<i>Parthenope verrucosa</i>	+					
<i>Atelecyclus rotundatus</i>			+			+
<i>Laeonectes vocans</i>			+			
<i>Portunus anceps</i>				+		
<i>Acidops cessacii</i>			+			
<i>Cataleptodius olsoni</i>	+					
<i>Domecia acanthophora</i>			+	+		
<i>Euryozius sanguineus</i>		+		+		

TABLE 1 continued.

Ascension Decapods	ASC	SH	EA	WA	EP	IWP
<i>Microcassiope minor</i>		+	+	+		
<i>Nannocassiope melanodactylus</i>		+	+		+	
<i>Panopeus hartii</i>				+		
<i>Paractaea rufopunctata africana</i>			+			
<i>Platypodiella picta</i>			+			
<i>Xanthodius denticulatus</i>			+	+		
<i>Gecarcinus lagostoma</i>				+		
<i>Grapsus adscensionis</i>		+	+			
<i>Pachygrapsus corrugatus</i>				+		
<i>Pachygrapsus loveridgei</i>		+				
<i>Percnon abbreviatum</i>					+	+
<i>Percnon gibbesi</i>			+	+	+	
<i>Plagusia depressa</i>		+	+	+		
<i>Opecarcinus hypostegus</i>				+		
<i>Troglodius corallicola</i>		+	+	+		
Total	14	22	36	41	13	13
Percentage	19%	30%	49%	55%	18%	18%

rigens, *Brachycarpus biunguiculatus*, *Alpheus bouvieri*, *Alpheus paracrinitus*, *Metalpheus rostratipes*, *Lysmata intermedia*, *Sympagurus dimorphus*, and *Percnon gibbesi*, occur in the Indo-West Pacific and/or the eastern Pacific. Ten (29%) of the species from St. Helena are amphi-Atlantic. Thus amphi-Atlantic components of the faunas of these two islands are slightly greater on Saint Helena.

That the distance across the Atlantic is too great for most species to cross is supported by the fact that components of the Ascension decapod fauna with ties to one side or the other, 31 species or 42% of the total, are larger than amphi-Atlantic components, 22 species or 30% of the total. Cases of amphi-Atlantic distribution patterns are rare in the decapods, possibly reflecting their limited long distance dispersal potential. For example, of more than 200 species of crabs from West Africa treated by Manning and Holthuis (1981), only 20 or about 10% show amphi-Atlantic distributions. Fourteen of these are shallow-water tropical species, and 8 of the 14, or the majority of shallow-water, tropical species, *Apiomithrax violaceus*, *Calappa galloides*, *Microcassiope minor*, *Percnon gibbesi*, *Plagusia depressa*, *Laeonectes vocans*, *Ranilia constricta*, and *Xanthodius denticulatus*, are known to occur on Ascension.

Of these, *Apiomithrax violaceus* is the only majid, *Calappa galloides* is the only calappid, *Ranilia constricta* is the only raninid, and *Laeonectes vocans* is one of only two portunids to show amphi-Atlantic distributions. Further, the only amphi-Atlantic palinurid, *Panulirus echinatus*, also lives at Ascension.

So far as we can tell, the following species are the only shallow-water tropical amphi-Atlantic species (including pan-

tropical but excluding introduced species or pelagic species such as *Portunus sayi* (Gibbes); an asterisk identifies the species found on Ascension (ASC) or St. Helena (SH):

PENAELIDAE

Penaeus duorarum notialis Pérez Farfante

BRESILIIDAE

Discias atlanticus Gurney

RHYNCHOCINETIDAE

**Rhynchocinetes rigens* Gordon ASC

GNATHOPHYLLIDAE

Gnathophyllum americanum Guérin Méneville

PALAEMONIDAE

**Brachycarpus biunguiculatus* (Lucas) ASC, SH

Pontonia domestica Gibbes

ALPHEIDAE

**Alpheus bouvieri* A. Milne Edwards ASC

Alpheus cristulifrons Rathbun

Alpheus cylindricus Kingsley

Alpheus floridanus Kingsley

Alpheus intrinsecus Bate

Alpheus malleator Dana

**Alpheus paracrinitus* Miers ASC

Automate evermanni Rathbun

**Metalpheus rostratipes* (Pocock) ASC

HIPPOLYTIDAE

Latreutes parvulus Stimpson

**Lysmata grabhami* (Gordon) ASC

**Lysmata intermedia* (Kingsley) ASC

**Lysmata moorei* (Rathbun) ASC

**Trachycaris restricta* (A. Milne Edwards) SH

OGYRIDIDAE

Ogyrides occidentalis (Ortmann)

ENOPLOMETOPIDAE

**Enoplometopus antillensis* Lütken ASC, SH

PALINURIDAE

**Panulirus echinatus* Smith ASC, SH

TABLE 2.—Distribution patterns of the 35 species known from St. Helena (SH = St. Helena only; ASC = Ascension; EA = Eastern Atlantic; WA = Western Atlantic; EP = Eastern Pacific; IWP = Indo-West Pacific).

St. Helena Decapods	SH	ASC	EA	WA	EP	IWP
<i>Brachycarpus biunguiculatus</i>		+	+	+	+	+
<i>Pontonia pinnophylax</i>		+	+			
<i>Alpheus macrocheles</i>		+	+			
<i>Metalpheus paragracilis</i>		+				+
<i>Synalpheus fritzmulleri</i>		+		+	+	
<i>Trachycaris restricta</i>			+	+		
<i>Enoplometopus antillensis</i>		+	+	+		
<i>Panulirus echinatus</i>		+	+	+		
<i>Scyllarides delfosi</i>		+		+		
<i>Dardanus arrosor</i>			+	+		+
<i>Dardanus imperator</i>		+				
<i>Albunea carabus</i>			+			
<i>Dromia erythropus</i>		+		+		
<i>Dromia marmorea</i>		+	+			
<i>Dromia personata</i>		+	+			
<i>Dromidia antillensis</i>		+		+		
<i>Petalomera wilsoni</i>						+
<i>Ranilia constricta</i>		+	+	+		
<i>Calappa bicornis</i>						+
<i>Cycloes cristata</i>			+			
<i>Mursia cristimanus</i>				+		+
<i>Chaceon atopus</i>	+					
<i>Chaceon sanctaehelenae</i>	+					
<i>Euryozius sanguineus</i>		+		+		
<i>Microcassiope minor</i>		+	+	+		
<i>Nannocassiope melanodactylus</i>		+	+		+	
<i>Paractaea margaritaria</i>			+			
<i>Grapsus adscensionis</i>		+	+			
<i>Pachygrapsus loveridgei</i>		+				
<i>Planes cyaneus</i>			+	+	+	+
<i>Planes marinus</i>					+	+
<i>Plagusia depressa</i>		+	+	+		
<i>Acanthonyx sanctaehelenae</i>		+				
<i>Pisa sanctaehelenae</i>	+					
<i>Troglocarcinus corallicola</i>		+	+	+		
Total	3	22	19	16	5	8
Percentage	9%	63%	54%	46%	14%	23%

DIOGENIDAE

**Dardanus arrosor* (Herbst) SH

PORCELLANIDAE

Petrolisthes armatus (Gibbes)**Petrolisthes marginatus* Stimpson ASC

ALBUNEIDAE

Albunea paretii (Guérin Méneville)

RANINIDAE

**Ranilia constricta* (A. Milne Edwards) ASC

CALAPPIDAE

**Calappa galloides* Stimpson ASC

MAJIDAE

**Apiomithrax violaceus* (A. Milne Edwards) ASC

PORTUNIDAE

Cronius ruber (Lamarck)**Laeonectes vocans* (A. Milne Edwards) ASC

XANTHIDAE

Catantopodius floridanus (Gibbes)**Domecia acanthophora* (Schramm) ASC*Menippe nodifrons* Stimpson**Microcassiope minor* (Dana) ASC,SH**Xanthodius denticulatus* (White) ASC

GRAPSIDAE

Cyclograpsus integer H. Milne Edwards*Geograpsus lividus* (H. Milne Edwards)*Pachygrapsus gracilis* (De Saussure)*Pachygrapsus transversus* (Gibbes)**Percnon gibbesi* (H. Milne Edwards) ASC**Plagusia depressa* (Fabricius) ASC,SH

CRYPTOCHIRIDAE

**Troglocarcinus corallicola* Verrill ASC,SH

Whereas many decapod families may contain species that

have long enough larval lives for the adults to be very widely distributed, the fact remains that relatively few species of decapods have the capability for long distance dispersal. A measure of the number of species in the western Atlantic is provided by Abele and Kim (1986), who reported almost 800 species from Florida. Yet less than 50 species are known to have an amphi-Atlantic distribution pattern. Not surprisingly, more than half of those, 23, occur at Ascension and/or St. Helena.

Fourteen species (19%) are endemic to Ascension, whereas only three species (9%) are endemic to St. Helena. Three other species, *Dardanus imperator*, *Acanthonyx sanctaehelena*, and *Pachygrapsus loveridgei*, are known only from Ascension and St. Helena islands. *Gecarcinus lagostoma* is known only from central Atlantic islands (Ascension, Ilha Trindade, and Fernando de Noronha), and *Euryozius sanguineus* also is a central Atlantic species, occurring at Ascension, St. Helena, and St. Paul's Rocks. Endemic elements are higher on Ascension. In contrast, endemism in shore fishes is somewhat higher at St. Helena (22%; Briggs, 1974) than at Ascension (16%; Lubbock, 1980).

Briggs (1974:95) remarked that the 22% (27% in Briggs, 1966) rate of endemism among shore fishes at St. Helena is far higher than on any other oceanic island in the tropical Atlantic, and Rosewater (1975) reported a much higher rate of endemism in mollusks from St. Helena (51%) than Ascension (1%). This has been attributed in part to the age of the islands, St. Helena of Miocene age (~36 million years old) and with a stable climatic history (Briggs, 1966), and Ascension of Pleistocene age, ~1.5 million years old. Yet on Ascension endemism of both decapods (19%) and fishes (16%) is similar to that of fishes on St. Helena, and both groups differ markedly from the endemism in the mollusks.

Thirteen Ascension species (18%) also occur in the eastern Pacific; all but two of these, *Nannocassiope melanodactylus* and *Percnon abbreviatum*, also are recorded from the western Atlantic. Of the species from St. Helena, five (14%) also are found in the eastern Pacific. Three of the five, *Brachycarpus biunguiculatus*, *Synalpheus fritzmulleri*, and *Nannocassiope melanodactylus*, also occur at Ascension, but the two species of *Planes* known from St. Helena do not.

Seven of the 13 Ascension species known from the eastern Pacific also live in the Indo-West Pacific, as do three of the five species shared by St. Helena and the eastern Pacific.

Thirteen species (18%) from Ascension are known from Indo-West Pacific localities, and the following seven of these are pantropical: *Brachycarpus biunguiculatus*, *Alpheus paracrinitus*, *Automate dolichognatha*, *Metapheus rostratipes*, *Neopalpheopsis euryone*, *Stenopus hispidus*, and *Percnon abbreviatum*.

Two of those known from the Indo-West Pacific, *Metapheus paragracilis* and *Percnon abbreviatum*, are known in the Atlantic only at Ascension or at Ascension and St. Helena, and the Indo-West Pacific genus *Mursia* is represented by a

different species on each island. *Sympagurus dimorphus* is a southern hemisphere species, living on both sides of the Atlantic and in the Indo-West Pacific as well.

So far as we can tell, the seven species listed above and *Gnathophylloides mineri* Schmitt and *Alpheus sulcatus* Kingsley are the only shallow-water pantropical decapods (pantropical as in Rosewater, 1975:3, occurring in Atlantic, eastern Pacific, and Indo-West Pacific; = circumtropical sensu Ekman, 1953:3). So all but two of the known pantropical shallow water decapods and the only pantropical stomatopod, *Tetrasquilla mccullochae*, occur on Ascension. This must reflect their dispersal ability, for Tethyan relicts would not be found on a young island like Ascension, and their ability to colonize and live in relatively harsh environments. Bruce (1978:352) commented on how few decapods had a pantropical distribution.

Briggs (1960:171; 1961:545) reported that only 13 species of shore fishes had circumtropical (= pantropical) distributions. His definition of circumtropical includes species occurring in the eastern Pacific, on both sides of the Atlantic, and in the Indo-West Pacific as well. Using that definition, there are only three pantropical decapods (*Brachycarpus biunguiculatus*, *Alpheus paracrinitus*, and *Metapheus rostratipes*) and no pantropical stomatopods.

A slightly larger proportion of the species from St. Helena, eight (23%), are known from the Indo-West Pacific. Two of these, *Brachycarpus biunguiculatus* and *Metapheus paragracilis*, also are found on Ascension, but the other six, *Dardanus arrosor*, *Petalomera wilsoni*, *Calappa bicornis*, *Mursia cristimanus*, *Planes cyaneus*, and *Planes minutus* are not. *Mursia cristimanus* is an Indo-West Pacific species that also occurs off Namibia. The records for *Petalomera wilsoni* and *Calappa bicornis* from St. Helena are the only Atlantic records for these two species.

Excluding the pantropical species, there are relatively few species of decapods, excluding introduced and pelagic species, that occur in both the Atlantic and the Indo-West Pacific. These are listed below (data from Chace, 1972; Kensley, 1981a, 1981c, 1983; Kim and Abele, 1988; Manning and Holthuis, 1981); species occurring on Ascension (ASC) or St. Helena (SH) are identified with an asterisk:

BRESILIIDAE

Discias atlanticus Gurney

RHYNCHOCINETIDAE

**Rhynchocinetes rigens* Gordon ASC

GNATHOPHYLLIDAE

Gnathophyllum americanum Guérin Méneville

PALAEOMONIDAE

Fennera chacei Holthuis

ALPHEIDAE

**Alpheus crockeri* (Armstrong) ASC

Alpheus lottini Guérin-Méneville

Alpheus pacificus Dana

Alpheus sulcatus Kingsley

Athanas nitescens Leach

**Metapheus paragracilis* (Coutière) ASC, SH

HIPPOLYTIDAE

Thor amboinensis (De Man)

AXIIDAE

**Axiopsis serratifrons* (A. Milne Edwards) ASC

DIOGENIDAE

**Dardanus arrosor* (Herbst) SH

PAGURIDAE

Pagurus cuanensis (Bell)

DROMIIDAE

**Petalomera wilsoni* (Fulton and Grant) SH

DORIPPIDAE

Medorippe lanata (Linnaeus)

CALAPPIDAE

Calappa bicornis* Miers SHMursia cristimanus* De Haan SH

LEUCOSIIDAE

Ebalia tuberculata (Miers)

ATELECYCLIDAE

**Atelecyclus rotundatus* (Oliv) ASC

MAIIDAE

Eurynome aspera (Pennant)*Inachus dorsettensis* (Pennant)*Macropodia rostrata* (Linnaeus)

PORTUNIDAE

Liocarcinus corrugatus (Pennant)*Thalamita poissoni* (Audouin)*Xaiva mcleayi* (Barnard)

XANTHIDAE

Leopoldius pisifer (MacLeay)*Panopeus africanus* A. Milne Edwards

GRAPSIDAE

Cyclograpsus integer (H. Milne Edwards)

Seven of these, *Athanas nitescens*, *Pagurus cuanensis*, *Ebalia tuberculata*, *Eurynome aspera*, *Macropodia rostrata*, *Leopoldius pisifer*, and *Panopeus africanus*, are eastern Atlantic species whose ranges extend to South Africa.

Distribution patterns of stomatopods from Ascension and St. Helena are summarized in Table 3. Both stomatopods from Ascension are widely distributed. *Pseudosquilla oculata* is found across the Indo-West Pacific, from Hawaii to East Africa and on both sides of the Atlantic, but it does not occur in the eastern Pacific. *Tectasquilla mccullochae* is essentially pantropical, occurring in the eastern Pacific, western and central Atlantic, and Indian Oceans.

Three stomatopods have been recorded from St. Helena (Manning, 1969), *Alima hyalina* Leach, 1817, *Pseudosquilla ciliata* (Fabricius, 1787), and *Pseudosquilla oculata*. The latter

also occurs at Ascension, and all three species are widely distributed in the Indo-West Pacific and are amphi-Atlantic as well.

Put another way, three of four (75%) of the amphi-Atlantic stomatopods and the only pantropical stomatopod, *Tectasquilla mccullochae*, occur on Ascension and/or St. Helena, attesting to their unusual dispersal ability.

The decapod fauna of St. Helena shows close affinities with that of Ascension, with 22 of the 35 (63%) of the decapods known from St. Helena also occurring on Ascension. The following 13 species known from St. Helena have not been taken at Ascension (data from Chace, 1966, 1968; Doflein, 1900; Forest, 1974; Gurney, 1940; Manning and Holthuis, 1989; and herein):

Trachycaris restricta A. Milne Edwards, 1878 [reported from St. Helena by Gurney (1940)].

Dardanus arrosor (Herbst, 1796).

Albunea carabus (Linnaeus, 1758) [This species was reported from St. Helena by Stebbing (1914:255, 281) and listed by Chace (1966:635). There is a female, cl 11 mm, from St. Helena, in the collections of the National Museum of Natural History, that corroborates Stebbing's identification].

Petalomera wilsoni (Fulton and Grant, 1902) [reported from St. Helena by Forest (1974)].

Calappa bicornis Miers, 1884 [reported from St. Helena by Chace (1966:636) as *Calappa gallus*].

Cycloes cristata (Brullé, 1837) [We consider *C. deweti* Chace, 1968, based on a male, cl 73 mm, to be an unusually large representative of this species. There is a male, cl 37 mm, from the Canary Islands with the color pattern of *C. deweti* in the collections of the Zoological Museum, Copenhagen. There is material of this species from St. Helena in the collections of the Zoological Museum, Copenhagen, and the National Museum of Natural History, Smithsonian Institution].

Mursia cristimanus de Haan, 1837 [reported from St. Helena by Doflein (1900)].

Chaceon atopus Manning and Holthuis, 1989.

Chaceon sanctaehelena Manning and Holthuis, 1989.

Paractaea margaritaria (A. Milne Edwards, 1867).

Planes cyaneus Dana, 1852(a).

Planes marinus Rathbun, 1914.

Pisa sanctaehelena Chace, 1966.

Three of these, the two species of *Chaceon* and *Pisa sanctaehelena*, are known only from St. Helena. Three species, *Albunea carabus*, *Cycloes cristata*, and *Paractaea margaritaria*, are otherwise known only from the eastern Atlantic. *Trachycaris restricta* and *Dardanus arrosor* occur on both sides of the Atlantic and *D. arrosor* is found in the Indo-West Pacific as well. Four of the remaining five species, *Petalomera wilsoni*, *Calappa bicornis*, and the two species of *Planes*, are found in the Indo-West Pacific; the records for *Petalomera wilsoni*, *Calappa bicornis*, and *Planes marinus* from St. Helena are the only Atlantic records for these species; the presence of *Planes cyaneus* in the Atlantic has been discussed by Manning

TABLE 3.—Distribution patterns of Stomatopoda from Ascension and St. Helena (ASC = Ascension; SH = St. Helena; EA = eastern Atlantic; WA = western Atlantic; EP = eastern Pacific; IWP = Indo-West Pacific).

Species	ASC	SH	EA	WA	EP	IWP
<i>Alima hyalina</i>		+	+	+		+
<i>Pseudosquilla ciliata</i>		+	+	+		+
<i>Pseudosquilla oculata</i>	+	+	+	+		+
<i>Tectasquilla mccullochae</i>	+			+	+	+

and Holthuis (1981:236, 237). *Mursia cristimanus* is a South African species that also occurs off Namibia. The occurrence of a species of *Pisa* at St. Helena is the only extension of the range of this genus outside of the eastern Atlantic.

In summary, a total of 87 species of decapods are known to occur at both Ascension and St. Helena. Of this total 42 species (48%) occur in the eastern Atlantic, 44 species (51%) occur in the western Atlantic, 15 species (17%) are found in the eastern Pacific, and 19 species (22%) also occur in the Indo-West Pacific. Although a higher percentage of Ascension species (26%) than species from St. Helena (14%) are found otherwise in the western Atlantic, 20% of the decapods of St. Helena and 19% of the decapod fauna of Ascension is found only in the eastern and central Atlantic.

Distribution patterns of decapods, fishes, echinoderms, and mollusks from Ascension are summarized in Table 4. The three invertebrate groups show a higher proportion of eastern Atlantic components than do the fishes (16–27% versus 7%). In fishes, species occurring in the central and western Atlantic form 30% of the total, whereas in the other groups they form 24–26% of the total. Lubbock (1980:300) suggested that in fishes this reflects the greater diversity of the western Atlantic fish fauna.

Among the invertebrate groups, decapods show the highest percentage of species occurring only at Ascension (20% versus 4–16%). This could certainly reflect lack of collecting effort elsewhere. Note that two species found on Ascension, *Pachygrapsus corrugatus* and *Corallianassa hartmeyeri*, are rare elsewhere in the Atlantic; the Ascension record for the latter is only the second record for the species. Conversely, some species, like *Lysmata moorei*, are more abundant on Ascension than elsewhere in their ranges.

THE FAUNA OF ST. PAUL'S ROCKS

Of fifteen species of decapods reported from St. Paul's Rocks (Holthuis, Edwards, and Lubbock (1980), eight (53%) also occur at Ascension. Five species (33%), *Lysmata grabhami*, *Panulirus echinatus*, *Domecia acanthophora*, *Xanthodius denticulatus*, and *Plagusia depressa*, are amphi-

Atlantic, one, *Euryozius sanguineus*, is a central Atlantic island species, and two, *Synalpheus fritzmulleri* and *Pachygrapsus corrugatus*, are western Atlantic forms. Of the other species recorded by Holthuis, Edwards, and Lubbock (1980), three are widespread pelagic species, one also occurs in the eastern Atlantic, two are western Atlantic, and the identity of one is uncertain. Lubbock and Edwards (1981:155) and Edwards and Lubbock (1983:65) concluded that the fauna of St. Paul's Rocks formed an impoverished outpost of the Brazilian mainland fauna, with few ties to the eastern Atlantic. This seems to hold for the decapods, too.

One stomatopod, *Gonodactylus austrinus* Manning, 1969, has been recorded from St. Paul's Rocks; it is a western Atlantic species.

THE FAUNA OF FERNANDO DE NORONHA

Fausto Filho (1974) reported 62 species of decapods from Fernando de Noronha, Brazil, and 12 of these (19%) also are found at Ascension. One species, *Gecarcinus lagostoma*, is a central Atlantic island species, eight other species are amphi-Atlantic, and three, *Panopeus hartii*, *Hippa testudinaria*, and *Stenopus hispidus*, are otherwise found in the western Atlantic; the latter species also is widely distributed in the Indo-West Pacific.

Four stomatopods have been reported from Fernando de Noronha (Fausto Filho, 1974; herein). The three listed by Fausto Filho, a *Meiosquilla* and two species of *Gonodactylus*, are western Atlantic species and their ranges do not extend to the central Atlantic. The fourth species, *Tectasquilla mccullochae*, occurs on Ascension and is pantropical in distribution.

The decapod fauna of Fernando de Noronha is basically an extension of the Brazilian mainland fauna.

THE FAUNA OF BERMUDA

Markham and McDermott (1981) listed 265 species of decapods from Bermuda (not including *Dardanus imperator*, which they listed but which doesn't occur outside of the south central Atlantic), and Manning and Camp (1989) added a

TABLE 4.—The distribution patterns within the Atlantic of Ascension decapods compared with the patterns shown by fishes (excluding one doubtful record; Lubbock, 1980), echinoderms (recalculated from Pawson, 1978), and mollusks (Rosewater, 1975).

Distribution	Decapods	Fishes	Echinoderms	Mollusks
Number of species	74	71	25	89
Amphi-Atlantic	22 (30%)	21 (30%)	10 (40%)	27 (30%)
Central & West Atlantic	19 (26%)	21 (30%)	6 (24%)	21 (24%)
Central & East Atlantic	14 (19%)	5 (7%)	4 (16%)	24 (27%)
Ascension/St. Helena only	4 (5%)	12 (17%)	4 (16%)	5 (6%)
Ascension only	15 (20%)	11 (16%)	1 (4%)	12 (13%)

record for *Enoplometopus antillensis*. Of the 265 species known from Bermuda, 23 (9%) also are found on Ascension, and all 23 have broad distributions in the western Atlantic. The fauna of Bermuda is an extension of that of the West Indies and is characterized by low endemism, about 2%.

Five stomatopods have been recorded from Bermuda, and four of the five do not occur outside of the western Atlantic. The fifth, *Pseudosquilla ciliata*, a widespread tropical species, occurs at St. Helena but not Ascension.

The faunas of Bermuda and Ascension are linked by representatives of two genera that share the anchialine habitat, *Procaris* and *Typhlatya*. On Ascension these genera are represented by *Procaris ascensionis* and *Typhlatya rogersi* and on Bermuda by *Procaris chacei* Hart and Manning, 1986 and *Typhlatya iliffei* Hart and Manning, 1981. Members of *Typhlatya* from Ascension and Bermuda are the only representatives of the genus to live in salt water. Manning, Hart, and Iliffe (1986) commented on the difficulties of deriving these salt water atyids on oceanic islands from fresh water stock in the Caribbean, and suggested that these populations had colonized these habitats in the Jurassic, having invaded the groundwater systems in ancient times and having survived there until the present. This is what J. Tuzo Wilson had suggested (in litt.) to us (Chace and Manning, 1972:6), "it is just conceivable that forms of life might have survived on Ascension from the times when the Atlantic was very narrow." Wilson also raised the possibility that Ascension "is only the latest in a series of islands whose remains form scattered seamounts and ridges" from Ascension to Cameroon via the Guinea Rise and from Ascension to Brazil. Garth (1966:466) pointed out that submerged banks and guyots could have

provided stepping stones for the migration of benthic species across wide expanses of ocean. These may well have played a role in the colonization of Ascension, especially by sublittoral species.

DISCONTINUOUS DISTRIBUTIONS

An interesting phenomenon is the discontinuous distribution of *Nannocassiope melanodactylus*, known from the eastern Pacific and the eastern Atlantic, including Ascension and St. Helena, but apparently absent from the western Atlantic. The genus *Acidops*, with one eastern Pacific and one eastern Atlantic species, the latter occurring on Ascension, also shows this pattern, as do members of the genus *Globopilumnus* (see Garth, 1968). One stomatopod also shows this discontinuity, as pointed out by Manning (1977). *Squilla aculeata* Bigelow, 1893 is represented in the eastern Pacific by *Squilla aculeata aculeata* and in the eastern Atlantic by *Squilla aculeata calmani* Holthuis, 1959(b), but the species does not occur in the western Atlantic. These examples all support the recognition of a distinct Atlanto-East Pacific faunal Province by Ekman (1953).

Perhaps *Petrolisthes armatus* (Gibbes, 1850), which is unknown from both Ascension and St. Helena but is recognized as part of the decapod faunas of the eastern and western Atlantic and the eastern Pacific, represents a member of this faunal province in which the western Atlantic population seems to have diverged from the other two populations but not to the point of elimination (Chace, 1956:19, 20), as may have occurred in the discontinuous patterns of the species mentioned above.

Appendix: Station Data

R.B. Manning's 1971 Expedition to Ascension

- RBM ASC-1 Shelly Beach, inland tide pool (marl pool), bottom marl, depth ~18 inches (~50 cm), hand, RBM, Doug Rogers, 18 May 1971: material reported in Chace and Manning (1972).
- RBM ASC-2 Shelly Beach, inland tide pool (coral pool), bottom rock, coral, and algae (*Valonia*), depth ~18 inches (~50 cm), hand, RBM, Doug Rogers, 18 May 1971: material reported in Chace and Manning (1972).
- RBM ASC-3 McArthur Point, beach (Turtle Shell Beach), and rocky point at northern edge of South West Bay, coarse sand beach and rocky intertidal, with large sand bottom tide pool rimmed with oysters, hand, RBM, Doug Rogers, 18 May 1971: *Grapsus adscensionis*, *Hippa testudinaria*, *Pachygrapsus loveridgei*.
- RBM ASC-4 Green Mountain, southern face, elevation ~1300-1600 ft (396-488 m), RBM, Doug Rogers, 18 May 1971: *Gecarcinus lagostoma*.
- RBM ASC-5 North East Bay, beach and tide pools on rocky point west of main beach, hand and poison, RBM, Doug Rogers, P. Kashulines, 19 May 1971: *Alpheus dentipes*, *Cataleptodius olsoni*, *Clibanarius rosewateri*, *Gecarcinus lagostoma*, *Grapsus adscensionis*, *Hippa testudinaria*, *Pachygrapsus loveridgei*, *Troglocarcinus corallicola*.
- RBM ASC-6 Green Mountain, pasture at summit of central peak, elevation 2558 ft (780 m), RBM, Doug Rogers, P. Kashulines, 19 May 1971: *Gecarcinus lagostoma*.
- RBM ASC-7 Green Mountain, along road just below the farm, in moist earth under pumice blocks, RBM, Doug Rogers, P. Kashulines, 19 May 1971: *Gecarcinus lagostoma*.
- RBM ASC-8 English Bay, at northern edge of northernmost beach, sand beach with lava flow, large boulders with sabellariid worms at 4-15 ft (1-4.5 m) depth, hand and poison, RBM, Doug Rogers, P. Kashulines, 19 May 1971: *Cataleptodius olsoni*, *Clibanarius rosewateri*, *Microcassiope minor*, *Pachygrapsus loveridgei*, *Panopeus hartii*, *Percnon gibbesi*.
- RBM ASC-9 McArthur Point, northern edge of South West Bay (Turtle Shell Beach), tide pool with sand bottom in lava flow, poison, RBM, P. Kashulines, 20 May 1971: *Alpheus dentipes*, *Brachycarpus biunguiculatus*, *Lysmata moorei*.
- RBM ASC-10 English Bay, rocky point at northern edge of bay, intertidal pools and subtidal rocky shore, some coarse sand on bottom, shore to 4 ft (0-1.2 m), hand and poison, RBM, P. Kashulines, 20 May 1971: *Panopeus hartii*, *Xanthodius denticulatus*; *Tetrasquilla mcullochae*.
- RBM ASC-11 English Bay, rocky point at northern edge of bay, formalin wash of rock scrapings, RBM, 21 May 1971: *Alpheus dentipes*, *Alpheus paracrinus*, *Cataleptodius olsoni*, *Grapsus adscensionis*, *Metalpheus paragracilis*, *Microcassiope minor*, *Pachygrapsus loveridgei*, *Panopeus hartii*.
- RBM ASC-12 McArthur Point, northern edge of South West Bay, beach and tide pool with sand bottom in lava flow, formalin wash of coralline algal mats, RBM, 21 May 1971: *Acanthonyx sanctaehelenae*, *Alpheus dentipes*, *Cataleptodius olsoni*, *Clibanarius rosewateri*, *Grapsus adscensionis*, *Hippa testudinaria*, *Metalpheus paragracilis*, *Microcassiope minor*, *Pachygrapsus loveridgei*, *Panopeus hartii*, *Processa packeri*, *Salmonus setosus*, *Xanthodius denticulatus*.
- RBM ASC-13 Georgetown, rocky point of Fort Hayes, hand and formalin wash of sabellariid worm colonies, *Padina* and *Sargassum*, and of filamentous green algal mats from intertidal rocks, RBM, Doug Rogers, 22 May 1971: *Acanthonyx sanctaehelenae*, *Alpheus bouvieri*, *Cataleptodius olsoni*, *Clibanarius rosewateri*, *Metalpheus paragracilis*, *Metalpheus rostratus*, *Microcassiope minor*, *Pachygrapsus corrugatus*, *Pachygrapsus loveridgei*, *Petrolisthes marginatus*.
- RBM ASC-14 South of Collyer Point, rocky surface with dense algal mat at low tide adjacent to Cable and Wireless Beach, algal wash and by hand, RBM, Doug Rogers, 22 May 1971: *Cataleptodius olsoni*, *Clibanarius rosewateri*, *Pachygrapsus loveridgei*.
- RBM ASC-15 English Bay, rocky point at northern edge of bay, intertidal pool and subtidal rocky shore, some coarse sand bottom, hand and formalin wash of rocks, RBM, D. Rogers, K. Double, 22 May 1971: *Acanthonyx sanctaehelenae*, *Alpheus dentipes*, *Alpheus paracrinus*, *Automate dolichognatha*, *Axiopsis serratifrons*, *Brachycarpus biunguiculatus*, *Calcinus tubularis*, *Cataleptodius olsoni*, *Clibanarius rosewateri*, *Metalpheus paragracilis*, *Microcassiope minor*, *Opearcinus hypostegus*, *Panopeus hartii*, *Salmonus setosus*, *Xanthodius denticulatus*.
- RBM ASC-16 Shelly Beach, flat exposed at low tide on open beach, hand, RBM, Doug Rogers, 22 May 1971: *Brachycarpus biunguiculatus*, *Lysmata moorei*, *Pachygrapsus loveridgei*, *Percnon gibbesi*.
- RBM ASC-17 Shelly Beach, inland tide pool (marl pool), bottom marl, hand, RBM, Doug Rogers, K. Double, 23 May 1971: Material reported in Chace and Manning (1972).
- RBM ASC-18 Shelly Beach, tide pools in flat exposed at low tide on open beach, hand and poison, RBM, Doug Rogers, K. Double, 23 May 1971: *Alpheus bouvieri*, *Clibanarius rosewateri*, *Grapsus adscensionis*, *Lysmata moorei*, *Microcassiope minor*, *Pachygrapsus loveridgei*, *Percnon gibbesi*, *Troglocarcinus corallicola*, *Xanthodius denticulatus*.
- RBM ASC-19 Shelly Beach, inland tide pool (coral pool), bottom rock, coral, and algae (*Valonia*), hand and formalin wash of coral, RBM, Doug Rogers, K. Double, 23 May 1971: no decapods. South of Collyer Point, rocky point adjacent to Cable and Wireless Beach, hand, RBM, Doug Rogers, 23 May 1971: *Gecarcinus lagostoma*, *Grapsus adscensionis*, *Pachygrapsus loveridgei*.
- RBM ASC-21 English Bay, rocky point at northern edge of bay, tide pools on rocky flat, hand and formalin wash of green algal clumps, oyster clumps, and rocks, also poison, RBM, 24 May 1971: *Acanthonyx sanctaehelenae*, *Alpheus dentipes*, *Alpheus paracrinus*, *Brachycarpus biunguiculatus*, *Cataleptodius olsoni*, *Clibanarius rosewateri*, *Metalpheus paragracilis*, *Microcassiope minor*, *Pachygrapsus loveridgei*, *Percnon abbreviatum*, *Percnon gibbesi*, *Salmonus setosus*, *Synalpheus fritzmulleri*, *Xanthodius denticulatus*.
- RBM ASC-22 McArthur Point, northern edge of South West Bay (Turtle Shell Beach), tide pool with sand bottom in lava flow, hand and poison, RBM, 24 May 1971: *Alpheus dentipes*, *Alpheus macrocheles*, *Alpheus paracrinus*, *Brachycarpus biunguiculatus*, *Clibanarius rosewateri*, *Corallianassa hartmeyerii*, *Gnathophyllum ascensione*, *Lysmata moorei*, *Metalpheus paragracilis*, *Petrolisthes marginatus*, *Processa packeri*, *Portunus anceps*, *Synalpheus fritzmulleri*, *Xanthodius denticulatus*.
- RBM ASC-23 McArthur Point, northern edge of South West Bay (Turtle Shell Beach), tide pool with sand bottom, hand and poison, RBM, K. Double, 25 May 1971: *Acanthonyx sanctaehelenae*, *Alpheus bouvieri*, *Alpheus dentipes*, *Alpheus paracrinus*, *Clibanarius rosewateri*, *Gnathophyllum ascensione*, *Lysmata moorei*, *Metalpheus paragracilis*, *Pachygrapsus loveridgei*, *Processa packeri*, *Salmonus teres*, *Troglocarcinus corallicola*.
- RBM ASC-24 South of Collyer Point, intertidal rocky flat around blowhole adjacent to Cable and Wireless Beach, hand, RBM, K. Double, 25 May 1971: *Plagusia depressa*.
- RBM ASC-25 South of Collyer Point, intertidal rocky flat around blowhole adjacent to Cable and Wireless Beach, hand and poison,

RBM, 25 May 1971: *Alpheus dentipes*, *Axiopsis serratifrons*, *Clibanarius rosewateri*, *Gnathophyllum ascensione*, *Metalpheus rostratipes*, *Pachygrapsus corrugatus*, *Percnon gibbesi*, *Plagusia depressa*, *Processa packeri*.

The 1976 Smithsonian Expedition to Ascension

- ASC 1-76 McArthur Point, 11 July 1976:
- 1A sand in isolated tide pool: no decapods.
- 1B associated with rocks: *Acanthonyx sanctaehelenae*, *Alpheus dentipes*, *Cataleptodius olsoni*, *Clibanarius rosewateri*, *Grapsus adscensionis*, *Metalpheus paragracilis*, *Metalpheus rostratipes*, *Pachygrapsus loveridgei*, *Paractaea rufopunctata africana*, *Percnon abbreviatum*, *Percnon gibbesi*, *Petrolisthes marginatus*, *Plagusia depressa*, *Troglocarcinus corallicola*, *Xanthodius denticulatus*.
- 1C in clumps of coralline algae: *Alpheus dentipes*, *Cataleptodius olsoni*, *Metalpheus rostratipes*, *Microcassiope minor*, *Nannocassiope melanodactylus*, *Pachygrapsus loveridgei*, *Paractaea rufopunctata africana*, *Percnon abbreviatum*, *Percnon gibbesi*, *Petrolisthes marginatus*, *Synalpheus fritzmulleri*, *Typton ascensionis*, *Xanthodius denticulatus*.
- 1D *Hippa* in surf, Turtle Shell Beach: *Hippa testudinaria*.
- ASC 2-76 Green Mountain, farm near summit, elevation ~2490 ft (759 m), 12 July 1976: no decapods.
- ASC 3-76 English Bay, 12 July 1976: *Panulirus echinatus*.
- 3A sand, inner tide pool: *Alpheus paracrinitus*, *Automate dolichognatha*, *Cataleptodius olsoni*, *Clibanarius rosewateri*, *Pachygrapsus loveridgei*, *Panopeus hartii*.
- 3B sand, outer pool: *Clibanarius rosewateri*.
- 3C associated with rocks, beyond outer pool: *Alpheus dentipes*, *Cataleptodius olsoni*, *Clibanarius rosewateri*, *Metalpheus rostratipes*, *Microcassiope minor*, *Percnon gibbesi*, *Synalpheus fritzmulleri*, *Typton ascensionis*, *Xanthodius denticulatus*.
- 3D associated with rocks, outer pool: *Alpheus dentipes*, *Alpheus paracrinitus*, *Cataleptodius olsoni*, *Domecia acanthophora*, *Metalpheus paragracilis*, *Synalpheus fritzmulleri*.
- 3E algae from pools at north end of bay: no decapods.
- 3F *Hipponyx* living under *Echinometra*.
- 3G snorkeling in 5–10 m beyond outer tide pool, calcareous sand and rock bottom: no decapods.
- ASC 4-76 McArthur Point, *Grapsus* from rocks, 12 July 1976: *Grapsus adscensionis*, *Pachygrapsus loveridgei*.
- ASC 5-76 Shelly Beach, 13 July 1976:
- 5A isolated tide pools in back of open shore, poison: *Acidops cessacii*, *Alpheus bouvieri*, *Alpheus dentipes*, *Alpheus paracrinitus*, *Automate dolichognatha*, *Cataleptodius olsoni*, *Clibanarius rosewateri*, *Corallianassa hartmeyerii*, *Dromia personata*, *Gnathophyllum ascensione*, *Grapsus adscensionis*, *Metalpheus paragracilis*, *Neopalpheopsis euryone*, *Pachygrapsus loveridgei*, *Panopeus hartii*, *Percnon gibbesi*, *Platypodiella picta*, *Xanthodius denticulatus*. Also *Tetrasquilla mccullochae*.
- 5B coral pool, 100 yds inshore from open sea: *Procaris ascensionis*, *Typhlatya rogersi*.
- 5C marl pool, seined and agitated water: *Typhlatya rogersi*.
- 5D formalin wash of coralline algae crusts from coral pool: *Alpheus dentipes*, *Cataleptodius olsoni*, *Clibanarius rosewateri*, *Lysmata moorei*, *Pachygrapsus loveridgei*.
- 5E formalin wash of echinoids from coral pool: *Clibanarius rosewateri*.
- 5F formalin wash of *Manicina* from coral pool: no decapods.
- ASC 6-76 South of Collyer Point, 14 July 1976:
- 6A isolated tide pools, poison: *Alpheus bouvieri*, *Alpheus dentipes*.
- 6B associated with exposed rocks: *Clibanarius rosewateri*, *Metalpheus rostratipes*, *Pachygrapsus loveridgei*, *Plagusia depressa*, *Troglocarcinus corallicola*.
- 6C formalin wash of echinoids: no decapods.
- ASC 7-76 Off Collyer Point, diving, collected by K. Jourdan, 14 July 1976: *Dardanus imperator*, *Euryozius sanguineus*, *Panulirus echinatus*.
- ASC 8-76 McArthur Point, isolated tide pool, poison, 15 July 1976: *Alpheus dentipes*, *Alpheus macrocheles*, *Alpheus paracrinitus*, *Brachycarpus biunguiculatus*, *Corallianassa hartmeyerii*, *Grapsus adscensionis*, *Lysmata moorei*, *Metalpheus paragracilis*, *Neopalpheopsis euryone*, *Pachygrapsus loveridgei*, *Percnon gibbesi*, *Portunus anceps*, *Synalpheus fritzmulleri*, *Xanthodius denticulatus*.
- ASC 9-76 Northeast Bay, with Kilene Speck and Edith Packard, 16 July 1976:
- 9A sand beach in zone of wave wash: *Hippa testudinaria*.
- 9B off sand beach, ~1 m deep, in finer sand than upper beach, just beyond breaking point of waves: no decapods.
- 9C isolated tide pool, poison: *Alpheus dentipes*, *Clibanarius rosewateri*, *Gnathophyllum ascensione*, *Metalpheus paragracilis*, *Metalpheus rostratipes*, *Pachygrapsus loveridgei*, *Panopeus hartii*, *Percnon gibbesi*.
- 9D associated with rocks, intertidal: no decapods.

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Front matter (preceding the text) should include: **title page** with only title and author and no other information, **abstract page** with author, title, series, etc., following the established format; table of **contents** with indents reflecting the hierarchy of heads in the paper; also, **foreword** and/or **preface**, if appropriate.

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Center heads of whatever level should be typed with initial caps of major words, with extra space above and below the head, but no other preparation (such as all caps or underline, except for the underline necessary for generic and specific epithets). Run-in paragraph heads should use period/dashes or colons as necessary.

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Taxonomic keys in natural history papers should use the aligned-couplet form for zoology and may use the multi-level indent form for botany. If cross referencing is required between key and text, do not include page references within the key, but number the keyed-out taxa, using the same numbers with their corresponding heads in the text.

Synonymy in zoology must use the short form (taxon, author, year:page), with full reference at the end of the paper under "Literature Cited." For botany, the long form (taxon, author, abbreviated journal or book title, volume, page, year, with no reference in "Literature Cited") is optional.

Text-reference system (author, year:page used within the text, with full citation in "Literature Cited" at the end of the text) must be used in place of bibliographic footnotes in all Contributions Series and is strongly recommended in the Studies Series: "(Jones. 1910:122)" or "... Jones (1910:122)." If bibliographic

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Footnotes, when few in number, whether annotative or bibliographic, should be typed on separate sheets and inserted immediately after the text pages on which the references occur. Extensive notes must be gathered together and placed at the end of the text in a notes section.

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