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One Representing a New Family, from
Marine Pools on Ascension Island
(Crustacea: Decapoda: Natantia)

FENNER A. CHACE, JR.

and

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ABSTRACT

Chace, Fenner A., Jr., and Raymond B. Manning. Two New Caridean Shrimps, One Representing a New Family, from Marine Pools on Ascension Island (Crustacea: Decapoda: Natantia). *Smithsonian Contributions to Zoology*, number 131, 18 pages, 11 figures, 1972.—*Procaris ascensionis*, new genus and new species, and *Typhlatya rogersi*, new species, are described from isolated marine pools on Ascension Island. The habitats are described and the possible origins of the shrimps discussed. *Procaris*, which also represents a new superfamily, may be one of the most primitive living members of the Caridea yet discovered. A key to the caridean superfamilies is presented. The *Typhlatya* (family Atyidae) is the first species of that genus to be collected outside of the Gulf of Mexico and Caribbean Sea and the first known from salt water. A key to the species of *Typhlatya* is included.

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Two New Caridean Shrimps, One Representing a New Family, from Marine Pools on Ascension Island (Crustacea: Decapoda: Natantia)

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Introduction

In June 1970, Storrs S. Olson, a graduate student at Johns Hopkins University, visited Ascension Island, South Atlantic Ocean, to seek evidence of an extinct rail-like bird that had been reported from the island. During that visit, he made several collections of marine animals for the Department of Invertebrate Zoology, National Museum of Natural History. Among the specimens brought to the Museum by Mr. Olson was a series of a small shrimp collected from an inland salt-water pool by Douglas S. Rogers, an employee of Pan American World Airways and Curator of the Fort Hayes Museum of the Ascension Historical Society. The existence of these shrimps was known to several people on the island, and their occurrence in the pools was reported by John E. Packer (1968) in his handbook on Ascension Island. The shrimps proved to belong to the caridean genus *Typhlatya*, the four other known members of which live in fresh water, usually subterranean, habitats in Yucatan and on some Caribbean islands. Subsequently, additional collections from the salt-water pools on Ascension were sent to us through Mr.

Blake Lorenz of the National Aeronautics and Space Administration and, inadvertently, through the District of Columbia Police Department which recovered the samples after they were stolen from Mr. Lorenz's automobile.

After examining these collections, we decided that the decapod and stomatopod crustaceans of Ascension needed more intensive study. With the help of Helena Weiss, then Registrar of the Smithsonian Institution, a trip to Ascension was arranged for one of us (RBM) in May 1971, and 10 days were spent making collections there.

In correspondence exchanged during preparation for the trip, Mr. Rogers forwarded a sketch of the area in which were located two series of small pools containing *Typhlatya*. The first sample examined was taken from what we shall refer to as the "marl pool." Subsequent lots were taken from that pool as well as from the seaward member of a nearby, larger series of pools, one containing living coral that we shall refer to as the "coral pool." The coral pool was the habitat of both *Typhlatya* and a second, larger shrimp, *Procaris*, belonging to a previously unknown family. This report is based on the shrimps found in these pools. A more extensive report on the marine decapods and stomatopods of Ascension Island is in preparation.

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Acknowledgments

Many persons have contributed to this study. We thank Storrs S. Olson for making the collections that originally kindled our interest and led to the discovery of the two unusual shrimps in the Shelly Beach habitat. Mr. Olson and Blake Lorenz both contributed by delivering collections made by Douglas Rogers. The visit by one of us to Ascension was facilitated by Miss Helena Weiss, and permission to visit the island was granted by its Administrator, Brigadier H. W. D. McDonald. Valuable background information on Ascension Island was provided prior to the trip by John E. Packer, who was stationed there for many years. During the visit to Ascension, dormitory and mess facilities were made available by Major Jack Couch, Base Commander of the U. S. Auxiliary Air Force Base. The success of the brief visit resulted in large measure from the interest and valuable assistance of Douglas S. Rogers, who provided transportation on the island and introduced the second author to a variety of habitats. Ken Double of Pan American World Airways also assisted on several excursions. We thank J. Tuzo Wilson of Erindale College, University of Toronto, and J. D. Bell of the University of Oxford for information on the geology of Ascension. Among our colleagues at the Smithsonian, Isabel Pérez Farfante, Horton H. Hobbs, Jr., and Austin B. Williams discussed several aspects of the study with us. We thank Joseph Rosewater for the identification of the mollusks, F. M. Bayer for identifying the coral, and Thomas E. Bowman for identifying the amphipod and reviewing the manuscript.

The Habitats

The pools in which *Procaris* and *Typhlatya* were collected are situated on a rough lava flow extending from South Gannet Hill to Shelly Beach near the southwestern corner of the island; the general location, but not the exact shapes, of the pools is shown in Figure 1. The area is known locally as Wideawake Fairs, the breeding ground of the Wideawake or Sooty Tern. John Packer (in litt.) gave the following account: "The pools are in fractured and jagged basalt, they connect by percolation with the adjacent ocean and there may be subterranean cavities of some size, but the

species [*Typhlatya*] is not truly spelean as they are always present in numbers in the open surface pools." These habitats have been found only in the Shelly Beach area. Unfortunately, there is no information as to the nature of subterranean marine passages on Ascension. Both series of pools are situated from 55 to 90 meters inland from the beach proper (Figure 1), from which they are separated by a shelly ridge rising 4-6 meters above sea level. There was no evidence that extreme high or storm tides had recently reached as far inland as the pools; flotsam was common on the seaward side of the beach ridge, but was not observed on the landward side. However, the coarse shelly material forming the beach and beach ridge extended inland from the ridge to the seaward pool in both series.

The marl pool is the largest and seawardmost member of a series of three or four pools (Figure 2). It is perhaps 6 meters in major diameter, with a maximum water depth of one-half meter and a bottom composed of a deep, soft, marl-like material, the flocculent surface layer of which readily goes into suspension. It is the only one of the marl pool series in which shrimps were observed, and only *Typhlatya* was collected there. Other organisms observed and collected included numerous sphaeromatid isopods, a gastropod, *Nodilittorina melearis* (Quoy and Gaimard), a large burrowing anemone, burrowing worms, copepods, and a tanaid. On 18 May, the salinity (measured by salinometer) in this pool was 39 ‰ at 29°C; on 23 May, it was 35 ‰ at 25°C. On 23 May, salinity in tide pools on the open beach was 40 ‰ at 27°C. The landward members of the marl pool series are completely dry at low tide, and no organisms were observed in them. Three subterranean openings were located in the marl pools by Mr. Rogers, and, during periods of tidal change, water flow can be observed at these openings.

The coral pool, in which both *Procaris* and *Typhlatya* were found, is the seaward pool in the larger series of about 10 pools situated approximately 125 meters southeast of and parallel with the marl pool series (Figure 3). The narrower and shallower members of this partially disconnected series are lined with marl and sand, but the primary substrate of the very irregularly shaped coral pool is rock. The deeper parts of this pool, with a

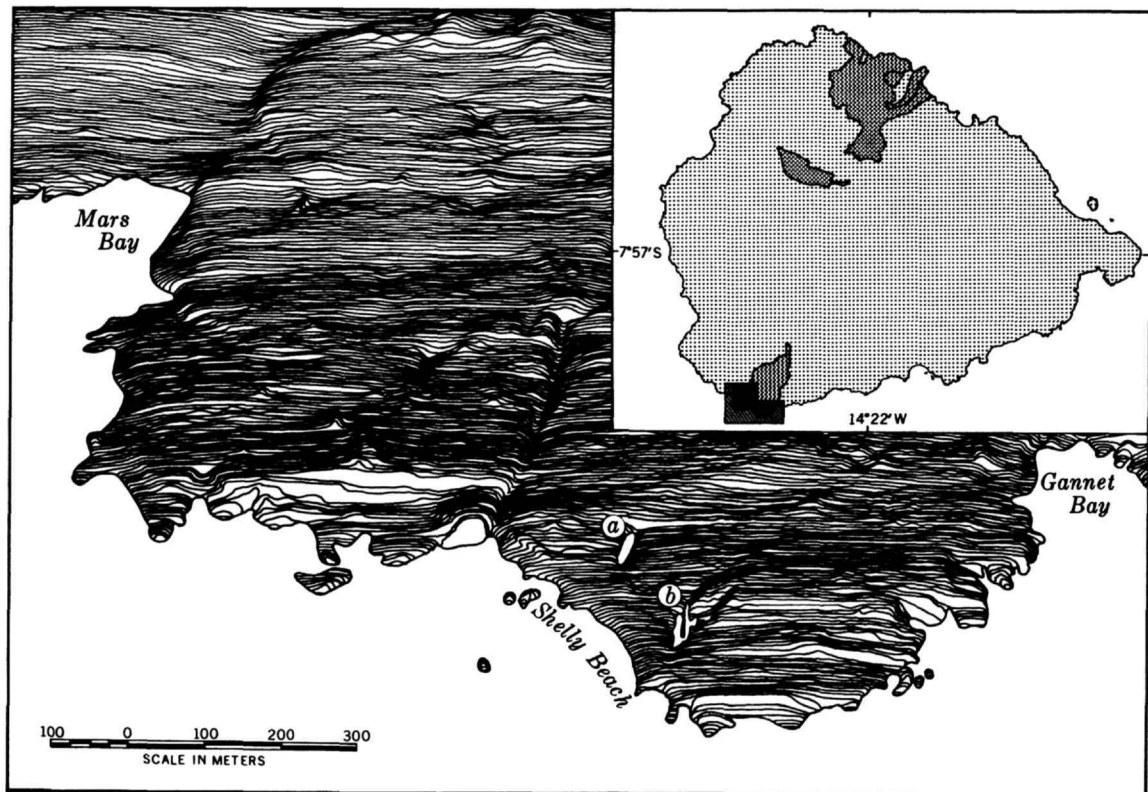


FIGURE 1.—Portion of southwestern coastal region of Ascension Island, showing locations of (a) marl pool and (b) coral pool series inland from Shelly Beach (prepared from U.S. Navy Topographic Map of Ascension Island, Sheet 14, 1962); Inset: outline map of Ascension Island, showing most recent lava flows (after Atkins, Baker, Bell, and Smith, 1964) and site of enlarged area.

water depth of about 1 meter, are protected from direct sunlight by irregular rocky overhangs and large boulders. It is the only one of the series in which shrimps were collected. The most conspicuous other organisms in the pool were extensive colonies of algae (*Valonia*) and irregular beds of coral (*Favia*); also present were the limpets *Fissurella nubecula* (Linnaeus) and *Diadora gibberula* (Lamarck), a black gammaridean amphipod of the genus *Melita*, and polychaete worms. Formalin washes of the corals and algae yielded primarily amphipods and worms. On 18 May, the salinity in the coral pool was 40 ‰ at 29°C, and, on 23 May, it was also 40 ‰ at 27°C.

No other macroinvertebrates or fishes were observed or collected in any of these pools. On one

visit to the area, a single *Grapsus grapsus* (Linnaeus), the commonest shore crab on the island, was seen on the rocks adjoining the pool, but none was seen in or near the water.

The shrimps were active in both pools by day and by night; at night, however, greater activity was apparent in the more open marl pool than in the coral pool. Both shrimps tried to evade collecting nets, but *Procaris* was more agile than *Typhlatya*. A sweep of the net in the coral pool might yield dozens of *Typhlatya*, but the less abundant *Procaris* had to be sought and collected individually. It took refuge under boulders and in crevices in the irregular bottom and was difficult to catch.

The extent to which the Wideawake or Sooty Tern preys upon these shrimps, if at all, is not

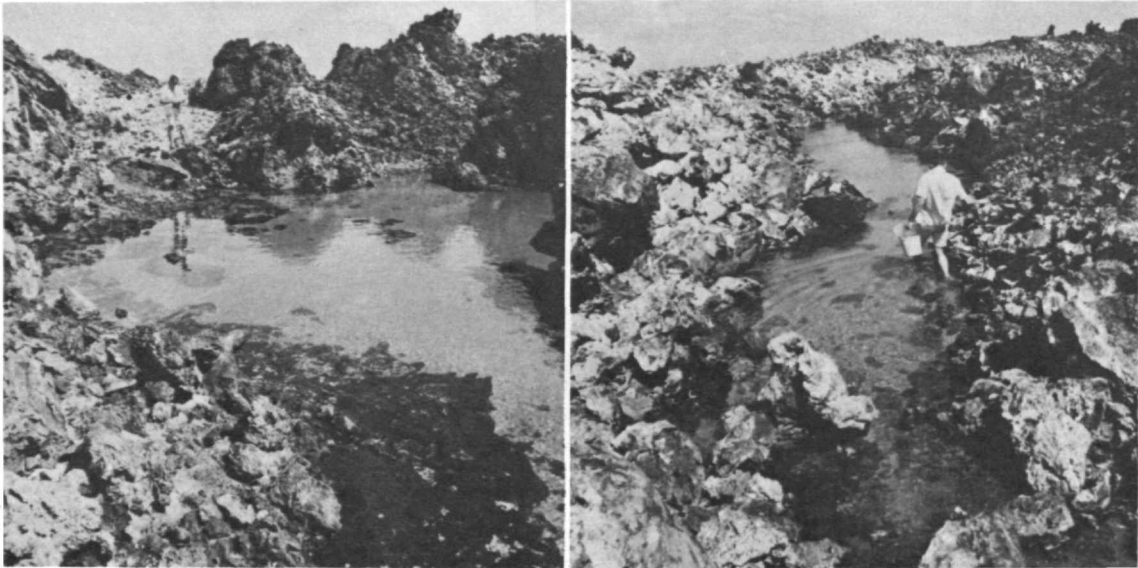


FIGURE 2.—Left, seaward portion of marl pool series, showing largest pool. Right, narrower landward extension of marl pool series. Photos by D. S. Rogers.

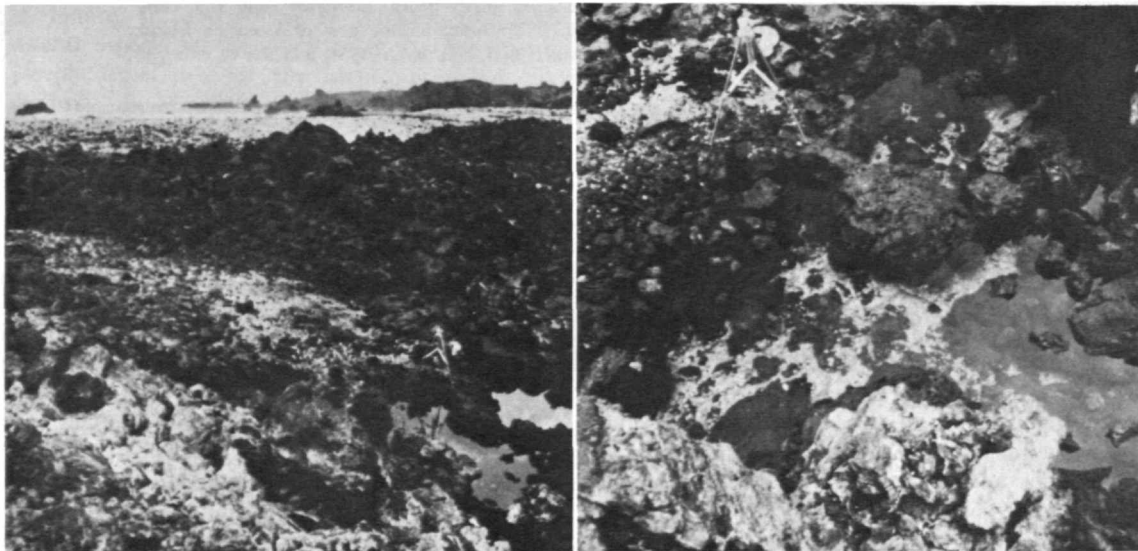


FIGURE 3.—Left, seaward pool of coral pool series. Right, larger pool in coral pool series showing coral colonies near center. The tripod is in the same position in each figure. Photos by D. S. Rogers.

known; in both pools, the shrimps would seem to be vulnerable to these and other sea birds. The activities of man may have some adverse overall effects on the shrimp populations. During World War II, the area in which the pools are located was a practice bombing range, and there are several bomb craters in the immediate vicinity of the pools. At the present time, aquarium enthusiasts among the residents of Ascension visit the area to collect the shrimps to feed aquarium fishes. The inaccessibility of the site and its relative isolation from the populated areas of the island, however, help to protect the animals living there.

Origins of the Shrimps

The fragmentary fossil record of caridean shrimps offers little evidence for the origin and affinities of either *Typhlatya* or *Procaris*. According to Glaessner (1969), fossil Caridea, not identifiable to family, are known from the Lower Jurassic and Cretaceous, and members of the fossil family Udorellidae, as well as species possibly of the Oplophoridae, also existed during those periods. Udorellids are known only from the Upper Jurassic, but fossils identified as oplophorids are known from both the Upper Jurassic and Upper Cretaceous. Other caridean families are not known until the middle Tertiary, when members of the families Atyidae and Palaemonidae appeared. Carideans are represented by four genera in the Jurassic and three genera in the Tertiary. The fact that more than 170 Recent genera are recognized might seem to indicate that the Caridea evolved rapidly after the Tertiary, but it is more likely that this group, generally of small size and soft integument, did not fossilize well and that the fossil record does not reflect accurately the abundance and diversity of these shrimps before the Recent.

According to several sources, Ascension is a relatively young oceanic island of volcanic origin. In one of the more complete accounts of the geology of the island, Daly (1925:10) notes that "geologically the island is extremely young." J. Tuzo Wilson, in a semipopular article (1963), points out that the age of Atlantic islands tends to increase with increasing distance from the Mid-Atlantic Ridge. Thus, Ascension Island, on the

ridge, is estimated to be a million years old, whereas Fernando de Noronha, several hundred miles to the west, is thought to be as much as 120 million years old. J. D. Bell, a participant in a geological expedition to Ascension in 1964, kindly gave us (in litt.) an approximate age of the island of 1.0 to 1.5 million years, based on potassium-argon dating methods, but he pointed out that the accuracy of this estimate might be questioned. In any case, the island is probably no more than 2 million years old; in other words, it must have appeared during the late Pliocene or early Pleistocene.

This estimated age seems to suggest that the stocks from which *Procaris* and *Typhlatya* descended were free-living marine forms that could have colonized the island in relatively recent times. It seems unlikely, however, that the present habitat of these shrimps, in salt-water pools in the lava flow from South Gannet Hill, is the original site of colonization, for the sea level during the Pleistocene glacial periods almost certainly was lower than it is at present, and the South Gannet Hill lava flow is comparatively recent (Atkins, et al., 1964; Bell, in litt.).

The availability of Ascension for colonization by *Typhlatya* in the late Pliocene or early Pleistocene seems to suggest, as did Creaser (1936), that *Typhlatya* populated its present habitats during or shortly before the Pleistocene. If this is true, and assuming that the directions of oceanic currents during that time were similar to those of existing currents, then the Ascension *Typhlatya* precursor possibly was an amphi-Atlantic marine shrimp, perhaps pelagic, which existed at least into the Pleistocene but did not survive in the oceanic habitat into the present; living atyids are confined almost entirely to fresh water. The close similarities of the known species of *Typhlatya* suggest a common origin, but their relationships may be obscured by convergence.

This explanation of the origin of the *Typhlatya* on Ascension may not be applicable to *Procaris*, for the presumably primitive features of that shrimp suggest that it was derived from a more ancient stock. It is certainly possible that *Procaris* or a *Procaris* ancestor existed as a wide-ranging form, possibly pelagic as suggested by the long pereopodal exopods, at least until the Pleistocene.

This possibility is supported to some extent by the orange coloration of *P. ascensionis*, which might have persisted from the reddish pigmentation of an ancestral pelagic shrimp; many mesopelagic natantians are characteristically red in color. On the other hand, reddish coloration is found in many land-locked or subterranean shrimps that do not have pelagic relatives, such as species of *Metabetaeus*, *Ligur*, and *Barbouria* (Holthuis, 1963).

An alternative explanation of the origin of the Ascension shrimps was proposed by J. Tuzo Wilson (in litt.): "another possibility which I think much more likely and intriguing from your point of view is that Ascension is only the latest in a series of islands whose remains form scattered seamounts and ridges from Ascension Island to the Cameroons in one direction (The Guinea Rise) and in the other direction to the north-east corner of Brazil. The idea that I proposed in the *Scientific American* [Wilson, 1963] was that there had been a continuously active centre from the time that Recife separated from the Cameroons and that these two chevron-shaped ridges formed as a result of continuous volcanic action at the centre now represented by Ascension Island. If that is so, it is just conceivable that forms of life might have survived on Ascension from the time when the Atlantic was very narrow and the forerunners of Ascension were in contact with Brazil and the Cameroons." Thus, the present populations of these shrimps on Ascension may be relicts of earlier populations that inhabited islands that have since subsided. This explanation could well apply to either or both of the shrimps found in the Shelly Beach habitats.

Superfamily PROCARIDOIDEA, new superfamily

(For diagnosis, see Key to Recent Superfamilies of Caridea, p. 13.)

Family PROCARIDIDAE, new family

Third maxillipeds composed of seven segments. None of pereopods chelate or subchelate. Epipods on four anterior pereopods very large, forming right angle and extending dorsad well into branchial chamber.

This family contains only the following genus.

Genus *Procaris*, new genus

Rostrum small, unarmed. Mandible with fused molar and incisor processes, palp large, 3-jointed. Dactyl of 2nd maxilliped articulating obliquely on propodus. Maxillipeds and pereopods each with large exopod. Anterior four pereopods with pleurobranch, setobranch, and massive simple epipod. Pleopods with short endopods, lacking appendices internae or masculinae.

TYPE-SPECIES.—*Procaris ascensionis*, new species.

ETYMOLOGY.—From the Latin, "pro," before, and "caris," shrimp. The gender is feminine.

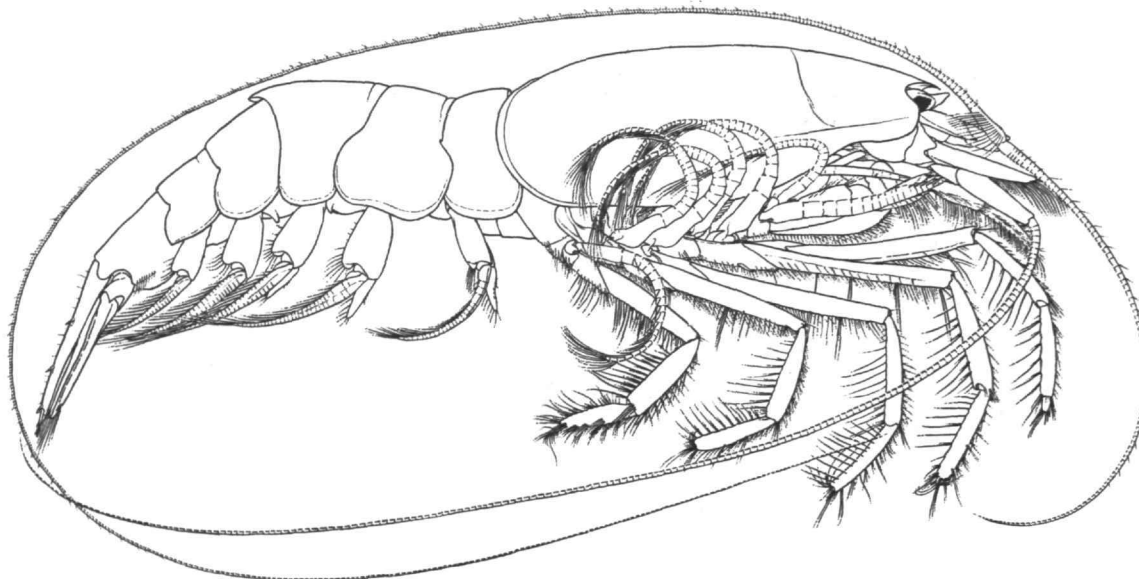
Procaris ascensionis, new species

FIGURES 4-9

MATERIAL.—Coral pool back of Shelly Beach, Ascension Island; 25 October 1970, 12:00-2:00 p.m.; D. S. Rogers: 4 specimens.—Same; 18 May 1971, 3:00 p.m.; R. B. Manning: 2 specimens (1 is holotype, USNM 139461).—Same; 23 May 1971, 12:00-2:00 p.m.; R. B. Manning: 14 specimens.

DESCRIPTION.—Integument thin, rather fragile. Rostrum short, acutely triangular, unarmed, not reaching distal margins of eyes. Carapace (Figure 4) completely unarmed; anterior margin slightly convex, nearly vertical, anterior portion of ventral margin forming shallow sinus below hepatic region, trending posteroventrally to nearly horizontal ventral margin of branchiostegite; surface evenly inflated except (1) deep furrow extending from near anterior margin below orbit posteriorly and slightly ventrally to anterior branchial region in line with base of 1st pereopod and (2) less prominent cervical groove extending from just above furrow on hepatic region nearly to dorsal midline but not quite continuous across dorsum.

Abdomen (Figure 4) with 3rd somite produced posterodorsally as narrowly rounded cap over anterior half of 4th somite; pleura not deep, barely concealing ventral surface of abdomen from lateral view, those of four anterior somites rounded, of 5th subrectangular posteroventrally; 6th somite with posterior lobes embracing base of telson rounded, unarmed. Ventral surface of abdomen armed with sharp spine or blunt tubercle in midline between bases of each pair of pleopods (Figure 5b); 6th somite with bulbous tubercle armed with

FIGURE 4.—*Procaris ascensionis*. x7.

sharp spine directed posteriorly on ventral surface between bases of uropods (Figure 5c). Telson (Figure 5d), not including posterior spines about $1\frac{3}{4}$ times as long as 6th somite, armed with two subequally spaced pairs of dorsal spines; posterior margin (Figure 5e) subtriangular, armed typically with four pairs of spines, sublateral pair very long, two mesial pairs about one-half as long, subequal, lateral pair shortest.

Eyestalk (Figure 5a) produced into two distal triangular lobes, mesial lobe longer, directed distodorsally, lateral lobe directed distally, containing irregular mass of black pigment but without discrete cornea.

Antennular peduncle (Figure 5a) short and broad, not overreaching proximal limit of distal one-third of antennal scale; stylocerite situated in nearly vertical plane, with subparallel margins in proximal two-thirds, tapering distally to acute tip overreaching distal margin of 2nd segment of peduncle, ventrolateral margin strengthened by marginal rib; segments subequal in length, basal segment with anterior margin deeply incised dorsomesially and with proximomesial portion of segment raised, suggesting nonexistent extra segment. Lateral flagellum (Figure 4) fully twice as long as body of animal, irregularly setose through-

out, extreme basal portion swollen and bearing row of long setae. Mesial flagellum much shorter, about as long as carapace and two anterior abdominal somites combined.

Antennal scale (Figure 5f) slightly less than $2\frac{1}{2}$ times as long as wide, distal margin rounded, produced distomesially, without distolateral tooth. Antennal peduncle reaching about as far as distal margin of scale, armed with acute but not sharp tooth beneath base of scale. Flagellum slightly longer than body of animal, irregularly setose on mesial surface.

Mandible (Figures 6a-c) massive, with prominent 3-jointed palp, incisor and molar processes fused; incisor process subtriangular, scooplike, with only two obscure marginal teeth in addition to acute apex; molar process low, indistinct, without apparent grinding surface. Paragnaths (Figure 6d) sinuous, distally pointed, partially enveloping bases of mandibles. First maxilla (Figure 6e) with endites well formed, palp simple with long slender terminal seta and shorter stouter subterminal one. Second maxilla (Figure 6f) with two unequally cleft endites, prominent slender palp, and relatively small scaphognathite. First maxilliped (Figure 6g) with subsemicircular endite, strong palp, base of exopod little expanded, and epipod simple, sub-

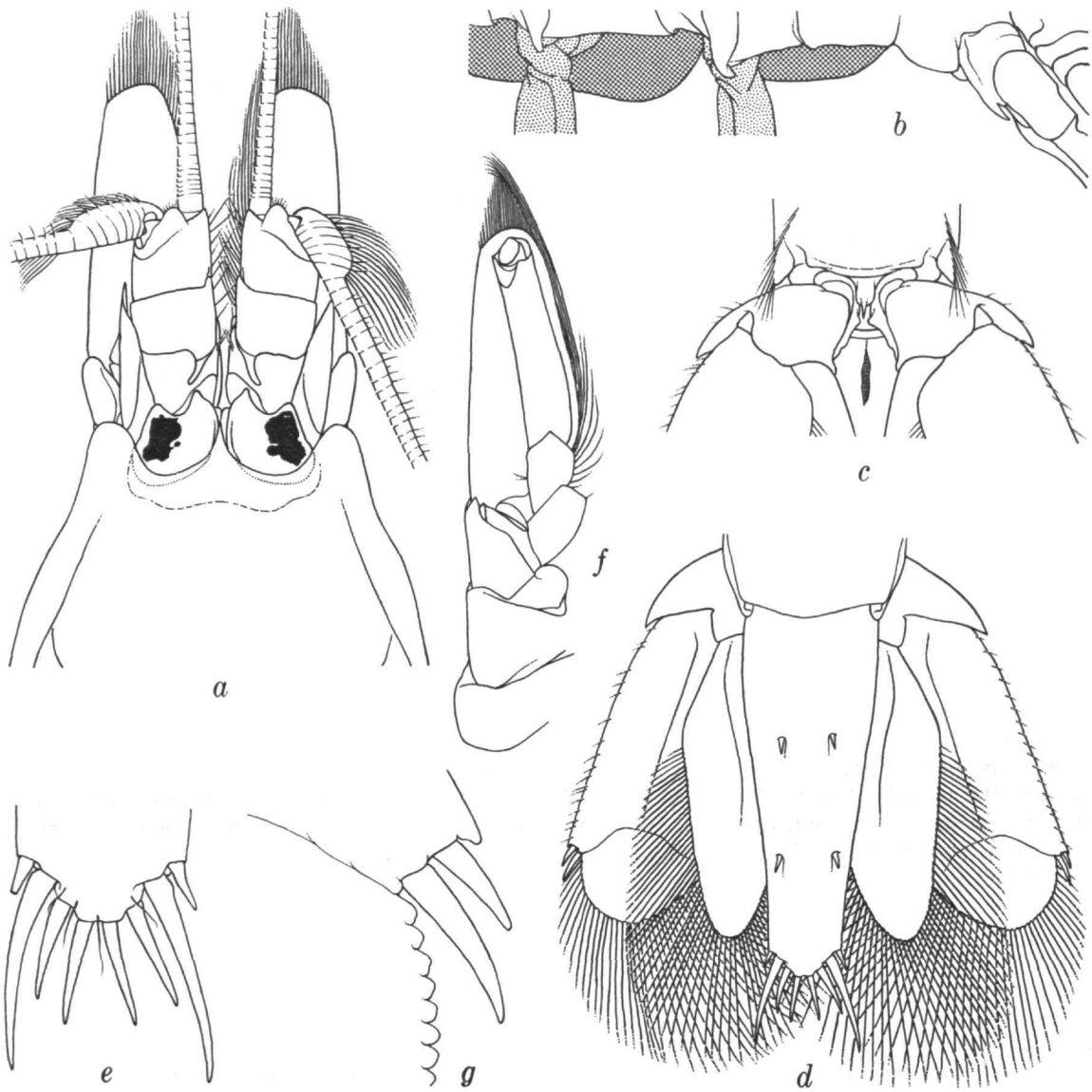


FIGURE 5.—*Procaris ascensionis*, holotype: *a*, anterior region in dorsal view; *b*, ventral portions of posterior thoracic and two anterior abdominal somites, viewed from right side, showing projections in midline between bases of pleopods and posterolateral spine on coxa of 5th pereopod; *c*, ventral surfaces of posterior end of 6th abdominal somite and anterior portions of telson and uropods; *d*, telson and uropods; *e*, end of telson; *f*, right antennal peduncle, ventral view; *g*, posterolateral angle of right lateral uropod. Magnifications: *a-d*, *f*, x18; *e*, x36; *g*, x91.

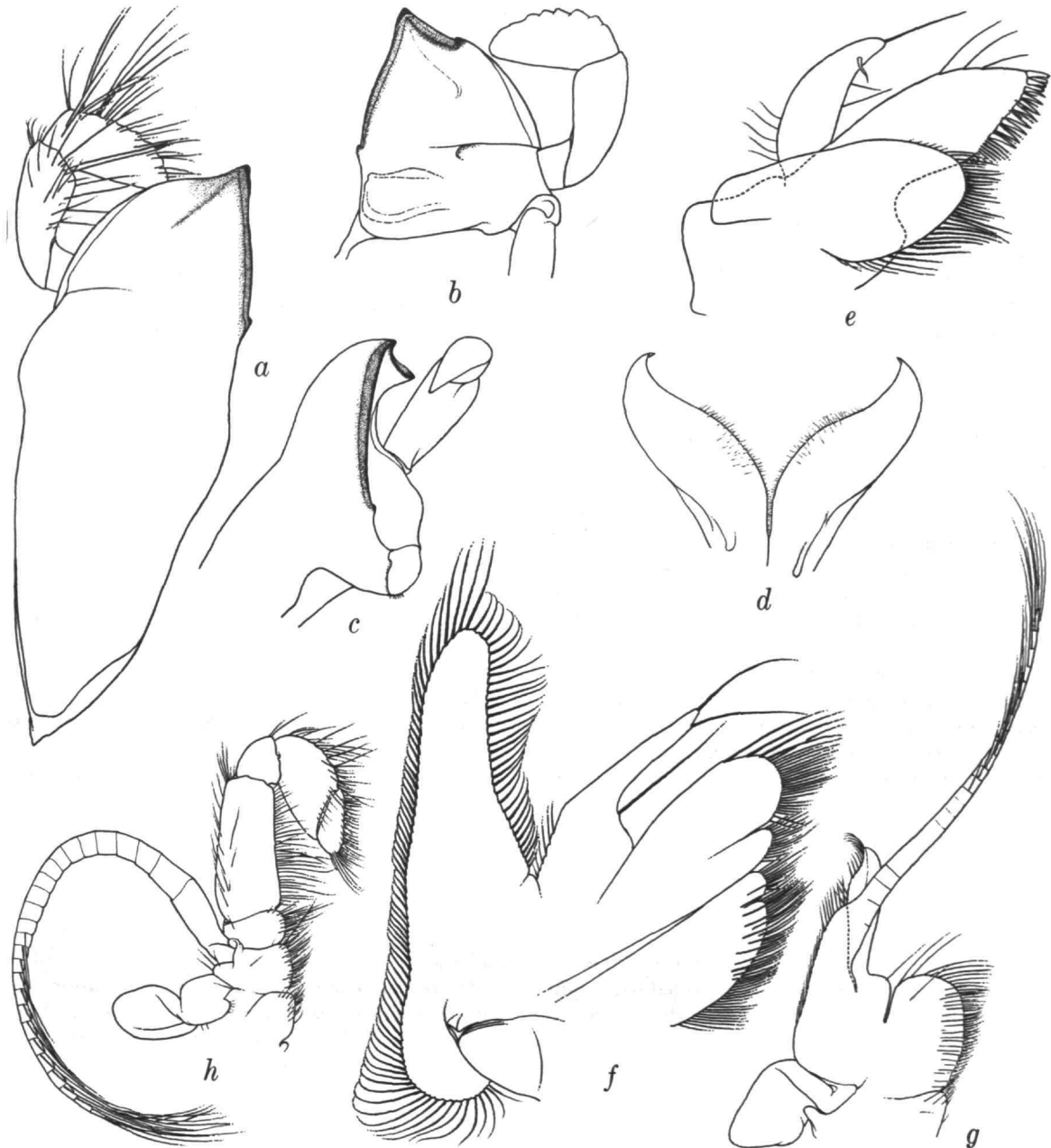


FIGURE 6.—*Procaris ascensionis*, holotype: *a*, right mandible, extensor surface; *b*, same, flexor surface; *c*, same, lateral view; *d*, paragnaths; *e*, right 1st maxilla; *f*, right 2nd maxilla; *g*, right 1st maxilliped; *h*, right 2nd maxilliped. Magnifications: *g*, *h*, x18; *a-f*, x36.

triangular. Second maxilliped (Figure 6*h*) 7-segmented, with large exopod and simple epipod, segments of endopod not expanded, dactyl attached diagonally to propodus. Third maxilliped (Figure 7*a*) overreaching antennal scale by dactyl and extreme distal end of propodus, 7-segmented, with exopod nearly as long as endopod and with rather large simple epipod; dactyl (Figure 7*b*) short, subtruncate, bearing one long spine and five long strong setae.

All five pairs of pereopods similar, each with large exopod and with long simple setae on flexor margins, especially of carpus and propodus; dactyls short and stout, armed with eight or nine long curved spines in addition to numerous long setae. Four anterior pairs each provided with pleurobranch, setobranche, and massive simple epipod (Figure 9), in addition to exopod. First pereopod (Figure 7*c*) overreaching antennal scale by dactyl, propodus, and one-third of carpus; propodus slightly shorter than carpus, merus twice as long as carpus; dactyl (Figure 7*d*) armed with eight long spines, longest about $1\frac{3}{4}$ times as long as dactyl proper. Second pereopod (Figure 7*e*) distinctly longer than 1st but overreaching antennal scale only by dactyl and propodus; propodus considerably shorter than carpus, merus about 1.8 times as long as carpus; dactyl (Figure 7*f*) armed with nine long spines, longest about $1\frac{1}{3}$ times as long as dactyl proper. Third pereopod (Figure 7*g*) subequal in length to 1st, overreaching antennal scale by dactyl and three-fourths of propodus; propodus sensibly shorter than carpus, merus 1.9 times as long as carpus; dactyl (Figure 7*h*) armed with eight moderately long spines, longest no longer than dactyl proper. Fourth pereopod (Figure 8*a*) noticeably shorter than 1st and 3rd, reaching little beyond midlength of antennal scale; propodus somewhat shorter than carpus, merus 1.8 times as long as carpus; dactyl (Figure 8*b*) armed with eight spines, longest two-thirds as long as dactyl proper. Fifth pereopod (Figure 8*c*) shorter than any of preceding pairs, reaching at most as far as level of anterior margin of carapace, without pleurobranch, setobranche, and epipod; propodus distinctly shorter than carpus, merus somewhat less than $1\frac{1}{2}$ times as long as carpus; dactyl (Figure 8*d*) especially short and stout, armed with eight comparatively short spines, longest barely two-thirds as long as dactyl proper.

All pleopods (Figures 8*e-i*) with short, poorly developed endopods, none with appendices internae or masculinae, but each of four anterior pairs armed with three to five small, slender, inconspicuous spines near midlength of mesial margin; that of 5th pair without spines, only long setae on mesial margin. Uropod branches (Figure 5*d*) subequal in length, not reaching posterior margin of telson, each branch with sharp longitudinal submedian carina, lateral branch with two unequal spines in deep notch at juncture of lateral and posterior margins (Figure 5*g*).

SIZE.—Holotype with total length about 22 mm, carapace length 7.8 mm. Paratypes ranging in carapace length from 4.7 to 8.6 mm.

COLOR.—Uniformly pale orange.

REMARKS.—The absence of obvious secondary sexual characters and of ovigerous specimens in the limited series available to us precluded the recognition of males and/or females from external characters. There is a remote possibility, of course, that our specimens are juveniles, but they display no evident postlarval characters. Certainly the absence of appendices internae on the pleopods is not associated with immaturity necessarily, for they are present in the postlarvae of most carideans, and even appendices masculinae are sometimes developed at the post larval stage.

The unusual combination of characters manifested by *Procaris* may well affect the accepted classification of the "macruran" decapods in ways that we cannot fully comprehend at the present time. This little shrimp may possibly revive the concept of the Natantia as a natural group—a concept that has apparently been abandoned in recent years (Burkenroad, 1963:4; Glaessner, 1969:R444). The 7-segmented 3rd maxilliped, the subterminal rather than subcentral attachments of the pleurobranches, and the lack of appendices internae on the pleopods are characters that are commonly associated with penaeideans and stenopodideans, rather than carideans, and the massive epipods extending well into the branchial chamber are similar to those found in penaeids and quite unlike any occurring in other caridean families. There seems little doubt, on the other hand, that *Procaris* is more closely related to the carideans than it is to either of the other natantian sections, as indicated by the anteriorly expanded and overlapping pleuron of the 2nd abdominal somite, the form of the telson and uro-

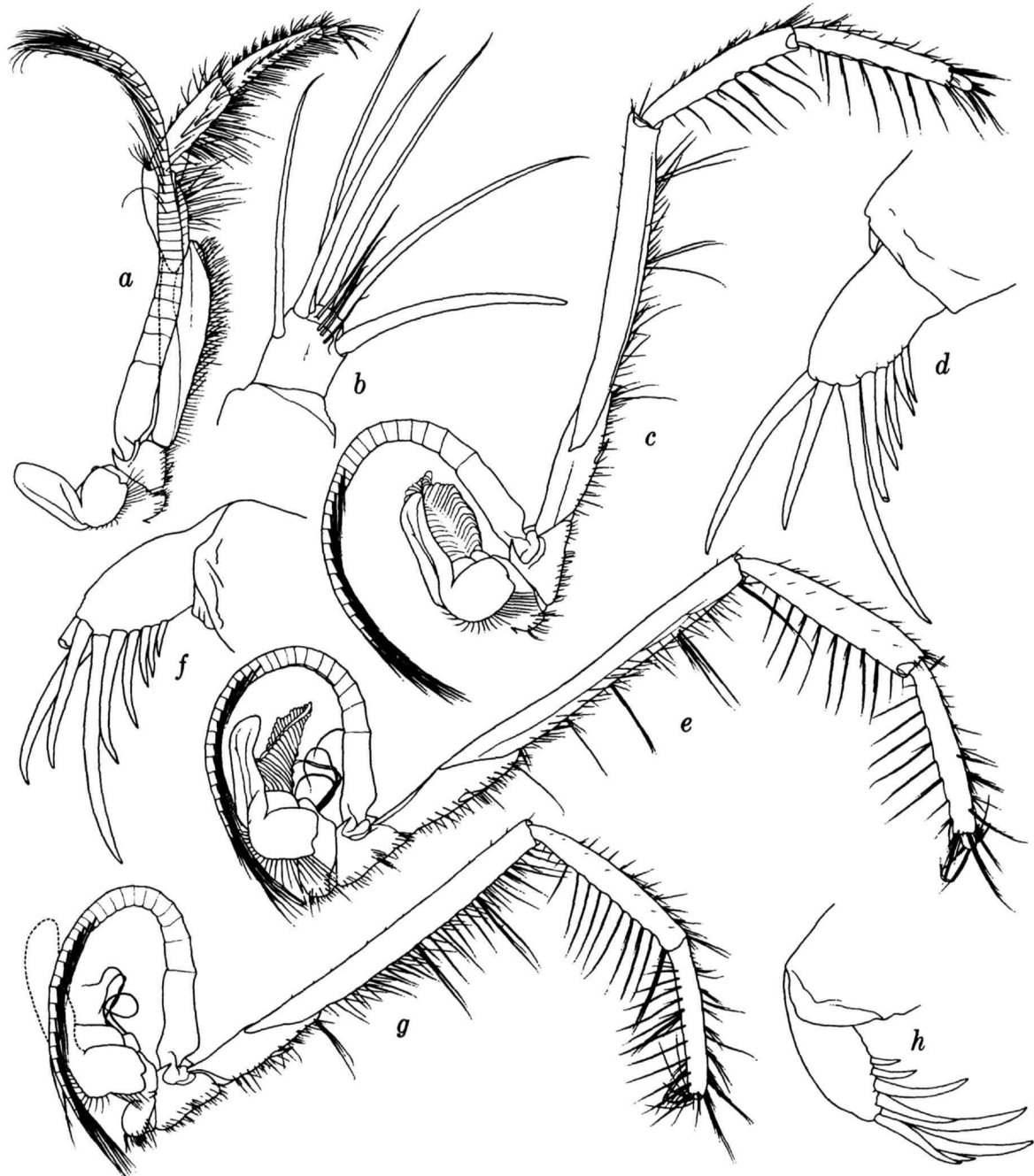


FIGURE 7.—*Procaris ascensionis*, holotype: *a*, right 3rd maxilliped; *b*, same, dactyl; *c*, right 1st pereopod; *d*, same, dactyl (denuded); *e*, right 2nd pereopod; *f*, same, dactyl (denuded); *g*, right 3rd pereopod; *h*, same, dactyl (denuded). Magnifications: *a*, *c*, *e*, *g*, x13.5; *b*, *d*, *f*, *h*, x68.

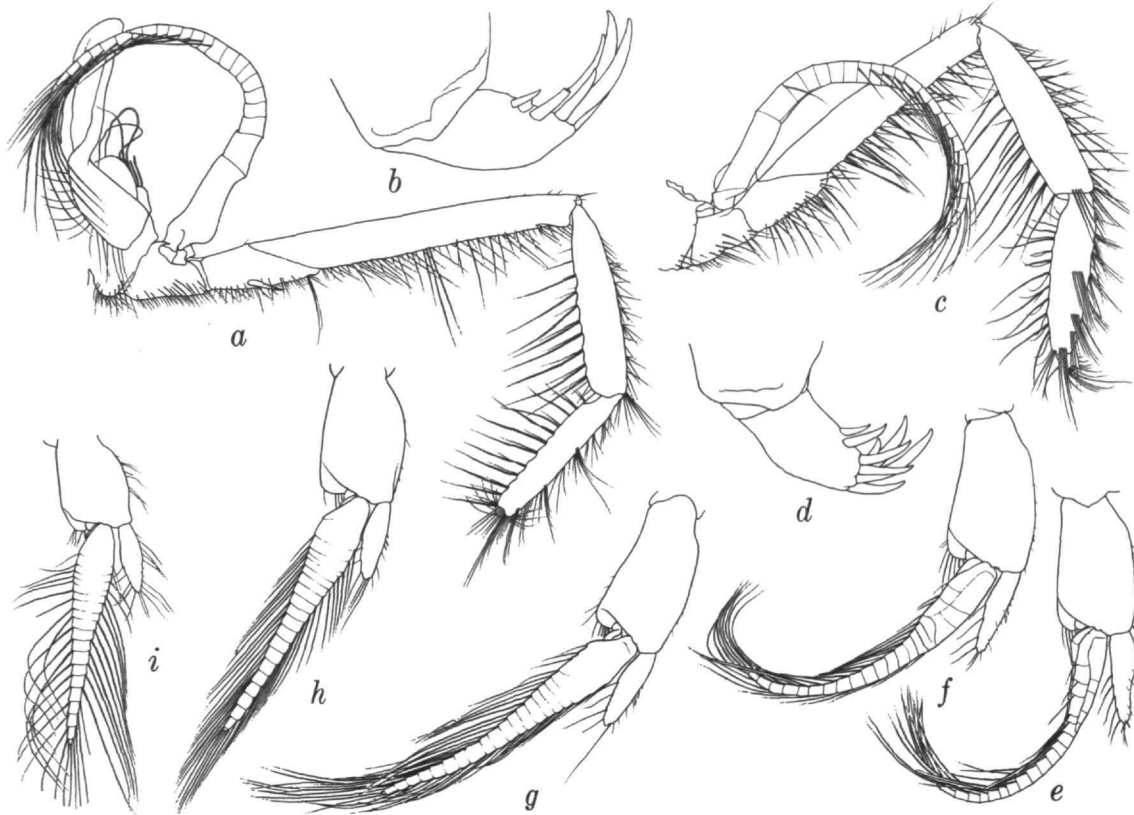


FIGURE 8.—*Procaris ascensionis*, holotype: *a*, right 4th pereopod; *b*, same, dactyl (denuded); *c*, right 5th pereopod; *d*, same, dactyl (denuded); *e*, right 1st pleopod; *f*, right 2nd pleopod; *g*, right 3rd pleopod; *h*, right 4th pleopod; *i*, right 5th pleopod. Magnifications: *a*, *c*, *e-i*, x13.5; *b*, *d*, x68.

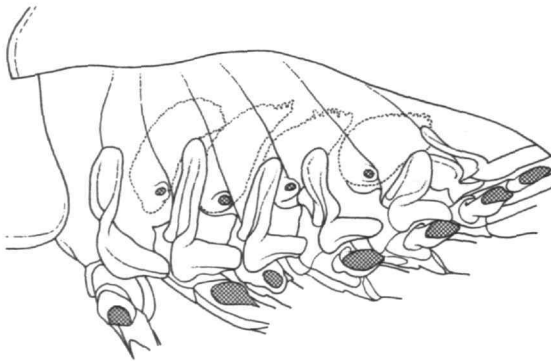


FIGURE 9.—*Procaris ascensionis*, paratype with carapace length of 7.0 mm. Right side of thorax with branchiostegite removed to show epipods and points of attachment of pleurobranches. x14.

pods, as well as of the mandibles and other anterior mouth parts, and, especially, by the phyllobranchiate structure of the pleurobranches.

As a means of indicating some of the differences and similarities between the Procarididae and the caridean families known heretofore, we include below a key to the Recent superfamilies recognized by Holthuis (1955:10-12) and the Procaridoidea. There is still much to be said for the stand taken by Kemp (1910:36) that superfamilies should not be established in the Caridea until the family limits and relationships are better understood, but recognition of superfamilies does offer an opportunity for generalized comparisons that would not be possible otherwise. We agree completely with the

Key to Recent Superfamilies of Caridea

(Modified from Holthuis, 1955)

1. Third maxillipeds composed of seven segments; none of pereopods chelate or subchelate; epipods on four anterior pereopods very large, forming right angle and extending dorsad far into branchial chamber. (All maxillipeds and pereopods with prominent exopods; 1st pereopod not stouter than 2nd; 2nd pereopod with undivided carpus; all pleopods with endopods poorly developed without appendices internae.).....**PROCARIDOIDEA**
 Third maxillipeds composed of four or five segments; 1st and/or 2nd pereopods chelate or subchelate; epipods when present, small, not extending vertically into branchial chamber **2**
2. (1) First pair of pereopods subchelate; pleopods with endopods poorly or moderately developed, with or without appendices internae. (Pereopods without epipods; 1st pereopod much stouter than 2nd; 2nd pereopod chelate, simple, or absent, with carpus subdivided or not.).....**CRANGONOIDEA**
 First pair of pereopods chelate or simple, not subchelate; 2nd to 5th pleopods usually with well-developed endopods and appendices internae.....**3**
3. (2) First and 2nd pereopods with fingers pectinate on opposable margins. (Pereopods with exopods, without epipods; 1st and 2nd pereopods chelate, similar, 1st usually shorter and not much stouter than 2nd.).....**PASIPHAEOIDEA**
 Fingers of chelae not pectinate on opposable margins..... **4**
4. (3) Second pereopod with undivided carpus; 1st pereopod with well-developed chela..... **5**
 Second pereopod with carpus usually subdivided into two or more joints; if not, 1st pereopod simple, not chelate..... **9**
5. (4) Second maxilliped with two terminal segments articulated side by side on preceding segment; 1st and 2nd pereopods with fingers of chelae extremely long and slender. (Pereopods without exopods or epipods; 1st and 2nd pereopods similar, subequal.)**STYLODACTYLOIDEA**
 Second maxilliped with distal segments articulating serially; fingers of chelae not extremely long..... **6**
6. (5) First pereopod with two movable crossing fingers; 2nd pereopod not chelate, terminating in tuft of setae. (Pereopods without exopods or epipods.).....**PSALIDOPODOIDEA**
 First pereopod with single movable finger (dactyl); 2nd pereopod chelate..... **7**
7. (6) First pereopod stouter, although often shorter, than 2nd; if not clearly so, tips of fingers dark colored. (Pereopods with or without exopods, with or without epipods.).....**BRESILIOIDEA**
 First pereopod not much stouter, usually more slender, than 2nd; fingers not dark colored **8**
8. (7) Pereopods usually bearing exopods; if not, chelae of first two pairs terminating in brushes of long hairs. (Pereopods with or without epipods.).....**OPLOPHOROIDEA**
 Pereopods without exopods; chelae not terminating in dense brushes of long hairs. (Pereopods without epipods.).....**PALAEMONOIDEA**
9. (4) First pereopod distinctly chelate, at least on right side, usually stouter than 2nd, often remarkably so.....**ALPHEOIDEA**
 First pereopod with chela microscopically small or absent, usually no stouter than 2nd pereopod**PANDALOIDEA**

qualifications expressed by Holthuis (1955:10) in introducing his key to the caridean families and superfamilies. Certainly full consideration must be given to the mouth parts, gill formulae, secondary sexual characters, and, especially, larval development in any potentially stable classification of the Caridea, but the one proposed by Holthuis, based largely on the form of the two anterior pairs of

pereopods, seems to be as tenable as any that have been proposed.

Glaessner (1969:R452) has noted the futility of attempting to integrate the few-known fossil carideans into a classification based on characters usually discernible only in Recent animals. For that reason, we have excluded fossil taxa from the key. Also, we have not included the superfamily Amphionelloida

tentatively proposed by Balss (1957:1525) and adopted by Heegaard (1969:67) as the subtribe *Amphionidea*. Even though Heegaard considered *Amphion reynaudi* "as possibly the most primitive of the known Caridea . . .," we are not yet fully convinced that it is a caridean. Neither do we accept the superfamily Heterocarpoidea and family Heterocarpodidae (more correctly "Heterocarpoidea" and "Heterocarpidae") proposed by Thompson (1967:323); the terminal pegs on the fingers of the chelae that Thompson believed distinguished *Heterocarpus* from other genera assigned to the family Pandalidae are just as prominent, sometimes more so, in the typical genera *Pandalus* and *Pandalopsis*.

Typhlatya rogersi, new species

FIGURES 10, 11

MATERIAL.—Marl pool, back of Shelly Beach, Ascension Island; 17 May 1970; D. S. Rogers: 104 males, 115 females, 14 juveniles (including male holotype, USNM 139465).—Same; 25 October 1970, 12:00–2:00 p.m.; D. S. Rogers: 135 males, 700 females, 84 juveniles.—Same; 18 May 1971, 2:20 p.m.; R. B. Manning and D. S. Rogers: 4 males, 11 females.—Same; 23 May 1971, 9:00–10:00 a.m.; R. B. Manning, D. S. Rogers, and K. Double: 3 males, 7 females, 2 ?.—Coral pool, near marl pool; 25 October 1970, 12:00–2:00 p.m.; D. S. Rogers: 7 males, 12 females.—Same; 18 May 1971, 3:00 p.m.; R. B. Manning: 4 males, 14 females.—Same; 23 May 1971, 12:00 p.m.; R. B. Manning: 2 females.

DESCRIPTION.—Rostrum (Figures 10a, b) triangular, unarmed, extending beyond eyes but at most only slightly beyond first segment of antennular peduncle. Carapace completely unarmed, suborbital lobe forming obtuse angle projecting anteriorly distinctly beyond remainder of anterior margin.

Abdomen (Figure 10c) with pleura of first two somites marginally rounded, of 3rd somite somewhat angulate, of 4th and 5th somites subrectangular posteroventrally. Sternites of first two somites bearing triangular, flaplike projection between pleopods in both sexes. Sixth somite about $1\frac{1}{3}$ times as long as 5th, with lobe on either side of telson rounded but bearing minute denticle at apex and with sharp, posteriorly recurved pre-anal tooth at

posterior end of ventral midline between bases of uropods (Figure 10d). Telson (Figure 10e), not including marginal spines, slightly longer than 6th somite, armed in posterior half with two pairs of small dorsolateral spines; posterior margin (Figure 10f) rounded but with shallow median sinus and armed with four unequal pairs of spines and mesial pair of slender setae.

Eyes (Figure 10b) distally subconical, without cornea but with irregular dark pigment spot.

Antennular peduncle (Figure 10g) robust and short, not nearly reaching level of distal margin of antennal scale. Stylocerite triangular distally, extending about as far as distal margin of basal segment of peduncle. Antennular flagella subequal, slightly more than twice as long as carapace.

Antennal scale (Figure 10h) slightly less than twice as long as wide; lateral margin little convex in proximal two-thirds, distal tooth short and broad but distinct. Antennal peduncle nearly reaching distal one-third of blade; basal segment with prominent tooth near base of scale. Flagellum $5\frac{1}{2}$ times as long as carapace, extending posteriorly beyond telson by about two-fifths length of flagellum.

Mouth parts as figured (Figures 10i-m, 11a). Mandible with five small, crowded teeth at extremity of incisor process. Scaphognathite of 2nd maxilla broadly truncate distally; palp composed of two segments. First maxilliped with caridean lobe not strongly produced distomesially. Second maxilliped with penultimate segment distally truncate, not produced along lateral margin of terminal segment. Third maxilliped overreaching antennal scale by about one-half length of terminal segment.

All pereopods with well-developed exopods. First pereopod (Figure 11b) reaching to about distal one-third of antennal scale; carpus, even including flexor extension, short and stout, distinctly shorter than chela; ischiomerar articulation not discernible. Second pereopod (Figure 11c) reaching about as far as 1st; carpus short, in overall length slightly shorter than chela; ischiomerar articulation obscure. Third pereopod (Figure 11d) overreaching antennal scale by length of dactyl and one-third of propodus; dactyl (Figure 11e) with four accessory spines, increasing in length distally, on flexor margin; propodus slightly more than three times as long as dactyl, nearly twice as long as carpus; merus nearly one-third again as long as propodus,

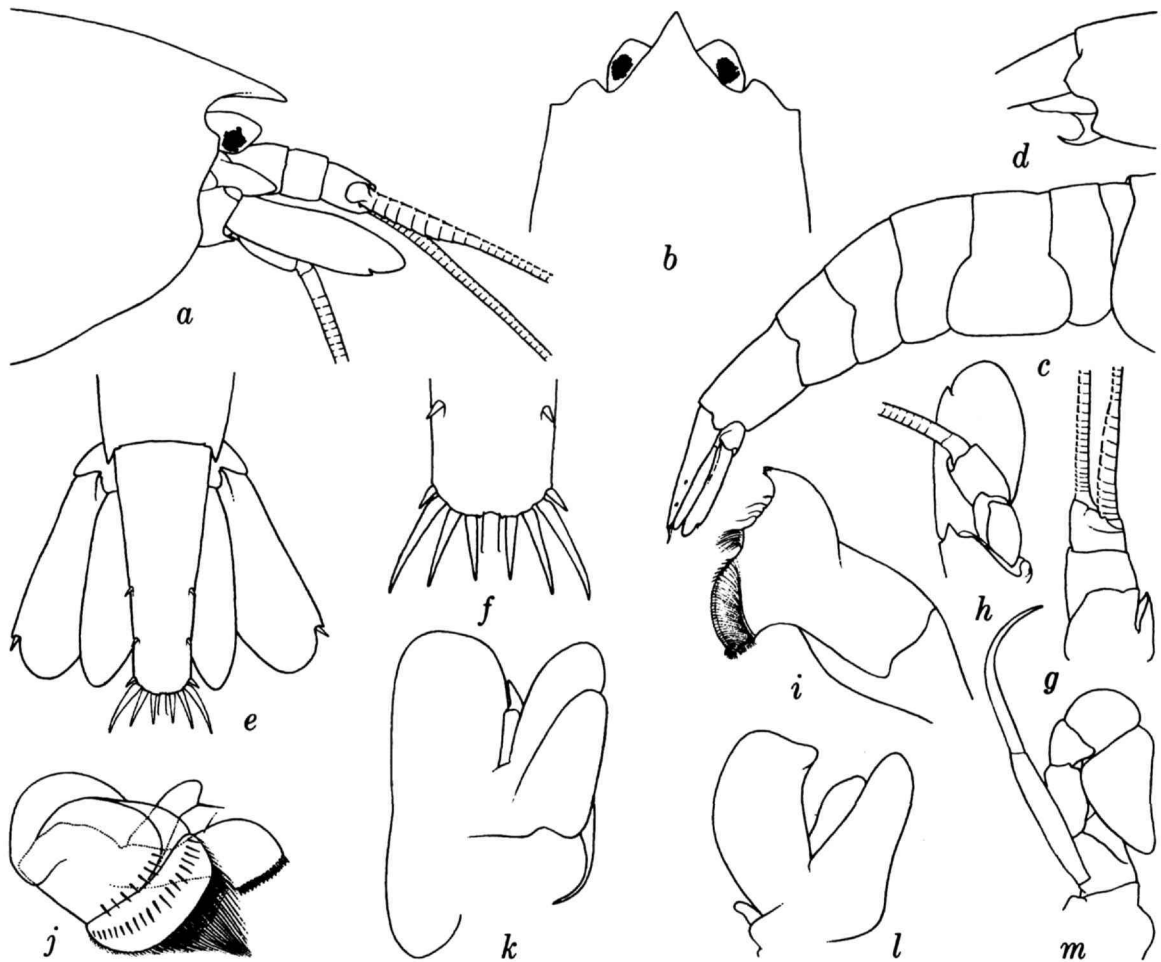


FIGURE 10.—*Typhlatya rogersi*, holotype: *a*, anterior region in lateral view; *b*, anterior part of carapace and eyes in dorsal view; *c*, abdomen; *d*, juncture of 6th abdominal somite and telson, with right uropod removed to show pre-anal spine; *e*, telson and uropods; *f*, end of telson; *g*, right antennule; *h*, right antenna; *i*, right mandible; *j*, right 1st maxilla; *k*, right 2nd maxilla; *l*, right 1st maxilliped; *m*, right 2nd maxilliped. Magnifications: *c*, x9 *a*, *b*, *d*, *e*, *g*, *h*, x18; *f*, *i*-*m*, x36.

armed with two movable spines laterally; ischium shorter than dactyl, armed with one lateral spine. Fourth pereopod (Figures 11*f*, *g*) similar to 3rd, but shorter, reaching about to end of antennal scale. Fifth pereopod (Figure 11*h*) longer than but reaching anteriorly about as far as 4th; dactyl (Figures 11*i*, *j*) elongate, armed on flexor margin with nearly 50 denticulate spines; propodus fully twice as long as dactyl and about twice as long as

carpus; merus about as long as propodus, armed with one slender spine on lateral surface; ischium less than one-third as long as merus, armed with single slender spine near distal margin.

Endopod of 1st pleopod of male (Figures 11*k*, *l*) subtriangular with microscopic distal denticle, without conspicuous marginal setae. Appendix masculina (Figure 11*n*) on endopod of 2nd pleopod shorter than appendix interna, armed with about

seven apical and subapical spines. Lateral branch of uropod (Figure 10e) with rather prominent movable spine inserted between distolateral angle and margin of blade.

Gill series consisting of five pleurobranches on pereopodal somites, arthrobranch on 3rd maxilliped, and strap-shaped epipods on 3rd maxilliped and all but 5th pereopod.

SIZE.—Carapace lengths of males, 2.5–4.2mm (holotype, 3.45 mm); of females, 2.5–4.5 mm; of juveniles, 1.6–2.5 mm. Smallest recognizable males,

with appendix masculina no more than bud, with carapace lengths 2.5– or 2.6 mm. None of females ovigerous.

COLOR.—White except for orange stomach contents.

REMARKS.—As indicated in the key presented below, this species differs most noticeably from the four species previously known, from the West Indies and Yucatan, by its shorter and stouter pereopods; this is especially apparent in the proportions of the carpus of the 1st and 2nd pairs. It



FIGURE 11.—*Typhlatya rogersi*, holotype: a, right 3rd maxilliped; b, right 1st pereopod, c, right 2nd pereopod; d, right 3rd pereopod; e, same, dactyl; f, right 4th pereopod; g, same, dactyl; h, right 5th pereopod; i, same, dactyl; j, same, spines on flexor margin; k, right 1st pleopod; l, same, endopod; m, right 2nd pleopod; n, appendices masculina and interna. Magnifications: a-d, f, h, k, m, x18; e, g, i, l, n, x91; j, x375.

resembles the type-species from Yucatan, *T. pearsei*, and its Cuban analogue, *T. consobrina*, in having the rostrum overreaching the eyestalks, but it differs from those species most obviously in the presence of four, rather than three, pairs of spines on the posterior margin of the telson and a pigment spot in the eyestalks, both of which are characters that *T. rogersi* shares with *T. garciai* from Cuba and the latter's analogue, *T. monae*, from Isla Mona and Barbuda. It differs from *T. garciai*, however, in having only four, rather than five or more, accessory denticles on the flexor margin of the dactyls of the 3rd and 4th pereopods. It may be distinguished from *T. monae* by the longer rostrum and by the anterior pair of dorsolateral spines situated in the posterior, rather than the anterior, half of the telson, as well as by the fully developed exopod of the 5th pereopod. In addition, all five species of *Typhlatya* seem to display rather subtle differences in the mouth parts.

In view of the possibility expressed by Botosăneanu and Holthuis (1970) that *T. consobrina*

may prove to be only a subspecies of *T. pearsei*, we have re-examined a series of about ten paratypes of the latter species from Balam Canche Cave and can verify that five of the six differences mentioned as means of distinguishing the Cuban from Yucatan populations are based on errors in the original description of *T. pearsei* or are probably too variable to be useful. The telson is misrepresented in Creaser's figure; the antennal scale has a somewhat obscure, but definite, anterolateral tooth; the 3rd maxilliped bears only one arthrobranch; and the 3rd pereopod is armed with three meral spines. All of the specimens examined, however, have the exopod on the 5th pereopod reduced, and it seems best to treat *T. pearsei* and *T. consobrina* as specifically distinct on the basis of this character for the time being, as in *T. garciai* and *T. monae*.

We take pleasure in naming this species for Douglas S. Rogers, who was responsible for bringing these two remarkable shrimps to our attention and who followed up this initial motivating effort

Key to Species of *Typhlatya*

1. Rostrum overreaching eyestalks.....2
 Rostrum not reaching distal margin of eyestalks. (Telson armed with five pairs of spines and/or setae on posterior margin; eyestalks with inclusion of black pigment; 1st pereopod with extensor surface of carpus much longer than palm of chela; 2nd pereopod with extensor surface of carpus considerably longer than entire chela not including terminal setae; 3rd pereopod with merus seven or eight times as long as wide.).....4
2. (1) Telson with posterior margin bearing four pairs of spines and mesial pair of setae; eyestalks with irregular inclusion of black pigment; 1st pereopod with extensor surface of carpus shorter than palm of chela; 2nd pereopod with extensor surface of carpus much shorter than entire chela not including terminal setae; 3rd pereopod with merus less than seven times as long as wide. (Fifth pereopod with well-developed exopod.).....
T. rogersi, new species
 Telson with posterior margin bearing three pairs of spines; eyestalks without pigment spot; 1st pereopod with extensor surface of carpus considerably longer than palm of chela; 2nd pereopod with extensor surface of carpus about as long as, or longer than, entire chela not including terminal setae; 3rd pereopod with merus more than nine times as long as wide.....3
3. (2) Fifth pereopod with exopod extending beyond ischiomeral articulation
T. consobrina Botosăneanu and Holthuis, 1970
 [Provincias de Pinar del Rio and Camagüey, Cuba; subterranean fresh-water "lakes."]
 Fifth pereopod with exopod reduced, barely overreaching basis..... *T. pearsei* Creaser, 1936
 [Estado de Yucatan, Mexico; subterranean fresh water.]
4. (1) Fifth pereopod with exopod extending far beyond ischiomeral articulation
T. garciai Chace, 1942
 [Provincia de Oriente, Cuba; subterranean fresh-water "lakes."]
 Fifth pereopod with exopod vestigial, barely visible..... *T. monae* Chace, 1954
 [Isla Mona (Puerto Rico) and Barbuda (Leeward Islands); fresh water chiefly subterranean.]

by furnishing invaluable operational assistance to our general survey of the decapod and stomatopod faunas of Ascension Island. Perhaps we should take this opportunity to note that it is still possible for the amateur naturalist to make significant contributions to knowledge, especially if he or she has the chance to observe and collect in a part of the world that has not yet succumbed to the careless misdeeds of civilized man.

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Addendum

The description of *Typhlatya galapagensis* and the detailed discussion of related genera and species by Théodore Monod and Philippe Cals (1970) in *Mission zoologique belge aux îles Galapagos et en Ecuador (N. et J. Leleup, 1964-1965)*, 2: 57-103, figures 1-67, came to our attention after this paper was in press and too late to permit revision of the key to the species of *Typhlatya* and of our remarks about the possible origin of the genus.

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