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MEMOIRS OF THE HOURGLASS CRUISES

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CRABS OF THE FAMILY PARTHENOPIDAE (CRUSTACEA BRACHYURA: OXYRHYNCHA) WITH NOTES ON SPECIMENS FROM THE INDIAN RIVER REGION OF FLORIDA

By

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ABSTRACT

Eight species (*Cryptopodia concava*, *Heterocrypta granulata*, *Mesorhoea sexspinosa*, *Parthenope agona*, *P. fraterculus*, *P. serrata*, *P. granulata*, and *Solenolambrus tenellus*) in five genera of parthenopid crabs were captured in a 28-month systematic sampling program at ten stations (6-73m) along two transects in the Gulf of Mexico on the central western Florida shelf. These collections were supplemented by additional material (including an additional species, *Parthenope pourtalesii*), sampled over a two-year period (1973-75) from the continental shelf along the central eastern Florida coast. Twenty-two species of the family Parthenopidae are known from the western Atlantic; twelve occur in the Gulf of Mexico. Species considered herein are tropical in affinity, with only two (*Parthenope pourtalesii* and *Heterocrypta granulata*) occurring farther north than Cape Hatteras. Four additional Floridan species (*Leiolambrus nitidus*, *Solenolambrus decemspinosus*, *S. typicus*, and *Tutankhamen cristatipes*) not collected during either survey are also treated.

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This public document was promulgated at an annual cost of $4592.00 or $2.30 per copy to provide the scientific data necessary to preserve, manage, and protect Florida's marine resources and to increase public awareness of the detailed information needed to wisely govern our marine environment.

Seven of the thirteen Floridan species have Eastern Pacific analogues. Where equal effort occurred, more specimens in all species were dredged than were trawled, probably because of their semi-burrowing habits. *Parthenope agona* and *P. fraterculus* were more abundant in night samples than in day samples; other species showed little difference in abundance between day and night samples. Presence of ovigerous females in samples indicated that several species (*Parthenope agona*, *P. serrata*, *P. granulata*, *P. fraterculus*, *Heterocrypta granulata*, and *Solenolambrus tenellus*) have extended breeding seasons. Stomach contents analyses indicated omnivorous diet. In the Hourglass study area, *Heterocrypta granulata*, *Parthenope serrata*, and *P. granulata* were numerically dominant at depths of 6, 18, and 37 m respectively; *P. agona* dominated at both 55 and 73 m depths.

INTRODUCTION

The Parthenopidae, or pentagon crabs (Fowler, 1912), an unusual and distinctive family of decapod crustaceans presently thought to be related to cancroid or majid crabs (see Monod, 1956; Yang, 1971), occur in all tropical and subtropical seas. They are widely distributed in the western Atlantic Ocean and the Gulf of Mexico, with records from Massachusetts, U.S.A., to vicinity of São Paulo, Brazil, and from the Yucatan Peninsula eastward to the Bahama Islands. In this region, members of the family occur predominantly in the sublittoral zone in habitats of sand, shell hash, and coralline rubble over a depth range from the intertidal zone to 618 m. The unusual shapes of these crabs often cause them to be mistaken for small pebbles or pieces of rocks; thus the family also has the common name of pebble crabs. Hay and Shore (1918) referred to the group as "long-armed crabs". Seven genera and 13 species which have been collected or recorded, or would be expected to occur, on the eastern or western Floridan continental shelves are treated in this report. The majority of specimens of this study was collected by the Florida Department of Natural Resources (FDNR) for the Hourglass Project, 1965-1967, in the Gulf of Mexico off the central western Florida coast (Figure 1). The remaining specimens were collected either by R/V *Joie de Vivre*, Florida Institute of Technology (FIT), Melbourne, R/V *Gosnold* of the Smithsonian Institution-Harbor Branch Foundation Scientific Consortium for the Indian River Coastal Zone Survey (IRCZS), or R/V *Hernan Cortez* while sampling during a FDNR Rock Shrimp Project (RSP). These latter investigations were carried out off the central eastern Florida coast between approximately 27° and 30° N latitude (Figure 2).

Not all species recorded from the aforementioned regions were taken by these vessels. In order to complete the survey of the family, several specimens of species recorded from the Gulf of Mexico and northwestern Atlantic, but not collected by either FDNR or IRCZS research vessels, were examined in collections taken in the Caribbean Sea by R/V *John Elliot Pillsbury* of the University of Miami Rosenstiel School of Marine and Atmospheric Sciences. These specimens are noted under the respective species accounts below. The total material consisted of 1104 specimens in 474 lots and forms the subject of this report.

Previous major taxonomic studies on the family Parthenopidae included the monographic work by Rathbun (1925) on American spider crabs, the Siboga Expedition Report by Flipse (1930), and Garth's (1958) monograph on the Oxyrhyncha in the eastern Pacific Ocean. However, the species which occur in the northwestern Atlantic Ocean and the Gulf of Mexico were descriptively considered only in Rathbun's (1925) monograph. Several other primarily local studies were carried out by Rodrigues da Costa (1961, 1968, 1969) and Righi (1966), both of whom treated species in the coastal area of Brazil.

Although the family Parthenopidae is relatively well known in the western North Atlantic, distribution records are badly out of date, especially for the zoogeographic transitional areas along the central eastern and

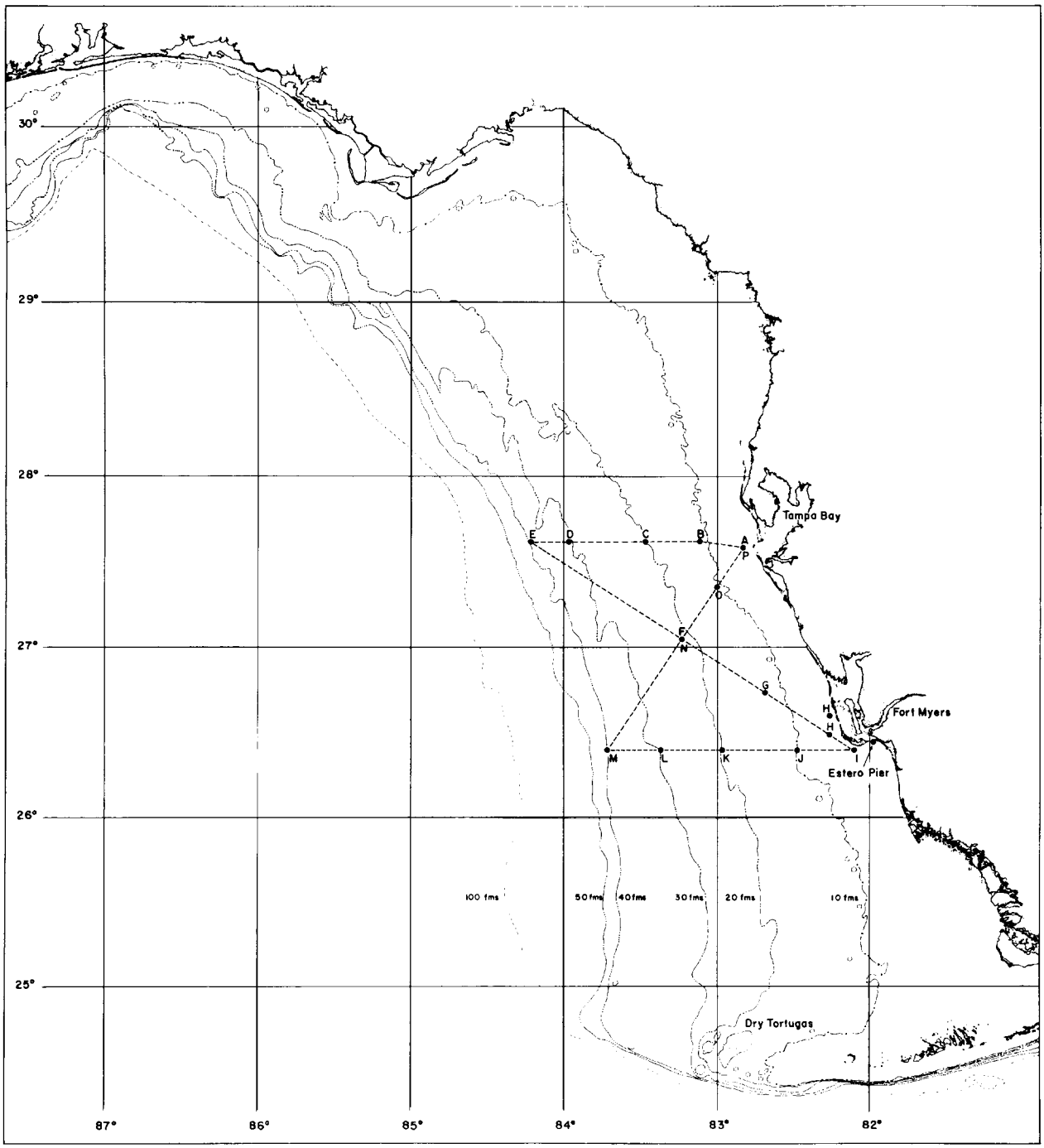

Figure 1. Hourglass cruise pattern and station locations.

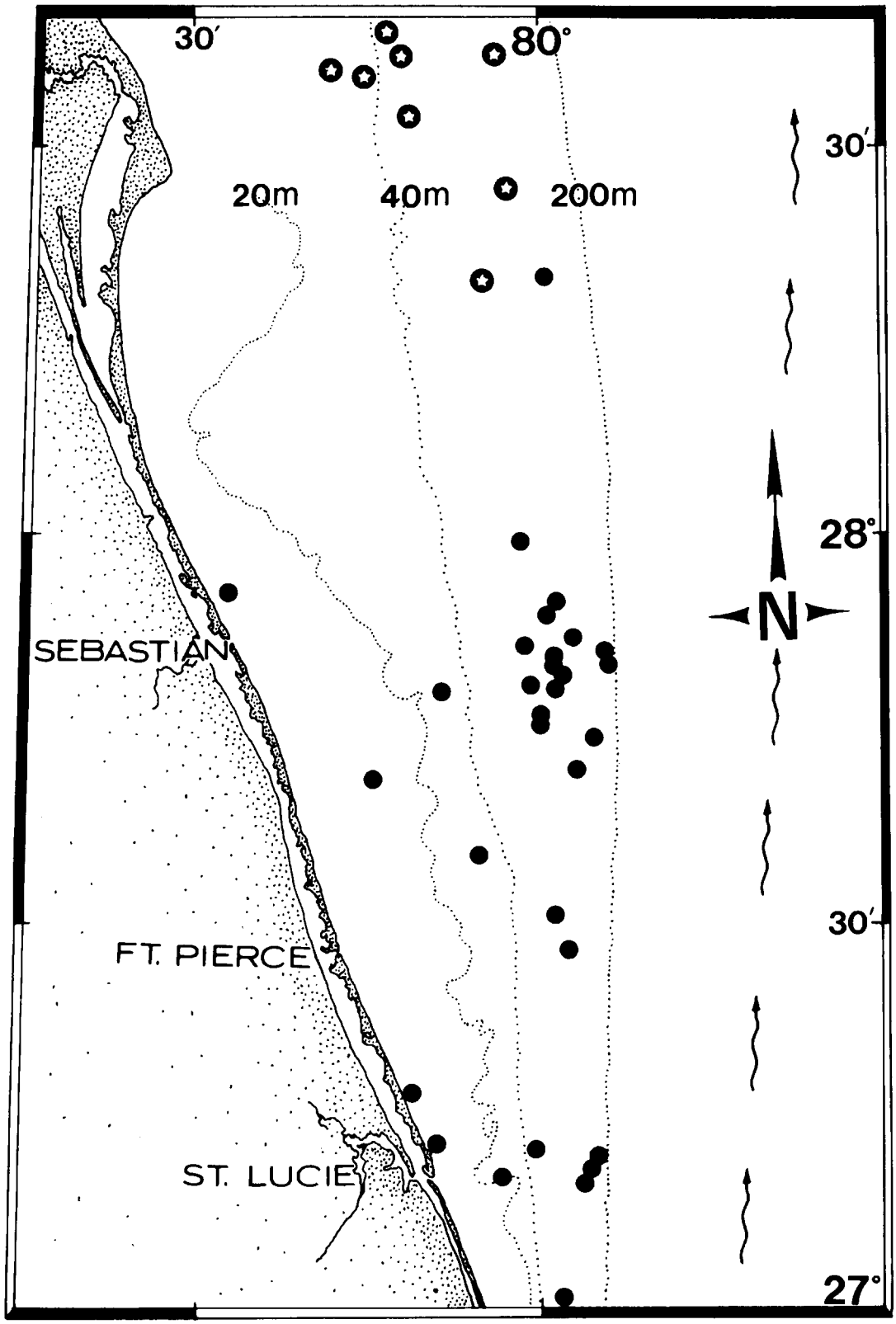

Figure 2. Indian River region on central eastern Florida coast; stations sampled by R/V *Gosnold* (dots) and R/V *Hernan Cortez* (starred dots), 1970-1974, at which parthenopid crabs were collected.

western Florida coasts between latitudes 26° and 28° N. The material collected during the Hourglass Cruises, and that obtained later chiefly by R/V *Gosnold*, thus allows us to fill in the distributional gaps for several species in these regions. In addition, gonopod studies were made which, besides being the first ever for nearly all the species here considered, also revealed that *Parthenope serrata* actually consisted of two species, *viz.* true *P. serrata* (H. Milne Edwards, 1834) and a previously relegated junior subjective synonym, *P. granulata* (Kingsley, 1879). We have re-established the latter species in another paper (Gore, 1977).

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METHODS AND MATERIALS

The Parthenopidae from the ten fisheries stations of the Hourglass Cruises were collected over a 28-month period by 30 min tows using 20 ft flat and balloon trynets during nighttime sampling of Stations A-E and I-M, and post-cruise daytime sampling of Stations B, C, and D. Bottom organisms were concurrently sampled by a heavy steel box dredge, 13″ X 16″ X 30″, lined with ¾″ X 1 ½″ metal screening, pulled for 15 min at each fishery station. Fishery station locations are listed in Table 1. Further information on the sampling program is contained in Joyce and Williams (1969).

Continental shelf collections off the central eastern coast of Florida were obtained during a one-year sampling program in 1973-74 conducted by the Indian River Coastal Zone Study. Sampling gear used during this investigation consisted of 5 to 15 min tows with standard box and pipe dredges over areas of coralline rubble, and 30 to 60 min tows with 10 and 20 ft otter trawls and 5 ft Blake trawls, depending on substratum composition and water depth. Most were carried out over smooth bottom areas as determined by precision depth recorder traces. Exact station locations for R/V *Gosnold* cruises are listed in Table 2.

TABLE 1. LOCATION AND DEPTH OF HOURGLASS STATIONS PRODUCING PARTHENOPIDAE.

Station	Latitude*	Longitude*	Established Depth (meters)	Approximate Nautical Miles Offshore*
A	27°35′N	82°50′W	6.1	4, due W of Egmont Key
B	27°37′N	83°07′W	18.3	19, due W of Egmont Key
C	27°37′N	83°28′W	36.6	38, due W of Egmont Key
D	27°37′N	83°58′W	54.9	65, due W of Egmont Key
E	27°37′N	84°13′W	73.2	78, due W of Egmont Key
I	26°24′N	82°06′W	6.1	4, due W of Sanibel Island Light
J	26°24′N	82°28′W	18.3	24, due W of Sanibel Island Light
K	26°24′N	82°58′W	36.6	51, due W of Sanibel Island Light
L	26°24′N	83°22′W	54.9	73, due W of Sanibel Island Light
M	26°24′N	83°43′W	73.2	92, due W of Sanibel Island Light

*U. S. Coast and Geodetic Chart No. 1003, dated June 1966

R/V *Joie de Vivre* sampling was confined to an area immediately east of Ft. Pierce Inlet, using a modified box dredge termed a Kirtley dredge, during July and August, 1973. Water depths varied from 20 to 80 m.

Specimens from a two-year fishery study on *Sicyonia brevirostris* Stimpson, 1871 (rock shrimp) by FDNR were obtained from monthly collections of triplicate samples on two consecutive nights, using a 22 ft otter trawl (Kennedy et al., 1977). Locations and depths of rock shrimp project stations producing Parthenopidae are listed in Table 3.

All specimens were measured to the nearest 0.1 mm using either dial calipers or a stage micrometer calibrated to an ocular reticle in a Wild M-5 stereomicroscope. The following measurements were used for analysis of each specimen:

1) Rostral Carapace Length (RCL), measured from the tip of the rostrum (or if broken, the point nearest the anterior margin) along the dorsal midline to the posterior margin of the carapace. This is the only measurement listed for each species under "Material examined."

2) Spined Carapace Width (SCW), measured from the tip of each lateral spine transversely across the widest part of the carapace.

3) Carapace Width (CW), measured from the base of each lateral protuberance, tooth or spine (if broken) across the widest part of the carapace. All of these measurements were used in analysis of length-width ratios, and incorporated into species descriptions when appropriate.

4) Propodus:Dactylus Ratio (PDR), measured along the extensor margin of the propodus of the last walking leg, from the junction of the carpus to the dactylar junction; and similarly along the dactylus from the junction of the propodus. These measurements are used to distinquish between juvenile and some adult specimens of *Parthenope fraterculus* and *P. pourtalesii*, and must be made with extreme care, preferably under a dissecting microscope, in order to ensure proper application in determining the correct species.

Text figures were made using a camera lucida on either a Wild M-5 dissecting stereomicroscope or M20 compound microscope.

Determination of sex in specimens was based on the presence or development of gonopods in males and

TABLE 2. STATION DATA FOR PARTHENOPIDAE FROM THE CENTRAL EASTERN FLORIDA COAST COLLECTED BY THE R/V *GOSNOLD*.

Cruise	Station	Latitude	Longitude	Date	Depth (m)	Gear
220	226	27°41.2′N 27°42.0′N	80°14.5′W to 80°14.7′W	13 Feb 74	17	Small biological dredge
225	360	27°47.9′N 27°45.8′N	80°01.8′W to 80°02.3′W	21 Mar 74	50-46	10′ otter trawl
229	407	27°15.5′N	80°11.6′W	16 Apr 74	9.5	Box dredge
	408	27°10.7′N 27°10.7′N	80°07.4′W to 80°07.5′W	16 Apr 74	13	10′ otter trawl
	412	27°10.8′N 27°13.1′N	79°55.5′W to 79°56.6′W	17 Apr 74	122-111	20′ otter trawl
	416	27°27.8′N	79°57.3′W	17 Apr 74	95	5′ Blake trawl
230	427	27°55.3′N 27°56.4′N	80°27.7′W to 80°28.6′W	18 Apr 74	10	10′ otter trawl
237	502	26°59.7′N	79°58.8′W	10 Jun 74	45	10′ otter trawl
	514	27°47.1′N 27°43.5′N	80°08.6′W to 80°08.5′W	12 Jun 74	25	20′ otter trawl
	515	27°34.5′N	80°05.3′W	12 Jun 74	27	20′ otter trawl
242	601	27°12.3′N	80°00.4′W	14 Aug 74	49	Pipe dredge
245	695	27°30.3′N 27°29.0′N	79°59.0′W to 79°59.5′W	28 Aug 74	72	20′ otter trawl
246	696	27°49.3′N	79°58.5′W	3 Sep 74	74	Pipe dredge
	698	27°54.0′N	79°59.0′W	3 Sep 74	64-70	Pipe dredge
	702	27°50.3′N	79°57.4′W	3 Sep 74	61-79	Pipe dredge
	709	27°44.3′N	79°58.0′W	4 Sep 74	72	Pipe dredge
	710	27°42.1′N	79°58.5′W	4 Sep 74	72	Pipe dredge
248	731	28°19.8′N 28°18.8′N	79°59.9′W to 79°59.8′W	17 Sep 74	95	20′ otter trawl
	735	27°50.2′N	79°57.9′W	18 Sep 74	84-80	Box dredge
	737	27°51.8′N	79°58.0′W	18 Sep 74	83	Box dredge
	738	27°53.6′N	79°58.3′W	18 Sep 74	70	Box dredge

TABLE 2. STATION DATA FOR PARTHENOPIDAE FROM THE CENTRAL EASTERN FLORIDA COAST COLLECTED BY THE R/V *GOSNOLD*. (Continued)

Cruise	Station	Latitude	Longitude	Date	Depth (m)	Gear
	740	27°59.1′N	80°02.3′W to	18 Sep 74	50	10′ otter trawl
		27°57.1′N	80°02.4′W			
	741	27°50.8′N	80°01.0′W to	18 Sep 74	50	10′ otter trawl
		27°49.5′N	80°00.4′W			
249	748	27°45.6′N	80°00.0′W	11 Feb 75	72	Box dredge
250	758	27°48.8′N	79°58.8′W	18 Feb 75	75-85	Box dredge
	759	27°49.6′N	79°58.9′W	18 Feb 75	75-85	Box dredge
262	772	27°10.8′N	80°04.2′W	12 Aug 75	18	Box dredge
	783	27°45.7′N	79°59.5′W	13 Aug 75	64	Box dredge
	785	27°50.0′N	79°58.3′W	13 Aug 75	70-90	Box dredge
267	793	27°11.4′N	79°57.2′W	2 Dec 75	78	Box dredge
	796	27°09.5′N	79°56.9′W to	2 Dec 75	75-74	Pipe dredge
		27°10.5′N	79°56.9′W			

TABLE 3. LOCATIONS AND DEPTHS OF ROCK SHRIMP PROJECT STATIONS PRODUCING PARTHENOPIDAE.

Station	Latitude	Longitude	Established Depth (m)
01A	28°35.9′N	80°18.6′W	26
001	28°34.8′N	80°14.8′W	33
002	28°39.4′N	80°13.2′W	40
003	28°37.0′N	80°11.2′W	40
004	28°32.5′N	80°10.3′W	40
005	28°37.1′N	80°04.8′W	64
076	30°05.4′N	80°29.5′W	37
180	29°15.8′N	80°13.9′W	64
222	28°51.5′N	80°08.7′W	64
251	28°27.2′N	80°02.9′W	64
262	28°19.0′N	80°04.5′W	55

the presence of gonopores and/or developed pleopods in females. Because few illustrations exist for the gonopods of any members of the Parthenopidae, we include herein figures of these appendages from eleven species known from the Gulf of Mexico and tropical western Atlantic. Differences in gonopod structure are important in the family and, as will be shown, may allow distinction of closely related species.

Gut content analyses were performed on 10% of the Hourglass Parthenopidae (5% of *Parthenope*

agona), usually including specimens from several stations at which each species was collected. Whenever feasible, equal numbers of males, females, ovigerous females and juveniles were examined. Analyses were performed by excising a square portion of the carapace dorsally in the area of the gastric region and removing the entire stomach. The stomach was teased apart and examined under both low-power dissecting and high-power compound microscopes. Because of difficulty with taxonomic identifications, gut contents were denoted only in general categories.

SYSTEMATICS

Eight genera and 22 species of Parthenopidae are presently known to occur in the western Atlantic Ocean, including the Gulf of Mexico and the Caribbean Sea. Two of these species are exceedingly rare. *Thyrolambrus astroides* Rathbun, 1894 has been collected only off Cuba, and *Solenolambrus portoricensis* Rathbun, 1924 is known from the unique type specimen off Puerto Rico. *Parthenope meridionalis* (Boschi, 1965), *P. aylthoni* Righi, 1965, *P. guerini* (Brito Capello, 1871), *Solenolambrus brasiliensis* Rodrigues da Costa, 1961, *Heterocrypta aloysioi* Rodriques da Costa, 1968, *H. lapidea* Rathbun, 1901, and *H. tommasii* Rodriques da Costa, 1959 are known from northeastern South America, Brazilian, or Uruguayan waters. These species, except *H. lapidea*, are not considered further in this report.

Of 15 species known from the western North Atlantic, 12 occur in the Gulf of Mexico, and all are rather widely distributed throughout the tropical regions of the Caribbean. Only two species occur north of Cape Hatteras, North Carolina. *Parthenope pourtalesii* (Stimpson, 1871) and *Heterocrypta granulata* (Gibbes, 1850) have been collected in the vicinity of Cape Cod, Massachusetts, although their primary distribution, based on published records, seems to be throughout the Gulf of Mexico. *Tutankhamen cristatipes* (A. Milne Edwards, 1880) is known only from the Florida Straits and St. Vincent in the Lesser Antilles.

In the following account, material examined for each species is arranged by ship station, then by chronological order of capture, then by gear used. Specimen data include number of specimens by sex, range of sizes, and female reproductive state when apparent. With the exception of R/V *Pillsbury* material which was returned to the University of Miami, specimens we examined have been divided among the Marine Research Laboratory, St. Petersburg, Florida (FSBC I), the Smithsonian Institution Reference Museum, Ft. Pierce, Florida (SIFP), the Muséum National d'Histoire Naturelle, Paris, France (MNHNP), the Muséum d'Histoire Naturelle de Genève, Geneva, Switzerland (MHNG), the Rijksmuseum van Natuurlijke Historie, Leiden, Netherlands (RNHL), the Universitetets Zoologiske Museum, Copenhagen, Denmark (UZMC), and the National Museum of Natural History, Washington, D. C. (USNM). Specimens sent to MNHNP have been assigned accession numbers only; catalogue numbers have not yet been assigned. Specimens sent to UZMC have received only accession date designations; accession and catalogue numbers have not been assigned. No numbers have been received from MHNG. Numbers of specimens captured at each station, each month, are listed in Appendix II for the Hourglass collections in the eastern Gulf of Mexico.

Preliminary processing procedure of Hourglass samples at the Marine Research laboratory during the first half of the sampling program dictated that, after retaining an adequate and representative series of well-known species for the Invertebrate Reference Collection, some subsequent specimens were identified, recorded, and discarded. The "well-known" *Parthenope serrata*, since learned to actually consist of two species, and *P. agona* were among species so treated. These data are listed within species accounts as discarded material and are only included in further analyses where other evidence indicates such consideration appropriate. All specimens from the second half of the sampling program were retained.

In species accounts, we relied heavily on familial, generic and specific diagnoses and descriptions provided by Rathbun (1925). In many cases we supplemented these descriptions with additional observations based on our examined material, making special effort to incorporate noticeable variations in morphology into species descriptions to provide a more complete means of identification for this often exasperatingly variable family. This is especially true in regard to juvenile stages of some species, the young of which rival the Portunidae in difficulty of identification.

Synonymies for each species are complete species bibliographies gathered from all the literature known to us, and include original descriptions, first use of a name in its presently accepted combination, and references to the species in other systematic and biological literature.

The following generic and species key is taken in large part from Rathbun (1925), and the more recent update of those keys by Garth (1958). Species marked with an asterisk (*) are known to occur in waters contiguous to Florida, but were not collected by either R/V *Hernan Cortez* or R/V *Gosnold* during our investigations. Following the key are systematic accounts of all species collected during the Hourglass Cruises and by R/V *Gosnold* or R/V *Hernan Cortez* along the central eastern Florida coast, supplemented by R/V *Pillsbury* collections from the Caribbean Sea.

KEY TO GENERA AND SPECIES OF PARTHENOPIDAE FROM WATERS OFF THE FLORIDAN PENINSULA

(Modified from Rathbun, 1925, and Garth, 1958)

1. Carapace not laterally expanded over ambulatory legs 2

1. Carapace expanded to form vault concealing ambulatory legs 12

2. Carapace tuberculate or eroded 3

2. Carapace smooth, except for few strong spines 8

3. Carapace equilaterally subtriangular; basal antennal article long, almost or completely reaching orbital hiatus ..... *Tutankhamen cristatipes* (A. Milne Edwards)*

3. Carapace ovate-pentagonal or broadly triangular; basal antennal article short, not reaching orbital hiatus (Genus *Parthenope*) 4

4. Carapace ovate-pentagonal, surface little carinate in adult; chelipeds at least twice as long as carapace ..... *Parthenope agona* (Stimpson)

4. Carapace broadly triangular, surface carinate or tuberculate, sides more or less rounded; chelipeds as above 5

5. Carapace and chelipeds very flat; spine at end of main dorsal branchial ridge small 6

5. Carapace very convex; spine at end of main dorsal branchial ridge large; chelipeds not flat 7

6. Triangular spines on outer margin of chelipeds rounded posteriorly; carapace posterolateral spine directed laterally or nearly so; carapace moderately tuberculate; angle formed by posterolateral spine, gastric tubercle and outer orbital margin always distinctly less than 90° ..... *Parthenope serrata* (H. Milne Edwards)

6. Triangular spines on outer margins of chelipeds acute, margins straight; carapace posterolateral spine directed obliquely posteriad; carapace heavily tuberculate; angle formed by posterolateral spine, gastric tubercle and outer orbital margin always 90°, or nearly so ..... *Parthenope granulata* (Kingsley)

7. Dactyl of walking leg 4 about 1.3 times longer than propodus; carapace much broader than long; manus with 8-10 teeth on inner, 10-12 teeth on outer margin ..... *Parthenope pourtalesii* (Stimpson)

7. Dactyl of walking leg 4 about 1.4 times longer than propodus; carapace little, if any, broader than long; manus with 6-8 teeth on inner, 3-5 teeth on outer margin ..... *Parthenope fraterculus* (Stimpson)

8. Efferent branchial channels opening at middle of endostome as in Oxystomata (Figure 3) ..... *Mesorhoea sexspinosa* Stimpson

8. Efferent branchial channels opening at sides of endostome as customary in Oxrhyncha 9

9. Carapace depressed, with strong lateral spine ..... *Leiolambrus nitidus* Rathbun*

9. Carapace high, without strong lateral spine (Genus *Solenolambrus*) 10

10. No spines or teeth on posterior or posterolateral margin; dorsal protuberance round ..... *Solenolambrus tenellus* Stimpson

10. Some teeth or spines on posterior or posterolateral margin; dorsal protuberance angular 11

11. Not more than four teeth on posterior and posterolateral margins ... *Solenolambrus typicus* Stimpson*

11. Six teeth or spines on posterior and posterolateral margins; two median spines; spine near middle of branchial ridge ..... *Solenolambrus decemspinosus* Rathbun*

12. Carapace greatly expanded both laterally and posteriorly; pterygostomian region smooth, not ridged ..... *Cryptopodia concava* Stimpson

12. Carapace expanded laterally, not posteriorly; 1.1-1.5 times as wide as long; pterygostomian and subhepatic regions transversed by granulate or crenulate ridge ... *Heterocrypta granulata* (Gibbes)

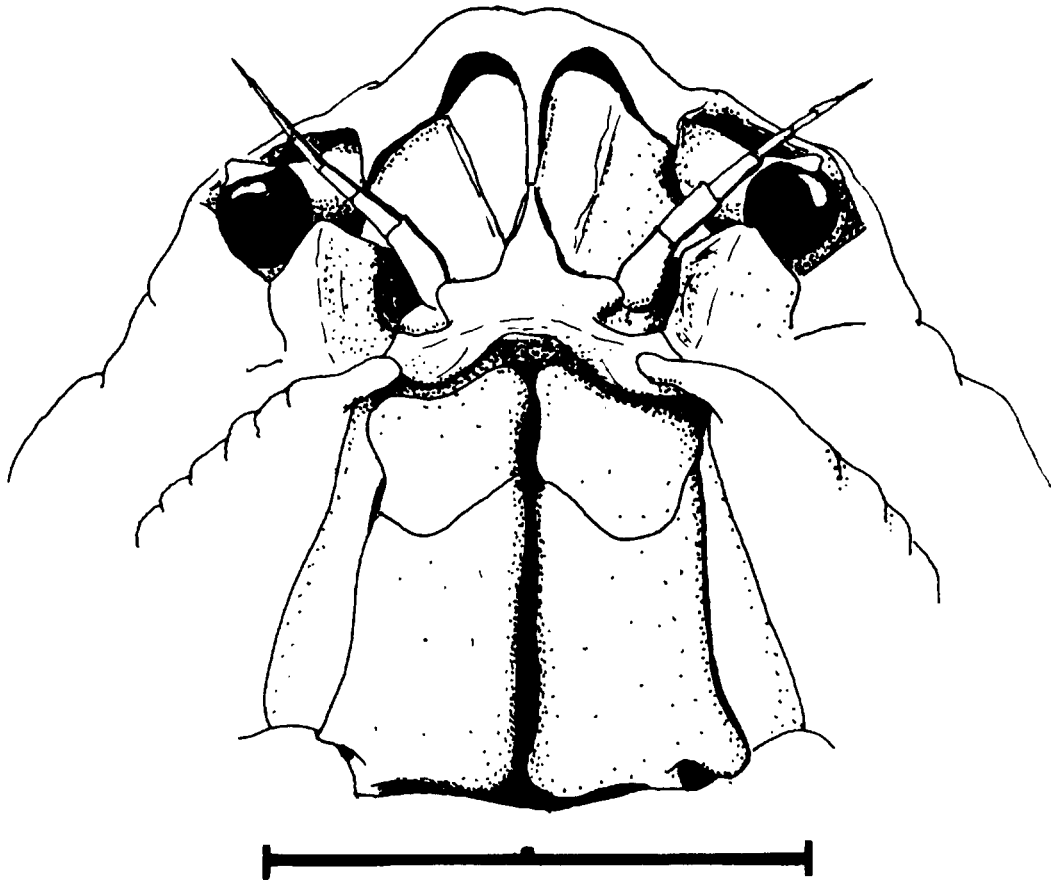

Figure 3. Mouth region of *Mesorhoea sexspinosa* Stimpson, showing efferent branchial channel opening at middle of endostome. Two millimeters indicated.

Family Parthenopidae MacLeay, 1838

Diagnosis: "Eyes usually retractile within small circular well-defined orbits; floor of orbit nearly continued to the front, leaving a hiatus usually filled by the second [article] of the antennary peduncle. Basal antennal [article] small, and deeply embedded between the inner angle of the orbit and the antennulary fossae. Antennules folding a little obliquely." (Alcock, *in* Garth, 1958).

"Chelipeds not specially mobile, usually much longer and heavier than other legs, and with fingers bent on the hand at an angle toward the side with the fixed finger. Second article of antenna small, short, and not fused with epistome or front. Orbits well made. Hooked hairs almost always wanting. Male openings coxal. Palp of external maxilliped articulated at anterointernal angle of merus." (Borradaile, *in* Garth, 1958).

Remarks: The family is divided into two subfamilies, the extensive Parthenopinae (to which all of the American genera belong), and the smaller Eumedoninae, which is primarily Indo-West Pacific in distribution.

Subfamily Parthenopinae MacLeay, 1838

Diagnosis: "Carapace commonly equilaterally-triangular, sometimes sub-pentagonal or ovate-pentagonal, and sometimes almost semicircular or semielliptical in outline; cardiac and gastric regions usually deeply marked off from branchial regions on either side, making dorsal surface of carapace trilobed. Chelipeds vastly longer and more massive than ambulatory legs. Rostrum simple or obscurely trilobed." (Alcock, *in* Garth, 1958).

Gonopod 1 of variable length, more or less stout, robust, tapering apically or bluntly truncate, usually heavily armed with spines, spinules, setae or combination of all three. Gonopod 2 shorter than gonopod 1 (except in *Platylambrus carinatus* where it equals length of gonopod 1), recurved distally, tip appearing semispatulate, often with minute spinules or teeth. (Modified from Stephensen, *in* Garth, 1958).

Genus *Cryptopodia* H. Milne Edwards, 1834

Cryptopodia H. Milne Edwards, 1834, p. 360.

Crytopodia concava Stimpson, 1871

Figures 4, 5 H-P

Cryptopodia concava Stimpson, 1871a, p. 137; A. Milne Edwards, 1878, p. 168, pl. 29, figs. 1-1c, 2-2c; 1880b, p. 5; Miers, 1881, p. 210 [discussion]; Rathbun, 1898, p. 261 [listed]; 1900, p. 515 [key]; 1901, p. 82; A. Milne Edwards and Bouvier, 1923, p. 360; Rathbun, 1925, p. 553, text-fig. 151, pl. 202, figs. 3, 4, pl. 282, figs. 6-11; Flipse, 1930, p. 82 [listed]; Rathbun, 1933, p. 42, text-fig. 37; Garth, 1958, pp. 471-473 [discussion]; Williams et al., 1968, p. 64; Rodrigues da Costa, 1969, p. 176; Coelho and Araújo Ramos, 1972, p. 206 [listed]; L. Pequegnat, 1975, p. 47 [listed].

Material examined: HOURGLASS STATION C: 1 ♂, 6.3; 3 January 1966; trawl; FSBC I 15124. — 1 juv., crushed; 2 June 1967; dredge; FSBC I 15125. — 1 ♂, 5.8; 1 July 1967; dredge; FSBC I 15126. — 1 ♂, 5.6; 1 ♀, 6.4; 11 July 1967; dredge; UZMC 15.I.1977. — 1 ♂, 6.8; 5 October 1967; dredge; USNM 156482. — HOURGLASS STATION D: 1 ♀, 7.1; 11 July 1966; dredge; USNM 156480. — 1 ♂, 3.6; 2 August 1966; trawl; FSBC I 15127. — 2 ♀, 5.8-6.0; 2 August 1966; dredge; FSBC I 3611. — 1 juv., molt; 9 November 1966; dredge; FSBC I 15128. — 1 ♂, 3.1; 28 February 1967; dredge; FSBC I 15129. — 2 juvs., 2.4-2.5; 3 March 1967; dredge; FSBC I 15130. — 1 ♂, 5.6; 21 May 1967; dredge; FSBC I 15131. — 1 ♂, 5.6; 3 ♀, 4.1-6.8; 12 July 1967; dredge; SIFP 89:2489. — HOURGLASS STATION E: 1 ♂, 6.3; 1 juv., crushed; 2 December 1966; dredge; FSBC I 15132. — 2 ♀, 3.3-4.1; 12 May 1967; dredge; USNM 156481. — 1 ♂, 5.3; 1 ♀, 7.1; 2 August 1967; dredge; SIFP 89:2486. — 1 ♀, 7.4; 6 October 1967; trawl; FSBC I 15133. — HOURGLASS STATION K: 1 ♂, 5.0; 5 July 1967; dredge; MNHNP acc. no. 7665. — HOURGLASS STATION L: 1 ♀, 6.3; 6 July 1966; trawl; FSBC I 15134. — 1 ♂, 5.7; 1 ♀, crushed; 6 July 1966; dredge; FSBC I 3171. — 3 ♂, 4.4-5.3; 1 ♀, 6.2; 5 September 1966; dredge; FSBC I 4271. — 1 ♀, 6.4; 13 October 1966; dredge; FSBC I 15135. — 1 ♂, 6.3; 13 January 1967; trawl; FSBC I 15136. — 2 ♀, 2.5, crushed; 16 February 1967; dredge; FSBC I 15137. — 1 ♂, crushed; 1 ♀, 6.4; 9 March 1967; trawl; UZMC 15.I.1977. — 1 ♂, 6.4; 1 ♀, 6.3; 8 April 1967; trawl; RNHL D 31398. — 1 ♀, 6.3, ovigerous; 12 October 1967; trawl; SIFP 89:2492. — 1 juv., 3.0; 15 November 1967; trawl; FSBC I 15138. — HOURGLASS STATION M: 2 ♀, 6.6-6.8; 5 September 1966; dredge; FSBC I 4505. — 1 ♀, crushed; 7 December 1966; dredge; FSBC I 15139. — 1 ♂, 3.1; 9 March 1967; dredge; FSBC I 15140. — EAST FLORIDA: RSP STATION 004: 1 ♂, 9.7; 15

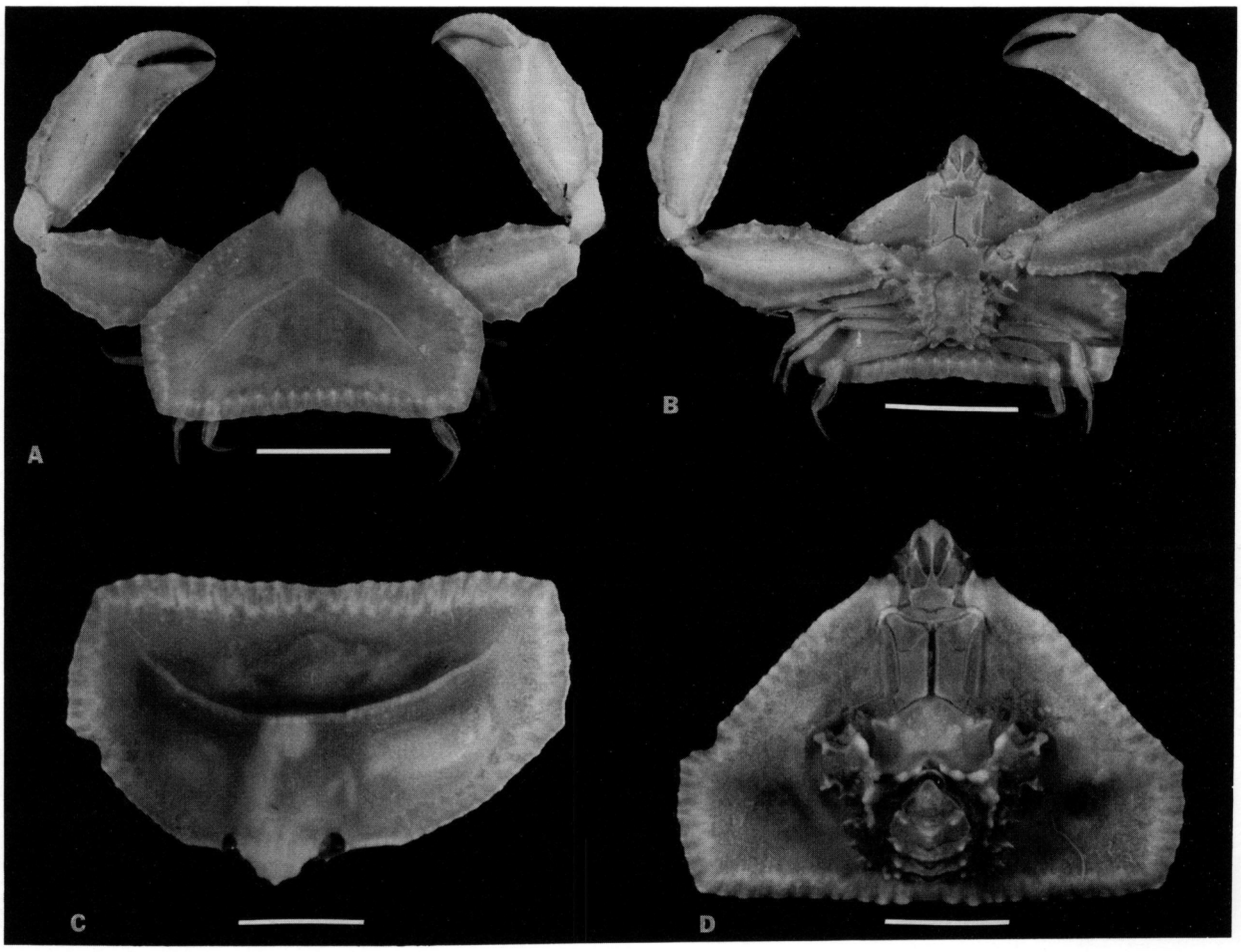

Figure 4. *Cryptopodia concava* Stimpson. A. male, off Cape Canaveral, Florida east coast, dorsal view; B. same, ventral view; scale lines = 5 mm; C. female, Gulf of Mexico, off Egmont Key, Florida, fronto-dorsal view; D. same, ventral view; scale lines = 2 mm.

May 1974; trawl; SIFP 89:1437. — 1 ♀, 8.0, ovigerous; 6 December 1974; trawl; SIFP 89:1996.

Diagnosis: Carapace 1.0 to 1.4 times as wide as long; rostrum distinctly broader than long. Branchial ridges convex anteriorly. (Modified from Rathbun, 1925).

Description: Carapace about 1.0-1.4 times wider than long (CW:RCL); anterolateral margins twice as long as posterolateral, meeting latter at obtuse, often rounded angle; posterolateral margins converging slightly posteriad; posterior margin straight to slightly emarginate in adult males and females, more noticeably emarginate in younger forms. Gastrobranchial ridges granulate, margins cut into small, rectangular or rounded, truncate teeth separated by closed fissures and often with denticulate margins. Lateral expansions of carapace not covering walking legs when latter extended. Surface overall smooth, shining, often appearing punctate under higher magnification. Front triangular, flattened or very slightly rounded dorsally near tip. Merus of maxillipeds triangular, with internal angle truncate.

Upper surface of hand and arm of cheliped somewhat expanded near middle, margins denticulate, with

few obscure teeth. Crests on walking legs denticulate.

Sternum very concave in front, with deep hollow fitting terminal somite of abdomen, with strong dentate crests prolonged to basal cheliped articles laterally. Gonopods as illustrated (Figure 5 H-P).

Type-locality: Conch Reef, southeastern Florida; 34 fms (62 m); type not extant (*fide* Rathbun, 1925).

Distribution: Cape Hatteras, North Carolina to the west coast of Florida; Bahama Banks; off St. Thomas, Virgin Islands; St. Vincent; Bahia, Brazil; 7-73 m. Hourglass Stations C, D, E, K, L and M; 37-73 m.

East Pacific analogue: *Cryptopodia hassleri* Rathbun, 1925 (*fide* Garth, 1958).

Remarks: According to Williams et al. (1968) and Soto (1972, unpubl.), the species is uncommon. However, the abundance of Hourglass material (48 specimens) suggests that it perhaps is only locally uncommon in nearshore areas. The species does appear to be more abundant in the Gulf of Mexico and Caribbean Sea than in Atlantic continental shelf waters off the eastern United States. Although slight variation in carapace morphology was noted between Gulf of Mexico and western Atlantic specimens (mainly in the degree of emargination), there was no significant variation in gonopod morphology among specimens from these regions as can be seen by comparing Figure 5 H-M and N-P.

Genus *Heterocrypta* Stimpson, 1871

Heterocrypta Stimpson, 1871b, p. 102 [129].

Heterocrypta granulata (Gibbs, 1850)

Figures 5 A-D, 6, 7

Cryptopodia granulata Gibbes, 1849, p. 21 [*nomen nudum*]; 1850, p. 173; 1856, p. 35 [woodcut]; Stimpson, 1860, p. 202; 1871b, p. 102 [discussion].

Heterocrypta granulata: Stimpson, 1871b, p. 102, 103 [discussion]; Verrill, 1873, p. 415 [discussion]; Verrill et al., 1873, p. 548; Coues and Yarrow, 1878, p. 297; Kingsley, 1878, p. 317; A. Milne Edwards, 1878, p. 166, pl. 29, fig. 4-4c; Kingsley, 1880, p. 391; A. Milne Edwards, 1880b, p. 5; Miers, 1881, p. 210 [discussion]; 1886, p. 103; Rathbun, 1897, p. 12; 1900, p. 515 [key]; Young, 1900, p. 112; Moreira, 1901, pp. 61, 129 [synonymy]; Rathbun, 1901, p. 83, text-fig. 13; 1905, pp. 1 [listed], 12; Fowler, 1912, p. 588; Sumner et al., 1913a, p. 141 [listed]; 1913b, p. 669; Hay and Shore, 1918, p. 464, pl. 39, fig. 9; A Milne Edwards and Bouvier, 1923, p. 360; Balss, 1924, p. 181; Rathbun, 1925, pp. 555, 559 [discussion], text-fig. 152, pl. 203, figs. 1, 2, pl. 282, figs. 1-3; Flipse, 1930, p. 82; Rathbun, 1933, p. 43, text-fig. 38; Garth, 1940, p. 72 [discussion]; Pearse et al., 1942, p. 186; Behre, 1950, p. 23 [listed]; Capart, 1951, p. 109 [discussion]; Hedgpeth, 1953, p. 164 [discussion]; Wass, 1955, pp. 140 [key], 168; Garth, 1958, pp. 474, 479, 480 [discussion]; Parker, 1959, p. 2131 [listed], pl. 3, fig. 16a, b; Hulings, 1961, p. 219 [listed]; Tabb and Manning, 1961, p. 603; 1962, p. 62 [listed];Dragovich and Kelly, 1964, p. 85; Bullis and Thompson, 1965, p. 13 [listed]; Williams, 1965, p. 270, text-figs. 251, 252E; Leary, 1967, pp. 45 [unnumbered fig.], 50; Rodrigues da Costa, 1968, p. 147 [discussion]; Fausto-Filho, 1970, p. 59; Rouse, 1970, p. 146; Lyons et al., 1971, p. 33; Coelho and Araújo Ramos, 1972, p. 206 [listed]; Felder, 1973, p. 45 [key], pl. 6, fig. 6; Williams, 1974, pp. 28 [key], 42, text-fig. 78; L. Pequegnat, 1975, p. 47 [listed].

?*Heterocrypta lapidea* Rathbun, 1901, p. 83, text-fig. 13; 1925, pp. 555 [key], 559, text-fig. 153; 1933, p. 44; Garth, 1958, p. 474 ["Atlantic analogue"]; ? Righi, 1966, p. 140 [listed, key]; ? Rodrigues da Costa, 1968, pp. 143, 147; ? Coelho and Araújo Ramos, 1972, p. 206 [listed].

Material examined: HOURGLASS STATION A: 1 ♂, 7.4; 3 January 1966; dredge; FSBC I 15142. — 2 ♂, 6.1-6.6; 1 ♀, 6.3; 6 June 1966; dredge; SIFP 89:2494. — 1 ♀, 5.0; 1 August 1966; dredge; FSBC I 3274. — 1 ♀, 6.4; 1 juv., 5.1; 8 October 1966; dredge; FSBC I 15143. — 2 ♂, 7.6-8.3; 2 June 1967; dredge; USNM 156483. — 1 ♂, 7.4; 1 August 1967; dredge; USNM 156484. — 1 ♀, 6.6, ovigerous; 5 October 1967; dredge; SIFP 89:2497. — HOURGLASS STATION B: 1 ♀, 6.8; 2 March 1967; dredge; SIFP 89:2449. — 2 ♂, 5.6-6.7; 11 May 1967; dredge; RNHL D 31401. — 2 ♀, 4.5-7.0; 2 November 1967; dredge; SIFP 89:2498. — HOURGLASS STATION I: 1 ♂, 7.3; 12 November 1965; dredge; MNHNP acc. no. 7684. — 3 ♂, 5.5-8.3; 1 ♀, 8.7, ovigerous; 12 June 1966; dredge; FSBC I 3118. — 1 ♂, 4.4; 1 ♀, 5.2, ovigerous; 5 July 1966; dredge; FSBC I 3154. — 1 ♂, 4.6; 12 October 1966; dredge; FSBC I 15144. — 1 ♂, 8.1; 7 April 1967; dredge; FSBC I 15145. — 1 ♀, 7.1; 1 juv., 5.1; 5 July 1967; dredge; FSBC I 15146. — 1 ♀, crushed; 7 August 1967; dredge; SIFP 89:2499. — 1 ♂, 7.0; 1 ♀, 7.8; 1 juv., 2.6; 4 September 1967; dredge; MHNG. — 2 ♂, 4.8-5.8; 11 October 1967; dredge; UZMC 15.I.1977. — 1 ♀, 4.5; 14 November 1967; dredge; FSBC I 15147. — HOURGLASS STATION J: 1 ♂, 6.9; 1 ♀, 7.0; 14 November 1967; dredge; MNHNP acc. no. 7666. — HOURGLASS STATION L (?): 1 ♀, 5.0; 7 August 1965; dredge; FSBC I 15148. — EAST FLORIDA: R/V GOSNOLD STATION 220/226: 2 ♂, 8.1-8.3; 13 February 1974; dredge; SIFP 89:0889. — R/V GOSNOLD STATION 225/360: 1 ♀, 9.8, ovigerous; 21 March 1974; trawl; RNHL D 31400. — R/V GOSNOLD STATION 229/407: 1 ♂, 9.6; 16 April 1974; dredge; SIFP 89:1448. — R/V GOSNOLD STATION 229/408: 1 ♀, 8.8; 16 April 1974; trawl; UZMC 15.I.1977. — R/V GOSNOLD STATION 230/427: 1 ♀, 11.0, ovigerous; 18 April 1974; trawl; SIFP 89:1539.

Diagnosis: Carapace 1.1 to 1.5 times as wide as long, margins crenulate, dentate, or lobate; posterolateral margin between branchial ridge and lateral angle straight, or slightly concave; gastric ridge unarmed on either side, or rarely with distinct granulate tubercle on either side; a third tubercle may occur posteriorly and mesially to those just noted.

Description: Carapace very wide, length from 1.1 to 1.5 times width, including rostrum; branchial ridges low, with crests formed by single or occasionally irregular double row of low granules, often indistinct; each ridge running almost parallel to anterolateral margin, becoming more faint before uniting with low gastric ridge; low depression proximal to union of branchial ridges with transverse gastric granulation; latter often distinctly granular, may terminate transversely with single, distinct, granulate tubercle on either side; third tubercle may occur posteriorly to these medially. Granulate longitudinal crest extending forward from either end of gastric ridge, usually attaining upper margin of orbit; crest quite distinct in some specimens yet not reaching orbital margin; crest in others obsolete, especially older specimens. Cardiac region with large, dome-like elevation, often granulate at apex, but also low or obsolete in some individuals. General surface of carapace finely punctate or faintly granulate, roughened dorsally. Anterolateral margins dentate, lobate or crenulate, meeting at perceptible angle with posterolateral margins; latter granulate, often with several larger, bluntly rounded teeth interspersed distally near posterior margin. Portion of margin between anterolateral margin and branchial ridge straight, slightly sinuous, or concave, often eroded or chipped. Posterior carapace margin forming, with posterolateral margin, an angle often little perceptible except in rear view. Rostrum broad, triangular or acute, thickened or blunt, little if at all deflexed, with margins rounded to nearly straight; surface granulous, upper surface smooth, with faint median furrow extending posteriorly on frontal region, becoming ill-defined or obsolete approaching gastric elevation. Merus of outer maxilliped with rectangular

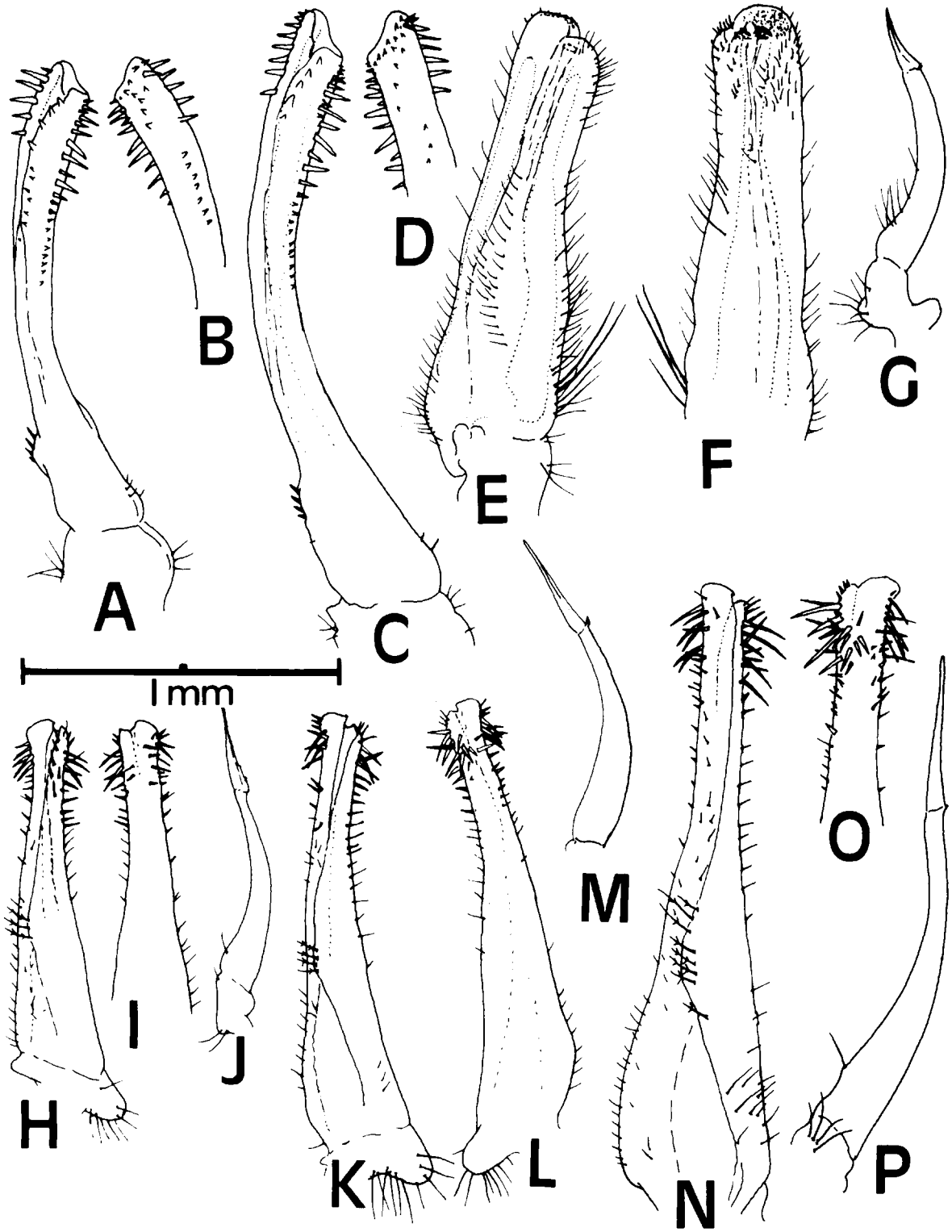

Figure 5. Major and minor left gonopods (pleopods 1 and 2) of male Parthenopidae. Gulf of Mexico specimens: *Heterocrypta granulata* (Gibbes): A. RNHL D 31401, major gonopod, mesiolateral view; B. same, ventral view; C. MHNG, major gonopod, mesiolateral view; D. same, ventral view. *Mesorhoea sexspinosa* Stimpson: E. SIFP 89:2490, major gonopod, medial view; F. same, ventral view; G. minor gonopod, mesiolateral view. *Cryptopodia concava* Stimpson: H. MNHNP acc. no. 7665, major gonopod, medial view; I. same, ventral view; J. minor gonopod, mesiolateral view; K. RNHL D 31398, major gonopod, medial view; L. same, ventral view; M. minor gonopod, mesiolateral view. *Crytopodia concava*, Atlantic specimen: N. SIFP 89:1437, major gonopod, medial view; O. same, ventral view; P. minor gonopod, mesiolateral view.

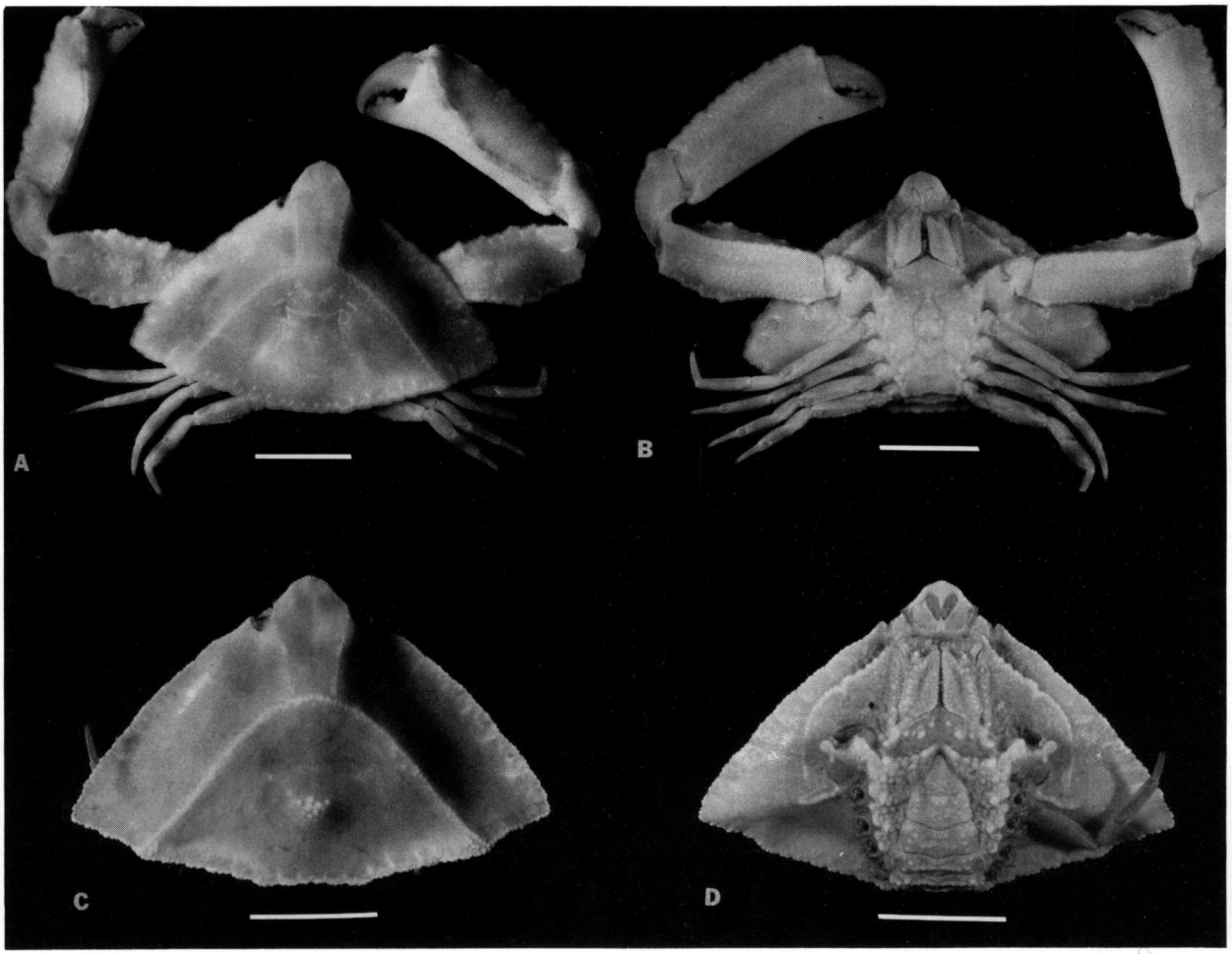

Figure 6. *Heterocrypta granulata* (Gibbes). A. male, off Vero Beach, Florida east coast, dorsal view; B. same, ventral view; C. female, Gulf of Mexico, off Sanibel Island, Florida, ventral view; D. same, dorsal view. Scale lines = 3 mm.

notch at inner angle; surface heavily granulate overall, with larger granules outlining inner and outer margins of ischium and merus, appearing more scattered on exopodite.

Chelipeds unequal, rather short and heavy, 1.5-2.1xRCL; upper surface of arm and hand dilated toward middle of irregularly dentate margins; fingers of larger chela with slight gape, less noticeable in smaller chela. Arm more roughened proximal to carapace, margins subparallel, with dentition more distinct anteriorly than posteriorly. Walking legs slender; merus with minute spinules dorsally, remaining segments with irregular granules or small spinules; merus of last pair barely visible in dorsal view.

Abdominal somites 3-5 of male fused, sixth with sharp, appressed, posteriorly directed spine; tip of spine lying between two more or less fused tubercles on somite 5. Sternum of male and female often heavily granulate, with large, low, pebble-like (often pearly) granules, becoming faint or absent on first sternal segment in some specimens. Gonopods as illustrated (Figure 5 A-D).

Type-locality: Near Kiawah Island, Sullivan's Island and White Point Shoal, Charleston Harbor, South

Carolina. Syntypic series probably not extant. Although a "type specimen" from Sullivan's Island was listed by Rathbun (1925: p. 555) as being in the University of South Carolina at Columbia, Dr. W. D. Dawson informs us it is no longer extant, being either destroyed during the Civil War or subsequently lost.

Distribution: Nantucket Sound, Massachusetts to Georgia and southeastern Florida; Gulf of Mexico from Aransas Pass, Texas to off Key West, Florida; Jamaica, Puerto Rico, and St. Thomas, Virgin Islands to Bahia, Brazil; 4-50 m; to 137 m if data for one female specimen (USNM 50385; Rathbun, 1925, Table, p. 557) are correct. Hourglass Stations A, B, I, J and (L?); 6-18 (55?) m.

East Pacific analogue: *Heterocrypta colombiana* Garth, 1940 (*fide* Garth, 1958).

Remarks: The similarity between this species and *H. lapidea* is striking if Rathbun's illustration (1901, p. 83, text-fig. 13) and reproduction of same (1925, p. 559, text-fig. 153) can be considered indicative. It would appear from these illustrations that *H. lapidea* is more noticeably granulate than *H. granulata*, especially on branchial and gastric ridges. The longitudinal crests from the gastric region appear to reach the orbital margins, and two prominent gastric tubercles, and possibly a third median tubercle immediately behind, are also indicated in her figure. There is, however, some doubt as to whether *H. lapidea* may remain a valid species. Balss (1924) was apparently the first to suggest that *H. lapidea* was, perhaps, based on a juvenile specimen of *H. granulata*, and Flipse (1930) synonymized *H. lapidea* with *H. granulata* without commenting further. After examination of our material of *H. granulata*, we tend to agree with both authors. Variation in granulosity along branchial, gastric, and protogastric ridges is extreme, ranging from granules distinctly present to barely noticeable. Four of our specimens, two males and two females (one ovigerous), seemed at first glance to be assignable to *H. lapidea*. These specimens had high, heavily granulate crests on the dorsum of the carapace, and possessed a more or less distinctly granulate tubercle at either end of the gastric ridge. In this material, a female from Station B had a third tubercle behind the two gastric tubercles (Figure 7 A), but a male from the same station was more obscure in this respect. However, a male specimen of *H. granulata* illustrated by Rathbun (1925, pl. 203, figs. 1, 2) also shows this third tubercle. Indeed, a comparison of these figures and that of figure 153 in the same work shows many similarities, especially in the distinctly granulate branchial ridges and those leading to the orbital margins from the transverse gastric ridge. In her study on Puerto Rican brachyurans, Rathbun (1933, text-fig. 38) inadvertently placed this same figure (which appears to be merely a copy of figure 153 in her 1925 work, which in turn depicts the holotype of *H. lapidea* as it was illustrated in the original description in 1901, p. 83, fig. 13) under the species account of *H. granulata* and labelled it as such. However, she also continued to list *H. lapidea* as a separate species in that paper.

We believe that much of the confusion surrounding these two species can be eliminated if, as Balss suggested, we consider *H. lapidea* to be merely a juvenile specimen of *H. granulata.* We can state that, in general, *H. granulata* is a smooth species, and is usually not heavily ornamented on the dorsal ridges of the carapace. We have also examined specimens in which the granulation on these ridges varies from usually low and indistinct to sharp and nearly tuberculous. The depressions between these ridges may be deep or shallow. These variations may be most easily seen by comparing specimens in frontal view (Figure 7 A, B). Other features in our material which showed variation were presence or absence of the posterior median tubercle on the gastric region, extension of granulosity from the gastric ridge to the orbital margin, height of gastric and cardiac elevations, and large, pebble-like granules on sternal segments of some individuals.

Comparison of gonopods from both the noticeably ornate "*lapidea*-like" specimens and the more smooth, typically "*granulata*-like" specimens in our material revealed no significant differences (Figure 5

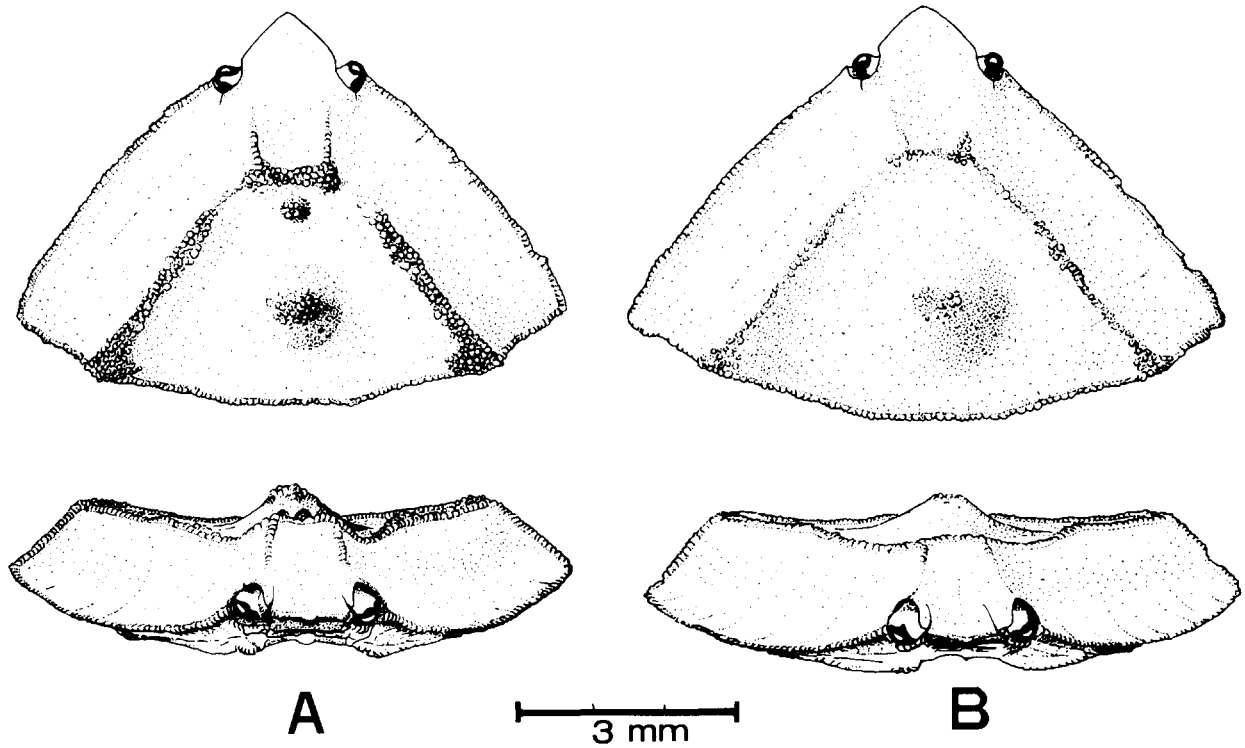

Figure 7. *Heterocrypta granulata* (Gibbes), Gulf of Mexico specimens: A. SIFP 89:2449, frontal and dorsal views of "*lapidea*-like" female; B. FSBC I 15146, frontal and dorsal views of typical female. Note presence or absence of distinct gastric tubercle, and variation in granulosity on cardiac protuberance.

A-D). Unfortunately, comparison with the female holotype of *H. lapidea* from the Virgin Islands is not possible in this regard, while the other specimen of this species in the National Museum, a male from Puerto Rico, is a juvenile.

There remains the question of material from Brazil. Coelho and Araújo Ramos (1972) have most recently noted the distribution of *H. lapidea* along the Brazilian coast from Céara to Santa Catarina. They also cited previous records from the Antilles, as mentioned above. Rodrigues da Costa (1968) listed five specimens of *H. lapidea* from Brazil (two males, three females) but did not illustrate them. He noted that carapacial teeth were more marked, and the angle between the posterolateral and posterior margins was more pronounced than that cited by Rathbun for her specimens. However, Rodrigues da Costa also stated that the branchial teeth, a character used by Rathbun in her description of the species, were not a constant feature and could not be correlated with either size or sex. Other more constant characters were presence of a median sulcus on the frontal region and shape of chelipeds. Variation of this type is similar to that noted by us in our Gulf of Mexico and subtropical western Atlantic material, which, in our opinion, consists of the single species, *H. granulata.* Whether the Brazilian specimens, themselves apparently somewhat variable, are assignable to *H. lapidea* or belong to an undescribed species cannot be presently ascertained. Perhaps studies on the gonopods will resolve this problem. Consequently, until such studies are done or further material becomes available, we are tentatively placing the northeastern Caribbean specimens of *H. lapidea* in synonymy with *H. granulata*, thus reaffirming Balss' and Flipse's original contentions.

Although lot FSBC I 15148 was transmitted to us as having been collected from Station L (55 m), other evidence revealed by FDNR personnel indicates the specimen was not from that locality. Erroneous

information probably resulted from inaccurate recording of the field sample number during preliminary sorting. No *Heterocrypta* were listed from Station L when Brachyura were sorted to genera.

Felder (1971, unpubl.) noted occurrence of *H. granulata* in stomach contents of a sheepshead fish, *Archosargus probatocephalus* (Walbaum).

Genus *Solenolambrus* Stimpson, 1871

Solenolambrus Stimpson, 1871a, p. 132.

Solenolambrus tenellus Stimpson, 1871

Figures 8, 9 D-F, 10 A

Solenolambrus tenellus Stimpson, 1871a, p. 134; A. Milne Edwards, 1878, p. 160; Rathbun, 1898, p. 261 [listed]; 1900, p. 514 [key]; Haeckel, 1904, pl. 86, fig. 5; Hay and Shore, 1918, p. 463, pl. 39, fig. 8; Rathbun, 1921, p. 80; A. Milne Edwards and Bouvier, 1923, p. 357; Rathbun, 1925, pp. 536 [key], 541, pl. 194, figs. 3, 4, pl. 279, figs. 5-9; Flipse, 1930, p. 89 [listed]; Rathbun, 1933, pp. 40 [key], 41; Chace, 1940, p. 54; Beatty, 1944, p. 175 [listed]; Wass, 1955, p. 171 [listed]; Monod, 1956, p. 595 [discussion]; Lewis, 1965, pp. 1054, 1071 [listed]; Williams, 1965, p. 270, text-fig. 250.

Pisolambrus nitidus A. Milne Edwards, 1878, p. 158, pl. 30, fig. 4-4e; 1880b, p. 5.

Lambrus (Pisolambrus) nitidus: Young, 1900, p. 107.

Material examined: HOURGLASS STATION D: 1 ♂, 4.2; 2 ♀, 3.8-4.6; 11 July 1966; dredge; FSBC I 15107. — 1 ♂, 4.4; 2 ♀, (1 ovigerous, 4.7) 2.3; 2 August 1966; dredge; FSBC I 3612. — 1 ♂, 2.8; 11 August 1966; dredge; FSBC I 3904. — 1 ♂, 2.8; 6 February 1967; dredge; FSBC I 15108. — 1 juv., 2.3; 28 February 1967; dredge; FSBC I 15109. — 1 ♀, 1.9; 12 May 1967; dredge; FSBC I 15110. — 1 ♀, 3.6; 21 May 1967; dredge; FSBC I 15111. — 2 ♂, 5.3-5.9; 3 June 1967; dredge; SIFP 89:2503. — 1 ♂, 4.4; 1 ♀, 4.6; 12 July 1967; dredge; USNM 156510. — 2 ♂, 4.1-5.4; 1 ♀, 4.8, ovigerous; 1 juv., 2.8; 1 September 1967; dredge; RNHL D 31399. — 1 ♂, 4.2; 1 ♀, 4.6, ovigerous; 6 October 1967; trawl; UZMC 15.I.1977. — 1 ♂, 4.0; 6 October 1967; dredge; FSBC I 15112. — 1 ♀, 5.2, ovigerous; 21 November 1967; dredge; USNM 156509. — HOURGLASS STATION E: 1 ♀, 3.9; 3 July 1966; trawl; FSBC I 15113. — 3 ♂, 4.3-4.7; 7 ♀, (1 ovigerous, 6.5) 2.4-4.7; 2 juvs., crushed; 2 August 1966; dredge; FSBC I 3703. — 1 ♂, 3.9; 1 molted carapace; 9 October 1966; dredge; FSBC I 15114. — 1 juv., 1.8; 2 December 1966; dredge; SIFP 89:2502. — 1 ♂, crushed; 1 ♀, 2.8; 2 juvs., 2.3-2.4; 3 March 1967; dredge; MNHNP acc. no. 7669. — 1 ♀, 2.9; 12 May 1967; dredge; USNM 156511. — 2 ♂, 4.1-4.5; 2 ♀, (1 ovigerous, 5.1) 5.0; 2 August 1967; dredge; SIFP 89:2501. — 1 ♂, 3.8; 6 October 1967; dredge; FSBC I 15115. — 1 ♂, 5.0; 6 October 1967; trawl; FSBC I 15116. — HOURGLASS STATION L: 1 ♀, 4.4, ovigerous; 6 August 1966; dredge; FSBC I 3784. — 2 ♂, 4.3-4.5; 4 ♀, (3 ovigerous) all 4.9; 5 September 1966; dredge; FSBC I 4272. — 1 ♀, 3.3; 16 February 1967; dredge; FSBC I 15117. — 1 ♀, 3.5; 16 May 1967; dredge; SIFP 89:2505. — 1 juv., 2.0; 7 June 1967; dredge; FSBC I 15118. — 1 ♀, 3.8; 12 October 1967; dredge; FSBC I 15119. — HOURGLASS STATION M: 1 ♂, 6.0; 12 April 1966; trawl; FSBC I 2752. — 1 ♀, 3.2; 12 April 1966; dredge; FSBC I 2763. — 1 ♀, 4.1; 1 juv., 2.3; 12 May 1966; dredge; FSBC I 2816. — 1 ♂, 3.9; 13 June 1966; dredge; FSBC I 15120. — 4 ♂, 4.0-4.4; 9 ♀, (5 ovigerous, 4.4-5.0) 2.8-4.6; 5 September 1966; dredge; FSBC I 4513. — 1 ♂, 6.6; 1 ♀, 5.0, ovigerous; 13 November 1966; dredge; MHNG. — 1 ♂, 3.6; 3 July 1967; dredge; FSBC I 15121. — EAST FLORIDA : R/V GOSNOLD STATION 262/772: 1 ♀, 6.9, ovigerous; 12 August 1975; dredge; SIFP 89:2440.

Diagnosis: Carapace smooth to noticeably punctate; oblique row of tubercles on branchial regions extending to posterolateral margin; no spines or teeth on posterior or posterolateral margins; dorsal protuberances low, rounded; eyes very large in relation to body; margins of arms and hand noticeably serrate, chelipeds 2.4 to 3 times as long as carapace. (Modified from Rathbun, 1925).

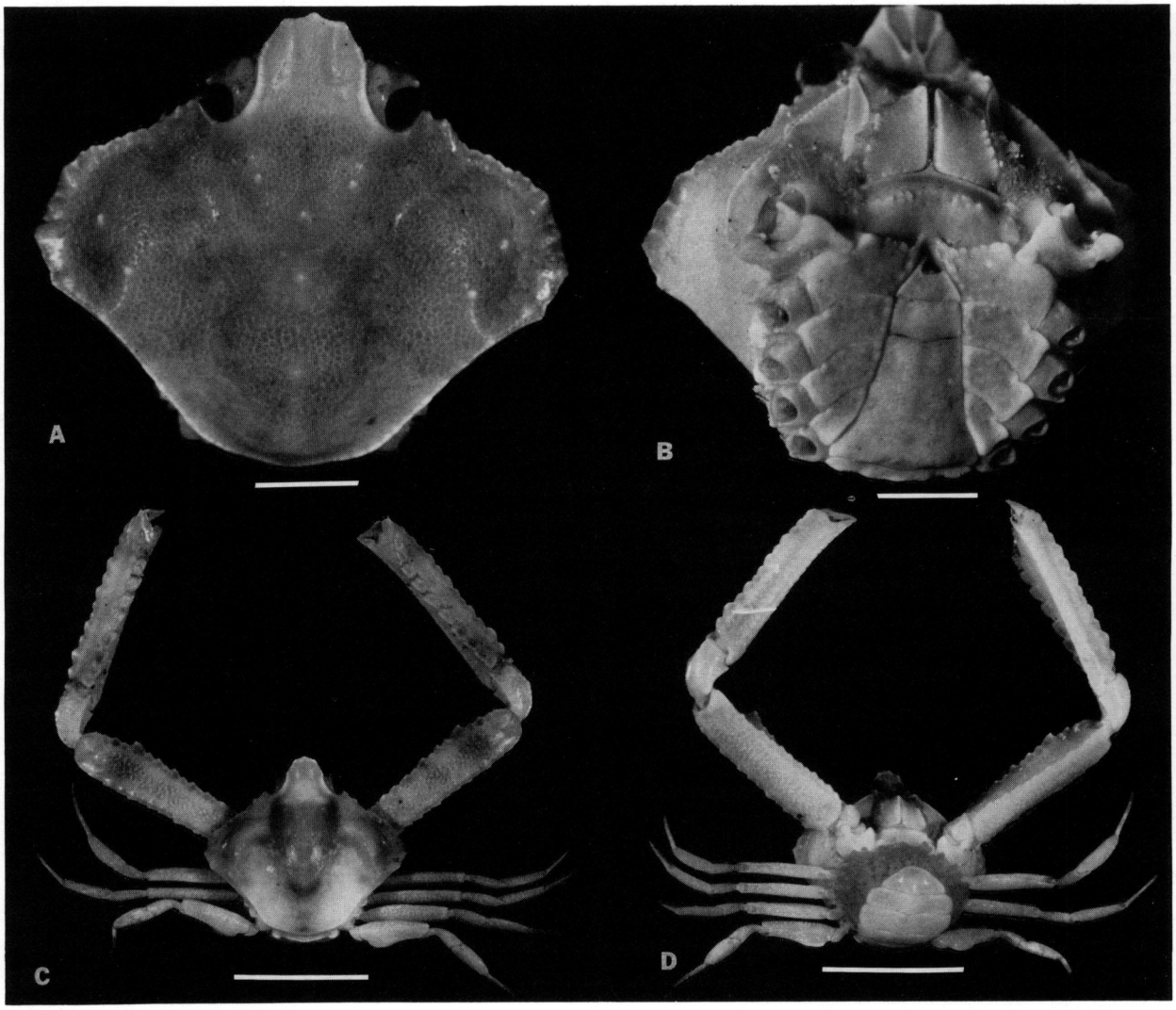

Figure 8. *Solenolambrus tenellus* Stimpson. A. male, Gulf of Mexico, off Egmont Key, Florida, dorsal view; B. same, ventral view; scale lines = 1 mm; C. female, ovigerous, off St. Lucie Inlet, Florida east coast, dorsal view; D. same, ventral view; scale lines = 5 mm.

Description: A small, delicate species. Carapace only slightly broader (1:1.07x) than long, about equally produced in front of and behind line of lateral angles; surface rather coarsely punctate; protuberances of carapace much less prominent than in *S. typicus*, those of gastric, cardiac and branchial regions obtusely rounded, without angular ridges, with or without small isolated tubercles; ridge of branchial region sufficiently well marked near posterolateral margin with oblique row of several granules of variable size, but almost obsolete anteriorly; margins of carapace crenulate or obsoletely denticulate, teeth most distinct on

flattened, expanded, broadly rounded lateral angle where they are either partially fused or number about six, not crenulated and but little projecting, being defined chiefly by impressed lines on marginal expansion. Two or three denticulated teeth on hepatic region, often obsolete in younger specimens; posterolateral margins slightly concave; posterior margin convex, with lateral angles rounded or obtuse. Rostrum rather prominent, margin often bluntly denticulate in young, sometimes only faintly tridentate at extremity; median tooth smallest, rounded, most prominent. External angle of orbit not produced, but sometimes dentate; one or two small teeth immediately distal to orbit on anterolateral margin. Eye large, with very minute tubercle at summit. Basal joint of external antenna about as long as next segment; subhepatic region slightly excavated, less sharply concave than *S. typicus*, with distinct, thin supplementary ridge obliquely mesial to anterolateral and pterygostomial ridges, nearly meeting latter at epistome. External maxillipeds and efferent channels nearly as in *S. typicus*, but with ridges less strongly tuberculate, if at all, and outer angle of merus more rounded, less acutely prominent. Sternum between bases of chelipeds with distinct, raised, rounded, sparsely tuberculate, transverse ridge; anterior margin with smooth, low, elevated rim, faintly convex on either side; otherwise nearly smooth.

Chelipeds long (about 2x RCL), slender, edges denticulate, surfaces smooth to coarsely punctate, polished. Merus with about 13 irregular denticles on either edge, those anteriorly thin and flattened; third denticle from distal end of anterior margin largest. Carpus with raised, mesial dorsal ridge, indistinctly granulate or denticulate; upper anterior margin thin, crenulate, produced into sharp, flattened tooth distally at junction with manus; lower outer margin with faint ridge ending in bluntly rounded tooth distally. Hand with 11-12 bluntly rounded to sharp, forward-curving teeth on superior edge; spiniform terminal tooth above movable finger considerably longer than others; outer edge of hand with 11-13 obtuse, less prominent, minutely crenulate teeth, inner edge with 18-20 very minute teeth. Walking legs naked, compressed; merus with thin, distinct, nonlaminiform crest dorsally, that of last pair with noticeable ventral expansion proximally; dactyls long, thin, needle-like.

Abdomen and sternum of male coarsely pitted, otherwise smooth and glabrous; that of female punctate, shining. Gonopods as illustrated (Figure 9 D-F).

Type-locality: Off Carysfort, Conch and French Reefs, southeastern Florida; 35-49 fms (64-90 m); types not extant (*fide* Rathbun, 1925, p. 541).

Distribution: Off Cape Lookout, North Carolina; Indian River region of Florida from off St. Lucie Inlet, through the Florida Keys to the eastern Gulf of Mexico near Cape St. George; southward through the Bahamas and Cuba to the Lesser Antilles, including St. Croix, St. Vincent and Barbados; 55-330 m. Hourglass Stations D, E, L and M; 55-73 m.

East Pacific analogue: None.

Remarks: *Solenolambrus tenellus* is moderately common off the west coast of Florida, but appears to be more abundant in the Caribbean Sea. The species is easily distinguishable from its congener, *S. typicus*, both in carapace shape and, in the males, by gonopod morphology (Figures 9, 10). The latter species is sparsely distributed in the Gulf of Mexico and more widely distributed in the Atlantic Ocean, if our specimens can be considered indicative.

Solenolambrus typicus Stimpson, 1871

Figures 9 A-C, 10 B, 11, 12

Solenolambrus typicus Stimpson, 1871a, p. 133; 1871b, pp. 101, 102 [discussion]; A. Milne Edwards, 1878, p. 159, pl. 28, figs. 4-4d; 1880b, p. 5; Rathbun, 1894, pp. 84, 85 [discussion]; 1898, p. 261 [listed]; Young, 1900, p. 110; Rathbun, 1901, pp. 81 [in part, *fide* author, not specimens from Puerto Rico], 82 [discussion]; A. Milne Edwards and Bouvier, 1923, p. 356; Rathbun, 1925, pp. 536 [key], 537, text-fig. 148, pls. 192, 193, pl. 279, figs. 1-4; Boone, 1927, p. 42; Flipse, 1930, p. 89 [listed]; Rathbun, 1933, p. 40, text-fig. 34; Chace, 1940, p. 53; Garth, 1946, p. 413 [discussion]; 1958, pp. 458-461 [discussion]; Rodrigues da Costa, 1961, pp. 1, 4 [discussion]; Lewis, 1965, pp. 1055, 1071 [listed]; Williams et al., 1968, p. 63; Rodrigues da Costa, 1969, p. 175; W. Pequegnat, 1970, pp. 173 [listed], 184; W. Pequegnat et al., 1971, p. 3 [listed], pl. 1, map C.

not *Solenolambrus typicus* Cano, 1889, pp. 87, 102, 187 [= *S. arcuatus* Stimpson, 1871, *fide* Rathbun, 1925, p. 538].

Material examined: None from Florida east coast or Gulf of Mexico (see *Remarks*).

Diagnosis: No more than four teeth on posterior and posterolateral margins; two acute elevations dorsally on median line of carapace; obtuse angle formed by granules dorsally at middle of branchial ridge; 2 1/2 to 3 rows of moderate sized tubercles on lower surface of palm, 2 rows on upper surface, margins dentate; chelipeds 2-2.5 times as long as carapace. (Modified from Rathbun, 1925).

Description: Carapace as wide as, or up to 1.2 times wider than, long; surface coarsely punctate, protuberances of gastric and cardiac regions triangularly pyramidal, rounded to acute, with ridges forming angles being faintly to distinctly crenulate; posterior ridge of each pyramid in median line of carapace, anterior ridges diverging in front; cardiac pyramid symmetrical, with each triangular side equal; gastric protuberance asymmetrical, with posterior ridge a short steep slope, and two anterior ridges longer, enclosing gradual, somewhat convex slope toward front; branchial ridge also crenulate, bent at middle into obtuse, almost 90° angle; male with each protuberance usually surmounted by acute spine, only rarely lacking; female with apical angles only rarely as acute. Margins of carapace more or less distinctly crenulate, especially anterolateral margin; latter with three small, poorly developed, often totally obsolescent teeth at outer and posterior end. Anterolateral margins concave anteriorly, obliquely or faintly convex posteriorly. Posterolateral margin distinctly concave to branchial ridge, becoming obliquely straight or faintly sinuous posteriad; in males, small tooth or even well developed spine may mark angle of branchial ridge. Posterior margin straight, lateral angle sharply defined, either dentiform or spiniform. Eyes rather large, with minute tubercle on anterior side of extremity. Basal joint of external antenna somewhat longer than next joint. Epistome of moderate length, palate deeply concave. External maxillipeds naked, ischium with distinct row of large, granular tubercles near outer margin and near extremity. Sternum with two contiguous, often tuberculate, prominences, plus few tubercles between bases of chelipeds.

Chelipeds long, naked except for some inconspicuous setae on crest of hand. Merus with denticulate margins, surface above smooth for most part, glossy, appearing coarsely punctate under mangnification; few tubercles near margins. Carpus with five irregular, denticulate crests. Hand trigonal, with ten strong, distinctly tuberculate teeth on inner crest, 12-14 small, granulate teeth on outer margin; usually 15 teeth increasing regularly in size toward extremity of lower margin; upper and inner surfaces each with two rows of tubercles, outer surface with three rows; all tubercles multigranular, ornamented with from two to five granules. Finger very small, between one-fourth and one-fifth length of palm; dactylus when flexed forming almost right angle with palm. Ambulatory legs compressed, naked, polished, with distinct laminiform crest

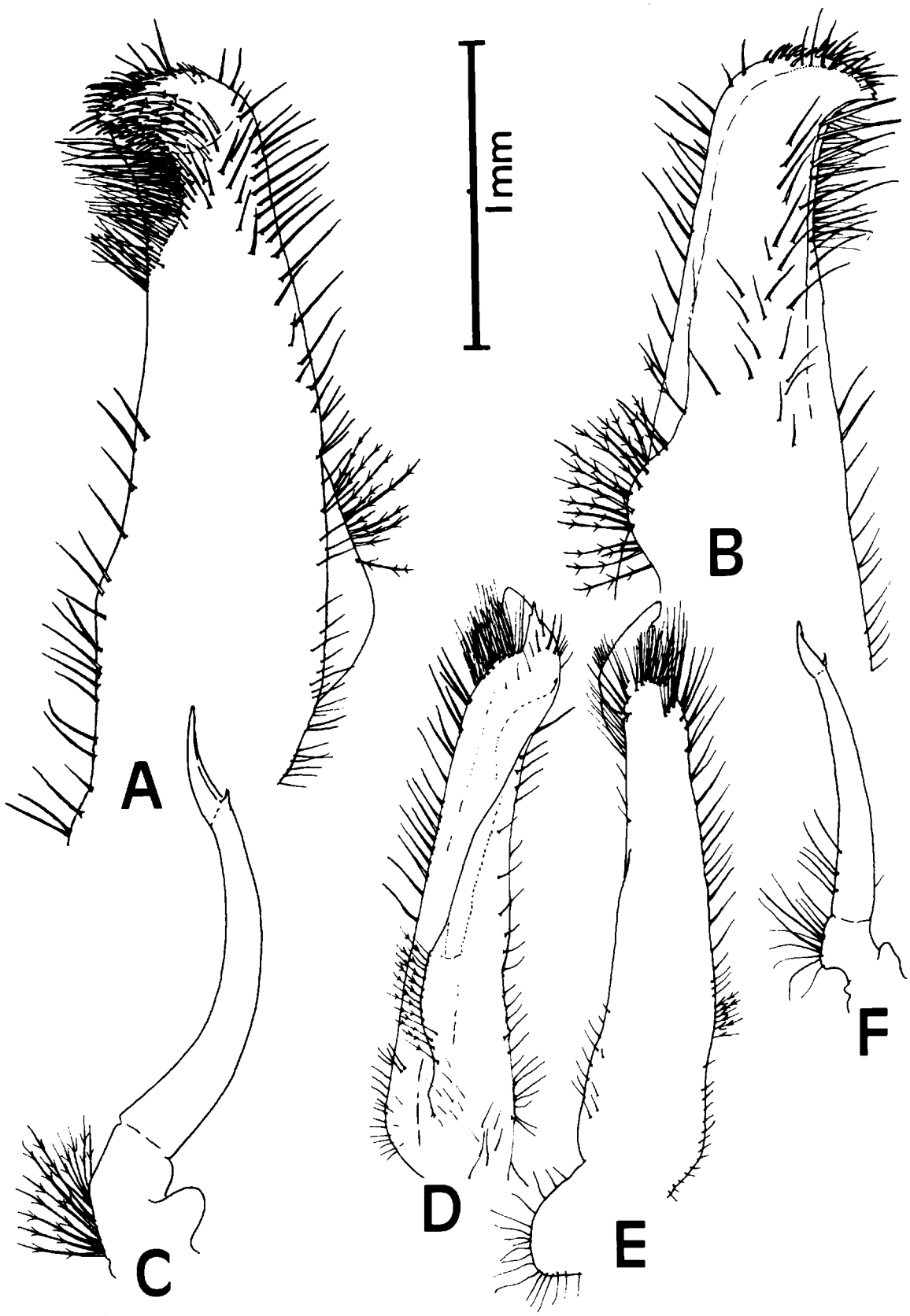

Figure 9. Major and minor left gonopods (pleopods 1 and 2) of male *Solenolambrus*. *Solenolambrus typicus* Stimpson, Caribbean specimen, R/V *Pillsbury* Sta. P-1354: A. major gonopod, mesioventral view; B. same, mesiolateral view; C. minor gonopod, mesiolateral view. *Solenolambrus tenellus* Stimpson, Gulf of Mexico specimen, MHNG: D. major gonopod, medial view; E. same, ventral view; F. minor gonopod, mesiolateral view.

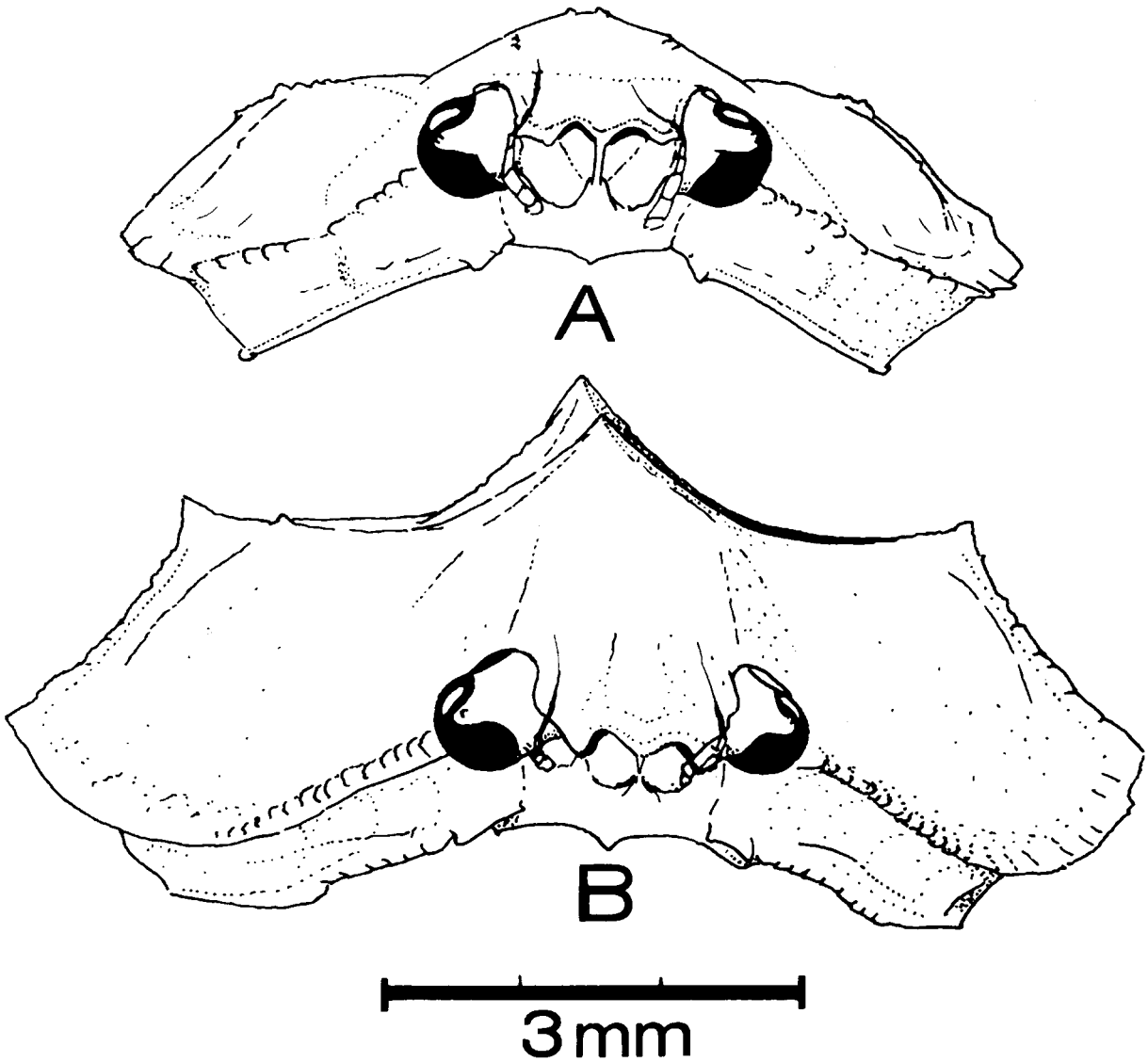

Figure 10. Frontal view of carapace in two species of *Solenolambrus*. A. *Solenolambrus tenellus* Stimpson, SIFP 89:2440, ovigerous female, Atlantic. B. *Solenolambrus typicus* Stimpson, R/V *Pillsbury* Sta. P-849, male, southeastern Caribbean.

above; meral joints of walking legs 3, 4 with crest below, appearing more developed on fourth; latter crest with lobe-like expansion at inner extremity.

Abdominal somites distinctly tuberculate laterally; telson with single median tubercle. Male abdomen tapering slightly. Gonopods as illustrated (Figure 9 A-C).

Type-locality: Off Samboes and Alligator Reefs, Florida; 80-110 fms (146-201 m); types not extant (*fide* Rathbun, 1925, p. 537).

Distribution: Cape Hatteras, North Carolina; Bahama Bank; Straits of Florida, including Florida Keys; Gulf of Mexico in the vicinity of Key West, east of Corpus Christi, Texas, and north of Yucatan; Swan Island and

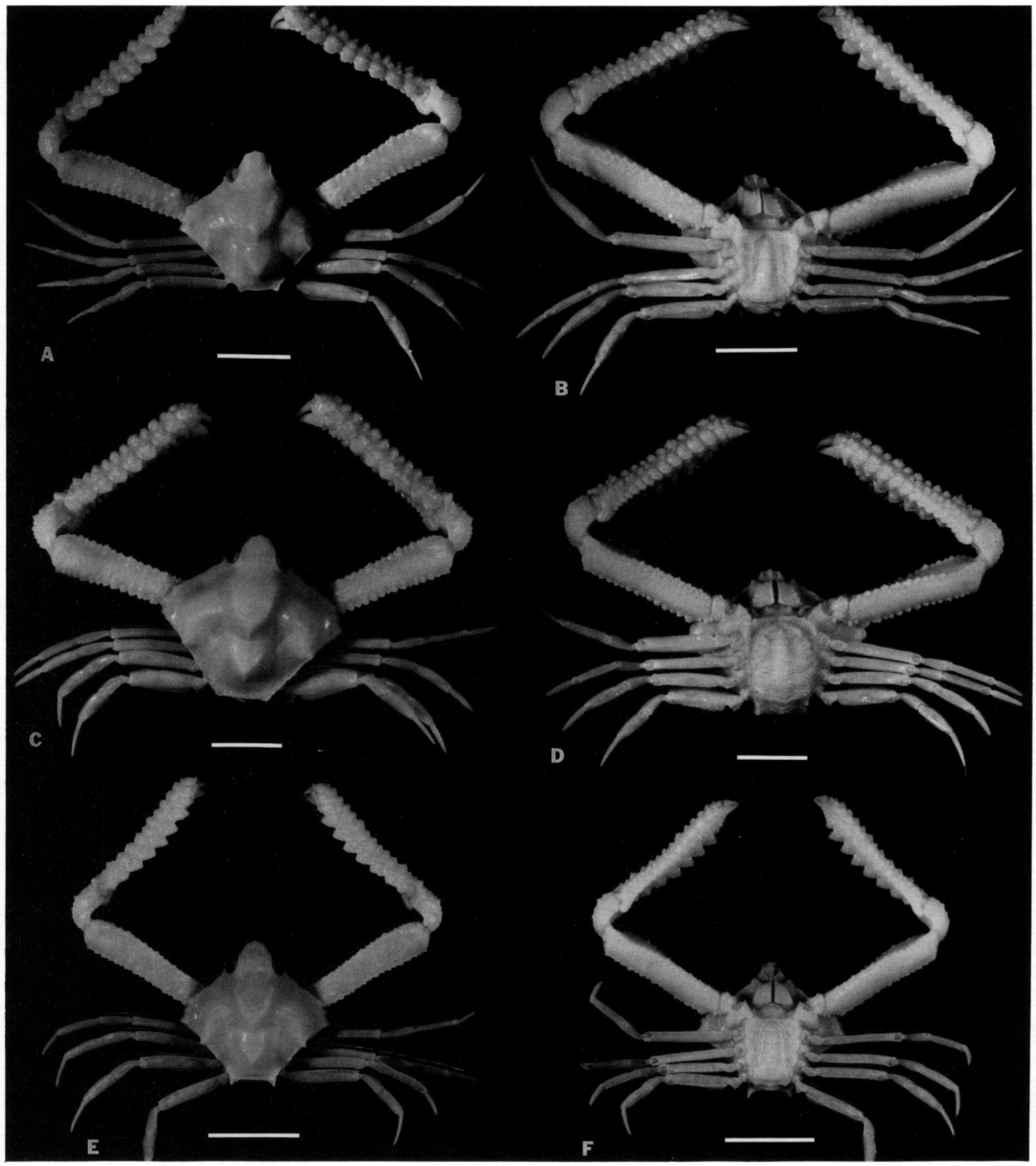

Figure 11. *Solenolambrus typicus* Stimpson. A. male, R/V *Pillsbury* Sta. P-943, off Guadeloupe, Lesser Antilles, dorsal view; B. same, ventral view; C. female, R/V *Pillsbury* Sta. P-1357, off Honduras, Central America, dorsal view; D. same, ventral view; E. male, R/V *Pillsbury* Sta. P-1396, off Dominican Republic, Greater Antilles, dorsal view; F. same, ventral view (this specimen approaches *S. decemspinosus* in spination). Scale lines = 5 mm.

Nicaragua shelf; Cuba, Puerto Rico and the Lesser Antilles southward to Surinam and Brazil; 91-618 m.

East Pacific analogue: *Solenolambrus arcuatus* Stimpson, 1871 (*fide* Garth, 1958).

Remarks: We examined approximately 20 specimens of *S. typicus* collected by R/V *Pillsbury* in the southern Caribbean Sea and noted much the same variation in the specimens as did Rathbun (1925) in her material. In our specimens, the most spinose, or those with the best developed teeth on the carapace, were almost invariably males (Figure 12A); only a single female approached the acute spinose condition of the dorsal

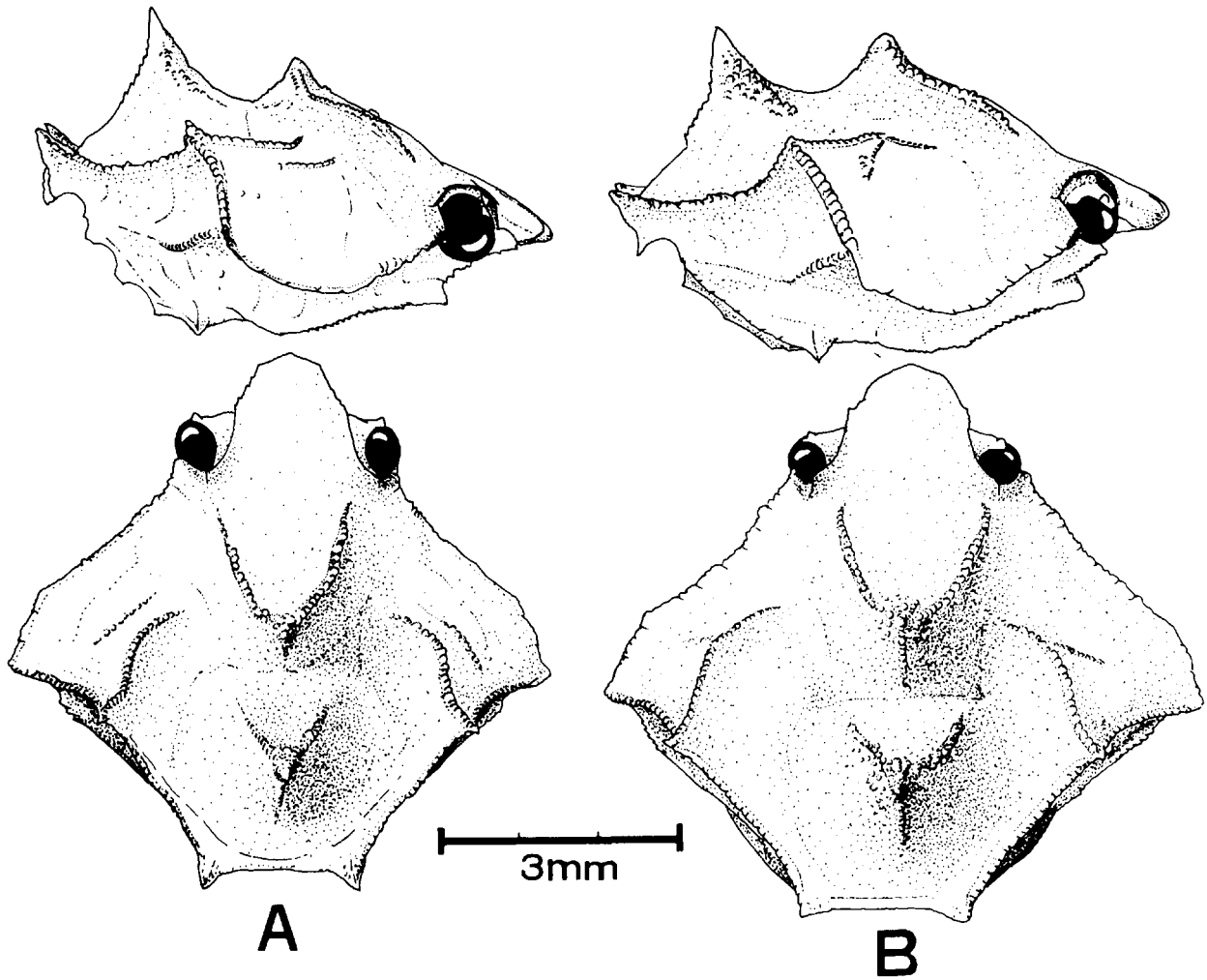

Figure 12. *Solenolambrus typicus* Stimpson, Caribbean specimens: A. male, R/V *Pillsbury* Sta. P-1396, dorsal and right lateral views of "*decemspinosus*-like" carapace; B. male, R/V *Pillsbury* Sta. P-1354, dorsal and right lateral views of more typical carapace. Note development and height of gastric and cardiac spines, and posterior paired teeth.

pyramidal protuberances characteristic of male specimens. We were at first inclined to consider the more ornamented males as possible variants of *S. decemspinosus*, an extremely rare species. But as we note in our discussion for that species, we hesitate to consider it valid at this time. None of our male specimens carried an

additional spine or tooth on the posterolateral margin between the very noticeable branchial spine and those of the posterior carapace angles (*e.g.*, Figures 11, 12 B), as supposed to characterize *S. decemspinosus*.

No material of *S. typicus* was collected during the Hourglass project or off central east Florida, but the lack of such material is, perhaps, not surprising because no Hourglass stations or RSP stations and only one R/V *Gosnold* station were within the known bathymetric range of the species. The only records from within the Gulf of Mexico appear to be those noted by Milne Edwards (1878) and W. Pequegnat (1970). Contrary to the latter author (1970, p. 184), the species was first recorded not by Stimpson in the Gulf of Mexico but by Agassiz (" . . . a l'entree du golfe du Mexique") (in Milne Edwards, 1878, p. 160), but the R/V *Alaminos* material noted by Pequegnat from off Corpus Christi, Texas, does mark the northernmost extension of range for the species in the Gulf of Mexico.

Solenolambrus decemspinosus Rathbun, 1894

Solenolambrus decemspinosus Rathbun, 1894, pp. 2 [advanced sheet], 84; 1900, p. 514 [key]; 1901, pp. 81 [key], 82; 1925, pp. 536 [key], 540, pl. 194, figs. 1, 2; 1933, pp. 40 [key], 41.

Material examined: None.

Diagnosis: Six spines on posterior and posterolateral margins; single spines at anterior ends of branchial ridges; two tall spines on median line of carapace. Outer and lower surfaces of palm with row of large, granulate tubercles parallel to each margin; outer and inner margins tuberculate; dactylus nearly at right angles to palm. Chelipeds twice as long as carapace. (Modified from Rathbun, 1925).

Type-locality: Off Cape San Blas, Florida, 28°44′N, 85°16′W; 60 fms (110 m); holotype USNM 18157.

Distribution: Northeastern Gulf of Mexico and Puerto Rico; 45-60 fms (82-110 m).

East Pacific analogue: None.

Remarks: This species is apparently known from only two specimens, the male holotype, and a second male from Puerto Rico. Rathbun (1925) noted that it was closely allied to *Solenolambrus typicus*. The differences between *S. decemspinosus* and *S. typicus*, noted by her in the description of *S. decemspinosus*, are similar to those we noted between juvenile and mature specimens of other parthenopids (*e.g.*, shape of the anterolateral margin of the carapace, development of spination, and others). Furthermore, as we discussed under the species account for *S. typicus*, males of the latter species tend to be more spinose with sharply acute or spiny dorsal pyramidal protuberances, and with well-developed teeth or spines on the branchial ridge at the posterolateral margin, whereas females do not exhibit these features. In view of these facts, and because *S. decemspinosus* is known from only two small, male specimens, it seems possible that the species is only a juvenile form of *S. typicus*. The former species is known from only off northwest Florida and the northeastern Caribbean Sea and has not been collected since 1899. The latter species is widely distributed from North Carolina throughout the Caribbean Sea, and W. Pequegnat (1970) listed a single Gulf of Mexico specimen from the continental shelf off Texas. Although we reluctantly maintain the validity of *S.*

decemspinosus for the present, unless additional material of the species becomes available, we would be inclined to think it only a juvenile of *S. typicus*.

Genus *Mesorhoea* Stimpson, 1871

Mesorhoea Stimpson, 1871a, p. 135.

Mesorhoea sexspinosa Stimpson, 1871

Figures 5 E-G, 13

Mesorhoea sexpinosa Stimpson, 1871a, p. 136 [*lapsus* for *Mesorhoea sexspinosa*].

Mesorhoea sexspinosa: A. Milne Edwards, 1878, p. 164; Rathbun, 1901, p. 81; 1925, p. 547, pl. 200; Flipse, 1930, p. 85 [listed]; Rathbun, 1933, p. 42, text-fig. 36; Crane, 1937, p. 66 [discussion]; Garth, 1946, p. 414 [discussion]; Wass, 1955, p. 171 [listed]; Garth, 1958, p. 466 [discussion]; Bullis and Thompson, 1965, p. 13 [listed]; Righi, 1966, p. 140; Williams et al., 1968, p. 64, text-fig. 17.

Solenolambrus fastigatus A. Milne Edwards, 1878, p. 163, pl. 29, fig. 5-5e; 1880b, p. 5; A. Milne Edwards and Bouvier, 1923, p. 357.

Solenolambrus typicus: Rathbun, 1901, p. 81 [in part, specimen from Punta de Melones, Puerto Rico, *fide* Rathbun, 1925, p. 547] [not *S. typicus* Stimpson, 1871].

Material examined: HOURGLASS STATION B: 1 ♀, 7.8, ovigerous; 6 June 1966; trawl; FSBC I 2858. — 1 ♀, 7.9; 8 October 1966; dredge; SIFP 89:2491. — 1 ♀, 4.8; 5 February 1967; dredge; USNM 156485. — 1 ♂, 4.0; 2 November 1967; dredge; FSBC I 15122. — HOURGLASS STATION J: 1 ♂, 5.6; 4 September 1966; dredge; SIFP 89:2490. — HOURGLASS STATION K: 1 juv., crushed; 4 September 1967; dredge; FSBC I 15123.

Diagnosis: Carapace approximately 1.2 to 1.3 times wider than long. Branchial ridges nearly straight; triangular cardiac prominence most slender. Movable finger vertical, without smooth, beaded granules. Outer angle of wrist laminate. (Modified from Rathbun, 1925).

Description: Carapace about equally produced anteriorly and posteriorly from transverse line uniting lateral angles. Surface punctate, inconspicuously pubescent. Gastric, cardiac and branchial protuberances strongly angular, each produced into triangular, almost spine-like, prominence, that of cardiac most slender; branchial prominence situated on posterolateral margin, forming projection of same; angles and ridges more or less crenulate or granulate. Lateral edges of gastric protuberance continued forward nearly to front, becoming parallel shortly after diverging from prominence. Branchial ridge curved. Carapace surface between protuberances and ridges appearing concave, sides of protuberances slightly, if at all, swollen. Rostrum short, triangular or truncate. Margins of carapace sublaminiform, nearly entire, with normal crenulation indicated only by faint, often indistinct, impressed lines; microscopic notches sometimes present on anterolateral margin; latter slightly convex toward lateral angle. Posterolateral margin concave, about twice as long as posterior margin; latter convex, terminating in small tooth at either side. Afferent channels deep, separated from subhepatic channels by thin, sharp, prominent, ciliated lamina; channels defined on inner side by ciliated outer edges of ischia of outer maxillipeds. Short ridge extending from anterior angle of buccal area to middle of inner orbital tooth, separating concavity of epistome from that of subhepatic region. Merus of maxilliped 3 with two or three prominent tubercles proximally between postero- and antero-exterior angles, with several smaller tubercles scattered between; anterior margin of meral joint deeply concave or notched sinuously.

Figure 13. *Mesorhoea sexspinosa* Stimpson. A. male, R/V *Pillsbury* Sta. P-1331, off Bluefields, Nicaragua, Central America, dorsal view; B. same, ventral view; C. female, same locality, dorsal view; D. same, ventral view. Scale lines = 3 mm.

Chelipeds short, pubescent, especially on toothed edges; surface between edges smooth; basal joint below with strong, triangular, pyramidal spine similar to, and nearly as large as, those on protuberances of dorsal surface of carapace; margins of merus crenulate, with six or seven small teeth on either edge; carpus flattened above, with two strong crenulate crests, outer crest bearing large spiniform tooth mesially; hand with elevated crest superiorly, bearing nine or more teeth; another ill-defined crest on outer margin, usually with 11 teeth; fingers very small, movable dactyl nearly vertical, at right angle to palm. Walking legs much compressed; carpus and propodus with laminiform crest dorsally; merus and propodus with reduced crests ventrally.

Abdomen of female smooth, shining, glabrous; male lightly granulate to smooth. Gonopods as illustrated (Figure 5 E-G). (Modified from Rathbun, 1925).

Type-locality: Four miles southwest of Loggerhead Key, southern Florida; 11 fms (20 m); type not extant (*fide* Rathbun, 1925, p. 547).

Distribution: Cape Hatteras to South Carolina; eastern Gulf of Mexico from Pensacola, Florida to Dry Tortugas; on the east coast of Florida only southward through the Keys; Puerto Rico and Flannegan Passage; São Paulo, Brazil; 8-49 m. Hourglass Stations B, J and K; 18-37 m.

East Pacific analogue: *Mesorhoea belli* (A. Milne Edwards, 1878) (*fide* Garth, 1958).

Remarks: Our six specimens exhibited variation similar to that noted by Rathbun (1925, p. 548), with sharper triangular dorsal protuberances and more distinct teeth on the posterior carapace margins in younger specimens. Although known from North Carolina, the species has not yet been recorded on the eastern Florida coastline north of the Florida Keys, in spite of extensive trawling and dredging in this area.

Genus *Leiolambrus* A. Milne Edwards, 1878

Leiolambrus A. Milne Edwards, 1878, p. 148.

Leiolambrus nitidus Rathbun, 1901

Figures 14, 15

Leiolambrus nitidus Rathbun, 1901, p. 80, text-fig. 12; 1925, p. 545, pls. 199, 281, fig. 1; Flipse, 1930, p. 84 [listed]; Rathbun, 1933, p. 41, text-fig. 35; Hildebrand, 1954, pp. 272, 346 [listed]; Springer and Bullis, 1956, p. 22 [listed]; Garth, 1958, p. 494 [discussion]; Holthuis, 1959, p. 192; Guinot-Dumortier, 1960, p. 182, figs. 23, 26; Dawson, 1966, p. 177 [listed]; Leary, 1967, pp. 45 [unnumbered text-fig.], 50 [listed]; Felder, 1973, p. 45, pl. 6, fig. 7; L. Pequegnat, 1975, p. 47 [listed].

Material examined: None from Florida or the Gulf of Mexico.

Diagnosis: Carapace smooth, unarmed dorsally, without strong marginal spines behind; lateral spine large, involving half of anterolateral margin; latter with three wide, serrate teeth before spine. Orbit large, approaching width of rostrum. (Modified from Rathbun, 1925).

Description: Carapace smooth, punctate, regions fairly well delimited, without dorsal spines or tubercles, produced anteriorly and containing large, cup-like orbits. Carapace about 1.5 times as wide as long, including lateral spines; anterolateral and posterolateral margins subequal; surface coarsely punctate in elevated regions, smoother in depressions, slightly granulose along summit of cardiac and posterior part of mesogastric protuberances; single, sinuous line of granules on branchial region extending to angle at posterolateral margin. Margin of front feebly tridentate dorsally, distinctly so in frontal view; frontal teeth deflexed, not advanced beyond antennular fossae; orbits wider than long, completely filled by large eyes; suborbital margin, and especially large, triangular, inner suborbital tooth, easily viewed dorsally when eyes retracted. Anterolateral margins obscurely dentate, usually with three more or less distinct teeth, each with

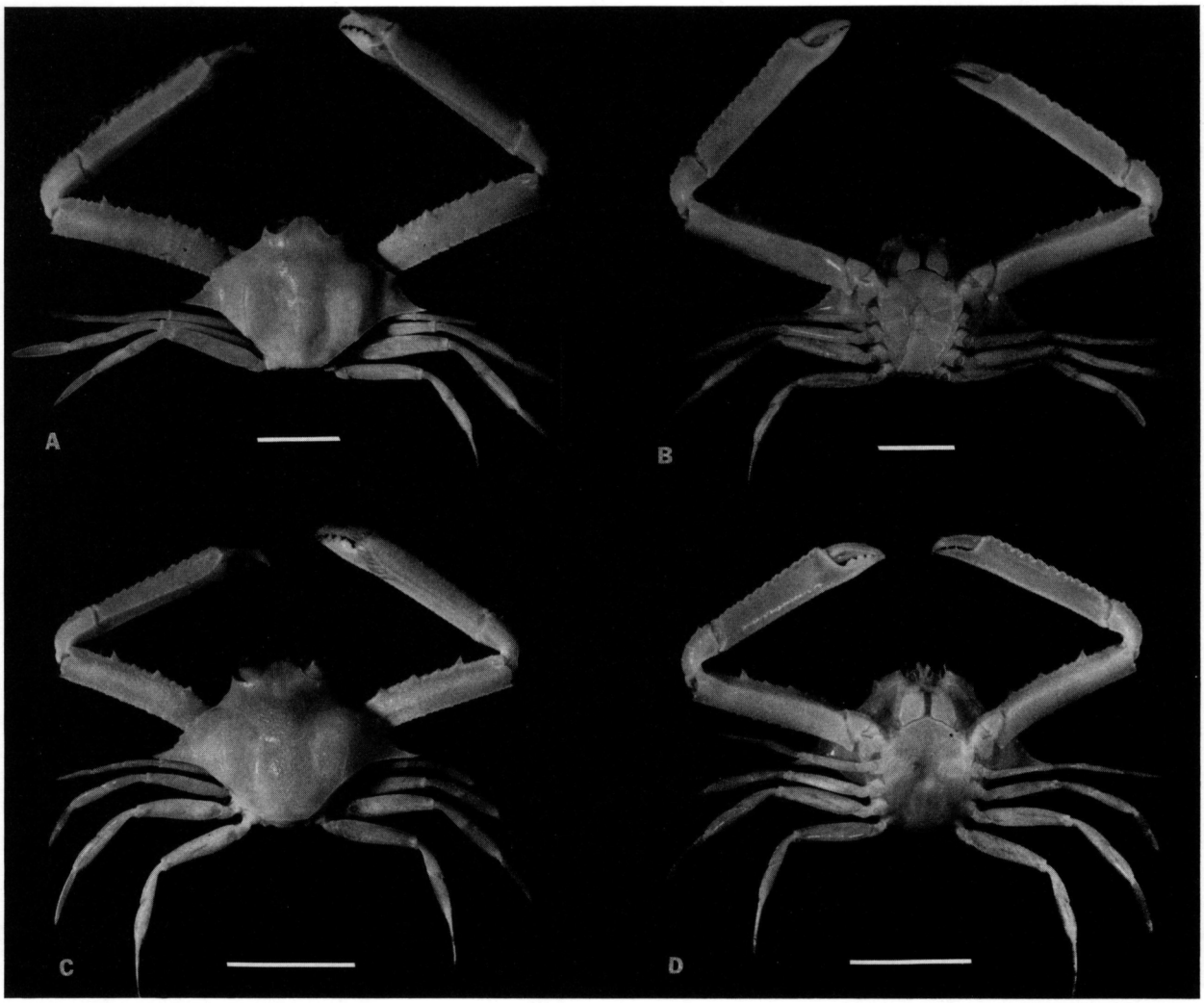

Figure 14. *Leiolambrus nitidus* Rathbun. A. male, R/V *Pillsbury* Sta. P-615, off Punta Gorda, Belize, Gulf of Honduras, dorsal view; B. same, ventral view; C. female, R/V *Pillsbury* Sta. P-1302, off Hispaniola, dorsal view; B. same, ventral view. Scale lines = 5 mm.

denticulate or granulate margins. Lateral spines strong, acuminate, directed outward or slightly backward, and upward; several small, widely separated granules on posterior margin. Branchial angle of posterolateral margin often with small tubercle; latter sometimes pointed, marking end of branchial ridge. Extremities of posterior margin either angular or marked with small tooth.

Chelipeds narrow, lower surface smooth, upper surface with scant marginal fringe of hair. Arm with upper convex, scabrous, anterior margin armed with many small denticulate teeth, three or four being noticeably larger and sometimes spiniform; posterior margins evenly denticulate, terminating in spine distally. Outer margin of wrists denticulate, often with two distinct, forward-pointing spinules; inner margin granulate, with longitudinal line of granules through middle of upper surface. Hand with denticulate inner and outer margins, granules along outer margin of upper surface; large spine at terminal third, directed distally; prehensile edge finely toothed. Fingers of larger claw with small gape. Last three pairs of ambulatory legs reaching beyond distal margin of arm; first pair barely reaching dactylus of second pair. Legs almost

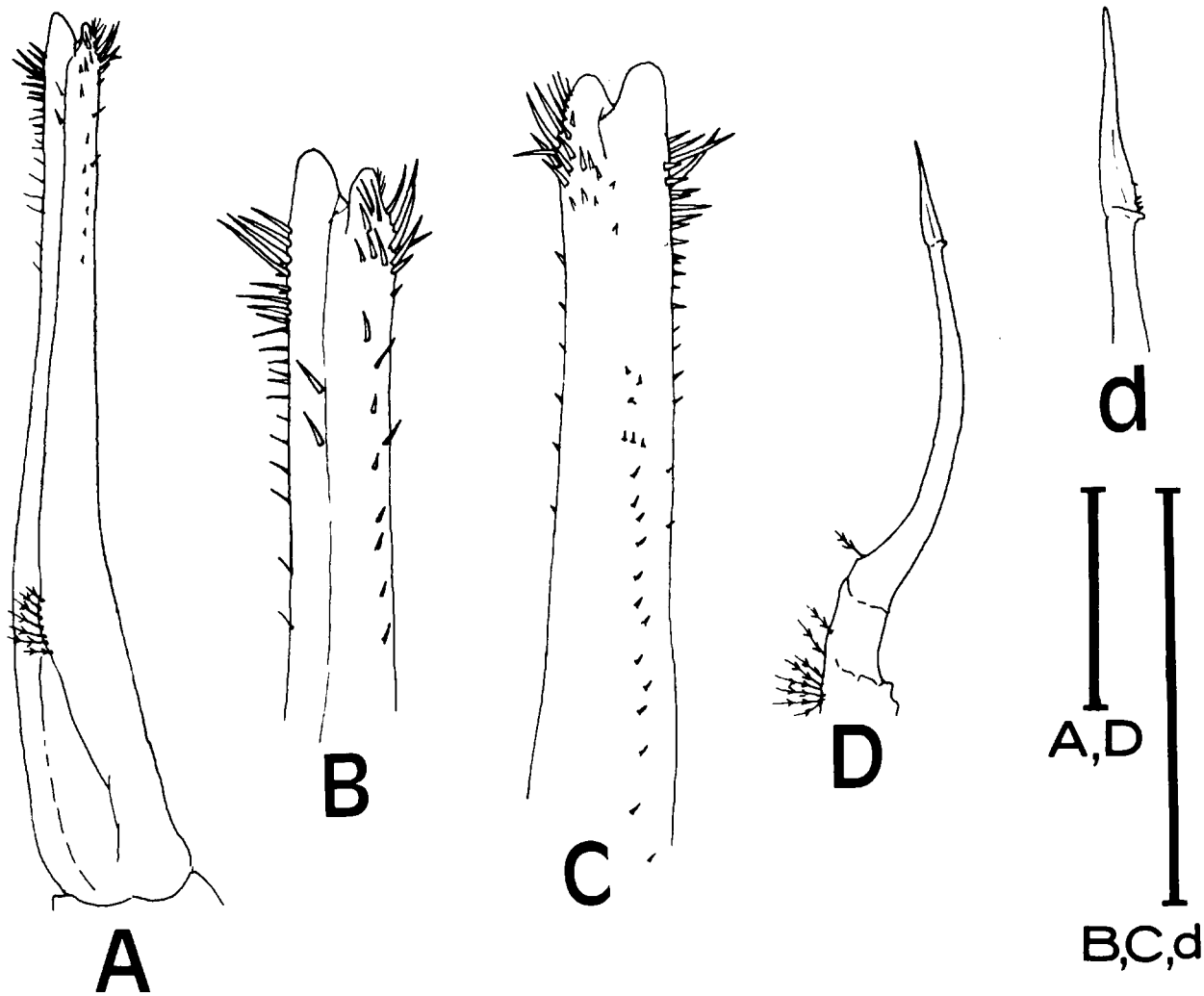

Figure 15. Major and minor gonopods (pleopods 1 and 2) of male *Leiolambrus nitidus* Rathbun, southeastern Caribbean specimen, R/V *Pillsbury* Sta. P-696: A. major gonopod, medial view; B. same, detail of distal portion; C. same, ventral view, detail of distal portion; D. minor gonopod, mesioventral view; d. same, detail of distal portion. Scale lines = 1 mm.

smooth; lower margin of meral joints very finely denticulate, almost serrate; other segments unarmed; dactylus wide, dorsoventrally flattened, spatulate, longer than propodi.

Abdominal somites 3-5 fused in male, separated in female. Gonopods as illustrated (Figure 15).

Type-locality: Mayaquez Harbor, Puerto Rico; 12-18 fms (22-33 m); holotype USNM 23776.

Distribution: Gulf of Mexico from off Freeport, Texas to off the eastern bank of the Mississippi River delta; Jamaica, Hispaniola, Puerto Rico, and Virgin Islands; Central America off Honduras and Nicaragua; Venezuela, Surinam and Guyana; 12-73 m.

East Pacific analogue: *Leiolambrus punctatissimus* (Owen, 1839) (*fide* Rathbun, 1925, and Garth, 1958).

Remarks: Holthuis (1959) noted that the small tubercle on the posterolateral margin at the end of the branchial ridge was a distinct tooth in his specimens from Surinam. We have seen one specimen, a male collected by R/V *Pillsbury* from off Isla de Margarita, north coast of Venezuela, which also agrees with those features mentioned by Holthuis. In our specimen, the branchial ridge terminates in a distinct blunt spine, and the posterior margin is marked by a small tooth. The possibility exists that these forms from along the northern coast of South America may be exhibiting subspecific variation from the more typical *L. nitidus* of the upper Caribbean. Other material collected by R/V *Pillsbury* from Yucatan and Hispaniola which we examined did not exhibit well-developed branchial ridge spines. However, the possibility cannot be dismissed that simple sexual variation in this spination is what we have observed, because variation of this type has been noted in other parthenopids, such as species of *Solenolambrus* noted earlier in this report.

Guinot-Dumortier (1960) provided figures of the major gonopod of a male collected from French Guiana, and, as shown by a comparison with our figures, the gonopod of that specimen is only slightly less spinulous than the gonopod of our specimen. Our comparative material in this instance was collected by R/V *Pillsbury* in the same general area as was Guinot-Dumortier's specimen. The minor variation in gonopod spinulation emphasizes the care necessary in dealing with this feature as a taxonomic character (*e.g.*, see *Parthenope fraterculus*).

Genus *Parthenope* Weber, 1795

Parthenope Weber, 1795, p. 92 [not *Parthenope* Fabricius, 1798, pp. 315, 352 (as established in Opinion 696, ICZN, Bull. Zool. Nomencl., 1963, pp. 94-96)].

Parthenope agona (Stimpson, 1871)

Figures 16, 17 E-h, 18

Lambrus agonus Stimpson, 1871a, p. 131; A. Milne Edwards, 1878, p. 151, pl. 28, fig. 3-3c; Kingsley, 1879, p. 150 [discussion]; A. Milne Edwards, 1880b, p. 4; Miers, 1886, p. 94 [listed]; Smith, 1886, p. 628 [24]; Rathbun, 1898, p. 261 [listed]; 1900, p. 514 [key]; 1901, p. 79; A. Milne Edwards and Bouvier, 1923, p. 354, text-fig. 13, pl. 10, fig. 2; Flipse, 1930, p. 83 [listed].

Lambrus (Lambrus) agonus: Young, 1900, pp. 102 [key], 104.

Parthenope agona: Hay and Shore, 1918, p. 462, pl. 39, fig. 5.

Parthenope (Parthenope) agonus: Rathbun, 1925, pp. 512 [key], 513, text-fig. 146, pls. 178, 179, pl. 275, figs. 1-3; Boone, 1930, p. 115, pl. 35; Rathbun, 1933, pp. 38 [key], 39; Springer and Bullis, 1956, p. 22 [listed]; Bullis and Thompson, 1965, p. 13 [listed]; Lewis, 1965, pp. 1053, 1072 [listed]; Türkay, 1968, p. 254.

Parthenope (Parthenope) agona: Garth, 1958, pp. 436, 438 [discussion]; Williams, 1965, p. 266, text-figs. 246, 252a; W. Pequegnat, 1970, pp. 173 [listed], 183; W. Pequegnat et al., 1971, p. 3 [listed], pl. 1, map C; L. Pequegnat, 1975, p. 48 [listed].

Material examined: HOURGLASS STATION A: 1 ♀, molt, not measured; 2 November 1967; trawl; FSBC I 15010. — HOURGLASS STATION C: 1 ♂, 12.5; 5 October 1967; dredge; FSBC I 15011. — HOURGLASS STATION D: 1 ♂, 7.1; 1 ♀, 12.8, ovigerous; 4 January 1966; trawl; FSBC I 1574. — 1 ♂, 6.8; 1 juv., 3.8; 3 May 1966; dredge; FSBC I 15012. — 1 ♀, damaged; 11 June 1966; trawl; FSBC I 15013. — 2 ♂, 12.1, damaged; 3 ♀, 5.1-6.4; 3 July 1966; trawl; USNM 165488. — 1 ♂, 8.9; 3 ♀, 4.9-9.9; 12 July 1966; dredge; SIFP 89:2527. — 6 ♂, 6.0-8.4; 5 ♀, (1 ovigerous, 6.3) 5.9-8.3; 2 August 1966; dredge; FSBC I 3610. — 1 ♂, 11.9; 4 ♀, (2 ovigerous, 9.5-13.8) 12.0-13.1; 9 October 1966; dredge; USNM 156489. — 1 ♂, 14.1; 6 ♀, (2

ovigerous, 9.3-12.0) 10.1-12.1; 9 October 1966; trawl; MNHNP acc. no. 7667. — 2 ♂, 9.5-12.5; 1 ♀, 15.8; 19 October 1966; dredge; RNHL D 31404. — 1 ♀, 7.5; 9 November 1966; trawl; FSBC I 15014. — 1 ♀, 12.8, ovigerous; 21 January 1967; dredge; SIFP 89:2653. — 1 ♀, 12.0; 6 February 1967; dredge; FSBC I 15015. — 1 ♂, 12.1; 6 February 1967; trawl; FSBC I 15016. — 1 ♂, crushed; 1 ♀, 8.1; 28 February 1967; dredge; FSBC I 15017. — 1 ♂, 14.1; 1 ♀, 11.0; 3 March 1967; dredge; SIFP 89:2543.— 1 ♂, 9.5; 1 ♀, crushed; 4 April 1967; trawl; FSBC I 15018. — 4 ♀, 8.6-15.5; 2 juvs., 2.4-4.8; 4 April 1967; dredge; FSBC I 15019. — 1 ♂, molt; 12 May 1967; trawl; FSBC I 15020. — 1 ♂, 6.6; 1 ♀, 4.8; 5 juvs., 2.6-2.8; 21 May 1967; dredge; FSBC I 15021. — 2 ♂, 11.2-11.5; 1 ♀, 7.0; 3 June 1967; trawl; FSBC I 15022. — 1 ♂, 11.9; 21 June 1967; dredge; FSBC I 15023. — 2 ♀, 4.6, crushed; 2 July 1967; dredge; FSBC I 15024. — 4 ♀, 4.5-6.8; 12 July 1967; dredge; FSBC I 15025. — 4 ♂, 8.1-14.0; 3 ♀, 8.8-12.3; 2 August 1967; dredge; SIFP 89:2532. — 4 ♂, 8.8-12.3; 1 ♀, 7.8; 2 August 1967; trawl; USNM 156496. — 1 ♂, 9.1; 3 ♀, 14.8-15.8; 1 juv., 3.5; 1 September 1967; trawl; SIFP 89:2531. — 2 ♂, 10.8-13.4; 5 ♀, 5.9-12.1; 1 September 1967; dredge; SIFP 89:2529. — 1 ♂, 4.3; 12 September, 1967; dredge; FSBC I 15026. — 3 ♀, (1 ovigerous, 8.3) 8.1, crushed; 6 October 1967; trawl; FSBC I 15027.— 5 ♂, 4.6-8.5; 5 ♀, (1 ovigerous, 8.0) 6.1-9.0; 1 juv., 3.5; 6 October 1967; dredge; USNM 156499. — 2 ♂, 8.6-12.0; 12 ♀, (4 ovigerous, 11.1-15.6) 9.6-15.5; 3 November 1967; trawl; MHNG. — 1 ♂, 11.3; 3 ♀, (2 ovigerous, 12.5-14.3) 14.8; 21 November 1967; dredge; UZMC 15.1.1977. — HOURGLASS STATION E: 1 ♀, 15.9; 4 December 1965; trawl; FSBC I 1380. — 2 ♂, 14.3-15.8; 3 ♀, (2 ovigerous, 12.5-14.6) 15.6; 4 December 1965; dredge; FSBC I 1383. — 1 ♂, 8.3; 2 ♀, (1 ovigerous, 13.6) 15.3; 4 January 1966; trawl; FSBC I 1599. — 4 ♀, (2 ovigerous, 14.6, crushed) 13.3-16.5; 4 January 1966; dredge; FSBC I 1612. — 1 ♂, crushed; 1 juv., 4.3; 8 February 1966; trawl; FSBC I 1962. — 1 ♂, 4.9; 8 February 1966; dredge; FSBC I 15029. — 1 juv., molt; 4 March 1966; trawl; FSBC I 15031. — 1 ♀, 6.2; 7 April 1966; trawl; FSBC I 15032. — 1 ♂, 6.6; 1 juv., 3.4; 3 July 1966; dredge; FSBC I 15033. — 1 ♂, 4.9; 6 juvs., 2.4-5.0; 2 August 1966; trawl; FSBC I 15034. — 1 ♂, 8.0; 7 ♀, (1 ovigerous, 15.9) 8.4-16.4; 15 juvs., 2.5-4.5; 9 October 1966; dredge; USNM 156490. — 2 ♀, 11.3-14.1; 9 October 1966; trawl; FSBC I 15035. — 1 ♂, 13.1; 7 ♀, (3 ovigerous, 15.1-15.9) 16.0-16.6; 9 November 1966; trawl; SIFP 89:2536. — 4 ♂, 4.6-7.3; 2 ♀, 5.5-5.9; 65 juvs., 2.4-3.4; 2 December 1966; dredge; SIFP 89:2546. — 2 ♂, 5.9-9.6; 2 December 1966; trawl; FSBC I 15036. — 1 ♂, 6.9; 1 ♀, 9.5; 6 February 1967; trawl; FSBC I 15037. — 2 ♀, 13.4-14.6; 1 juv., 7.6; 6 February 1967; dredge; FSBC I 15038. — 3 ♂, 13.4-16.8; 3 ♀, (2 ovigerous, 12.8-14.8) 15.6; 9 juvs., 3.1-5.4; 3 March 1967; dredge; SIFP 89:2534. — 1 ♀, 15.6; 1 juv., 4.7; 3 March 1967; trawl; FSBC I 15039. — 1 ♂, 7.0; 4 April 1967; trawl; USNM 156491. — 1 cheliped; 12 May 1967; trawl; FSBC I 15040. — 22 juvs., 2.8-5.6; 12 May 1967; dredge; USNM 156493. — 2 ♂, 11.0-13.8; 3 June 1967; dredge; FSBC I 15041. — 2 ♂, 14.1, crushed; 2 July 1967; dredge; USNM 156495. — 2 ♂, 14.6-14.9; 1 ♀, 15.9; 2 August 1967; trawl; SIFP 89:2540. — 3 ♂, 11.0-15.0; 1 ♀, 6.0; 2 juvs., 4.6-6.2; 2 August 1967; FSBC I 15042. — 2 ♂, 8.8-16.0; 1 ♀, 12.6; 1 September 1967; trawl; FSBC I 15043. — 4 ♂, 5.5-12.3; 2 ♀, 6.4-13.1; 6 October 1967; trawl; FSBC I 15044. — 6 ♂, 8.1-13.1; 2 ♀, 5.8-14.0; 2 juvs., 2.5, crushed; 6 October 1967; dredge; FSBC I 15045. — 1 ♂, 14.8; 1 ♀, 11.7; 3 November 1967; dredge; USNM 156501. — 4 ♂, 10.1-15.1; 2 ♀, 8.9-15.0; 3 November 1967; trawl; UZMC 15.1.1977. — 1 ♂, 12.1; 2 ♀, 14.3-14.4, both ovigerous; 3 November 1967; trawl; FSBC I 6459. — HOURGLASS STATION K: 1 ♂, 12.8; 1 ♀, 15.3, ovigerous; 6 December 1966; dredge; SIFP 89:2544. — 1 ♀, 13.1, ovigerous; 15 May 1967; dredge; USNM 156492. — HOURGLASS STATION L: 1 ♂, 6.9; 13 June 1966; dredge; FSBC I 15046. — 2 ♂, 5.3-7.1; 6 July 1966; dredge; FSBC I 15047. — 2 juvs., 2.7-3.7; 6 August 1966; dredge; FSBC I 15048. — 1 ♀, 9.6; 5 September 1966; dredge; FSBC I 4286. — 1 ♂, 5.8; 8 April 1967; dredge; FSBC I 15049. — 2 ♀, 8.3, crushed; 16 May 1967; trawl; SIFP 89:2545. — 3 ♀, 4.6-7.5; 16 May 1967; dredge; FSBC I 15050. — 2 ♂, 4.6-7.3; 7 June 1967; dredge; FSBC I 15051. — 1 ♀, 7.3; 6 July 1967; dredge; FSBC I 15052. — 2 ♂, 6.1-6.5; 6 ♀, 6.0-8.3; 8 August 1967; trawl; USNM 156497. — 1 ♂, 8.3;1 ♀, 7.6; 8 August 1967; dredge; SIFP 89:2535. — 2 ♀, both 7.9; 5 September 1967; dredge; USNM 156498. — 2 juvs., 3.2-3.3; 12 October 1967; dredge; FSBC I 15053. — 1 ♂, 7.4; 3 ♀, (2 ovigerous, 8.8-10.0) 4.4; 12 October 1967; USNM 156500. — 2 juvs., 2.6-3.1; 15 November 1967; trawl; FSBC I 15054. — 1 ♀, 7.0; 8 juvs., 2.1-4.4; 15 November 1967; dredge; SIFP 89:2533. — HOURGLASS STATION M: 1 ♀,

9.5; 13 October 1965; dredge; USNM 156486. — 1 ♂, 7.5; 1 ♀, 7.6; 12 April 1966; dredge; USNM 156487. — 1 juv., 4.3; 13 June 1966; dredge; FSBC I 15055. — 1 ♀, 5.8; 13 June 1966; trawl; FSBC I 15056. — 1 ♂, molt; 1 ♀, 7.0; 1 juv., crushed; 5 July 1966; dredge; FSBC I 15057. — 1 ♀, 4.7; 6 August 1966; dredge; FSBC I 15058. — 6 ♂, 2.3-7.6; 7 ♀, (1 ovigerous, 10.8) 5.4-10.8; 5 September 1966; dredge; FSBC I 4515. — 1 ♂, 8.0; 1 ♀, 3.5; 13 November 1966; dredge; FSBC I 15059. — 2 ♂, 8.0-15.6; 1 ♀, crushed, ovigerous; 13 January 1967; dredge; SIFP 89:2539. — 1 ♀, 12.8; 13 January 1967; trawl; SIFP 89: 2541. — 1 ♂, 14.4; 9 March 1967; trawl; SIFP 89:2542. — 2 ♂, 3.7, molt; 1 ♀, 4.4; 2 juvs., crushed; 9 March 1967; dredge; FSBC I 15060. — 1 ♂, 7.0; 1 ♀, 5.6; 8 April 1967; trawl; FSBC I 15061. — 1 ♂, molt; 16 May 1967; trawl; FSBC I 15062. — 2 ♂, 5.0-6.3; 7 June 1967; dredge; USNM 156494. — 2 ♂, 7.3-8.6; 1 ♀, 5.8; 6 July 1967; dredge; FSBC I 15063. — 1 ♂, crushed; 6 July 1967; trawl; FSBC I 15064. — 1 ♀, 6.0; 8 August 1967; dredge; FSBC I 15065. — 1 ♀, 13.4; 1 juv., crushed; 12 October 1967; dredge; FSBC I 15066. — EAST FLORIDA: RSP STATION 003: 1 ♀, 9.8; SIFP 89:1978; 1 ♂, 14.3; SIFP 89:1977; 15 August 1973; trawl. — 1 ♀, 10.0; 21 August 1973; trawl; RNHL D 31402. — 1 ♂, 12.4; SIFP 89:1973; 1 ♂, 15.0; MHNG; 10 October 1973; trawl. — 1 ♂, 10.1; MHNG; 1 ♀, 10.4; MNHNP acc. no. 7679; 2 ♂, 9.5-11.5; UZMC 15.I.1977; 18 July 1974; trawl. — 1 ♂, 8.7; 3 ♀, 11.2-13.1; SIFP 89:1410; 1 ♂, 10.8; 1 ♀, 14.0; SIFP 89:1411; 4 August 1974; trawl. — RSP STATION 004: 2 ♂, 11.0-12.1; SIFP 89:2092; 1 ♂, 10.8; FSBC I 10921; 13 August 1973; trawl. — 1 ♂, 10.0; FSBC I 10924; 1 ♀, 11.5, ovigerous; SIFP 89:1976; 1 ♂, damaged; SIFP 89:1981; 11 September 1973; trawl. — 1 ♂, 8.9; 15 May 1974; trawl; SIFP 89:1445. — 4 ♂, 9.8-12.1; 6 ♀, (3 ovigerous, 11.5-15.0) 13.3-13.7; SIFP 89:1425; 1 ♀, 9.1; SIFP 89:1408; 1 ♂, damaged; SIFP 89:1980; 1 ♂, 12.2; 1 ♀, 9.4; SIFP 89:1433; 17 July 1974; trawl. — 1 ♂, 10.1; 1 ♀, 12.3, ovigerous; SIFP 89:1538; 1 ♀, 13.1; FSBC I 10927; 15 August 1974; trawl. — RSP STATION 005: 1 ♂, 14.6; 18 January 1973; trawl; FSBC I 9806. — 1 ♂, 13.9; 5 March 1973; trawl; FSBC I 9828. — 3 ♂, 13.0-16.3; 4 ♀, (2 ovigerous, 13.8-14.1) 13.1-13.7; FSBC I 9849; 1 ♂, 13.2; 1 ♀, 13.9; FSBC I 9864; 4 April 1973; trawl. — 1 ♀, 10.0; 1 July 1973; trawl; FSBC I 10920. — 1 ♂, 7.8; 1 ♀, 13.0; FSBC I 10922; 1 ♀, 7.6; FSBC I 10923; 14 August 1973; trawl. — 1 ♂, 14.2; 1 ♀, 15.0; 9 September 1973; trawl; RNHL D 31403. — 2 ♀, 13.0-14.1; 17 October 1973; trawl; SIFP 89:1982. — 1 ♀, 14.4; 3 November 1973; trawl; FSBC I 10926. — 1 ♀, 14.0; 2 December 1973; trawl; SIFP 89:1983. — 1 ♂, 7.1; SIFP 89:1432; 1 ♂, 11.9; 1 ♀, 14.0, ovigerous; SIFP 89:1422; 19 April 1974; trawl. — 1 ♂, damaged; 16 May 1974; trawl; SIFP 89:1435. — 2 ♂, 12.0-13.6; SIFP 89:1423; 1 ♀, 13.8, ovigerous; SIFP 89:1407; 3 June 1974; trawl. — 1 ♂, 13.3; SIFP 89:1421; 1 ♂, 14.1; MNHNP acc. no. 7680; 1 ♀, 10.1; SIFP 89:1409; 19 July 1974; trawl. — 1 ♂, 9.3; RNHL D 31405; 1 ♀,14.8; MNHNP acc. no. 7681; 1 ♀, 15.1, ovigerous; UZMC 15.I.1977; 13 August 1974; trawl. — 2 ♂, 11.8-12.8; 5 December 1974; trawl; SIFP 89:1970. — RSP STATION 222: 3 ♂, 12.6-14.6; 2 ♀, 14.0-14.5, both ovigerous; 13 September 1973; trawl; FSBC I 10925. — RSP STATION 251: 1 ♂, 10.6; 26 June 1973; trawl; SIFP 89:1975. — R/V GOSNOLD STATION 229/416: 1 ♂, 7.3; 2 ♀, 4.9-5.0; 17 April 1974; trawl; SIFP 89:1163. — R/V GOSNOLD STATION 245/695: 1 ♂, 14.1; 1 ♀, 14.9; 28 August 1974; trawl; UZMC 15.I.1977. — R/V GOSNOLD STATION 246/710: 1 ♀, 16.0; 4 September 1974; dredge; SIFP 89:1444. — R/V GOSNOLD STATION 248/741: 1 ♂, 4.5; 1 ♀, 14.6; 18 September 1974; trawl; SIFP 89:1401. — R/V GOSNOLD STATION 249/748: 1 ♀, 13.8; 11 February 1975; dredge; SIFP 89:2327.

Discarded material: HOURGLASS STATION C: 1 ♀; 11 August 1966; dredge. — HOURGLASS STATION D: 1; 3 August 1965; trawl. — 1; 27 August 1965; trawl. — 1; 27 August 1965; dredge. — 1; 31 August 1965; trawl. — 2; 5 October 1965; trawl. — 1 ♀; 7 June 1966; trawl. — 1 ♂; 3 July 1966; dredge. — 3 ♂, 2 ♀; 11 July 1966; trawl. — 1 ♂; 11 August 1966; trawl. — 2 ♂, 1 ♀; 11 August 1966; dredge. — 1 ♀; 9 September 1966; trawl. — 1 ♂, 6 ♀ (2 ovigerous); 9 October 1966; trawl. — 2 ♂, 3 ♀ (2 ovigerous); 9 October 1966; dredge. — HOURGLASS STATION E: 1; 31 August 1965; dredge. — 4 ♂, 2 ♀, 2 undet.; 7 April 1966; trawl. — 1 ♂; 7 April 1966; dredge. — 1 ♂; 7 June 1966; trawl. — 8 ♂, 8 ♀; 7 June 1966; dredge. — 2 ♂, 3 ♀; 3 July 1966; trawl. — 7 ♂, 7 ♀; 2 August 1966; trawl. — 8 ♂, 15 ♀; 2 August 1966; dredge. — 2 ♀; 1

September 1966; trawl. — 1 ♂, 2 ♀; 1 September 1966; dredge. — 2 ♀; 9 October 1966; trawl. — 2 ♂, 6 ♀ (1 ovigerous); 9 October 1966; dredge. — HOURGLASS STATION J: 1 ♀; 11 April 1966; trawl. — 1 ♂; 5 July 1966; trawl. — HOURGLASS STATION K: 1 ♂; 4 September 1966; trawl. — 2 ♀; 4 September 1966; dredge. — HOURGLASS STATION L: 1 ♀; 6 August 1966; dredge. — HOURGLASS STATION M: 1 ♂; 12 April 1966; trawl. — 1 ♀; 13 June 1966; trawl. — 2 ♂, 3 ♀; 13 June 1966; dredge. — 1 ♂, 1 ♀; 6 July 1966; trawl. — 1 ♂; 6 July 1966; dredge. — 1 ♂, 3 ♀; 6 August 1966; dredge. — 1 ♀; 5 September 1966; trawl.

Diagnosis: Carapace ovate-pentagonal or subcircular, slightly wider (1:1.10) than long; ventral spine on each side opposite cheliped; latter very long, four times as long as carapace, or nearly so; second segment of abdomen conspicuously three-lobed. (Modified from Rathbun, 1925).

Description: Carapace ovate-pentagonal or subcircular, from 1.07 to 1.16 times broader than long, with rounded sides, not noticeably angular; moderate postorbital constriction, more pronounced in young; prominent dentate pterygostomian ridge from lower orbit to just above insertion of cheliped. Depressions

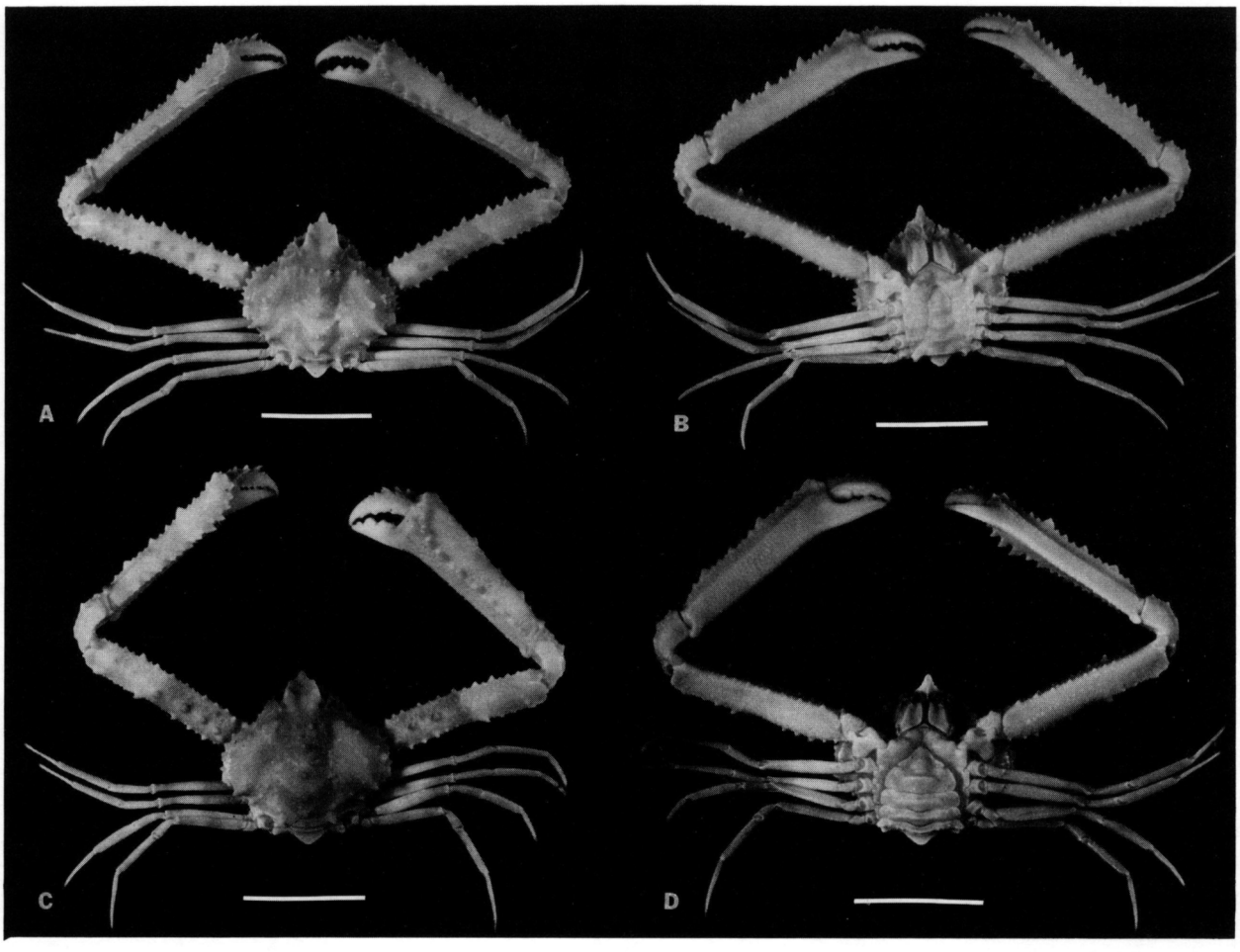

Figure 16. *Parthenope agona* (Stimpson). A. male, off Cape Canaveral, Florida east coast, dorsal view; B. same, ventral view; C. female, same locality, dorsal view; D. same, ventral view. Scale lines = 10 mm.

between regions dorsally and ventrally not remarkably deep but distinctly excavated. Surface coarsely punctate, or eroded in older specimens, covered with numerous rough granules or tubercles; larger tubercles more or less spiniform, often distinctly granulate at tips; smaller tubercles sometimes indistinct or obsolete; major tubercles arranged as follows: five on gastric region, four being smaller and near middle in transverse line, sometimes indistinct, fifth tubercle largest, on median line farther back; three large tubercles in longitudinal row on cardiac region; one on each urocardiac lobe; five on branchial region, outer and posteriormost larger, with latter often produced into blunt granular spine; one on each hepatic region. Anterolateral margin of branchial region armed with six small, irregular, often bifid teeth, fifth being smallest; broad, triangular tooth below and behind last of these; stout, incurved spine or tooth visible between ischia of cheliped and first walking leg lower on ventral surface. Rostrum declivate, slightly rounded with poor to well-developed median depression, produced into narrow, elongate, rounded tooth, often with denticles or irregular dentition laterally; acute, forward-pointing tooth over each antennular cavity; tooth often indistinct in older individuals. Several irregular spines on outer margin of orbit, small blunt spine on upper surface of eye distally.

Chelipeds extremely long, slender, arm length about 1.3 to 1.4 times width of carapace, upper surface finely rugose; irregular row of prominent or obsolescent dentiform tubercles near middle of upper surface of arm and wrist, nearer outer margin of hand; latter in some specimens either smooth or with one isolated or interrupted series of isolated tubercles; inner and outer margins of arm and wrist with similar tubercles; series of 18-20 irregular teeth on upper margin of hand, teeth increasing in size to point proximal to fingers, then abrubtly diminishing; outer margin of hand with four to six larger teeth, sometimes with many intermediate or smaller teeth between. Walking legs long for genus, first pair reaching at least to distal margin of wrist; all legs slender, usually bare, nearly smooth, possessing minute spinules or only faint indications of same on upper margins of meral joints; older specimens with joints distinctly serrate to tuberculate. Conical spine or tubercle on either side of sternum near base of chelipeds, another on coxal joints of chelipeds.

Second abdominal somite with sharp, transverse crest forming prominent lobe in center, rounded to more or less flattened tooth on each side. Gonopods as illustrated (Figure 17 E-h).

Type-locality: Off the Marquesas, Carysfort and Conch Reefs, southeastern Florida; 40-49 fms (73-90 m); types not extant (*fide* Rathbun, 1925, p. 513).

Distribution: Off Cape Hatteras and Cape Lookout, North Carolina, to the eastern Gulf of Mexico from near Pensacola to Ft. Myers, Florida; off Cape Canaveral and the Indian River region of Florida, southward through the Florida Straits; north coast of Yucatan, Mexico; Puerto Rico, Barbados, Trinidad, Margarita Island (Venezuela), and offshore waters between Guyana and Surinam; 37-392 m. Hourglass Stations A (?), C, D, E, J (?), K, L and M; 6-18 m (?), 37-73 m.

East Pacific analogue: *Parthenope* (*Parthenope*) *hyponca* (Stimpson, 1871) (*fide* Garth, 1958).

Remarks: Most noticeable variation occurs in the general tuberculation of the carapace, especially along the anterolateral margins. In young specimens (Figure 18) the rostrum is less produced, but in older individuals becomes more so, increasing in length and width to a distinctly elongate rounded tooth or lobe. In other specimens it often is armed laterally with one or more spinules or flattened lobes; these lobes appear to follow closely on gonopod and gonopore development.

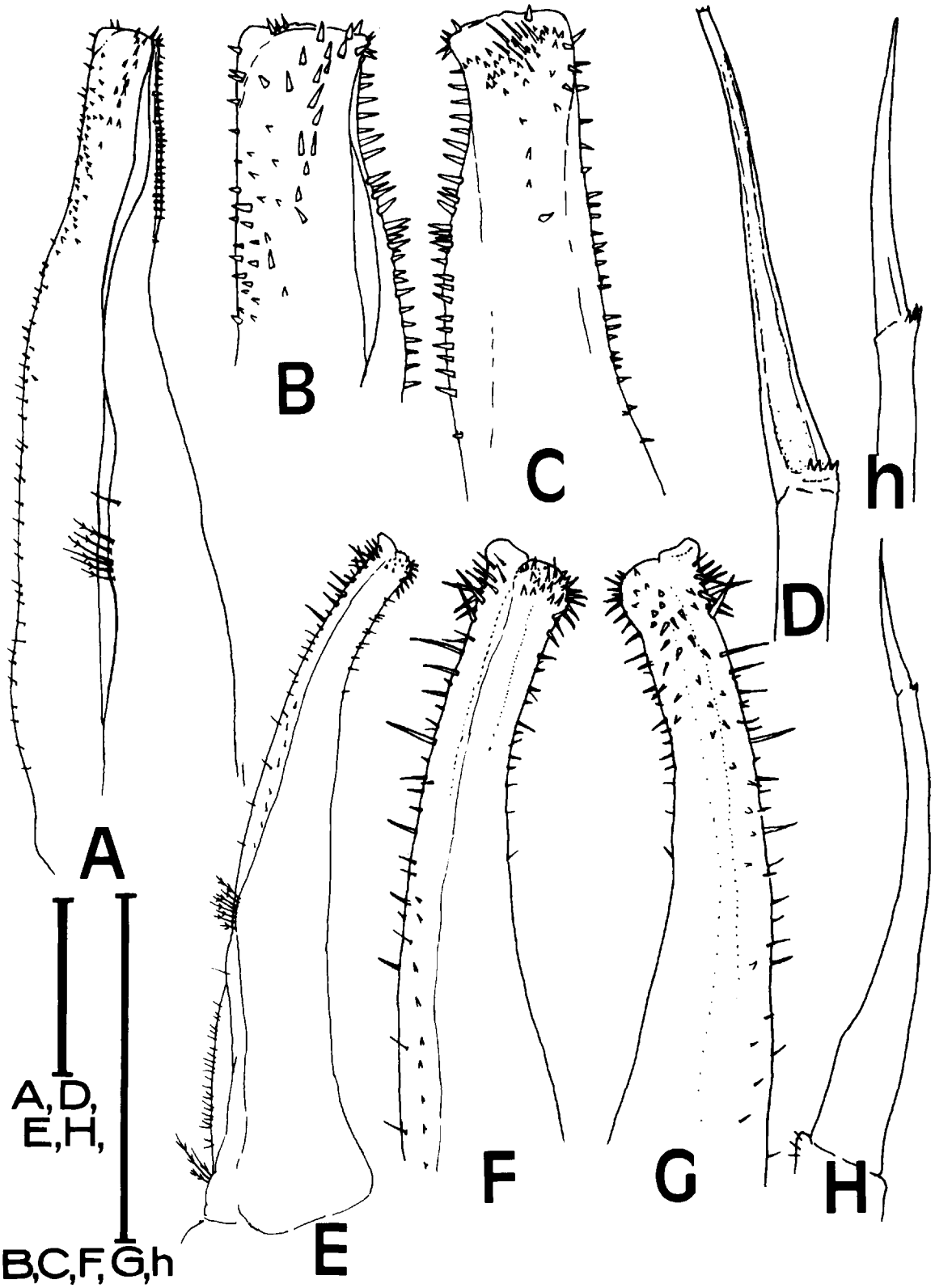

Figure 17. Major and minor left gonopods (pleopods 1 and 2) of male *Parthenope*, Atlantic specimens. *Parthenope pourtalesii* (Stimpson): A. UZMC 15.I.1977, major gonopod, medial view; B. same, detail of distal portion; C. same, ventral view, detail of distal portion; D. minor gonopod, mesiolateral view. *Parthenope agona* (Stimpson): E. MHNG, major gonopod, medial view; F. same, detail of distal portion; G. same, ventral view, detail of distal portion; H. minor gonopod, mesiolateral view; h. same, detail of distal portion. Scale lines = 1 mm.

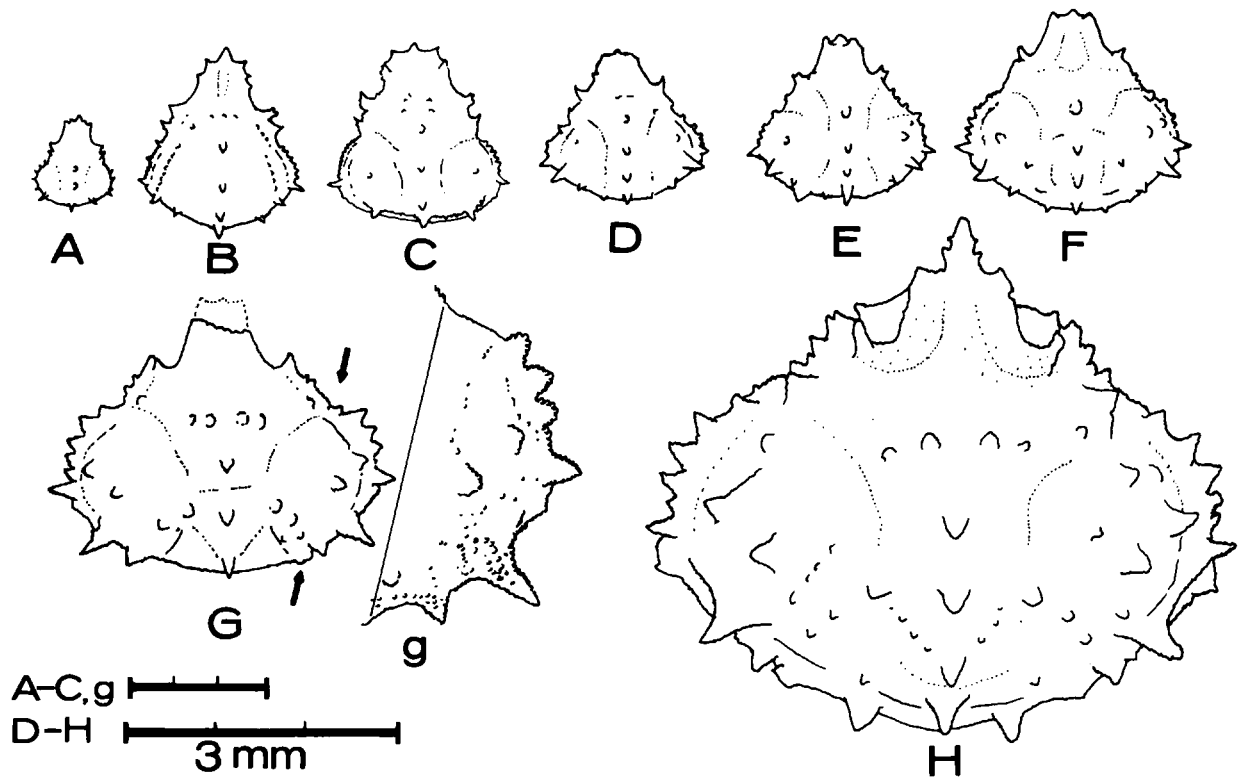

Figure 18. Development of carapace morphology in juvenile *Parthenope agona* (Stimpson), Gulf of Mexico specimens. A-F. SIFP 89:2546, unsexed juveniles; G. same lot, juvenile male, g. same, detail of right branchial region noted by arrows; H. SIFP 89:2532, juvenile male.

Discarded specimens of *P. agona* were considered in a separate analysis of depth distributions made by FDNR researchers. Rationale and discussion of these specimens is appended below.

Soto (1972, unpubl.) noted that *P. agona* was the most abundant parthenopid in his collections from the northeastern Gulf of Mexico continental shelf. This species was also the most numerous in both R/V *Hernan Cortez* and R/V *Gosnold* collections.

Parthenope fraterculus (Stimpson, 1871)

Figures 19-21

Lambrus fraterculus Stimpson, 1871a, p. 130; A. Milne Edwards, 1878, p. 150; Miers, 1886, p. 93 [listed]; Rathbun, 1898, p. 261 [listed]; 1900, p. 514 [key]; Holthuis, 1959, p. 192.

? *Parthenope horrida*: Young, 1900, p. 108 [not *Daldorfia horrida* (Linné) (= *Parthenope horrida*, *auct.*); see *Remarks*].

Parthenope (*Platylambrus*) *fraterculus*: Rathbun, 1921, p. 80; 1925, pp. 512 [key], 525, pls. 186, 187, pl. 190, fig. 2; Springer and Bullis, 1956, p. 22 [listed]; Bullis and Thompson, 1965, p. 13 [listed]; Williams, 1965, p. 269, text-figs. 249, 252D; L. Pequegnat, 1975, p. 48 [listed].

Platylambrus fraterculus: Flipse, 1930, p. 86 [listed].

Parthenope (*Platylambrus*) *fratercula*: Coelho and Araújo Ramos, 1972, p. 205 [listed].

Material examined: HOURGLASS STATION C: 1 ♂, 14.5; 11 July 1967; dredge; UZMC 15.I.1977. — HOURGLASS STATION D: 1 ♀, 5.8; 1 juv., crushed; 9 October 1966; dredge; SIFP 89:2829. — 4 ♂, 3.3-3.8; 9 November 1966; dredge; FSBC I 15149. — 1 ♂, 7.6; 1 ♀, 8.6; 6 February 1967; dredge; FSBC I 15150. — 1 ♀, 9.3; 4 April 1967; trawl; SIFP 89:2823. — 1 ♂, 5.1; 4 April 1967; dredge; SIFP 89:2821. — 4 juvs., 3.0-3.1; 12 May 1967; dredge; SIFP 89:2827. — 1 juv., 3.8; 21 May 1967; dredge; FSBC I 15151. — 1 ♂, 5.4; 5 juvs., 3.8-4.2; 2 July 1967; dredge; FSBC I 15152. — 1 ♀, 10.1, ovigerous; 2 August 1967; dredge; FSBC I 15153. — 1 ♀, 11.9; 12 September 1967; dredge; FSBC I 15154. — 2 juvs., 2.8-3.7; 6 October 1967; dredge; FSBC I 15155. — 1 ♂, 4.5; 1 ♀, 3.4; 2 juvs., 2.9-4.9; 6 October 1967; trawl; MNHNP acc. no. 7668. — 1 ♀, 6.5; 3 November 1967; trawl; FSBC I 15157. — 2 ♀, 10.6-12.1; 21 November 1967; dredge; FSBC I 15156. — HOURGLASS STATION E: 5 ♂, 10.8-15.8; 1 ♀, 10.0; 7 June 1966; dredge; FSBC I 3113. — 2 ♂, 4.3-11.8; 1 ♀, 5.9; 2 August 1966; dredge; FSBC I 3704. — 2 ♀, 4.7-5.0; 2 juvs., both 3.0; 3 March 1967; trawl; SIFP 89:2825. — 1 ♂, 13.9; 3 March 1967; trawl; FSBC I 15159. — 1 juv., 2.6; 12 May 1967; trawl; FSBC I 15160. — 1 ♂, 4.0; 2 juvs., both 2.8; 12 May 1967; dredge; FSBC I 15161. — 1 ♀, 5.3; 7 juvs., 3.1-3.8; 2 August 1967; dredge; UZMC 15.I.1977. — 1 ♀, 3.6; 6 October 1967; trawl; FSBC I 15162. — 1 ♀, 9.8; 3 November 1967; trawl; SIFP 89:2822. — HOURGLASS STATION L: 1 ♂, 6.9; 1 ♀, 6.9; 6 August 1966; dredge; FSBC I 3785. — 3 juvs., 2.9-3.6; 5 September 1966; dredge; FSBC I 4284. — 1 ♀, 7.0; 13 January 1967; trawl; FSBC I 15163. — 1 juv., 2.6; 16 February 1967; dredge; FSBC I 15164. — 1 ♂, 3.7; 1 juv., 3.7; 8 April 1967; dredge; FSBC I 15165. — 1 ♂, 5.0; 2 ♀, 4.8-5.0; 16 May 1967; dredge; FSBC I 15166. — 2 ♀, 6.1-11.3; 7 June 1967; dredge; FSBC I 15167. — 2 ♀, 4.0-5.0; 6 July 1967; dredge; FSBC I 15168. — 2 ♀, 7.3-9.4; 8 August 1967; trawl; FSBC I 15169. — 2 ♂, 7.0-7.6; 8 August 1967; dredge; MHNG. — 1 ♂, 5.3; 2 ♀, 6.6-8.9; 5 September 1967; dredge; FSBC I 15170. — 1 ♂, 8.8; 12 October 1967; trawl; FSBC I 15171. — 1 ♂, 6.0; 12 October 1967; dredge; FSBC I 15172. — 3 ♂, 3.9-7.4; 15 November 1967; dredge; SIFP 89:2820. — 4 juvs., 2.6-2.8; 15 November 1967; trawl; FSBC I 15173. — HOURGLASS STATION M: 2 ♀, 10.5-12.8; 13 October 1965; dredge; FSBC I 15174. — 2 ♂, 13.4-13.8; 13 November 1965; dredge; FSBC I 1198. — 1 ♀, crushed; 13 June 1966; dredge; FSBC I 15175. — 1 ♀, 9.1; 16 August 1966; trawl; FSBC I 3719. — 4 ♂, 5.5-7.3; 6 ♀, 5.2-6.4; 25 juvs., 2.6-2.8; 5 September 1966; dredge; FSBC I 4516. — 1 ♀, 7.3; 13 October 1966; trawl; FSBC I 15176. — 1 ♀, 7.4; 7 December 1966; dredge; FSBC I 15177. — 3 ♂, 11.9-16.4; 7 June 1967; dredge; SIFP 89:2828. — 7 juvs., all 3.0; 6 July 1967; dredge; FSBC I 15178. — 3 juvs., 4.8-6.1; 5 September 1967; dredge; FSBC I 15179. — EAST FLORIDA: RSP STATION 003: 1 ♀, 12.5; FSBC I 10929; 1 ♀, 12.4; SIFP 89:1994; 15 August 1973; trawl. — 1 ♀, 12.4; 10 September 1973; trawl; FSBC I 10931. — 1 ♀, 11.6; 10 April 1974; trawl; SIFP 89:1429. — 1 ♀, 12.4; FSBC I 10932; 1 ♀, 14.0; SIFP 89:1426; 4 June 1974; trawl. — 1 ♀, 11.0; SIFP 89:1419; 1 ♂, 12.1; FSBC I 10933; 18 July 1974; trawl. — 1 ♂, 10.8; 14 August 1974; trawl; SIFP 89:1512. — RSP STATION 004: 1 ♀, 11.6; 11 September 1973; trawl; SIFP 89:1989. — 1 ♀, 10.0; 5 June 1974; trawl; SIFP 89:1428. — 1 ♂, 9.0; SIFP 89:1434; 1 ♀, 13.8; MNHNP acc. no. 7683; 1 ♂, 9.8; RNHL D 31415; 19 July 1974; trawl. — 1 ♀, 11.0; SIFP 89:1429; 1 ♀, 11.9, ovigerous; MHNG; 15 August 1974; trawl. — 1 ♀, 11.4; 6 December 1974; trawl; SIFP 89:1971. — RSP STATION 005: 1 ♂, 13.8; FSBC I 10928; 1 ♂, 6.4; SIFP 89:2150; 6 February 1973; trawl. — 1 ♂, 13.9; 5 March 1973; trawl; FSBC I 9827. — 3 ♂, 9.2-14.7; 14 August 1973; trawl; SIFP 89:1988. — 1 ♂, 11.9; 9 September 1973; trawl; FSBC I 10930. — 1 ♀, 12.5; 17 January 1974; trawl; SIFP 89:1995. — 1 ♂, 8.3; 1 ♀, 11.4; RNHL D 31414; 1 ♀, 15.0, ovigerous; SIFP 89:1436; 16 May 1974; trawl. — 1 ♂, 8.4; 1 ♀, 9.6; 3 June 1974; trawl; UZMC 15.I.1977. — RSP STATION 076: 1 ♂, 13.1; 23 May 1974; trawl; SIFP 89:1998. — RSP STATION 222: 1 ♀, 15.6; 13 September 1973; trawl; SIFP 89:1990. — R/V GOSNOLD STATION 237/502: 1 ♀, 10.0; 10 June 1974; trawl; SIFP 89:1287. — R/V GOSNOLD STATION 237/514; 3 ♀, (2 ovigerous, 13.1-13.2) 17.7; 12 June 1974; trawl; BMNH no number. — R/V GOSNOLD STATION 237/515: 1 ♂, 9.5; 12 June 1974; trawl; RNHL D 31416. — R/V GOSNOLD STATION 242/601: 1 ♂, 11.6; 1 ♀, 10.1; 14

August 1974; dredge; SIFP 89:1405. — R/V GOSNOLD STATION 246/696: 1 ♀, 12.5; 3 September 1974; dredge; SIFP 89:1447. — R/V GOSNOLD STATION 246/698: 1 ♂, 13.5; 1 ♀, 11.5; 3 September 1974; dredge; SIFP 89:1442. — R/V GOSNOLD STATION 246/702: 2 ♂, 7.9-12.6; 3 September 1974; dredge; SIFP 89:1443. — R/V GOSNOLD 246/709: 1 ♂, 9.0; 4 September 1974; dredge; SIFP 89:1441. — R/V GOSNOLD STATION 248/735: 2 ♂, 11.4-11.7; 18 September 1974; dredge; SIFP 89:1449. — R/V GOSNOLD STATION 248/737: 2 ♂, 14.8-16.4; 18 September 1974; dredge; MHNG. — R/V GOSNOLD STATION 248/738: 1 ♀, 6.8; 18 September 1974; dredge; SIFP 89:1403. — R/V GOSNOLD STATION 248/740: 1 ♀, 12.8, ovigerous; 18 September 1974; trawl; SIFP 89:1400. — R/V GOSNOLD STATION 250/758: 1 ♀, 11.9; 18 February 1975; dredge; SIFP 89:2481. — R/V GOSNOLD STATION 250/759: 1 ♂, 9.0; 18 February 1975; dredge; MNHNP acc. no. 7682. — R/V GOSNOLD STATION 262/772: 1 ♂, 5.6; 12 August 1975; dredge; SIFP 89:2441. — R/V GOSNOLD STATION 262/783: 1 ♂, 14.1; 2 ♀, (1 ovigerous, 14.1) 13.0; 13 August 1975; dredge; UZMC 15.I.1977. — R/V GOSNOLD STATION 262/785: 1 ♂, 14.0; 2 ♀, (1 ovigerous, 13.8) 9.0; 13 August 1975; dredge; UZMC 15.I.1977. — R/V GOSNOLD STATION 267/793: 4 ♀, (2 ovigerous, 11.6-12.4) 10.6-12.5; 2 December 1975; dredge; SIFP 89:2758. — R/V GOSNOLD STATION 267/796: 1 ♂, 16.1; 1 ♀, 10.0; 2 December 1975; dredge; SIFP 89:2818.

Diagnosis: Carapace subtriangular to ovately pentagonal, about 1.06 times wider than long. Branchial regions inflated, usually separated from gastric-cardiac ridge by deep depression, abruptly delimited marginally, falling steeply away along anterolateral margin. Rostrum either rounded, triangular, or ending in long, narrow tooth. Slender spine outside of and below lateral tooth of front. Supraorbital ridge in males usually with distinct tubercle carrying tuft of setae apically; tuft wanting in some males. Meral joints of ambulatory legs with denticulate margins; dactyli setose, that of fourth walking leg at least 1.4 times longer than propodus.

Description: Carapace subtriangular to ovately pentagonal, four- to five-sided; posterolateral margins continuous with two sides of posterior margin; long, anterolateral margins in line with rostral borders. Depressions separating branchial from cardiac and hepatic regions usually deep. Narrow ridge connecting cardiac and gastric regions; wider ridge connecting branchial and hepatic regions; deep hollow below ridge visible in side view. Carapace ornamentation extremely variable, with few to many large tubercles and spines placed generally as follows: three gastric in triangle, posterior largest; one genital; two cardiac, anterior larger; three on branchial ridge, posterior longest; all variable in number, size and position. Front rounded, triangular or acute, usually inclined about 45° or less, often ending in narrow, blunt tooth; another blunt tooth on each side above antennules, with small, slender spine outside and below tooth. Tubercle on each preorbital lobe; second tubercle in males or well-developed prominence in females on supraorbital ridge; tubercles in males often carrying distinct tuft of setae. Large, submarginal tubercle on subhepatic region visible in dorsal view. Margin of branchial region in front of ridge variably armed, with 5-10 small teeth progressing posteriorly, second or third from last tooth being elongate; two or three small teeth behind ridge. Posterior margin with three distinct, equal teeth, often with larger tubercles interspersed. Small, blunt tooth at inner, lower angle of orbit; large tubercle between this tooth and angle of buccal cavity. Row of five or more tubercles near outer margin of endognath.

Chelipeds of male about 2.5 times as long as carapace, rather slender, especially merus; inner, upper, and outer margins of merus armed with few, very unequal, stout spines; carpus with one, occasionally two, large, tubercle-like spines on outer surface; outer and inner margins of manus armed with triangular, denticulate, very unequal teeth, usually six or seven larger ones on inner margin, three or four on outer margin; latter sometimes subequal in size; large, conical tubercle at proximal third. Upper surfaces of meri of walking legs denticulate; dactyli setose except at tip; carpus and propodus of last pair with two or three lobes

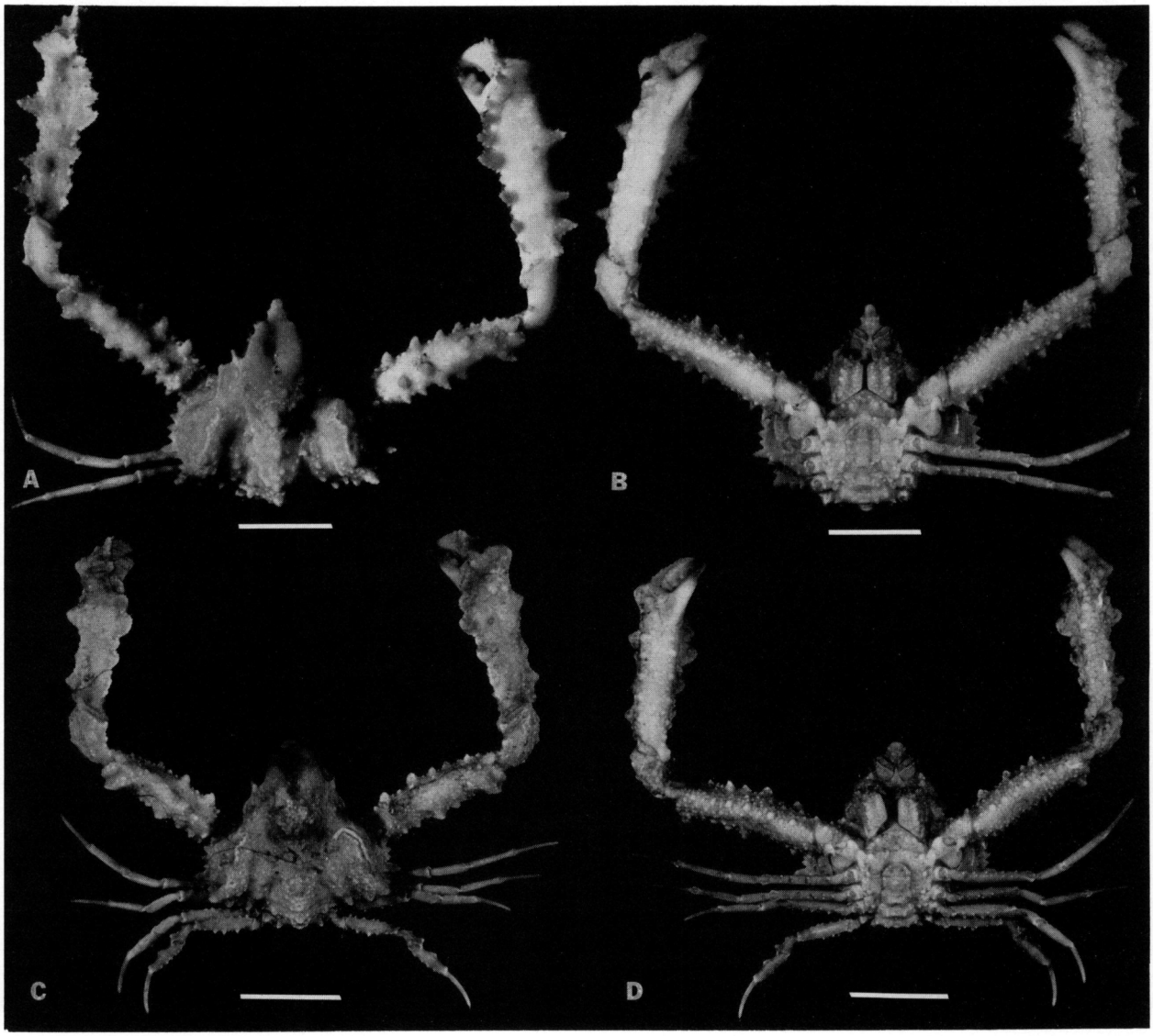

Figure 19. *Parthenope fraterculus* (Stimpson). A. male, spiny form, off St. Lucie Inlet, Florida east coast, dorsal view; B. same, ventral view; C. male, blunt form, off Ft. Pierce Inlet, Florida east coast, dorsal view; D. same, ventral view. Scale lines = 5 mm.

above, five denticles below; dactyl at least 1.4 (up to 1.6) times longer than propodus.

Sternum and abdominal somites variably tuberculate; large, transverse tubercle on each of abdominal somites 2-6. Gonopods as illustrated (Figure 21).

Type-locality: Off Sand Key, Carysfort and Conch Reefs, and west of Dry Tortugas, southern Florida; 26-68 fms (48-124 m); types not extant (*fide* Rathbun, 1925, p. 525).

Distribution: Off Cape Fear, North Carolina; peninsular Florida from the central east coast to Dry Tortugas,

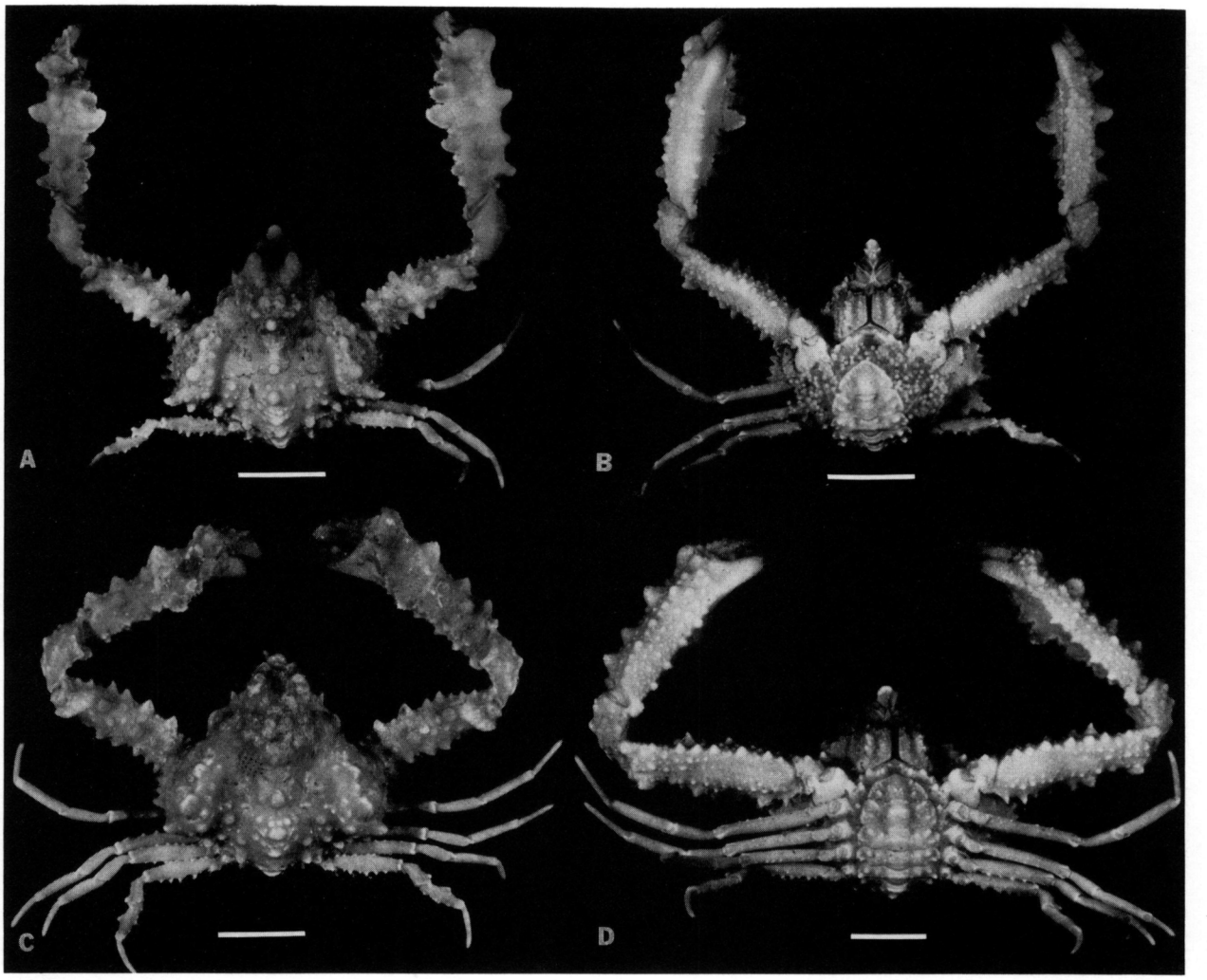

Figure 20. *Parthenope fraterculus* (Stimpson). A. female, ovigerous, sharply tuberculate form, off Cape Canaveral, Florida east coast, dorsal view; B. same, ventral view; C. female, bluntly tuberculate form, off St. Lucie Inlet, Florida east coast, dorsal view; D. same, ventral view. Scale lines = 5 mm.

and northward in the Gulf of Mexico to vicinity of Pensacola Bay; off Cape Catoche, Yucatan, Mexico; Barbados; Surinam; mouth of the Amazon River, Pará, Brazil; 7-201 m. Hourglass Stations C, D, E, L and M; 37-73 m.

East Pacific analogue: None.

Remarks: Young's (1900) brief description of *Parthenope horrida* might possibly be applied to *P. fraterculus*, known from Barbados. Young referred in synonymy to the "Lazy crab" of Hughes (1750: 262, pl. 25, fig. 1). According to Rathbun (1921), the "Lazy crab" was a composite illustration of the carapace of *Daldorfia horrida* (Linné) [=*Parthenope horrida, auct.*] and the pereiopods of *Mithrax spinosissimus* (Lamarck) (Majidae). The former is an Indo-West Pacific species, known to Hawaii; the latter is common on reefs

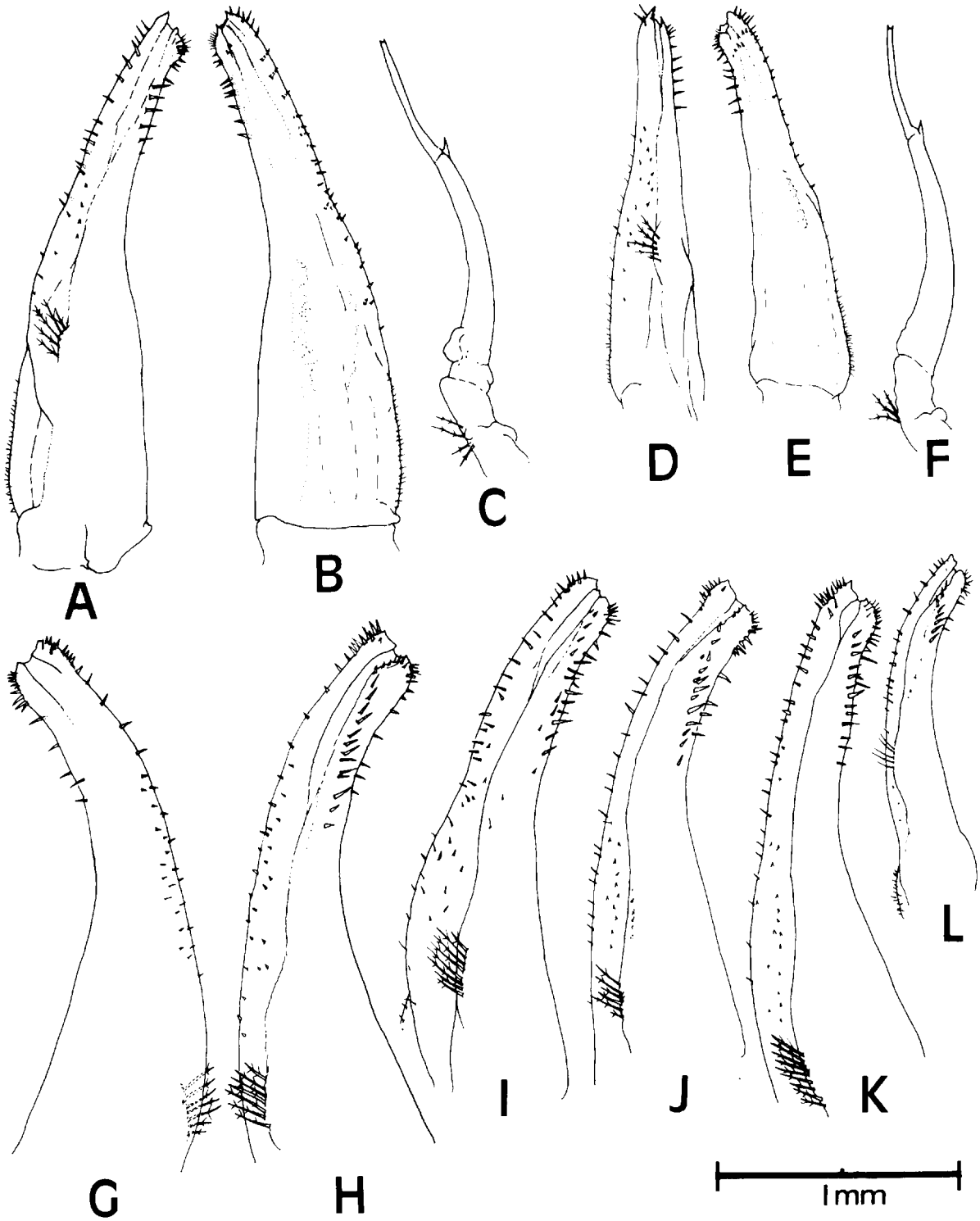

Figure 21. Major and minor left gonopods (pleopods 1 and 2) of male *Parthenope fraterculus* (Stimpson). Gulf of Mexico specimens with well-developed supraorbital tubercle: A. FSBC I 15150, major gonopod, ventral view; B. same, medial view; C. minor gonopod, mesiolateral view; D. MHNG, major gonopod, ventral view; E. same, medial view; F. minor gonopod, ventral view; G. SIFP 89:2828, major gonopod, medial view; H. same, ventral view. Atlantic specimens: I. SIFP 89:1888, major gonopod, medial view, specimen with no subraorbital tubercle; J. same lot, specimen with subraorbital tubercle; K. SIFP 89:1443; major gonopod, medial view, specimen with heavily rounded supraorbital ridge. Gulf of Mexico specimen: L. FSBC I 15172, major gonopod, medial view, specimen lacking subraorbital tubercle.

throughout the West Indies. Von Martens (1872: 8b) considered the "Lazy crab" only a male *M. spinosissimus*.

The range of morphological variation in *Parthenope fraterculus* is extensive. We have examined specimens in which the carapace was almost completely smooth or only slightly pitted, in decided contrast to other individuals in which the carapace was heavily nodulose or pustulose. Still other specimens exhibited conspicuous spines, spinules, and teeth dorsally and marginally. Branchial ridges varied from rounded to sharply carinate. The rostrum may be wide and bluntly rounded or narrow and tapering, and may or may not possess marginal teeth or spines. The angle of declivity can be slightly or acutely deflexed. The supraorbital ridge is gently rounded in some individuals, more inflated in others, and may be developed into a distinct, sharp tubercle in still other specimens. This tubercle could be discerned in some juveniles as small as 2.8 mm RCL.

The supraorbital tubercle appears to exhibit a form of sexual dimorphism; males possessed this feature more than females, although some of the latter did have a noticeable prominence above the orbit. Of 176 individuals examined, 97 (55%) possessed such tubercles in one form or another, whereas 79 (45%) did not. In tuberculate individuals, 36 (37%) were males, 13 (13%) were females, and 48 (49%) were juveniles. Some males also had a distinct tuft of long setae springing from the apex of the tubercle, a feature not seen in any females we examined. These setae were present in males as small as 5.2 mm RCL. Non-tuberculate individuals consisted of 20 males (25%), 46 females (58%) and 13 juveniles (16%).

Presence or absence of a distinct supraorbital tubercle, with or without apical setae, may also be correlated with geographical occurrence. A series of 56 males (30 Hourglass specimens, 26 R/V *Gosnold* specimens), and 59 females (30 Hourglass, 29 R/V *Gosnold*) were examined. Of the 36 males and 13 females with tubercles, 38 (78%) occurred in the Gulf of Mexico, whereas 11 (22%) were collected from the Atlantic Ocean. Contrarily, of the 20 non-tuberculate males and 46 females, 20 females and 2 males (33%) occurred in the Gulf while 18 males and 26 females (67%) were collected in the Atlantic. These data are presented in Table 4 in another manner. Sixty-four percent of all males examined were tuberculate, but this constituted 28 (93%)

TABLE 4. COMPARISON OF TWO MORPHOLOGICAL FORMS OF *Parthenope fraterculus* IN THE GULF OF MEXICO AND OFF THE CENTRAL EASTERN FLORIDA COAST.

Number and Sex	Area	Supraorbital Tubercle		N
		Present	Absent	
30 males	Gulf of Mexico	28 (50%)	2 (4%)	
26 males	Central eastern Florida coast	8 (14%)	18 (32%)	56
30 females	Gulf of Mexico	10 (17%)	20 (34%)	
29 females	Central eastern Florida coast	3 (5%)	26 (44%)	59

of all Gulf of Mexico specimens and only 8 (31%) of those from off central east Florida. The data are less decisive for females, because 78% of all females examined were non-tuberculate. However, 10 (33%) of those from the Gulf of Mexico possessed tubercules, whereas only 3 (10%) from Atlantic stations were tuberculate. It would thus appear that the Gulf of Mexico population of *Parthenope fraterculus* can be distinguished in many instances by the presence of a distinct supraorbital prominence or tubercle, which in most males was armed apically with a noticeable tuft of setae.

The type of carapace variation just discussed for *P. fraterculus* is similar to that exhibited by another parthenopid, *Parthenope* [as *Lambrus*] *massena* Roux, 1830, a Mediterranean and West African species which resembles, to some extent, *P. fraterculus*. Monod (1956) distinguished five more or less geographically restricted "formas": *P. massena* forma *typicus*, f. *atlanticus*, f. *pulchellus*, f. *rugosus*, and f. *bicarinatus*. All differed to some degree in the form of carapace ornamentation, cheliped armature, and rostral shape. Examination of Monod's illustrations (1956, figures 840-847) provides a good example of the degree, although not necessarily the kind, of ornamentation which similarly occurs in *P. fraterculus*. The latter species has not yet been given "forma" designations and, we believe, rightly so in view of the wide-scale variation to which the species is apparently subject.

Although we were able to distinguish with a reasonable degree of certitude the two forms from our areas of study, *i.e.*, those with well-developed supraorbital tubercles and (often) with apical setae, and those without either of these features, the range of variation in other features such as carapace ornamentation or cheliped armament was too extensive to allow further separation. Examination of gonopods in tuberculate and non-tuberculate populations of males from both the Gulf of Mexico and Atlantic Ocean revealed both individual variation in spination on the major gonopod (pleopod 1) and a general armament in gonopods 1 and 2 which, again, did not allow further distinction (Figure 21). The major gonopod in all males invariably possessed three rows of spines or spinules, one each located more or less marginally near the tip, the third located mesially and progressing distally. Tuberculate males (Figure 21 A-H, J) were in themselves somewhat variable in regard to actual numbers and positioning of these spinules, with older individuals, as a rule, being more noticeably spiny (Figure 21 H, J). A similar situation was observed in non-tuberculate males (Figure 21 I, K, L). If further material from these two areas remains consistent in regard to features just mentioned, then subspecific status might be warranted.

Although the principal distribution of *P. fraterculus* seems to be the Gulf of Mexico and the northwestern Atlantic to Cape Hatteras (see Figure 28), it remains to be seen whether males or females from the western Gulf of Mexico, or in the southern populations from the Lesser Antilles or the northeastern coast of South America to Brazil, exhibit any geographically correlated variation similar to that just noted.

Parthenope cf. *fraterculus* (Stimpson, 1871)

Material examined: HOURGLASS STATION E: 1 juv., 3.0; 9 October 1966; dredge; FSBC I 15180. — 2 juvs., 2.9, crushed; 9 November 1966; trawl; FSBC I 15181. — HOURGLASS STATION L: 1 juv., 2.1; 13 January 1967; trawl; FSBC I 15182. — 5 juvs., 3.0-3.8; 7 June 1967; dredge; FSBC I 15183. — HOURGLASS STATION M: 1 juv., 3.0; 12 May 1966; dredge; FSBC I 15184. — 1 juv., 2.8; 5 July 1966; dredge; FSBC I 15185. — 1 juv., 3.0; 13 October 1966; trawl; FSBC I 15186. — 1 juv., 2.9; 13 November 1966; dredge; FSBC I 15187. — 1 juv., crushed; 7 December 1966; dredge; FSBC I 15188. — 1 ♂, 4.0; 1 juv., 2.6; 9 March 1967; dredge; FSBC I 15189. — 1 juv., 3.0; 8 April 1967; dredge; FSBC I 15190. — 1 ♂, 3.9; 1 juv., crushed; 8 August 1967; dredge; FSBC I 15191. — 1 juv., 4.8; 5 September 1967; dredge; FSBC I 15192.

Distribution: Eastern Gulf of Mexico, Hourglass Stations E, L and M; 55-73 m.

Remarks: All of these specimens were too little developed to adequately identify them. Most, however, appeared to be young *P. fraterculus* based on general body configuration and rostral shape. As noted under the account of *Parthenope pourtalesii*, juveniles of that species are extremely close or identical to those of *P.*

fraterculus in general morphology. There is thus the possibility that some of the above specimens are actually *P. pourtalesii* juveniles. If our identification of the above material is correct, however, then the Hourglass Cruises did not obtain any *P. pourtalesii*, juvenile or adult, during 28 months of sampling in the eastern Gulf of Mexico. Further comment on morphology is presented in the following account.

Parthenope pourtalesii (Stimpson, 1871)

Figures 17 A-D, 22

Lambrus pourtalesii Stimpson, 1871a, p. 129; A. Milne Edwards, 1878, p. 149, pl. 30, fig. 2-2d; Kingsley, 1879, p. 150 [discussion]; A. Milne Edwards, 1880b, p. 4; Miers, 1886, p. 93 [listed]; Faxon, 1893, p. 152 [discussion, and synonymy of *L. verrillii* Smith]; 1895, pp. 15, 16 [discussion]; Rathbun, 1898, p. 260 [listed]; 1900, p. 514 [key], text-fig. 11; Arnold, 1903, p. 286, text-fig., pl. 64.

Lambrus verrillii Smith, 1881, pp. 415, 451 [listed]; 1883, p. 14; Verrill, 1885, p. 557 [listed]; Smith, 1886, p. 628 [24], pl. 2, fig. 2; Faxon, 1895, pp. 15, 16 [discussion]; Verrill, 1908, pp. 418, 419 [discussion].

Lambrous pourtalesii: Faxon, 1896, p. 154 [listed].

Lambrus ponstalesi: Gundlach and Torralbas, 1899 (1900), text-fig. 302 [reprint (1917), pl. [2], fig. 4] [*lapsus* for *pourtalesii*].

Lambrus (Lambrus) pourtalesii: Young, 1900, pp. 102 [key], 103.

Parthenope Pourtalesii: Verrill, 1908, pp. 418, 419.

Parthenope pourtalesii: Fowler, 1912, p. 587; Leary, 1967, p. 50 [listed].

Parthenope verrillii: Fowler, 1912, 587 [listed].

Parthenope (Platylambrus) pourtalesii: Hay and Shore, 1918, p. 462, pl. 39, fig. 6; Rathbun, 1925, pp. 512 [key], 521, pls. 182, 183, 276; Boone, 1930, p. 120 [probably not pl. 37, = *P. fraterculus* (Stimpson, 1871)?]; Rathbun, 1933, p. 39, text-fig. 33; Chace, 1940, p. 53; Garth, 1946, p. 409 [listed Atlantic analogue]; Springer and Bullis, 1956, p. 22 [listed]; Bullis and Thompson, 1965, p. 13 [listed]; Williams, 1965, pp. 266 [key], 268, text-figs. 248, 252C; W. Pequegnat, 1970, pp. 173 [listed], 183; W. Pequegnat et al., 1971, p. 3 [listed], pl. 1, map C; Felder, 1973, p. 48 [key], pl. 6, fig. 9 [right chela]; Williams, 1974, pp. 28 [key], 42, text-fig. 77; L. Pequegnat, 1975, p. 48 [listed].

Lambrus pourtalesi: A. Milne Edwards and Bouvier, 1923, p. 354.

Platylambrus pourtalesii: Flipse, 1930, p. 86 [listed].

Parthenope (Platylambrus) pourtalesi: Garth, 1958, p. 439 [discussion].

Material examined: EAST FLORIDA: RSP STATION 003: 1 ♂, 11.7; 14 August 1974; trawl; SIFP 89:1412. —RSP STATION 004: 1 ♀, 13.3; 11 September 1973; trawl; SIFP 89:2815. — RSP STATION 005: 1 ♂, 24.5; 4 April 1973; trawl; FSBC I 9863. — RSP STATION 180: 1 ♂, 14.0; 13 September 1973; trawl; MHNG. — R/V GOSNOLD STATION 229/412: 1 ♂, 22.6; 17 April 1974; trawl; SIFP 89:0975. — R/V GOSNOLD STATION 248/731: 3 ♂, 25.2-39.5; 3 ♀, 23.3-30.5; 17 September 1974; trawl; UZMC 15.I.1977. — R/V GOSNOLD STATION 248/737: 1 ♀, 17.8; 18 September 1974; dredge; MHNG.

Diagnosis: Carapace about 1.2 times wider than long, high, regions deeply separated, anterior margin continuing obliquely or slightly concave to rounded lateral margins; lateral margin inflated, falling away obliquely, with series of large spines; largest spine at lateral angle, another at posterior end of branchial ridge;

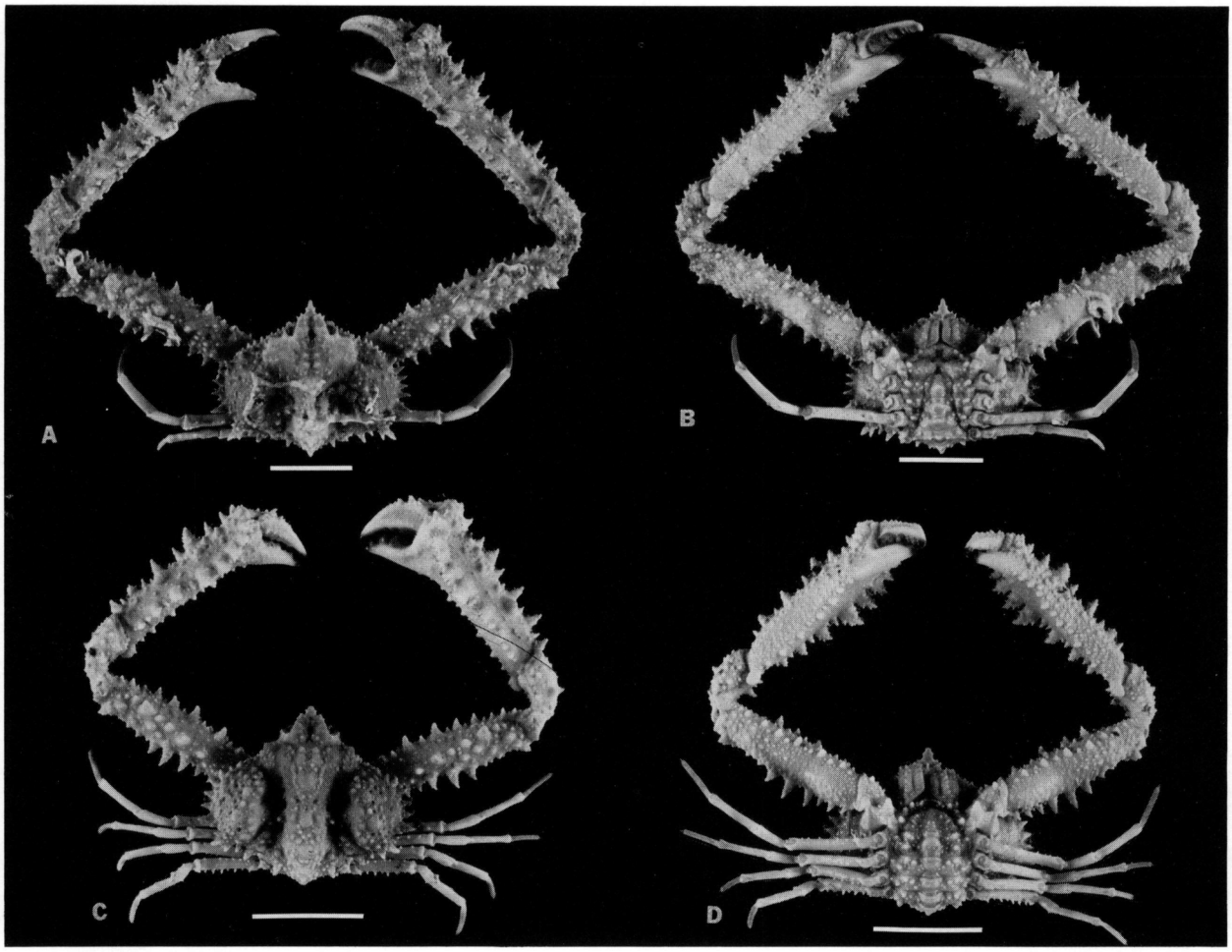

Figure 22. *Parthenope pourtalesii* (Stimpson). A. male, off Cape Canaveral, Florida east coast, dorsal view; B. same, ventral view; C. female, same locality, dorsal view; D. same, ventral view. Scale lines = 20 mm.

arms not flat above; dactyl of walking legs setose, that of fourth leg 1.3 times longer than propodus. (Modified from Rathbun, 1925).

Description: Crab heavily tuberculate and spiny. Carapace 1.08 to 1.28 times wider than long, broadly triangular, angles rounded, widest at spine of posterolateral angle. Branchial regions inflated, sloping outward moderately, rather deeply separated from similarly inflated gastric, cardiac and hepatic regions; largest spine at posterolateral angle, with one or two spines at base. Hepatic margin armed with small, prominent spine; anterolateral margins obliquely or slightly concave proximally, becoming convex after cervical suture, armed with eight or nine teeth or spines increasing in size posteriad, first three or four shorter than next five. Posterolateral margin armed with three or four unequal spines in addition to large single or double spine on branchial ridge. Posterior margin produced medially, with three larger and several smaller spines, largest appearing on medial line and flanking either side. Distinct depressions located at hepatic region and on either side of metagastric ridge, becoming deep sulci posteriorly adjacent to inflated cardiac region. General surface pitted and granulate, covered especially in elevated portions with granulate tubercles of varying size, largest (sometimes produced into blunt spines in males) disposed medially as follows: one

gastric, one genital (median), two cardiac (submedian); two on branchial ridge in line with longest lateral spines; tendency to form several rows of tubercles on branchial regions. Front produced into long, narrow, bluntly rounded or obtusely triangular rostrum; supraorbital ridge often developed, bearing distinct tubercle; rostral tooth often with denticle on either side; short spine below and outside subacute basal tooth.

Chelipeds 2.5 to 3 times longer than carapace, equal, very rough, armed with laciniate teeth and spines. Merus convex above, distinctly tuberculate, bearing row of unequal spines extending obliquely to anterodistal angle; posterior margin armed with three to seven long spines on proximal half, proximal spines larger; blunt, curved tooth near distal end. Anterior margin with four or five larger and several smaller spines. Wrist usually with largest spines at inner angle, largest spine often tuberculate, one or two smaller spines interspersed between latter and anterior margin of wrist; additional spines and tubercles on convex outer surface, those on dorsal margin and mesial and mesioventral surfaces prominent. Hand with about ten to twelve triangular and tuberculate spines of irregular height and position on outer margin, eight or ten similarly on inner margin, latter broader and closer together than former, particularly toward fingers. Single, forward-curving spine distally on dorsal inner margin of palm at junction with dactyl, followed by two to four smaller spines of decreasing size on proximal, upper, inner margin of movable finger; fingers gaping in right, nearly meeting in left, cheliped. Meral joints of walking legs spinulose, more prominently so dorsally than ventrally; carpus and propodus of last pair with large, flattened, spine-like tubercle on distal, dorsal margin of former, and mediodorsal margin of latter; dactyl 1.3 times longer than propodus, heavily setose.

Sternal region noticeably tuberculate, with single, large tubercles at bases of chelipeds and walking legs 1-3. Abdominal somites 2-6 with single, large, transversely compressed tubercles medially; several large conical tubercles at extremity of somites 2-6, becoming smaller and more scattered on somite 7. Gonopods as illustrated (Figure 17 A-D).

Type-locality: Off Conch Reef, French Reef, and American Shoal, southern Florida; 40-117 fms (73-214 m); types not extant (*fide* Rathbun, 1925, p. 521).

Distribution: Off Martha's Vineyard, Massachusetts; off New Jersey; North and South Carolina; eastern Florida to Key West and Western Dry Rocks; Gulf of Mexico from southwestern Florida, and off Mississippi River delta to Texas and Rio Grande, Mexico; entrance to Gulf of Mexico off Yucatan and off Cape San Antonio, Cuba; north coast of Cuba; Lesser Antilles from Virgin Islands and Grenada; 18-348 m.

East Pacific analogue: *Parthenope* (*Platylambrus*) *exilipes* (Rathbun, 1893) (*fide* Garth, 1958).

Remarks: We noted in our material much the same variation as did Rathbun (1925) in the number, prominence, and positioning of tubercles and teeth, and in construction and ornamentation of the rostrum. Elevations of the carapace tended generally to be tubercles in females and more spine-like in males, but either could occur in one or the other sex. In much of our adult material we also noted that the supraorbital ridge was often developed into a distinct tubercle, a feature noted much earlier by Smith (1883; 1886, pl. 2, fig. 2), and one which led that author to designate some of his material for a short time as a new species, *Lambrus* (= *Parthenope*) *verrillii*. Smith (1886) later considered that material to be simply a variation of *P. pourtalesii*.

As we noted in our account under *Parthenope fraterculus*, that species also possesses on occasion strongly developed supraorbital tubercles. Indeed, great difficulty is encountered in trying to separate some juvenile specimens of *P. pourtalesii* from juvenile *P. fraterculus*, and the very young or early crab stages are usually impossible to distinguish to either species. The difficulty is compounded by those juveniles of *P.*

fraterculus which possess a distinct supraorbital spinule or tubercle, which might lead one to identify these specimens (as we did for a time) as juvenile *P. pourtalesii*. However, the general outline of the carapace in the former seems to be more angular, not as rounded as in the few specimens of *P. pourtalesii* we examined. Outer margins of the branchial regions slope more gradually in *P. pourtalesii* than in *P. fraterculus*. Moreover, dorsal and ventral margins of meri of the walking legs were less noticeably tuberculate than those of *P. fraterculus*. These features, and especially the relative length of the dactylus to the propodus in the last pair of walking legs, allowed us to separate some juveniles of *P. pourtalesii* from *P. fraterculus* in our material. We cannot emphasize too strongly, however, that measurements on the propodus and dactylus of the last walking legs be made with extreme care and accuracy in the smaller specimens, preferably under a microscope, because an error of just 0.1-0.2 mm may result in erroneous identification of such juveniles. Mature specimens, especially males of *P. pourtalesii*, offer little problem, and the gonopods in any case are distinctive (Figure 17 A-D).

We would also note that careful collecting of individuals and still more careful preservation will reward the investigator with specimens which possess most or all of their pereiopods, thus facilitating the task of identification of members of this family. In our experience, only the anomuran porcelain crabs undergo such severe autotomy during collection and subsequent preservation.

Parthenope granulata (Kingsley, 1879)

Figures 23, 24 A-d, 25 A

Lambrus granulatus Kingsley, 1879, p. 150 [female syntype, USNM 55696, lectotype by subsequent designation by Gore, 1977; probably also male syntype, based on original description; specimen now lost].

Platylambrus serratus: Aurivillius, 1889, p. 59, pl. 4, fig. 8; Hay and Shore, 1918, p. 463, pl. 39, fig. 7 [not *Lambrus serratus* H. Milne Edwards, 1834].

Parthenope (Platylambrus) crenulata: Verrill, 1908, p. 417, pl. 28, fig. 5 [not pl. 27, as in text] [not *Lambrus crenulatus* Saussure, 1858].

Parthenope crenulata: Verrill, 1922, p. 155, text-fig. 12.

Parthenope (Platylambrus) serrata: Rathbun, 1925, p. 516 [in part, not pls. 180, 181, and pl. 275, figs. 7-10 (all = *P. serrata*)]; Boone, 1930, p. 117 [in part, probably not pl. 36, figs. A, B (= *P. serrata*)]; Springer and Bullis, 1956, p. 22 [listed]; Bullis and Thompson, 1965, p. 13 [*Silver Bay* Sta. 54, *Combat* Sta. 397 only]; Williams, 1965, p. 267, text-figs. 247, 252B.

Parthenope (Platylambrus) granulata: Gore, 1977, pp. 505*ff*, text-figs. 1A-d, 2A, pls. 3A, 4C, D, 5C, D.

Material examined: HOURGLASS STATION B: 1 cheliped; 3 January 1966; dredge; FSBC I 15068. — 1 ♂, 8.1; 18 May 1966; dredge; SIFP 89:2525. — 1 ♂, crushed; 19 November 1966; trawl; BMNH 1977:234. — 1 ♂, 7.0; 5 February 1967; dredge; SIFP 89:2911. — 1 ♂, 11.2; 11 May 1967; dredge; FSBC I 15072. — 2 ♂, 11.5-15.4; 2 June 1967; dredge; USNM 168520. — 1 ♀, 16.5; 1 July 1967; dredge; FSBC I 15073. — 1 ♀, 18.9, ovigerous; 5 October 1967; trawl; FSBC I 15074. — HOURGLASS STATION C: 1 ♂, 13.0; 20 October 1965; trawl; USNM 168517. — 1 ♂, 15.5; 8 October 1966; dredge; MNHNP acc. no. 7670-7673. — 1 ♀, 19.1; 6 November 1966; trawl; RNHL D 31406. — 1 ♀, 17.0; 1 December 1966; trawl; SIFP 89:2912. — 1 ♂, 14.0; 1 December 1966; dredge; RNHL D 31408. — 1 ♀, 12.2; 3 April 1967; dredge; FSBC I 15080. — 1 ♀, 18.1; 3 April 1967; trawl; FSBC I 15081. — 1 ♂, crushed; 11 May 1967; dredge; FSBC I 15082. — 1 ♂, 12.1; 1 ♀, 17.4; 21 June 1967; dredge; SIFP 89: 2909. — 1 ♂, molt; 11 July 1967; trawl; FSBC I 15083. — 1 ♂, crushed; 1 August 1967; trawl; FSBC I 15084. — 1 ♂, 14.1; 11 August 1967; dredge; MHNG. — 1 ♂, 16.0; 11

August 1967; trawl; MNHNP acc. no. 7670-7673. — 1 ♀, 7.9; 1 September 1967; trawl; SIFP 89:2518. — 1 ♀, 17.9; 25 October 1967; dredge; MHNG. — 1 ♂, 15.1; 25 October 1967; trawl; FSBC I 15086. — 1 ♀, 17.3; 2 November 1967; trawl; MNHNP acc. no. 7670-7673. — 1 ♀, 17.8, ovigerous; 21 November 1967; dredge; UZMC 15.I.1977. — HOURGLASS STATION D: 1 ♀, 21.9, ovigerous; 19 October 1966; dredge; SIFP 89:2513. — 1 ♀, 16.4; 7 January 1967; trawl; FSBC I 15088. — 2 ♀, 16.1-17.8, both ovigerous; 4 April 1967; dredge; USNM 168518. — 1 ♀, 6.9; 1 juv., 6.2; 12 April 1967; trawl; FSBC I 15090. — 1 ♀, molt; 21 June 1967; trawl; FSBC I 15092. — 2 ♀, (1 ovigerous, 19.3) 19.8; 21 November 1967; dredge; SIFP 89:2514. — HOURGLASS STATION J: 1 ♀, 16.5, ovigerous; 11 October 1967; dredge; BMNH 1977:236. — 1 ♂, crushed; 14 November 1967; dredge; USNM 168522. — 1 ♂, 16.0; 1 ♀, 12.4; 14 November 1967; trawl; USNM 168521. — HOURGLASS STATION K: 1 ♂, 15.2; 1 ♀, 15.4; 12 October 1966; trawl; MHNG. — 1 ♂, 17.0; 12 October 1966; dredge; RNHL D 31407. — 1 ♀, 17.5; 12 November 1966; trawl; FSBC I 15101. — 1 ♂, crushed; 15 May 1967; trawl; USNM 168519. — 3 ♀, 7.4-16.5; 6 June 1967; dredge; SIFP 89:2516. — 1 ♂, 5.3; 5 July 1967; dredge; SIFP 89:2913. — 1 ♀, 17.0; 4 September 1967; trawl; FSBC I 15103. — 2 ♀, 15.7-17.9; 4 September 1967; dredge; MNHNP acc. no. 7670-7673. — 3 ♂, 15.2-17.7; 3 ♀, (1 ovigerous, 15.6) 16.5, crushed; 11 October 1967; trawl; SIFP 89:2517. — 1 ♀, 16.5, ovigerous; 11 October 1967; dredge; SIFP 89:2515. — 2 ♀, 15.7-16.1; 14 November 1967; trawl; RNHL D 31409. — 2 ♀, 15.9-16.2; 14 November 1967; dredge; USNM 168523. — EAST FLORIDA: RSP STATION 01A: 2 ♂, 13.4-17.6; FSBC I 10935; 1 ♀, 19.5; FSBC I 10936; 2 July 1973; trawl. — RSP STATION 001: 1 ♂, 9.4; 4 June 1974; trawl; SIFP 89:2076. — RSP STATION 002: 1 ♀, 20.0; 16 January 1973; trawl; FSBC I 9789. — RSP STATION 003: 1 ♂, 10.3; MNHNP acc. no. 7675; 1 ♀, 14.3; MHNG; 18 July 1974; trawl. — 1 ♂, 13.1; FSBC I 10938; 2 ♀, 14.5-14.8; MNHNP acc. no. 7674; 1 ♀, 18.7; UZMC 15.I.1977; 15 August 1973; trawl. — 1 ♀, 12.8; BMNH 1977:235; 1 ♂, damaged; 1 ♀, 16.6; SIFP 89:1985; 30 June 1973; trawl. — RSP STATION 004: 1 ♂, 12.4; 1 ♀, 18.5; 1 July 1973; trawl; SIFP 89:1991. — 1 ♀, 18.0; 13 August 1973; trawl; FSBC I 10937. — 1 ♀, 19.0; 15 May 1974; trawl; SIFP 89:1438. — 1 ♀, 8.7; 5 June 1974; trawl; UZMC 15.I.1977. — 1 ♂, damaged; 15 August 1974; trawl; SIFP 89:1537. — RSP STATION 005: 1 ♀, 18.5; FSBC I 9778; 1 ♀, 20.6, ovigerous; FSBC I 9782; 5 March 1973; trawl. — 1 ♀, 18.5; 4 April 1973; trawl; FSBC I 9850. — RSP STATION 222: 1 ♀, 18.8, ovigerous; 13 September 1973; trawl; SIFP 89:1992. — RSP STATION 262: 1 ♂, damaged; 19 June 1973; trawl; FSBC I 10934. — R/V GOSNOLD STATION 237/514: 1 ♂, 15.3; 12 June 1974; trawl; SIFP 89:1154. — R/V JOIE DE VIVRE STATION: 1 ♂, 19.0; 13 July 1973; 27°28′N, 79°57′W to 27°32′N, 80°01′W; 70 m; 8 ft otter trawl; SIFP 89:0692.

Diagnosis: Carapace moderately flattened, noticeably tuberculate, hepatic regions rounded, continuing arc of anterolateral region; large, acuminate spine directed obliquely posteriad at posterolateral angle; suborbital and subhepatic regions deeply excavated; angle formed by posterolateral spine, gastric tubercle, and outer orbital margin 90° or nearly so. Chelipeds from 2.5 times to over 3 times as long as carapace; row of alternately large and small, triangular to lanceolate, outwardly directed spines along outer margin of manus. Major gonopod elongate, narrowing to truncate tip, heavily dentate and spinose laterally and ventrally, tip and outer face naked; gonopore with noticeable shelf-like projection above, giving opening semilunar aspect.

Description: Carapace rounded, nearly subcircular anteriorly, moderately depressed, about 1.2 to 1.3 times as wide as long (SCW:RCL) in adults; anterolateral margin of hepatic and branchial regions very convex, especially in larger individuals; long, flattened, acuminate or blunt spine, often foliate along lateral margin, directed obliquely posteriad at posterolateral angle; posterolateral margin oblique to slightly concave; posterior margin wide, rounded to angularly convex. Surface of carapace distinctly punctate, with roughened elevations on gastric, branchial, cardiac and intestinal regions; latter ornamented with single large, and several smaller, granulate tubercles, especially on midline and long crests of branchial ridges, with many low,

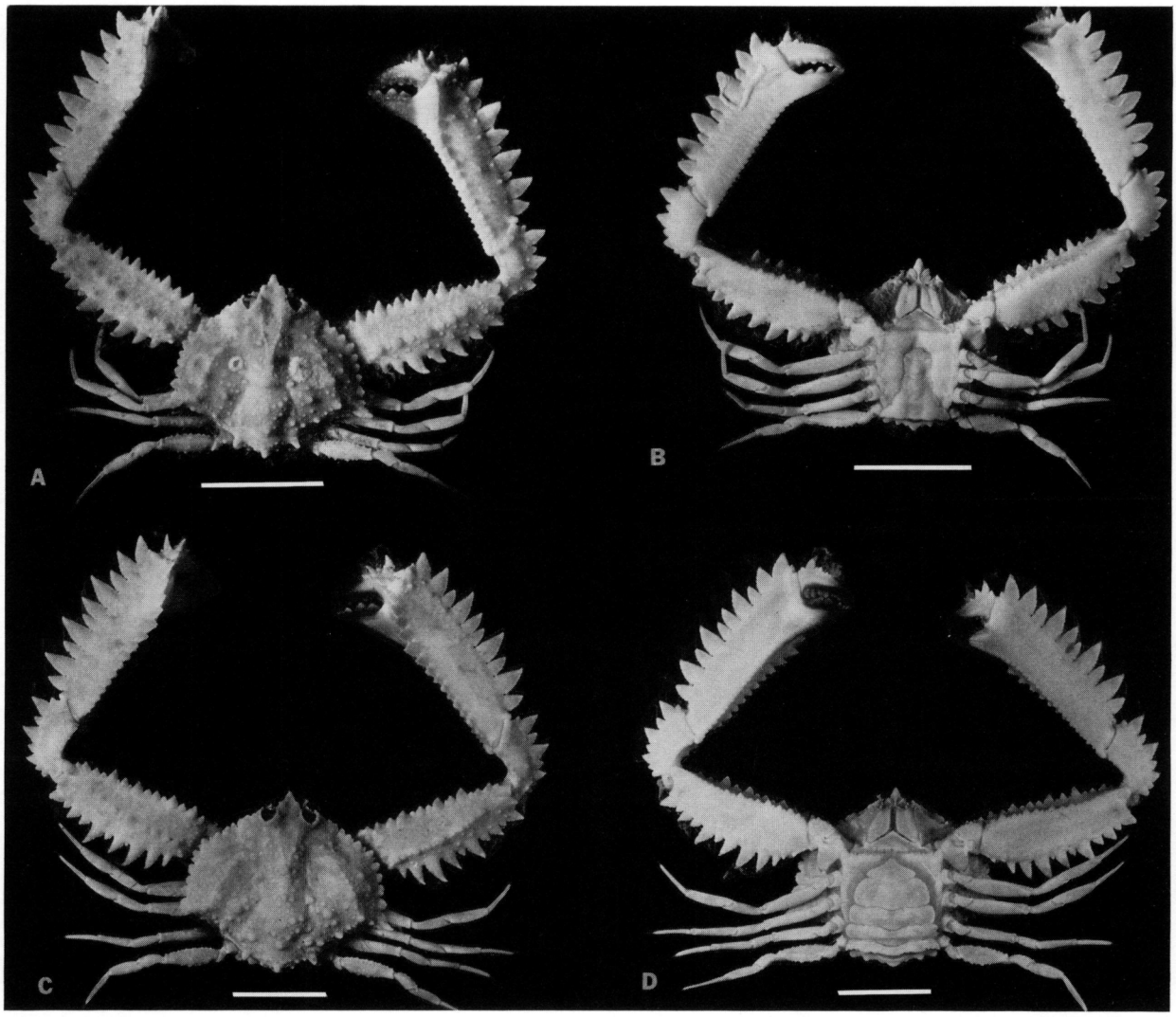

Figure 23. *Parthenope granulata* (Kingsley). A. male, off Sebastian Inlet, Florida east coast, dorsal view; B. same, ventral view; C. female, off Cape Canaveral, Florida east coast, dorsal view; D. same, ventral view. Scale lines = 10 mm. (After Gore, 1977).

less distinct tubercles and granules interspersed between. Angle formed by posterolateral spine, large gastric tuberculation, and outer orbital margin equaling 90° or nearly so. Gastric and branchial regions separated by deep depression; separations between hepatic and metabranchial regions less depressed. Rostrum short, tooth-like, bluntly rounded distally, faintly channeled, tridentate; lateral teeth well-developed; single, narrower tooth below and outside of each lateral tooth. Seven or eight (rarely up to ten) triangular, single,distinctly bifid, or multidentate teeth on branchial margin in advance of lateral spine; fourth or fifth tooth from orbit, on anterolateral angle, often larger than others; margins of teeth granulate in young, becoming dentate with maturity. Seven larger granulate tubercles on posterior and posterolateral margins; tubercles usually straight, directed more or less obliquely outward, but curved anteriorly in some individuals; longitudinal or oblique row of of smaller granules or tubercles extending anteriorly from each tooth-like tubercle in adults; row obsolete in subadults, sometimes absent in juveniles. Pterygostomian and subhepatic

regions excavated as channel extending to infero-exterior margin of orbit. Distinct sub-branchial spine present. Outer maxillipeds lightly granulate; inner margin bluntly dentate, especially in large specimens.

Chelipeds long, 2.5 to more than 3 times RCL, flattened, appearing triangular in cross-section. Hand with lower face glabrous, lower margin dentate; outer margin coarsely serrate, with nine or ten alternately large and small, acutely triangular or lanceolate teeth, directed outward or obliquely forward; teeth on inner margin of hand smaller, more numerous (15 or 16, often bifid or trifid), widely triangular, with crenulate margins; upper surface of manus with few low, scattered tubercles. Wrist smooth, outer margin sharply dentate, row of granules on inner margin, several larger granulose elevations dorsally. Arm with numerous bluntly triangular teeth anteriorly, about ten long, large, sharply conical teeth posteriorly, latter usually directed outward or curved toward wrist; upper surface of merus with longitudinal row of raised tubercles mesially, curving gently toward anterodistal angle; other more or less isolated tubercles scattered irregularly over meral surface. Walking legs smooth to moderately spinulose, especially meri of males and last pair of legs in both sexes; first pair of legs not reaching end of arm.

Abdomen of male with somites 3-5 fused, sixth usually with median spine or tubercle, rarely absent or obsolete. Female abdomen with distinctly raised, rounded, transverse carinae on somites 1-3. Gonopods and gonopores as illustrated (Figures 24 A-d, 25 A).

Type-locality: Tortugas, Florida; 9 fms (16 m); lectotype female by subsequent designation USNM 55696 (Gore, 1977).

Distribution: Bermuda; Cape Hatteras, North Carolina around peninsular Florida to off Louisiana in the northwestern Gulf of Mexico; Cuba?; St. Thomas, Virgin Islands; 7-73 m; to at least 677 m if R/V *Oregon* Station 635 data are not in error. Hourglass Stations B, C, D, J and K; 18-55 m.

East Pacific analogue: None.

Remarks: This species is morphologically similar to *Parthenope serrata*, which accounts for relegation of *P. granulata* to its synonymy for so many years. The importance of gonopod morphology studies in decapod crustaceans is further emphasized in the rediscovery of the validity of *P. granulata*, which differs most noticeably from *P. serrata* in gonopod structure; gonopore differences are also evident as can be seen in the accompanying illustrations (Figure 25). Indeed, had Williams (1965) not figured the gonopods which he attributed (erroneously as it turns out) to *P. serrata*, *P. granulata* might yet have gone undiscovered. It was only by purest serendipity that the specimen we chose for illustration of gonopod structure was one which differed noticeably from those illustrated by Williams, thus prompting further examination of our material, ultimately revealing the existence of *P. granulata*. In this regard it was interesting to note Verrill's (1908) comments on the differences between his *P. crenulata* [= *P. granulata*] from Bermuda and the somewhat stylized illustration of *P. serrata* provided by A. Milne Edwards (1878). Verrill was not the only one to notice differences between collected material and A. Milne Edwards' figures. Notes made by Leo Zehntner on a syntype of Saussure's *Lambrus crenulatus* indicated that Zehntner did not agree with A. Milne Edwards' synonymizing of Saussure's species with *P. serrata*. We have seen photographs of Saussure's syntype, a juvenile female, and the cheliped armature is noticeably different from that figured by A. Milne Edwards (1878) for *P. serrata*, and instead trends toward the armature seen in *P. granulata*. However, the carapace is unquestionably that of *P. serrata*. Part of Zehntner's confusion may also have arisen in comparing his

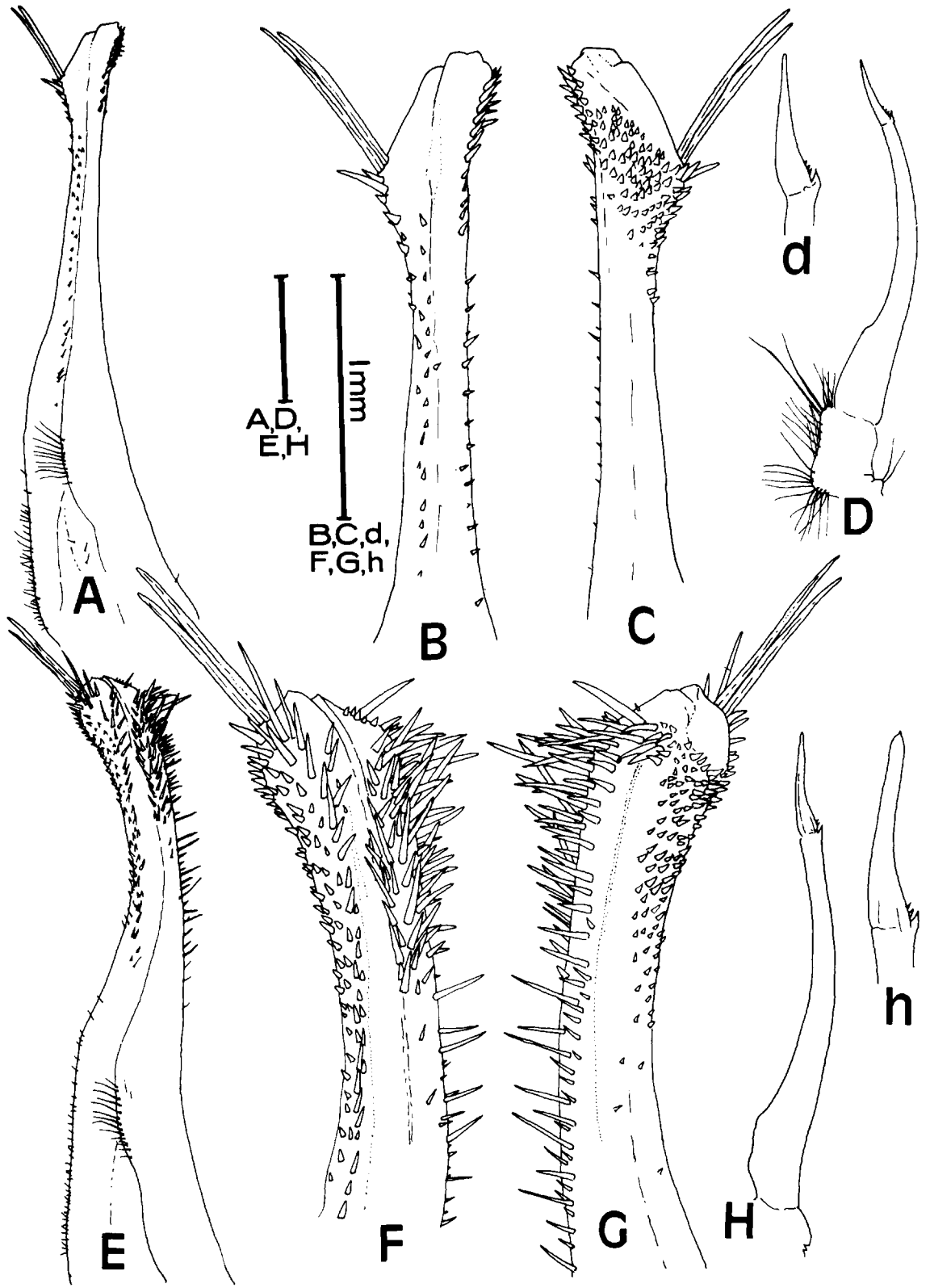

Figure 24. Major and minor gonopods (pleopods 1 and 2) of male *Parthenope. Parthenope granulata* (Kingsley), Atlantic specimen: A. SIFP 89:1537, major gonopod, medial view; B. same, detail of distal portion; C. same, ventral view, detail of distal portion; D. minor gonopod, mesiolateral view; d. same, detail of distal portion. *Parthenope serrata* (H. Milne Edwards), Gulf of Mexico specimen: E. MHNG, major gonopod, medial view; F. same, detail of distal portion; G. same, ventral view, detail of distal portion; H. minor gonopod, mesiolateral view; h. same, detail of distal portion. (After Gore, 1977).

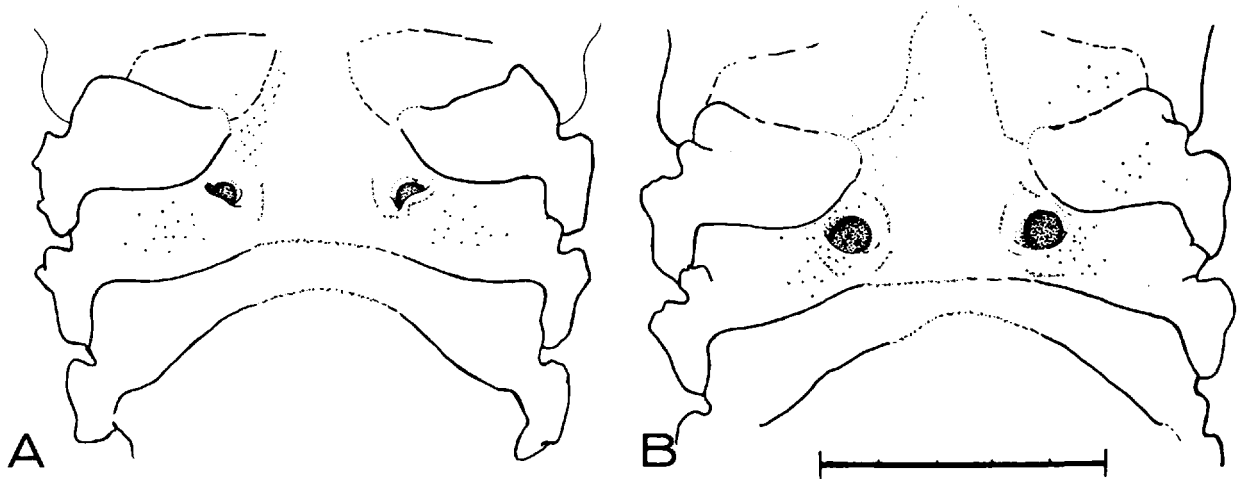

Figure 25. Gonopores of female *Parthenope*, Gulf of Mexico specimens. A. *Parthenope granulata* (Kingsley), SIFP 89:2912; B. *Parthenope serrata* (H. Milne Edwards), SIFP 89:2906. Scale line = 5 mm. (After Gore, 1977).

specimens to Saussure's figure of *L. crenulatus*. The illustration is most definitely that of *P. serrata*, and a larger, probably adult specimen as well, and bears little resemblance to the apparently sole surviving juvenile syntype. The latter specimen of *L. crenulatus* and the resultant taxonomic confusion have been considered at length in another paper (Gore, 1977).

Kingsley's (1879) *Lambrus granulatus* was established on a juvenile male, and a subsequently noted (Rathbun, 1925) female "cotype". The former specimen is apparently lost (H. Levi, in litt.) and the latter specimen, also a juvenile, has been designated as lectotype (Gore, 1977).

It is interesting that neither *P. granulata* nor its close relative, *P. serrata*, have eastern Pacific analogues, although *Parthenope depressiuscula* (Stimpson, 1871) is superficially similar morphologically.

It is possible that some Hourglass specimens discarded as "*P. serrata*" before we received the remaining material were actually *P. granulata*. The discarded material is listed in the account of *Parthenope incertae sedis*.

Parthenope serrata (H. Milne Edwards, 1834)

Figures 24 E-h, 25 B, 26

Lambrus serratus H. Milne Edwards, 1834, p. 357; Holthuis, 1959, p. 191. not *Lambrus serratus*: White, 1847, p. 12 [= *Lambrus hoplonotus* var. *granulosus* Miers, 1879].

Lambrus lupoides White, 1847, p. 12 [*nomen nudum*; specimen *c*, as restricted by Gore, 1977].

Lambrus crenulatus Saussure, 1858, p. 429 [13], pl. 1, fig. 4, 4a; Gundlach and Torralbas, 1899, pp. 301, text-fig. (33) p16, 303 [in reprint, 1917, p. 12, pl. [2], fig. 5].

Lambrus melanodactylus Desbonne, *in* Desbonne and Schramm, 1867, p. 21 [manuscript name].

Platylambrus serratus: A. Milne Edwards, 1878, p. 156, pl. 30, fig. 1-1c [lectotype (by subsequent designation by Gore, 1977) illustrated]; Rathbun, 1901, p. 80.

Lambrus (*Lambrus*) *serratus*: Young, 1900, pp. 102 [key], 105.

Parthenope (*Platylambrus*) *serrata*: Rathbun, 1919, p. 346; 1925, p. 516 [in part], pls. 180, 181, pl. 275, figs. 7-10 [after A. Milne Edwards, 1878; lectotype by subsequent designation]; Boone, 1930, p. 117 [in part, probably including pl. 36, figs. A, B]; Chace, 1956, p. 162 [in part, USNM specimens]; Bullis and Thompson, 1965, p. 13 [in part, *Oregon* stations and *Silver Bay* Sta. 71 only]; Leary, 1967, pp. 45 [unnumbered text-fig.], 50 [listed]; Yang, 1971, p. 166, figs. 1-9 [larval development]; Felder, 1973, p. 45 [key], pl. 6, fig. 8 [right chela]; Zeiller, 1974, p. 100, color plate; Gore, 1977, pp. 505*ff*, text-figs. 1E-h, 2B, pls. 1, 2 [*L. crenulatus* syntype], 3B [*L. lupoides*], 4A, B, 5A, B.

Lambrus (*Platylambrus*) *serratus*: Flipse, 1931, p. 93.

not *Parthenope* (*Platylambrus*) *serrata*: Williams, 1965, p. 267, text-figs. 247, 252B [= *P. granulata* (Kingsley, 1879)].

Material examined: HOURGLASS STATION A: 1 ♂, 16.7; 2 November 1967; dredge; MNHNP acc. no. 7676. — HOURGLASS STATION B: 1 ♂, 8.1; 1 August 1966; dredge; SIFP 89:2907. — 1 ♂, 8.3; 18 October 1966; dredge; SIFP 89:2905. — 1 ♀, crushed; 6 November 1966; trawl; USNM 156503. — 2 ♂, 15.8-17.7; 1 ♀, 15.6; 2 November 1967; dredge; SIFP 89:2509. — HOURGLASS STATION C: 2 ♀, (1 ovigerous, 15.9) 16.0; 8 November 1965; dredge; FSBC I 1134. — 1 ♀, 17.6, ovigerous; 3 December 1965; dredge; FSBC I 1367. — 1 ♀, 15.8, ovigerous; 13 December 1966; dredge; USNM 156504. — 1 juv., crushed; 5 February 1967; dredge; MNHNP acc. no. 7677. — 1 ♂, molt; 1 ♀, 7.4; 2 March 1967; trawl; USNM 156505. — 1 ♀, 17.4; 21 June 1967; dredge; SIFP 89:2511. — 1 ♀. 10.3; 21 November 1967; trawl; SIFP 89:2520. — HOURGLASS STATION D: 1 ♀, 13.3; 21 October 1965; trawl; FSBC I 981. — 1 juv., crushed; 6 February 1967; dredge; RNHL D 31410. — 2 ♀, 9.6, crushed; 21 May 1967; dredge; FSBC I 15091 (lost). — HOURGLASS STATION I: 2 ♀, 20.7-21.8, both ovigerous; 3 September 1965; trawl; FSBC I 865. — 1 ♂, 16.5; 2 ♀, 16.5-20.4; 5 August 1966; trawl; FSBC I 3680. — 1 ♀, crushed; 15 February 1967; dredge; RNHL D 31413. — 1 ♂, 19.9; 4 September 1967; dredge; RNHL D 31411. — 1 ♂, 18.1; 11 October 1967; dredge; USNM 156507. — 1 ♂, 21.1; 1 ♀, 22.1; 14 November 1967; dredge; MHNG. — HOURGLASS STATION J: 1 ♂, 15.5; 1 ♀, 19.3; 12 November 1965; trawl; FSBC I 1163. — 2 ♀, (1 ovigerous, 18.9) 16.6; 14 February 1966; trawl; FSBC I 1988. — 1 ♂, 17.8; 12 October 1966; trawl; RNHL D 31412. — 1 ♂, 19.4; 2 ♀, 19.3-19.8; 12 October 1966; dredge; UZMC 15.I.1977. — 1 ♂, 18.9; 12 November 1966; trawl; UZMC 15.I.1977. — 1 ♂, 19.8; 1 ♀, 19.4; 12 November 1966; dredge; MHNG. — 1 ♀, 17.7; 15 May 1967; dredge; SIFP 89:2906. — 1 ♀, 19.5; 11 October 1967; trawl; MNHNP acc. no. 7678. — 1 ♀, 18.8; 14 November 1967; trawl; USNM 156508. — HOURGLASS STATION K: 1 ♀, 17.0; 4 December 1966; trawl; USNM 156502. — 1 ♀, 10.3; 5 July 1967; trawl; USNM 156506. — HOURGLASS STATION L: 1 ♀, 20.5; 5 September 1966; dredge; FSBC I 4273. — 1 ♀, 7.3; 16 February 1967; dredge; MHNG. — EAST FLORIDA: JOIE DE VIVRE STATION: 1 ♂, 10.6; 11 July 1973; Capron Shoal, off Ft. Pierce, 10 m; Kirtley dredge; SIFP 89:0733.

Diagnosis: Carapace flattened, noticeably tuberculate and granulate, about 1.35 times wider than long; hepatic regions obliquely rounded, interrupting continuing arc of anterolateral region; long, large, usually acute spine at posterolateral angle, directed laterally; suborbital and subhepatic regions deeply and smoothly excavated; angle formed by posterolateral spine, gastric tubercle and outer orbital margin always much less than 90°. Chelipeds 2.5 to over 3 times as long as carapace; row of alternately large and small, acutely triangular spines along outer margin of manus, curved on posterior margins, with tips directed more or less toward fingers. Major gonopod bluntly truncate, club-shaped, heavily spinose and dentate over nearly entire tip distally; gonopore flattened against plane of sternum, rounded, exposed, without shelf-like projection.

Description: Carapace in general angularly rounded, subcircular, depressed, approximately 1.3-1.4 times as wide as long (SCW:RCL) in adults; anterolateral margin of hepatic region somewhat oblique, becoming

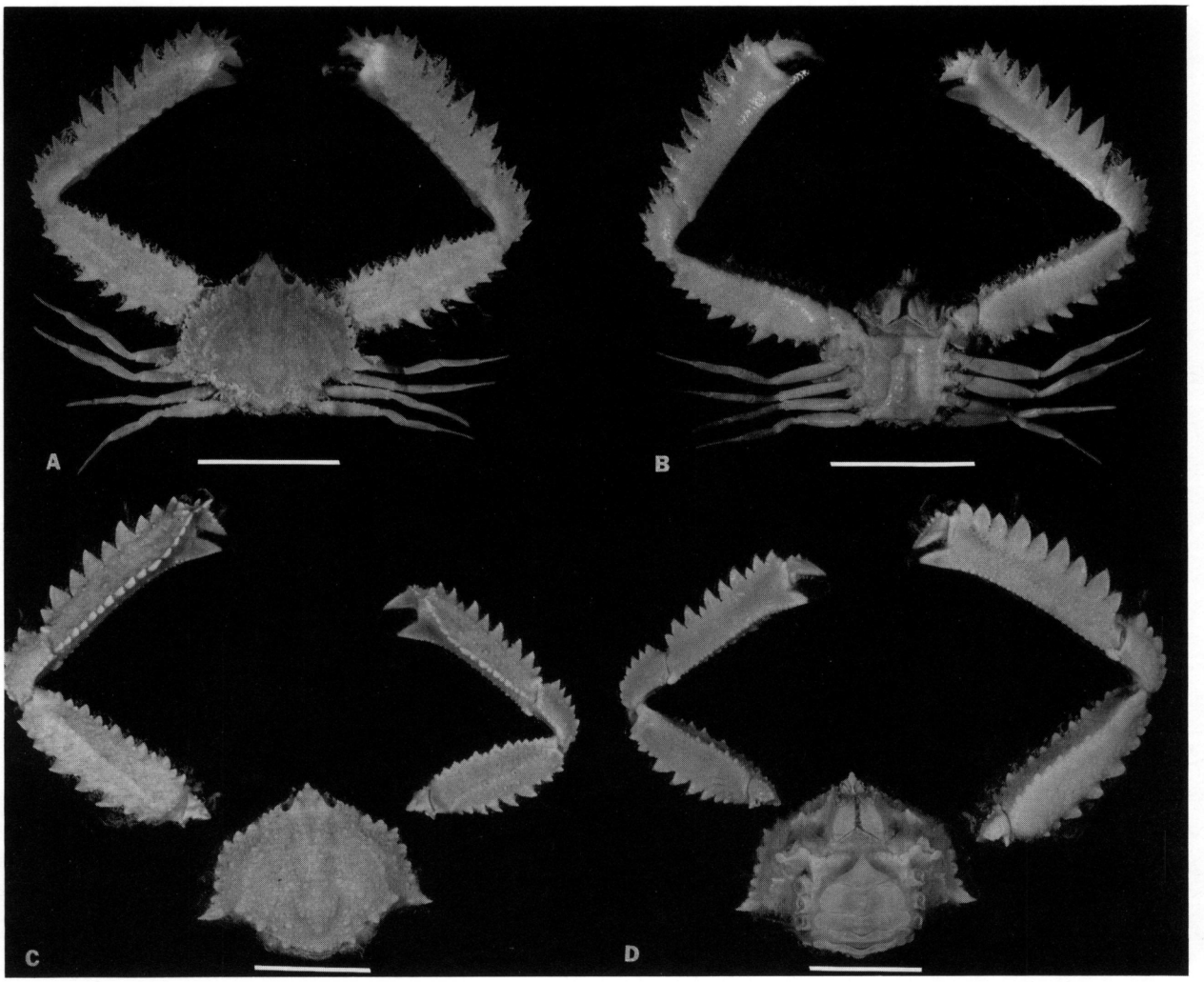

Figure 26. *Parthenope serrata* (H. Milne Edwards). A. male, off Honduras, Central America, dorsal view; B. same, ventral view; C. female, off Sanibel Island, Florida, dorsal view; D. same, ventral view. Scale lines = 10 mm. (After Gore, 1977).

convex at anterolateral angle, continuing as general curve around branchial region, especially in larger individuals; long, flattened, outward-pointing spine directed laterally at posterolateral angle before concave posterolateral margin; posterior margin wide, slightly convex. Surface of carapace punctate, sparsely to moderately pilose, with rough granulous elevations on gastric, branchial, cardiac and intestinal regions; each of latter bearing numerous, small, granulate tubercles clumped to form larger tuberculosities, surrounded by lower, less distinct granulations; those on branchial regions and midline of carapace most noticeable. Gastric and branchial regions separated by deep depression; depressions between hepatic and metabranchial regions shallower, often only slightly expressed. Rostrum short, produced into bluntly rounded, tubercle-like tooth, more widely expanded at tip in some, tridentate, often laterally dentate or granular in older individuals; smaller, narrower tooth below and outside of lateral tooth. Seven (up to ten) triangular, irregularly dentate teeth on branchial margin anterior to posterolateral spine; fourth or fifth tooth posteriad from orbit usually largest. Seven large tubercles on pilose posterior and posterolateral margins, often curved anteriorly, terminating in longitudinal or oblique line of smaller tubercles in adults; latter tubercles often obsolete or lacking in young, or indiscernible among profuse granulation in older individuals. Pterygostomian region

densely setose, with excavation extending to infero-exterior margin of orbit, forming covered afferent passages when chelipeds contracted against body; external aperture of passage visible between base of finger and margin of orbit. Sub-branchial spine present. Outer maxilliped usually lightly granulate, tuberculate to some degree in older specimens; inner margin bluntly dentate, especially in mature individuals.

Chelipeds long, 2.5 to over 3 times RCL, flattened, lower face smooth, outer margin coarsely serrate; manus with nine or ten alternately large and small acutely triangular teeth, rounded posteriorly, with tips directed forward slightly to moderately obliquely toward fingers; teeth on inner margin pilose, triangular, smaller, more numerous (15 or 16), granularly bifid or trifid; upper surface with few low, scattered tubercles; arm with longitudinal row of large, granular tubercles mesially, extending obliquely in straight line toward inner distal angle, several isolated single or double tubercles scattered over surface on either side of these; posterior margin with about nine or ten triangular, blunt teeth curved outward; all teeth on outer margin of cheliped with setae interspersed, more dense on posterior margin of arm. Walking legs smooth to moderately spinulose, first pair not reaching end of arm; anterior and posterior margins of meri variably granulate, more so on last pair.

Abdomen of male with somites 3-5 fused, sixth with median spine or tubercle; female abdomen with all somites free, with low, rounded transverse carinae on somites 1-3. Gonopods and gonopores as figured (Figures 24 E-h, 25 B).

Type-locality: Erroneously as "L'Océan indien"; restricted to Vera Cruz, Mexico, by subsequent designation of lectotype (Gore, 1977); lectotype in Muséum National d'Histoire Naturelle, Paris; MNHNP 4051. Two other specimens (MNHNP 629) without locality data, which may possibly be considered paralectotypes if and when collection data are rediscovered, are also in the Paris Museum.

Distribution: Bermuda; Ft. Pierce, Florida, around the Gulf of Mexico; Central America; Cuba; Lesser Antilles; islands off the northern coast of South America, southward to Bahia, Brazil; intertidally to 110 m. Hourglass Stations A, B, C, D, I, J, K and L; 6-55 m.

East Pacific analogue: None.

Remarks: The general shape of the carapace in young individuals is less circular and may be almost perfectly hexagonal. Branchial and posterolateral margins become more inflated with increasing maturity. Juvenile specimens are often nearly smooth dorsally, and the carapace is punctate instead of tuberculate; as in *P. granulata*, tuberculation increases with maturity, and in large adults, especially females, the dorsal surface is highly tuberculate and pustulose, although exhibiting a wider range of smaller granules, pustules, and tubercles than that seen in *P. granulata.*

Parthenope serrata may be distinguished from *P. granulata* by the laterally directed (instead of obliquely posteriad) posterolateral spine of the carapace, the more pilose carapace, and the angle formed by the posterolateral spine, gastric tubercle, and outer orbital margin which is always noticeably less than 90°, whereas it approaches closely or equals 90° in *P. granulata.* The anterior margin of the carapace in *P. serrata* is more or less obliquely straight, while in *P. granulata* it is more rounded. Teeth on the anterolateral and lateral margins appear slightly more produced in *P. serrata*, and the posterolateral tooth is usually longer, straighter, and more acuminate. Teeth on the manus are more noticeably triangular, never lanceolate, and almost invariably directed toward the fingers, especially the tips; their posterior margins are more convex and slanted than in *P. granulata.* The row of tubercles on the arm extends in an oblique straight line toward the

inner distal angle, while in *P. granulata* this row is curved. In many female specimens of *P. serrata*, the seventh abdominal somite is more acutely triangular, with a sharper tip and more concave margins than in *P. granulata*, but this feature often becomes quite subjective to interpret. The transverse abdominal carinae appear to be less developed in *P. serrata* than in *P. granulata*. Gonopods and gonopores, however, allow immediate distinction between the two species.

Color of *P. serrata* and *P. granulata* is quite similar to that noted by Rathbun (1925), but some individuals in both species appeared light brown, mottled with tan and white maculations overall, and with marginal teeth bordered in white. Eyes of juveniles were chestnut brown, those of adults bronze, in preservative. In many specimens of *P. serrata*, color of the fingers of chelipeds never was as dark, nor as completely diffused over the inner surface of the manus, as in *P. granulata,* but this feature assumes less value the longer specimens are preserved.

Because of our recognition of *P. granulata* among the Hourglass material, specimens identified earlier by FDNR researchers as *P. serrata* and since discarded may not all have been correctly identified. These specimens are not used in further analyses of either species but are listed as *Parthenope (Platylambrus) incertae sedis.*

Felder (1971, unpubl.) noted the occurrence of *P. serrata* in the gut contents of the red snapper, *Lutjanus campechanus* (Poey).

Parthenope incertae sedis

Lambrus crenulatus: Stimpson, 1860, p. 201; 1871a, p. 129; 1871b, p. 101 [discussion]; Von Martens, 1872, p. 85.

Platylambrus serratus: Kingsley, 1880, p. 390; A. Milne Edwards, 1880b, p. 5; Smith, 1886, p. 629 [25]; Rathbun, 1897, p. 12; 1898, p. 261 [in part, probably not Bahia Honda specimen (= *P. granulata*?)]; 1900, p. 514 [key]; A. Milne Edwards and Bouvier, 1923, p. 355; Balss, 1924, p. 181; Flipse, 1930, p. 86 [listed].

Lambrus serratus: Miers, 1886, pp. 94 [listed], 97; Ortmann, 1893, p. 415; Moreira, 1901, pp. 62, 129, 130 [synonymy]; Flipse, 1930, p. 84 [listed].

Parthenope (Platylambrus) serrata: Boone, 1927, p. 42; Rathbun, 1933, pp. 38 [key], 39; 1935, p. 114 [discussion]; Chace, 1956, p. 162 [in part, MHN LaSalle material only]; Righi, 1966, p. 140; Rodrigues da Costa, 1968, p. 143; 1969, p. 177 [abstract]; Türkay, 1968, p. 251; Coelho and Araújo Ramos, 1972, p. 205 [listed]; L. Pequegnat, 1975, p. 48 [listed].

Parthenope serrata: Hildebrand, 1955, p. 193; Wass, 1955, pp. 140 [key], 172; Hulings, 1961, p. 219 [listed]; Rouse, 1970, p. 146; Godcharles and Jaap, 1973, p. 48.

Discarded material: HOURGLASS STATION B: 2; 4 October 1965; dredge. — 2 ♂; 8 November 1965; trawl. — 1 ♂; 7 February 1966; trawl. — 1 ♂; 6 June 1966; dredge. — 1 ♀; 2 July 1966; trawl. — 1 ♂, 1 ♀; 10 July 1966; dredge. — HOURGLASS STATION C: 2; 3 August 1965; dredge. — 1 ♂, 1 ♀; 8 November 1965; trawl. — 1 ♂, 1 undet.; 6 June 1966; trawl. — 1 ♂; 18 June 1966; trawl. — 1 ♂; 18 June 1966; dredge. — 1 ♂, 1 ♀; 2 July 1966; dredge. — 2 ♀; 11 July 1966; dredge. — 1 ♂, 1 ♀; 1 August 1966; trawl. — 1 ♂, 1 ♀; 31 August 1966; trawl. — 1 ♂; 8 September1966; trawl. — 1 ♂; 8 October 1966; dredge. — HOURGLASS STATION D: 1 ♂; 4 January 1966; dredge. — 1 ♂, 3 ♀; 2 August 1966; trawl. — 1 ♀; 2 August 1966; dredge. — 1 ♂; 11 August 1966; dredge. — 1 ♂; 9 September 1966; dredge. — HOURGLASS STATION E: 1 ♀; 8 February 1966; dredge. — HOURGLASS STATION I: 1 ♂; 12 November 1965; dredge. — 1 ♂; 6 December 1965; dredge. — HOURGLASS STATION J: 3; 3 September 1965; dredge. — 1 ♀; 12 November 1965; dredge. — 1 ♂, 1 ♀; 6 December 1965; trawl. — 1 ♂, 6 December 1965; dredge. — 1 ♂,

1 ♀; 13 January 1966; trawl. — 1 ♂, 2 ♀; 13 January 1966; dredge. — 1 ♀ (ovigerous); 5 July 1966; dredge. — 1 ♀; 21 July 1966; trawl. — 1 ♂, 2 ♀ (1 ovigerous); 4 September 1966; dredge. — 1 ♂; 12 October 1966; trawl. — 1 ♂, 2 ♀; 12 October 1966; dredge. — HOURGLASS STATION K: 1; 6 August 1965; trawl. — 1 ♂; 7 December 1965; dredge. — 1 ♀ (ovigerous); 13 January 1966; trawl. — 1 ♂; 13 January 1966; dredge. — 1 ♂; 5 August 1966; trawl. — 1 ♂, 2 ♀; 5 August 1966; dredge. — 1 ♂, 1 ♀; 12 October 1966; trawl. — 1 ♂; 12 October 1966; dredge.

Remarks: Because of either lack of adequate descriptions or illustrations, specimens noted in the literature above cannot be safely assigned to either *Parthenope serrata* or *P. granulata*. In many cases (*e.g.*, Stimpson's material and perhaps von Martens'), the material has been destroyed. In still other instances, the material is so widely scattered that it is presently unfeasible to locate and examine it, although many of the specimens are undoubtedly still extant. It is hoped that future authors, working in the regions denoted by the above citations, will be able eventually to reduce this synonymy by examination of the respective material where such is still available.

Cheliped armature of the fossil species, *Parthenope* (*Platylambrus*) *charlottensis* Rathbun, 1935, from the southwestern Floridan Pliocene, Caloosahatchee marl, shows a closer relationship to *P.* (*P.*) *granulata*, and not to *P.* (*P*) *serrata* as Rathbun (1935) stated, based on her knowledge of the species at the time.

Seventy Hourglass specimens contained in 44 lots listed above were identified as *Parthenope serrata*, recorded, and discarded by Marine Research Laboratory personnel before we received the remaining specimens for examination, so actual species determinations cannot be made on this material. We know only that the specimens were either *P. serrata* or *P. granulata* but, because of uncertain identifications, the data cannot be used for analyses of either species. The lost specimen from Station E is particularly unfortunate, because neither species was otherwise noted to occur as deep as 73 m in the Hourglass study area.

Genus *Tutankhamen* Rathbun, 1925

Tutankhamen Rathbun, 1925, p. 530.

Tutankhamen cristatipes (A. Milne Edwards, 1880)

Mesorhoea cristatipes A. Milne Edwards, 1880a, p. 352, pl. 31A, fig. 6-6c; 1880b, p. 5; Young, 1900, p. 111; A. Milne Edwards and Bouvier, 1923, p. 359, pl. 10, fig. 3.

Lambrus cristatipes: Rathbun, 1898, p. 261 [listed].

Tutankhamen cristatipes: Rathbun, 1925, p. 530, pl. 277, figs. 3-5; Flipse, 1930, p. 90 [listed and synonymy].

Material examined: None.

Diagnosis: Carapace equilaterally subtriangular; rostrum large, deeply trilobed; lateral teeth of carapace small. Basal antennal article long, nearly or completely attaining orbital hiatus. Afferent channels of carapace deep, resembling *Mesorhoea* in aspect; channels differ markedly from those of *Mesorhoea* in being shorter, deeper, bordered above by laminar expansion of hepatic and anterior branchial margins; channels bordered below by parallel lamina with emargination near beginning of branchial regions; canals terminating in cul-de-sac behind orbit, opening on epistome by fissure between external angle of thin lamina forming anterior edge

of buccal cavity and promontory formed by infero-internal angle of orbit. Epistome spacious, very concave, separated by thin ridge and considerable distance from antennules. Maxilliped merus without antero-internal angle produced into point (as in *Mesorhoea*) or emarginated for insertion of palpus (as in *Parthenope*). (Modified from Rathbun, 1925).

Type-locality: St. Vincent, Lesser Antilles; type in Paris Museum (*fide* Rathbun, 1925), but not yet located in reorganized collections (J. Forest, personal communication).

Distribution: Pourtalès Plateau in Straits of Florida, and St. Vincent, Lesser Antilles; 124-200 fms (227-366 m).

Remarks: This exceedingly rare species seems to be known only from the male holotype and one other specimen, according to Rathbun (1925). It has not, to our knowledge, been reported again in the literature. The known depth range for *Tutankhamen cristatipes* may account in part for its rarity, as it implies that the species is an outer continental shelf and upper continental slope form. Consequently, it would not be expected to occur in the notably more shallow continental shelf waters sampled by R/V *Hernan Cortez* or R/V *Gosnold*. The species has not been listed in reports of collections made by R/V *Oregon*, R/V *Silver Bay*, R/V *Pelican*, and R/V *Combat* along the central and southern Florida coast (Springer and Bullis, 1956; Bullis and Thompson, 1965), nor in the extensive collections by R/V *Alaminos* in the deep waters of the Gulf of Mexico (W. Pequegnat, 1970).

DISCUSSION

Members of the family Parthenopidae, while not actually burrow-formers, are considered to be semi-burrowing, cryptic species, well-camouflaged to blend with the shell hash and rocky rubble substrate in which they live. They share with some members of the Oxystomata a carapace modified with grooves and ridges to allow respiratory water currents to be drawn over the gills while they lie nearly buried in the substratum. Both carapacial and functional morphology are undoubtedly protective adaptations to the open, exposed, rubble-covered benthos in which they live, an area which, on the continental shelf of the Indian River region of Florida's east coast, supports over 170 species of benthic, open-shelf fishes (Gilmore, unpublished), many of which are known predators of parthenopid crabs. Over five years of sampling in the adjacent estuarine waters of the Indian River lagoon, however, produced no parthenopid crabs, so it would appear that members of the family in this region may be classified as strictly marine. Faunal surveys on the west coast of Florida indicate similar stenohalinic requirements for various members of the family, usually with salinites above 28°/$_{00}$ prevailing. Records from Tampa Bay (Dragovich and Kelly, 1964), Florida Bay (Rouse, 1970), Alligator Harbor (Wass, 1955) and other areas all show that parthenopids may be collected nearshore, even off estuarine river mouths, but still in marine waters. Other records (Rathbun, 1925; Soto, 1972) show continental shelf distribution in totally marine waters.

COMPARISON OF DREDGE AND TRAWL COLLECTIONS

Dredging at Hourglass stations produced more specimens in all species of parthenopids (from 52% to

100% of all collected individuals in a species at all stations) than did trawling (from 48% to 0% of all collected individuals in a species at all stations) (Table 5). We noted similar results in R/V *Gosnold* collections with most specimens being taken by box or pipe dredge. This is hardly surprising because trawling with nets is usually intended to skim the benthos, and unless set incorrectly, most otter trawls do not "bite" deeply into the substratum. They consequently tend to sample fewer semi-burrowed organisms unless the latter are startled upward by a tickler chain. Parthenopid crabs are among the more lethargic decapod crustaceans, and it seems highly unlikely that they would startle at all. Smaller adult individuals and most juveniles would also tend to escape or be winnowed out through the relatively wider net mesh on an otter trawl, but would tend to be compacted in sediment dug by the heavier dredge.

COMPARISON OF DAY AND NIGHT COLLECTIONS

With the exception of *Parthenope agona* and *P. fraterculus*, there did not seem to be appreciable differences in the numbers of specimens collected during day compared with those taken during night sampling (Table 5). This result is, again, not unexpected because of the general cryptic nature of parthenopid species. We suspect that in general Floridan parthenopid crabs do not burrow during the day and emerge during the night; they simply burrow or move among the impedimentiae of their respective substrata and may therefore be collected at almost any given time, day or night.

The data for *P. agona* and *P. fraterculus* suggest that these two species may be more prevalent at night than during the day; both species were collected in large numbers, and the relative number of each species during these times was noticeably different. The two species are relatively large (up to RCL 18 mm), and could conceivably be more susceptible to predation if their large size was a hindrance to burrowing. Both crabs are noticeably spiny and tuberculate, and they probably rely on these attributes as a means of camouflage during the day (they bear a remarkable resemblance to eroded coralline pebbles), and as a defensive mechanism at night against predators (both carapace and chelipeds possess large, sharp spines). Unfortunately, day-night comparative collections were made only at Hourglass Stations B, C, and D, so there is little further support for these admittedly speculative suggestions.

Comparison of day-night sampling routines is not possible for the eastern Floridan species because the Rock Shrimp stations, which provided the majority of material, were carried out solely at night. However, R/V *Gosnold* stations were made around the clock on biological cruises and nearly equal numbers of individuals in a species were taken regardless of the time of day or night.

SPAWNING SEASONALITY

Seasonality in the Parthenopidae is difficult to determine because there are few records in the literature concerning presence or absence of ovigerous females. We have listed the more important of these in Table 6, along with numbers of ovigerous females from both the Hourglass material and collections made on the central eastern Florida coast that we have been able to examine. As can be seen, the only species which appears to breed throughout the year in Floridan waters is *Parthenope agona*, although *P. serrata*, *P. granulata*, *P. fraterculus*, *Heterocrypta granulata*, and *Solenolambrus tenellus* also exhibit extensive breeding seasons. Data are otherwise insufficient to allow more than generalized statements of seasonality, but it is intriguing to speculate on possible "staggered" breeding seasons between the Gulf of Mexico and Atlantic

TABLE 5. COMPARISON BY STATION OF DREDGE/TRAWL AND DAY/NIGHT COLLECTIONS OF HOURGLASS PARTHENOPID CRABS.

Species	Station / Depth (m)		A 6	B 18	C 37	D 55	E 73	I 6	J 18	K 37	L 55	M 73
Cryptopodia concava	Total:	48	--	--	6	13	7	--	--	1	17	4
	Night:	10		--	4	6						
	Day:	9		--	2	7						
	Dredge:	37										
	Trawl:	11										
Heterocrypta granulata	Total:	37	11	5	--	--	--	18	2	--	1?	--
	Night:	5		5	--	--						
	Day:	0		--	--	--						
	Dredge:	37										
	Trawl:	0										
Mesorhoea sexspinosa	Total:	6	--	4	--	--	--	--	1	1	--	--
	Night:	4		4	--	--						
	Day:	0		--	--	--						
	Dredge:	5										
	Trawl:	1										
*Parthenope agona**	Total:	584	1	--	2	161	306	--	2	6	45	61
	Night:	123		--	1	122						
	Day:	40		--	1	39						
	Dredge:	396										
	Trawl:	188										
Parthenope fraterculus	Total:	149	--	--	1	32	28	--	--	--	32	56
	Night:	28		--	--	28						
	Day:	5		--	1	4						
	Dredge:	125										
	Trawl:	24										
Parthenope granulata	Total:	64	--	9	19	9	--	--	4	23	--	--
	Night:	19		7	10	2						
	Day:	18		2	9	7						
	Dredge:	33										
	Trawl:	31										
Parthenope serrata	Total:	48	1	6	9	4	--	10	14	2	2	--
	Night:	11		4	6	1						
	Day:	8		2	3	3						
	Dredge:	28										
	Trawl:	20										
Solenolambrus tenellus	Total:	82	--	--	--	23	27	--	--	--	11	21
	Night:	14		--	--	14						
	Day:	9		--	--	9						
	Dredge:	77										
	Trawl:	5										

*Includes discarded material

TABLE 6. SEASONALITY OF OVIGEROUS PARTHENOPID CRABS BASED ON SPECIMENS EXAMINED AND PREVIOUS REPORTS.

Species	J	F	M	A	M	J	J	A	S	O	N	D	Collection
Cryptopodia concava	—	—	—	—	—	—	—	—	—	1	—	—	Gulf of Mexico
	—	—	—	—	—	—	—	—	—	—	—	1	Atlantic Ocean
Heterocrypta granulata	—	—	—	—	—	1	1	—	—	1	—	—	Gulf of Mexico
	—	—	1	1	—	W	W	W	—	—	—	—	Atlantic Ocean
Solenolambrus tenellus	—	—	—	—	—	—	—	4	9	1	2	—	Gulf of Mexico
	—	—	—	—	R	R	—	1(W)	—	—	—	—	Atlantic Ocean
Solenolambrus typicus	—	—	—	—	—	R	—	—	—	—	—	—	Gulf of Mexico
	P	—	—	—	—	—	P	—	—	—	—	—	Caribbean Sea
Solenolambrus decemspinosus	Known only from 2 male specimens (R)												Gulf of Mexico/Caribbean Sea
Mesorhoea sexspinosa	R	—	—	—	—	1	—	—	—	—	—	—	Gulf of Mexico
	—	—	—	—	—	—	—	—	—	—	—	—	Atlantic Ocean
Leiolambrus nitidus	—	—	—	—	—	—	—	—	—	—	—	—	Gulf of Mexico
	P	—	P	—	H	—	—	—	—	—	—	—	Caribbean Sea
Parthenope agona	6	—	2(R)	—	1	—	—	1	1	9+5D	11	3	Gulf of Mexico
	—	—	—	3	—	1	3	2	3(W)	—	—	—	Atlantic Ocean
Parthenope fraterculus	—	—	—	—	—	—	S	1	—	S	—	—	Gulf of Mexico
	—	—	—	—	1(R)	2	—	3(W)	1	—	—	2	Atlantic Ocean
Parthenope pourtalesii	—	—	—	—	—	—	P/C	—	—	—	—	—	Gulf of Mexico
	—	—	—	—	—	—	—	—	—	—	—	W	Atlantic Ocean
Parthenope granulata	1D?	—	—	2(S?)	—	—	1D?	—	1D?	5	2	—	Gulf of Mexico
	—	R?	1	—	—	W?	W?	W?	1	W?	—	—	Atlantic Ocean
Parthenope serrata	1D?	1	—	S?	—	—	1D?	—	2+1D?	—	1	2	Gulf of Mexico
	—	R?	Y	—	H	H;W?	W?	W?	—	W?	—	—	Atlantic Ocean

D = Hourglass discard; H = Holthuis, 1959; P = R/V *Pillsbury* collection; P/C = Pequegnat and Chace, 1970; R = Rathbun, 1925; S = Soto, 1972; W = Williams, 1965; Y = Yang, 1971; ? = in part, some material possibly misidentified

populations in the genus *Parthenope*. The majority of ovigerous females in *P. agona*, for example, occurred between October and January in the Gulf of Mexico, but were collected between April and September in the Atlantic. One possibility suggested by these data is that the Gulf of Mexico population tends to spawn during the subtropical dry season (from October-November through March), whereas the Atlantic population spawns during the concomitant wet season (April through September-October). Much more data are required, however, before further conclusions are warranted.

The remaining parthenopid species are little known. This may well be an artifact of collecting because very few specimens of *Cryptopodia concava* and *Mesorhoea sexspinosa*, for example, were taken during Hourglass, Rock Shrimp, or IRCZS cruises; the species are also poorly known in the literature. No ovigerous females of *Parthenope pourtalesii* occurred in any samples from these cruises, and the dearth of information on this species is also reflected in scanty literature records. Indeed, the seemingly paradoxical situation with *P. pourtalesii*, where no ovigerous females were taken during survey work on the central eastern Florida coast, and the total absence of the species from the extensive Hourglass collections in the eastern Gulf of Mexico, merely points up the need for further investigations in this regard because the species itself was otherwise relatively common.

LARVAL DEVELOPMENT IN WESTERN ATLANTIC PARTHENOPIDAE

The larval development of Western Atlantic species in the family is almost completely unknown. Yang (1971) summarized the knowledge and provided data on *Parthenope serrata*, describing six zoeal stages, one megalopa, and the first crab stage. Development required 30 days at 25 °C and 45 days at 20 °C. He also discussed first zoeal stages of *P. agona* and *Solenolambrus tenellus*. Yang noted that larval characters observed in species he reared suggested closer relationships to the Brachyrhyncha than to the Oxyrhyncha, the group to which the Parthenopidae has been traditionally assigned. Further studies are clearly needed in this aspect (see Thiriot, 1973, for review).

STOMACH CONTENT ANALYSES

Floridan parthenopid crabs may be classified as omnivores, and probably benthic-directed detritivores to some degree, if presence of large amounts of sediment particles in gut contents are indicative (Table 7). Most material in stomachs we examined was nearly completely macerated, suggesting both efficient mouthparts (especially mandibles) and an effective gastric mill. The function of sediment particles (sand, shell sherds) in food maceration in the gut remains an interesting but as yet unanswered question. Except for easily identifiable items, such as diatom frustules, foraminiferan shells, and spicules from sponges and holothurians (both usually quite distinctive), the remainder of the gut material could only be classified into very general categories, although a wide and varied diet of benthic related organisms and sediments is apparent. The ingested food items appear to be commensurate with the general substratum in which the crabs live. Our observations at sea on freshly trawled shell hash, for example, showed that this substratum is often covered with a variety of animal and plant life, both macroscopic and microscopic. Larger shell fragments (*e.g.*, *Argopecten gibbus*, *Dinocardium robustum*, *Chione latilirata*) often supported colonies of algae, polychaete worm tubes, encrusting bryozoans, barnacles, and other members of a generalized fouling assemblage. These probably form a diversified diet for the parthenopid crabs living among the shell hash on the nearshore continental shelf. Those crabs found on silty sand or sandy mud substrata presumably feed on either infauna

TABLE 7. FREQUENCY OF OCCURRENCE OF FOOD ITEMS BASED ON STOMACH CONTENT ANALYSES.

Species	Stations Examined*	Size Range (RCL mm)	Stomach Contents**													
			A	SF	D	F	SS	CF	PS	M	CS	HS	US	UT	SP	TS
Cryptopodia concava	C, D, E, L	3.1-7.4	--	--	3	1	--	--	1	--	2	--	--	5	5	5
Heterocrypta granulata	A, I, L	5.0-8.1	--	--	1	1	2	--	2	--	2	--	--	3	3	3
Mesorhoea sexspinosa	B	5.0	--	--	--	--	1	--	1	--	1	--	--	1	1	1
Parthenope agona	C, D, E, L, M	5.3-15.5	4	1	14	9	11	1	9	5	14	3	2	20	20	20
Parthenope fraterculus	C, D, E, L, M	5.0-16.3	--	--	5	4	8	--	6	2	10	--	--	15	11	15
Parthenope granulata	B, C, D, K	15.5-21.9	--	--	6	2	4	1	2	1	1	1	--	6	6	6
Parthenope serrata	A, I, J, L	7.3-19.9	--	--	3	2	5	--	3	--	4	--	--	5	5	5
Solenolambrus tenellus	D, E, L, M	3.3-4.0	2	--	7	2	1	--	5	--	5	--	5	8	8	8

*Does not necessarily include all stations at which a species was collected

** A = Algae
SF = Seagrass Fragments
D = Diatoms
F = Foraminiferans
SS = Sponge Spicules
CF = Coral Fragments
PS = Polychaete Setae and Fragments
M = Mollusca
CS = Crustacean Setae and Fragments
HS = Holothurian Spicules
US = Unidentified Setae
UT = Unidentifiable Animal Tissue
SP = Sediment Particles
TS = Total Specimens Examined

or attached or slow-moving epifauna in their respective habitats. Whether obligate or facultative predation is involved, or simply scavenging, could not be ascertained from the relatively amorphous masses of material in the gut contents, but none of these possibilities can be completely excluded.

ZOOGEOGRAPHICAL DISTRIBUTION

The widespread distribution of members of the family Parthenopidae in the western North Atlantic and Gulf of Mexico-Caribbean Sea regions, and to a lesser extent along the northeastern coast of South America, precludes the easy categorization of the species into any zoogeographical level other than "province" (Table 8). Six species, for example, could be considered members of the Caribbean faunal province, in which distribution occurs primarily along the continental margins of the Caribbean Sea, and lower Gulf of Mexico (Briggs, 1974), or in some cases, along continent-like islands such as Cuba or Jamaica (Darlington, 1957). Eleven species occur in the warm temperate Carolinian faunal province, although two of these (*Parthenope serrata* and *Solenolambrus decemspinosus*) are known only from their records off northwestern Florida. Two species (*Heterocrypta granulata* and *Parthenope pourtalesii*) are recorded into the cold temperate Virginian province above Cape Hatteras. Eight species have ranges extending southward along the northern and eastern coasts of South America into the Guianian, Brazilian, and Paùlistan provinces (Coelho and Araújo Ramos, 1972); however, these subdivisions may eventually prove to be too finely divided. These areas are all delimited continentally, the first by the states of Amapá, Pará, and part of Maranhão; the second from south of the vicinity of Ilha de São Luis, Maranhão, to the state of Espiritu Santo; the third from Espiritu Santo to the state of Santa Catarina, all in Brazil. All these provinces are tropical and subtropical in their decapod crustacean faunal affinities.

Species with primarily insular distribution (*e.g.*, *Solenolambrus*) may be classified as members of the West Indian faunal province (Briggs, 1974). Insular records are relatively fewer in number, but if they merely reflect less numerous collections, as we suspect they do in some cases, then most of the species in this report may eventually have to be classified simply as members of the Western Atlantic Warm Water Region. This region would include all of the previously named provinces, and several other subcategories of various authors.

Certainly none of the species in this report can be thought of as strictly tropical, or even subtropical, as a glance at the accompanying maps (Figures 27-32) will show. Latitudinally, the parthenopid crabs appear to be best classified as eurythermic tropical species (Briggs, 1974), and include those forms able to withstand some winter temperatures along warm and cold temperate coastlines. A good example would be *Heterocrypta granulata*, known from Nantucket Sound to Bahia, Brazil. The respective depth distributions of many of the species, however, imply a relationship more with warm temperate than cold temperate decapod crustaceans, if temperature tolerances are an important factor in their distribution (but see Abele, 1972; Coelho and Araújo Ramos, 1972).

Species of *Parthenope* treated herein as distributed primarily along continental margins of North America and Mexico, but records for *P. agona*, *P. fraterculus*, *P. pourtalesii* and *P. serrata* are also known from various islands in the Greater and Lesser Antilles. Absence of the genus along the lower coast of Central America is probably a collecting artifact because several related species of *Parthenope* are found along the northern coast of South America (Coelho and Araújo Ramos, 1972; Righi, 1966; Rodrigues da Costa, 1959, 1961, 1968, 1969), and to Brazil (Figures 27-29).

A partially exclusionary distribution between *Parthenope serrata* and *P. granulata* was noted. The

TABLE 8. DISTRIBUTION DATA FOR SPECIES OF FLORIDAN PARTHENOPIDAE.

Species	Locations* AA	BB	CC	DD	EE	FF	GG	HH	II	JJ	KK	LL
Cryptopodia concava	X			X	X	X	X	X	X	X		
Heterocrypta granulata	X	X			X		X	X	X	X	X	
Leiolambrus nitidus	X	X	X		X				X			
Mesorhoea sexspinosa	X				X		X	X	X	X		
Parthenope agona	X	X		X	X		X	X	X	X		
Parthenope fraterculus	X		X	X			X	X	X	X		
Parthenope pourtalesii				X	X		X	X	X	X	X	
Parthenope granulata				X	X?		X	X	X	X		X
Parthenope serrata	X	X	X		X	X	X	X	X	X		X
Solenolambrus decemspinosus					X			X				
Solenolambrus tenellus				X	X	X	X	X	X	X		
Solenolambrus typicus	X	X		X	X	X	X	X	X	X		
Tutankhamen cristatipes				X			X					

*AA = Surinam and Brazil
BB = Trinidad; north coast of South America, including Dutch West Indies
CC = Panama, Central America, Yucatan, Mexico
DD = Lesser Antilles
EE = Cuba, Hispanola, Puerto Rico, Virgin Islands
FF = Bahamas
GG = Central and southeastern Florida and Keys, including Tortugas
HH = Southwest Florida to Tampa Bay and Clearwater
II = Northwest Florida; north Gulf of Mexico to Texas
JJ = Georgia, North Carolina and South Carolina
KK = Virginia to Massachusetts (Boreal)
LL = Bermuda

former species extends from Brazil northward through the Caribbean Sea (predominantly but not exclusively along continental margins), into the western Gulf of Mexico and eastward around the southern tip of the Floridan peninsula. *Parthenope granulata*, on the other hand, appears to exhibit an extended Carolinian distribution (warm temperate/subtropical) from the vicinity of Cape Hatteras southward to the Indian River region on the eastern Florida coast, around peninsular Florida and northward to Louisiana (Figure 29). There is a single record from St. Thomas, Virgin Islands (Aurivillius, 1889) and a questionable record from the north coast of Cuba (Gore, 1977). Unlike *P. serrata*, which seems to have an extended tropical distribution, *P. granulata* does not appear to occur elsewhere in the Caribbean Sea. Both species, however, are known from Bermuda. The two are sympatric predominantly along the western and southern Florida continental

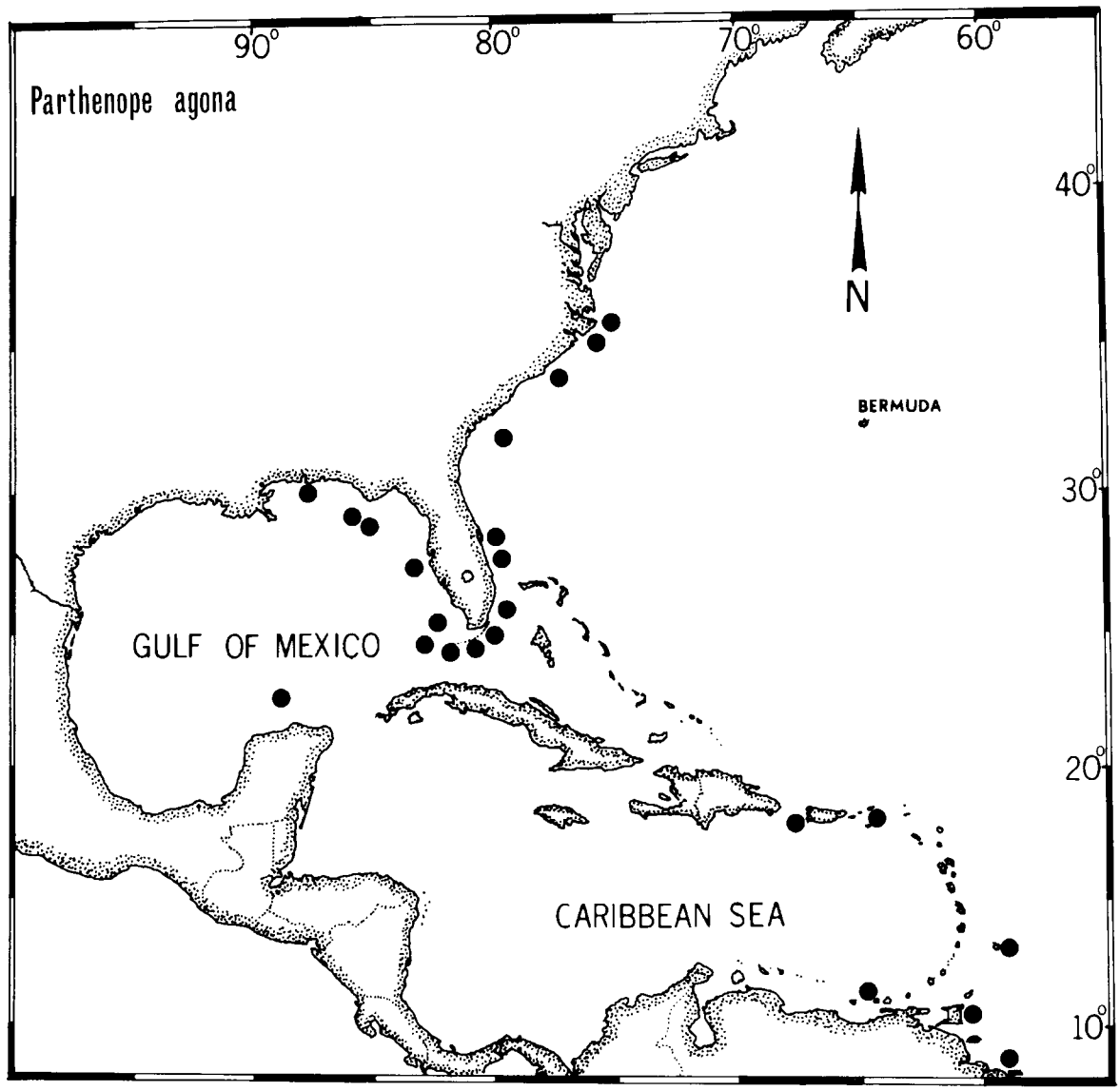

Figure 27. Distribution of *Parthenope agona* in the northwestern Atlantic and Gulf of Mexico.

shelves. Either species may be defined as a continental form, at least in the northern part of their respective ranges in Florida and may be catagorized as belonging in part to the Caribbean faunal province. The insular distribution of *P. serrata* and its presence along northern and eastern South America show that it must also be included in the West Indian, Guianian, Brazilian, and Paulistan provinces (Coelho and Araújo Ramos, 1972; Briggs, 1974).

The genera *Mesorhoea*, *Cryptopodia*, *Leiolambrus*, and *Heterocrypta* are also primarily limited to continental waters with some insular records. Species in these genera occur on continental margins of the North and Central American coasts, with several records from the coastal areas of northeastern South America and Brazil (Figures 30, 31). Again, collections of the lower Central American coast have not yet been examined, and the distributional picture will undoubtedly be modified when they are.

Little can be said for *Tutankhamen cristatipes*, presently known from only two specimens, and with a

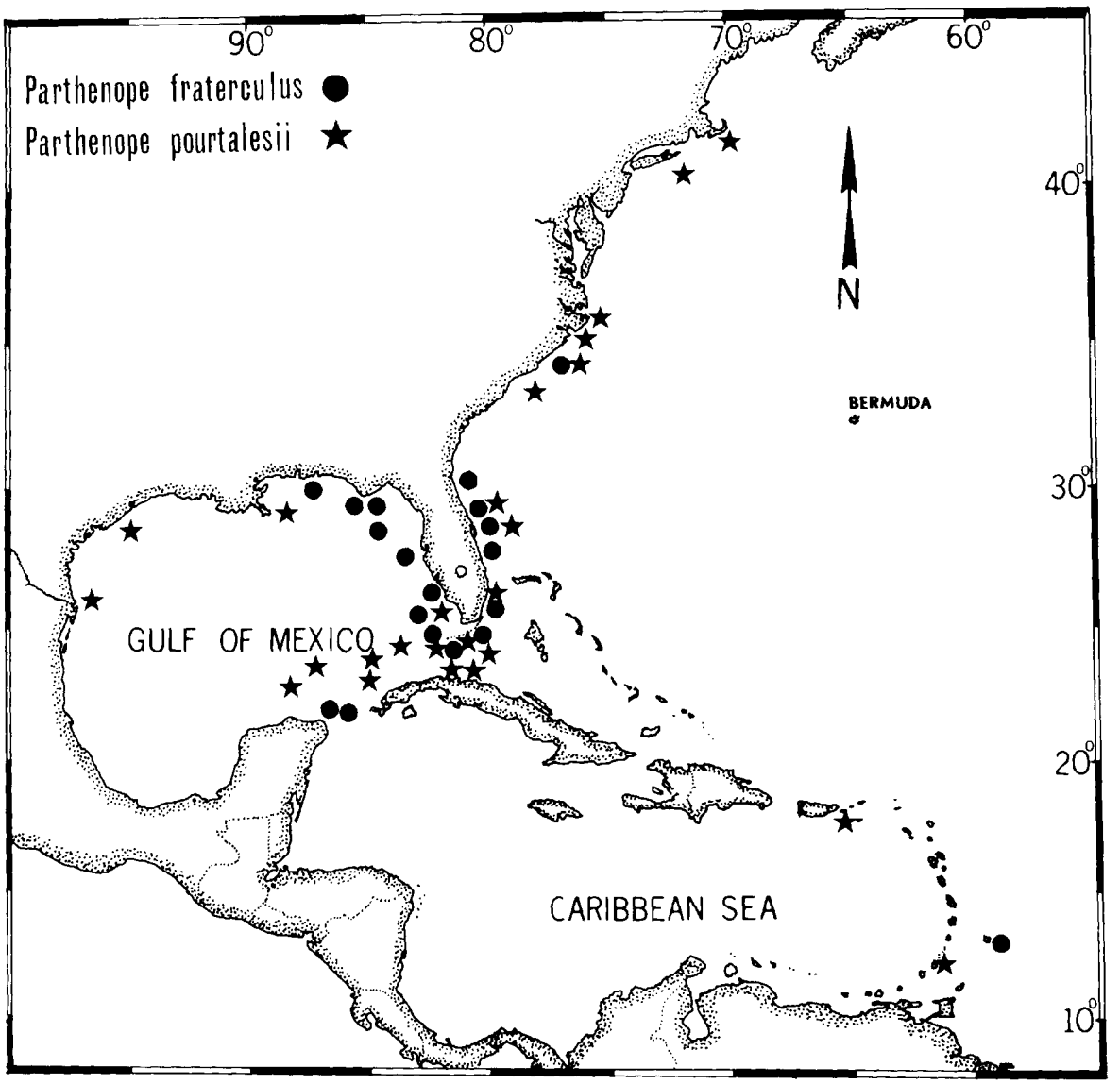

Figure 28. Distributions of *Parthenope fraterculus* and *P. pourtalesii* in the northwestern Atlantic and Gulf of Mexico.

distribution restricted, in Floridan waters, to the deeper continental shelf and upper slope of the Pourtalès Plateau. The only other record is from 227 m off St. Vincent, Lesser Antilles (Rathbun, 1925).

In the western Atlantic, the genus *Solenolambrus* appears to have its major distribution along the Antillean chain and in the deeper waters off Cuba and the Straits of Florida (Figure 32). The insular distribution of *Solenolambrus typicus* and *S. tenellus*, and the records from along the Central and North American continental margins, including Texas, the Floridan peninsula, and northward to the Carolinas, imply a great thermal tolerance. The general depth range of both species (see below) also suggests that deeper and cooler waters pose no problems to the adults. The northern limit of both species at Cape Hatteras and vicinity possibly reflects a thermal barrier to further larval dispersal along the Gulf Stream. The Cape Hatteras-Cape Fear area is a notable barrier to many decapod crustaceans with tropical affinities (Williams, 1965).

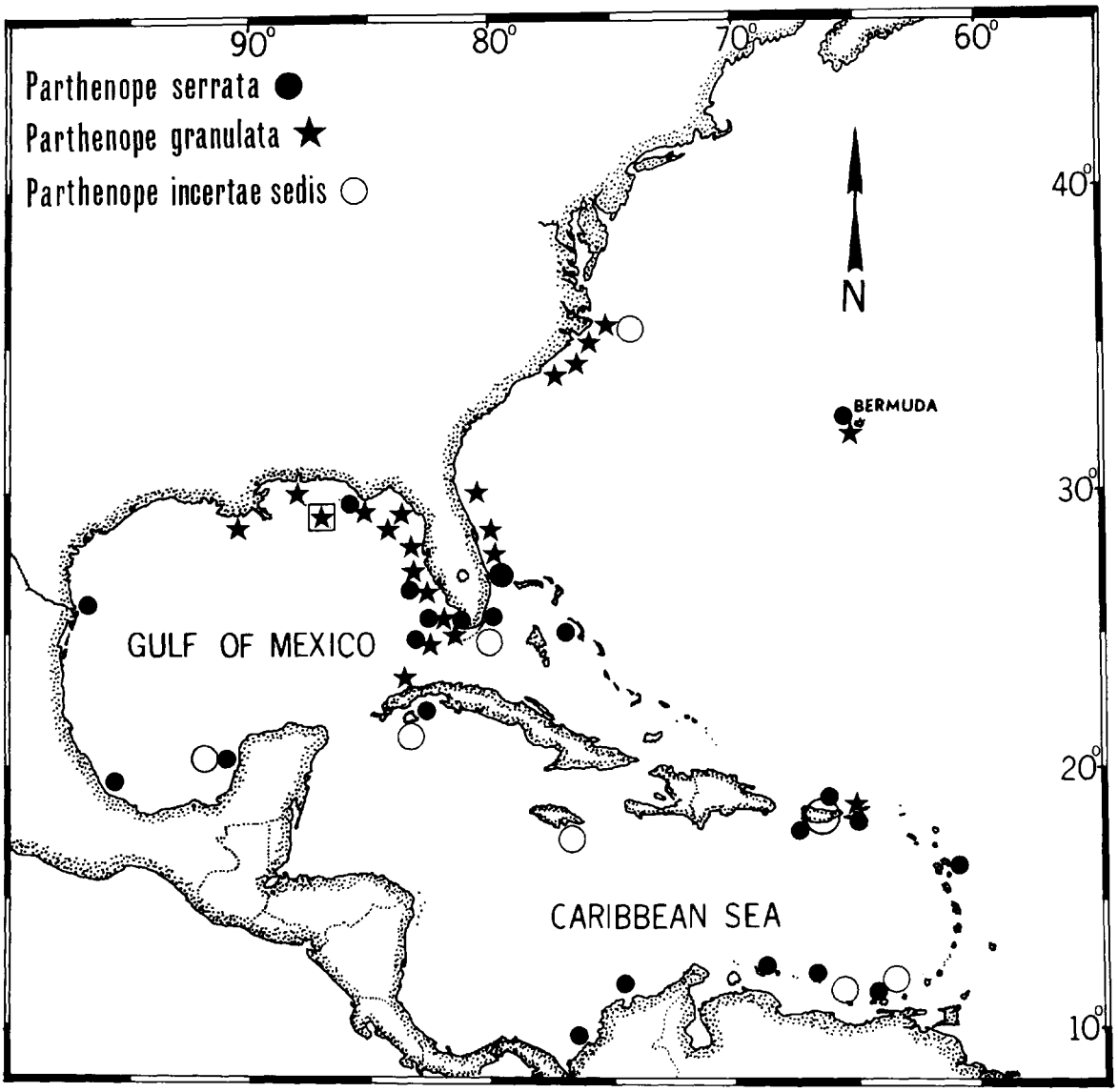

Figure 29. Distributions of *Parthenope serrata* and *P. granulata* in the northwestern Atlantic and Gulf of Mexico, including literature records not positively attributable to either species (*P. incertae sedis*); box denotes record for both species at same station.

BATHYMETRIC DISTRIBUTION

The depth distribution of Floridan parthenopids appears to reflect, in part, the zoogeographical distribution noted for the species in other areas of the Western Atlantic. Most of the species occur from nearshore, subtidal waters to the deep continental shelf, or in relatively shallow depths associated with continental or continental-associated islands throughout the Caribbean Sea. Only *Parthenope serrata* occurs intertidally (Rathbun, 1919).

In seven species, the general depth distribution is to waters less than 200 m deep (Figure 33); the remaining six species have more extensive ranges. *Parthenope agona*, *P. granulata*, *P. pourtalesii*,

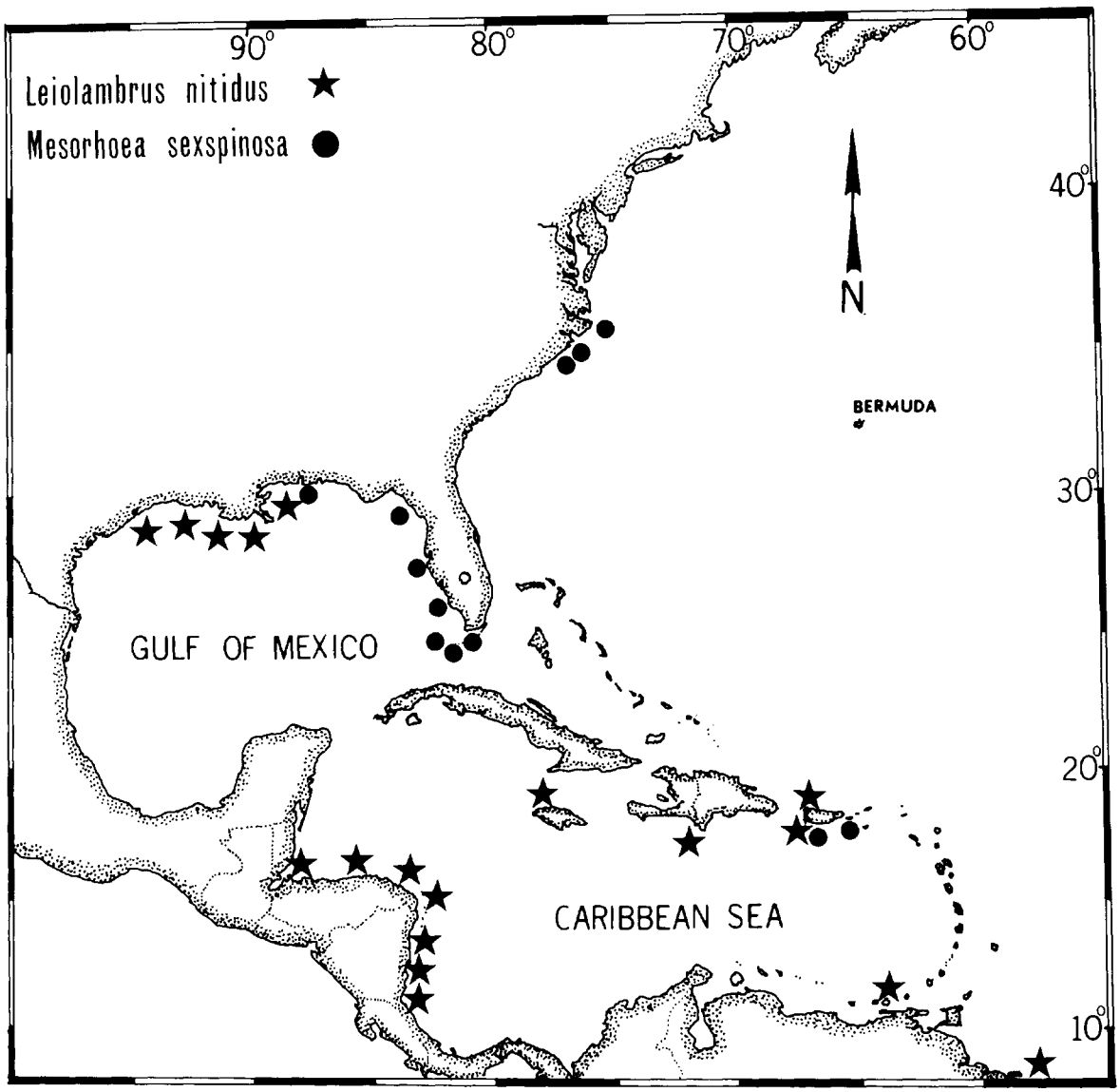

Figure 30. Distributions of *Leiolambrus nitidus* and *Mesorhoea sexspinosa* in the northwestern Atlantic and Gulf of Mexico.

Solenolambrus tenellus, *S. typicus* and *Tutankhamen cristatipes* are all known to depths greater than 300 m, and, in two instances (*P. granulata* and *S. typicus*), to over 600 m depth.

Although all species of *Parthenope* in this report are continental shelf forms, three species noted above occasionally exceed this area and can be collected on continental or island slopes. There seems to be no question as to the validity of depth records for *P. agona* and *P. pourtalesii*, but the remarkable depth range of *P. granulata* deserves some comment. Because the majority of records list this species in water less than 100 m deep, the R/V *Oregon* record is quite aberrant. Lyons and Camp (personal communication) offered two possible explanations. One is that station numbers were inadvertantly transposed, and the specimen may have been collected at R/V *Oregon* Station 634, made one day earlier using the same gear type (40 ft otter trawl) in about 40 m depth, but was erroneously listed as coming from Station 635, made the following day in 677 m depth. Another alternative is that the net may have been inadequately cleaned after Station 634, and, when brought on deck at Station 635, produced the "found" specimen of *P. granulata* which actually was

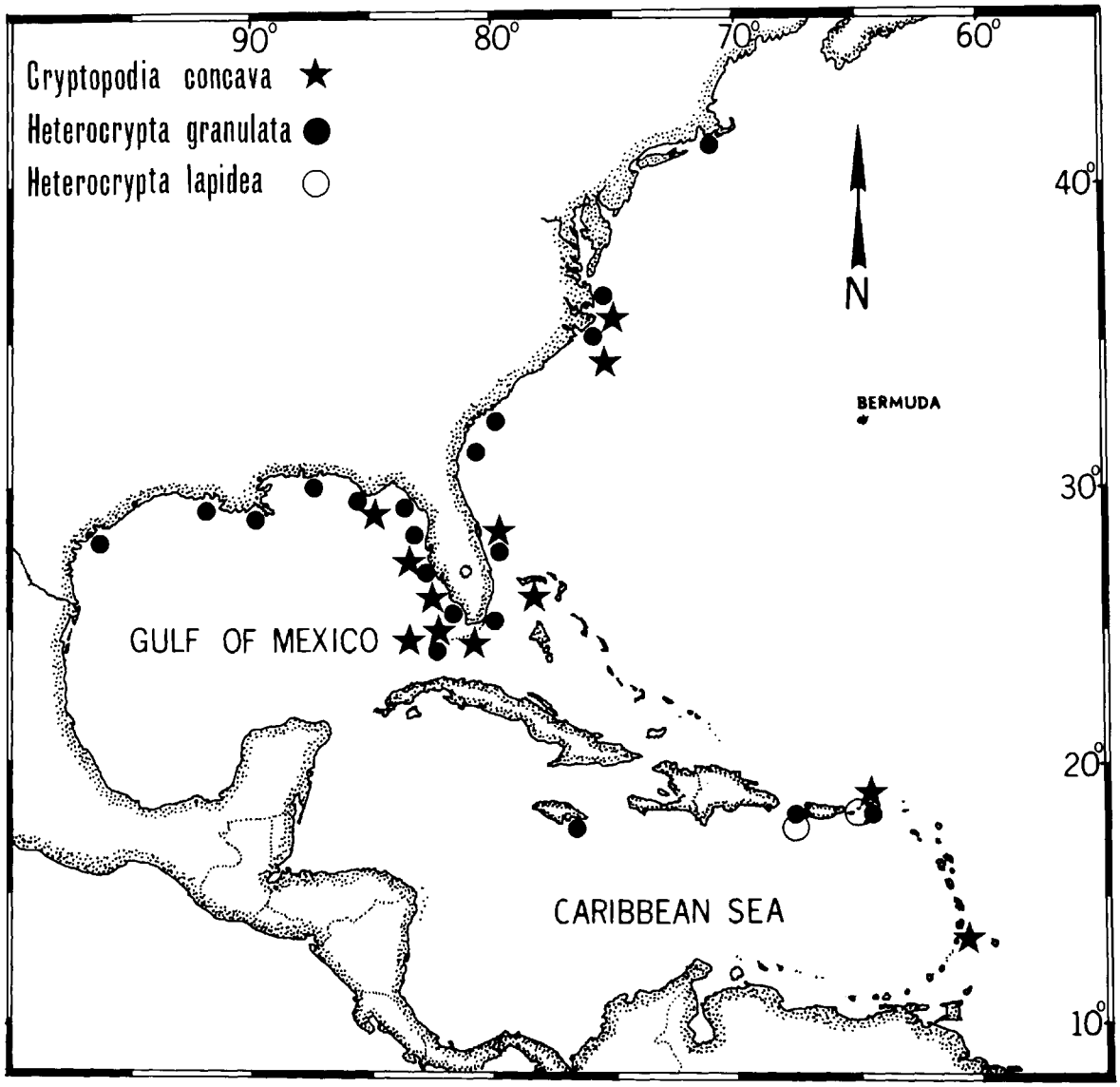

Figure 31. Distributions of *Cryptopodia concava, Heterocrypta granulata*, and *H. lapidea* in the northwestern Atlantic and Gulf of Mexico.

collected the previous day. The deep record should rightfully be viewed with some suspicion, but also weighed against the possibility that *P. granulata* may occur to 600+ m depths on rare occasions.

Three other depth records deserve comment. Rathbun (1925) recorded *Parthenope pourtalesii* from a *Fish Hawk* station at 10 fms (18 m), an uncharacteristically shallow (but not improbable) depth. However, the species has also been collected at Sand Key (Rathbun, 1898) in 15 fms (27 m), and the minimum depth of the type localities on the Florida Keys reef tract was 40 fms (73 m).

A second unusually shallow record is that of Rathbun (1925) for Henderson's specimen of *Parthenope fraterculus* from 4 fms (7 m). The species is usually not found in waters less than 25 m deep, although on one occasion a specimen was dredged in 18 m on the eastern Florida continental shelf by R/V *Gosnold*. Henderson's specimen from off the Tortugas, an area well known for the numerous shallow water collections

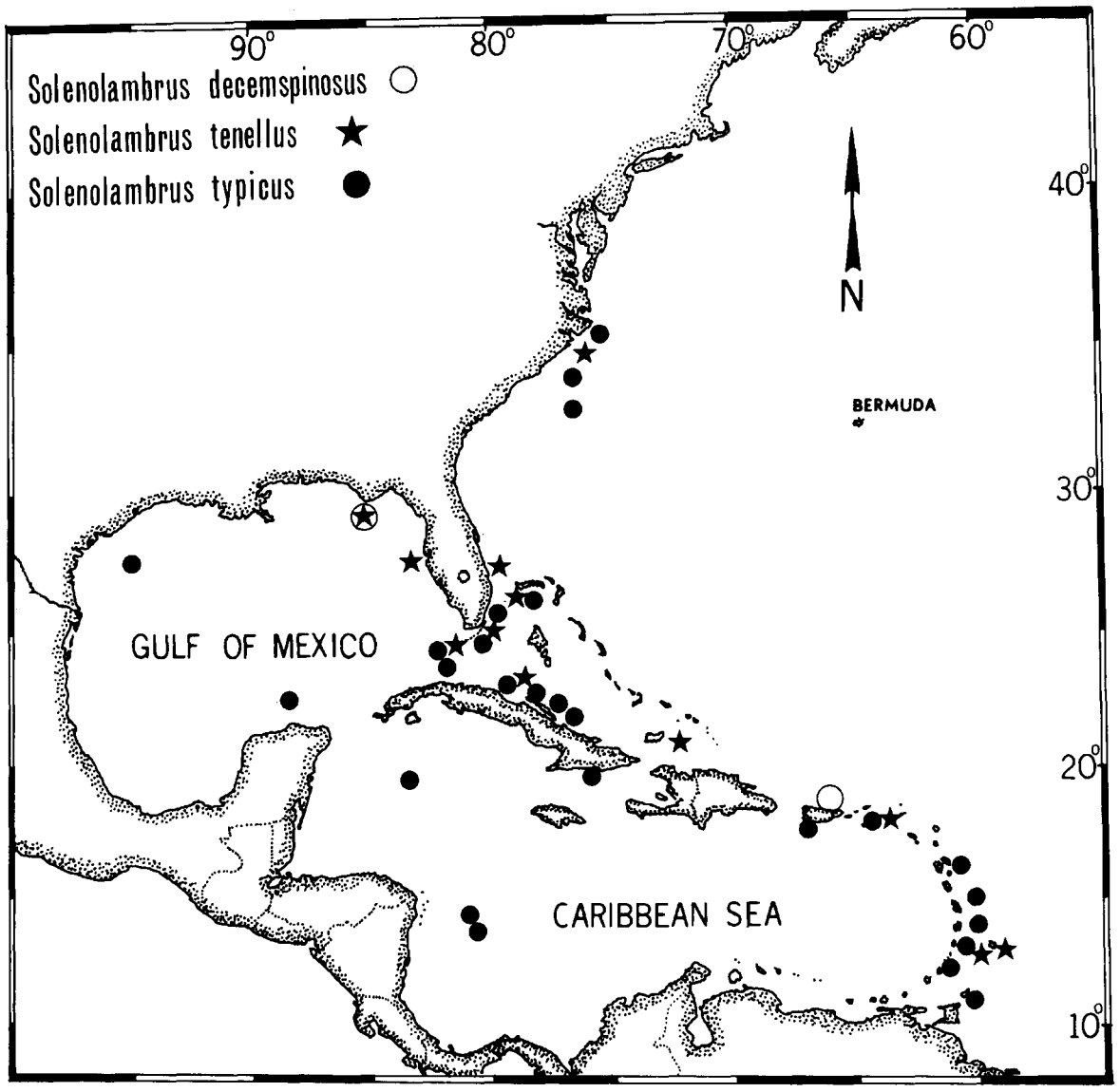

Figure 32. Distributions of *Solenolambrus decemspinosus*, *S. tenellus*, and *S. typicus* in the northwestern Atlantic and Gulf of Mexico.

made there, indicates that the species can occasionally be found in the shallow subtidal region.

Rathbun's (1925) record of *Heterocrypta granulata* from 75 fms (137 m) may be an error for 7.5 fms (14 m). This species is not otherwise known to occur in depths greater than about 50 m. The record, while not impossible, should probably be viewed with suspicion until corroborated by other material.

In the Hourglass study area, both intraspecific and interspecific relationships with particular depth zones were apparent among the eight parthenopid species. Analyses of these relationships included the following qualifications. Thirty-eight Hourglass lots containing 136 specimens of *Parthenope agona* were recorded and discarded by FDNR Marine Research Laboratory personnel. Ten lots containing 46 specimens collected during the same period were retained at the Marine Research Laboratory. We reexamined these and found them to be correctly identified. Results of analyses of relative abundance, both inter- and intraspecific,

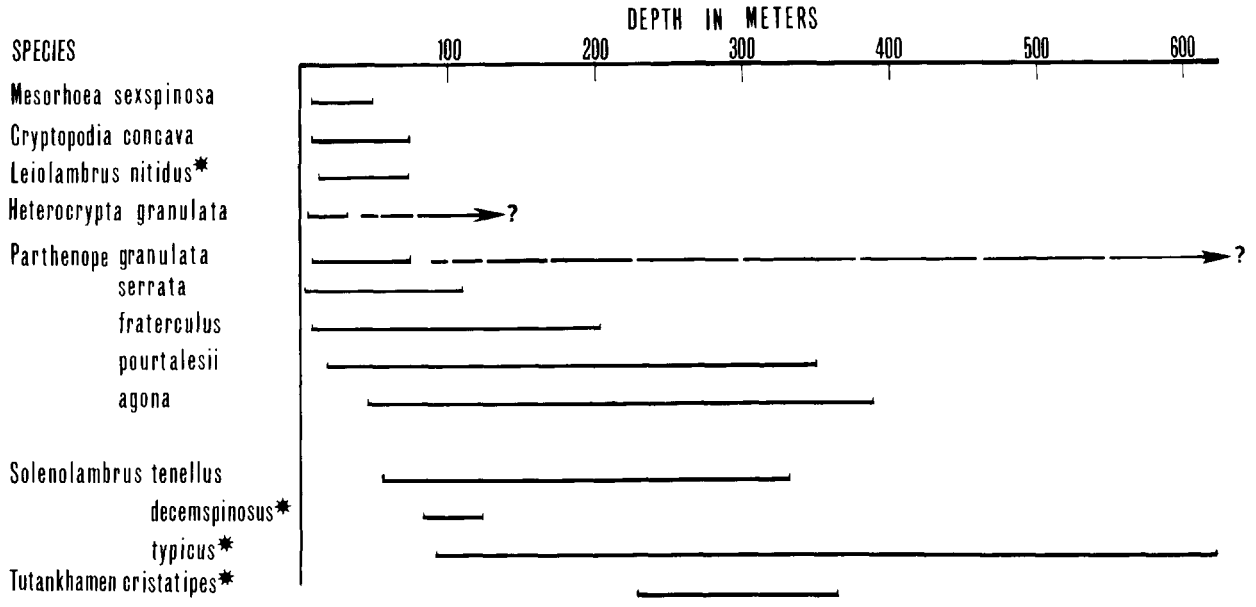

Figure 33. Depth distributions of Floridan Parthenopidae. Species marked with an asterisk (*) not collected by R/V *Hernan Cortez* or R/V *Gosnold*. Questionable ranges (?) discussed in text.

would possibly be more accurate by including both these reexamined specimens and others which had been previously discarded. However, the possibility, albeit remote, remains that some discarded specimens may have been misidentified. Additionally, all such analyses of *P. granulata* and *P. serrata* were based only upon retained specimens examined by us, because actual identity of specimens discarded as "*P. serrata*" could not be made. Therefore, analyses of relative abundance took two forms: 1) relative dominance of eight species by depth (Figure 34), excluding the discarded specimens; 2) intraspecific relative abundance (Appendix Figure 1) and interspecific relative dominance (Appendix Figure 2), including discarded *P. agona* and a separate category (*Parthenope incertae sedis*) for discarded "*P. serrata*". We are responsible for the former, whereas the latter was graciously performed by Marine Research Laboratory personnel. A discussion of the former analysis follows; the latter is provided in Appendix I.

Eight species collected during the Hourglass project were ranked according to the percent relative abundance of extant specimens of each species at a given depth (Figure 34). Hourglass Stations A/I, B/J, C/K, D/L, and E/M were made in about 6, 18, 37, 55, and 73 m respectively (Joyce and Williams, 1969).

The shallowest stations (A/I, 6 m) were dominated by two species, *Heterocrypta granulata* and *Parthenope serrata*. Occurence of *Parthenope agona* was based on a single molted carapace. The shallowest depth at which this species was collected at other Hourglass stations and by R/V *Gosnold* on the eastern Florida coast was at least 37 m.

At Stations B/J (18 m) two species again were dominant. *Parthenope serrata* was most abundant, followed by its sympatric congener, *P. granulata*. *Heterocrypta granulata* assumed decreasing importance at these depths, while *Mesorhoea sexspinosa* attained its greatest abundance there.

At the intermediate depth stations (C/K, 37 m) *P. granulata* reached its greatest relative abundance. These stations showed increasing species richness (six species). *Parthenope fraterculus*, *P. agona*, and *Cryptopodia concava* exhibited increasing importance. *Parthenope serrata* remained about as numerous as

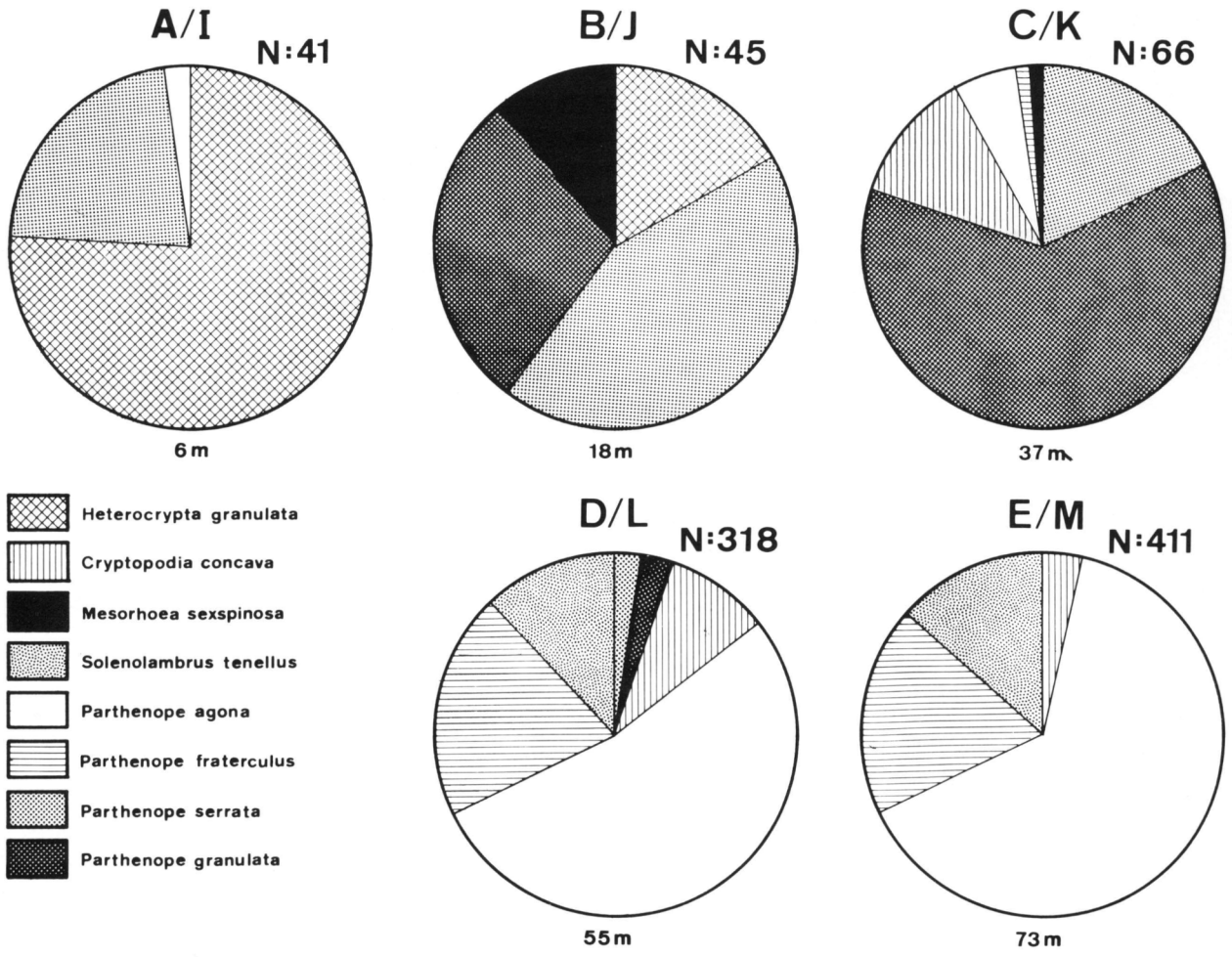

Figure 34. Relative dominance by depth of species of Hourglass Parthenopidae, based on extant specimens.

the latter three species, but *Mesorhoea sexspinosa* was almost eliminated at these depths.

The deeper stations (D/L, 55 m) were also species rich (six species), but with elimination of *M. sexspinosa* and decreased importance of both *P. granulata* and *P. serrata*, the deep water species *Solenolambrus tenellus* first made its appearance. *Parthenope agona* became numerically dominant and remained so.

At the deepest Hourglass stations (E/M, 73 m) *P. agona* was by far the most abundant species, followed by *P. fraterculus* which assumed increasing importance since its first appearance at the intermediate stations (C/K). Only four species were recorded from the deepest stations. Three of these (*P. agona*, *P. fraterculus*, and *S. tenellus*) are all deeper water species known to occur to depths greater than 200+ m. The fourth species, *C. concava*, reaches its greatest recorded depth (73 m) at the Gulf of Mexico Hourglass stations noted here.

The relative abundances by depth are in good agreement with the depth distributions recorded in the literature, and those noted for eastern Floridan species (Figure 33). Two important species not represented in Hourglass collections (*Parthenope pourtalesii* and *Solenolambrus typicus*) both occur down the continental

slope to depths greater than 300 and 600 m, respectively. Data in Figure 33 suggest that *P. pourtalesii* has depth requirements similar to *P. agona*, although the latter is known from slightly deeper waters than the former. *Solenolambrus typicus* is probably the only species which will occur at depths greater than 400 m (excluding the previously dicussed *P. granulata*). The paradoxical absence of *P. pourtalesii* has been discussed earlier, whereas *S. typicus* would not be expected to occur in Hourglass collections, because its shallowest recorded depth is 91 m, well beyond that sampled by R/V *Hernan Cortez* during this study.

Leiolambrus nitidus appears to be bathymetrically similar to *Cryptopodia concava* and *Mesorhoea sexspinosa*, but all three species are relatively rare in collections, so little more can be said regarding them.

Tutankhamen cristatipes is far too rare to allow any speculation, as is *Solenolambrus decemspinosus*. It is worth noting that if the latter species is merely a juvenile of *S. typicus*, then the shallow depth range of that species would be extended only a little, from 91 to 82 m.

TRANSPANAMANIAN RELATIONS AMONG SPECIES

Before the Panamanian-Central American land bridge became permanent, approximately 2-5 million years B.P. (Woodring, 1966), both the Atlantic and Pacific Oceans were interconnected, and so, presumably, were many if not all populations of marine organisms in this area. By the Miocene, and certainly by the Pliocene, the emergence of the land bridge was complete, thus splitting the formerly continuous marine biota into two separate populations which continued to evolve independently. The Panamanian-Central American land bridge presently continues to act as a barrier to marine organisms, producing consequent geographical isolation and preventing genetic exchange between the species. Approximately 45% of the species of decapod crustaceans once common to the Tertiary Caribbean Province have since sufficiently diverged morphologically, physiologically or ontogenetically to be considered separate but similar species called twin, geminate, cognate, or analogous. Abele (1976) provides further treatment and discussion on this subject, and points out the unique study opportunities this geological/biological situation has presented.

Seven of the 13 species (54%) treated herein have analogous species in the Eastern Pacific Ocean. Of the remaining six which do not, one (*Solenolambrus decemspinosus*) may ultimately prove to be only a juvenile of *S. tenellus*; a second (*Tutankhamen cristatipes*) is monotypic and known only from a very restricted range off Florida and St. Vincent, Lesser Antilles; and two (*Parthenope granulata* and *P. serrata*) are most closely related to each other.

Solenolambrus tenellus lacks, as yet, an Eastern Pacific analogue. The species is distinctly different in carapace form and gonopod structure from its closest Atlantic relative, *S. typicus* (Figures 9, 10). The latter species, however, is very similar in carapace and gonopod morphology to its Panamic geminate, *S. arcuatus* (see Garth, 1958).

The close relationship between *Parthenope granulata* and *P. serrata*, now separated easily by gonopod and gonopore morphology, has been discussed at length earlier. Although the Eastern Pacific species *Parthenope* (*Platylambrus*) *depressiuscula* (Stimpson, 1871) appears somewhat similar in carapace morphology to both *P. granulata* and *P. serrata*, the gonopods, as figured by Garth (1958), show little resemblance to those of either of the latter two species. Indeed, the gonopod most similar in form to either species is that figured by Garth (1958) for *Parthenope* (*Pseudolambrus*) *triangula* (Stimpson, 1860), which resembles somewhat that seen in *P. serrata* but not that of *P. granulata*. *Parthenope triangula* is otherwise not

comparable in carapace morphology to *P.* (*Platylambrus*) *serrata*, as evidenced by the different subgenera into which each has been assigned.

Parthenope fraterculus superficially resembles at least two Eastern Pacific species, *P. excavata* (Stimpson, 1871) and *P. stimpsoni* Garth, 1958, but, based on carapace morphology and gonopod structure and armature, it appears to be only distantly related to *P. excavata*; it is even less closely related to *P. stimpsoni*. The two Eastern Pacific species are closely related to each other, however, and were separated by Garth on the basis of differences in gonopod structure. They reflect the situation previously described for *P. granulata-P. serrata* herein.

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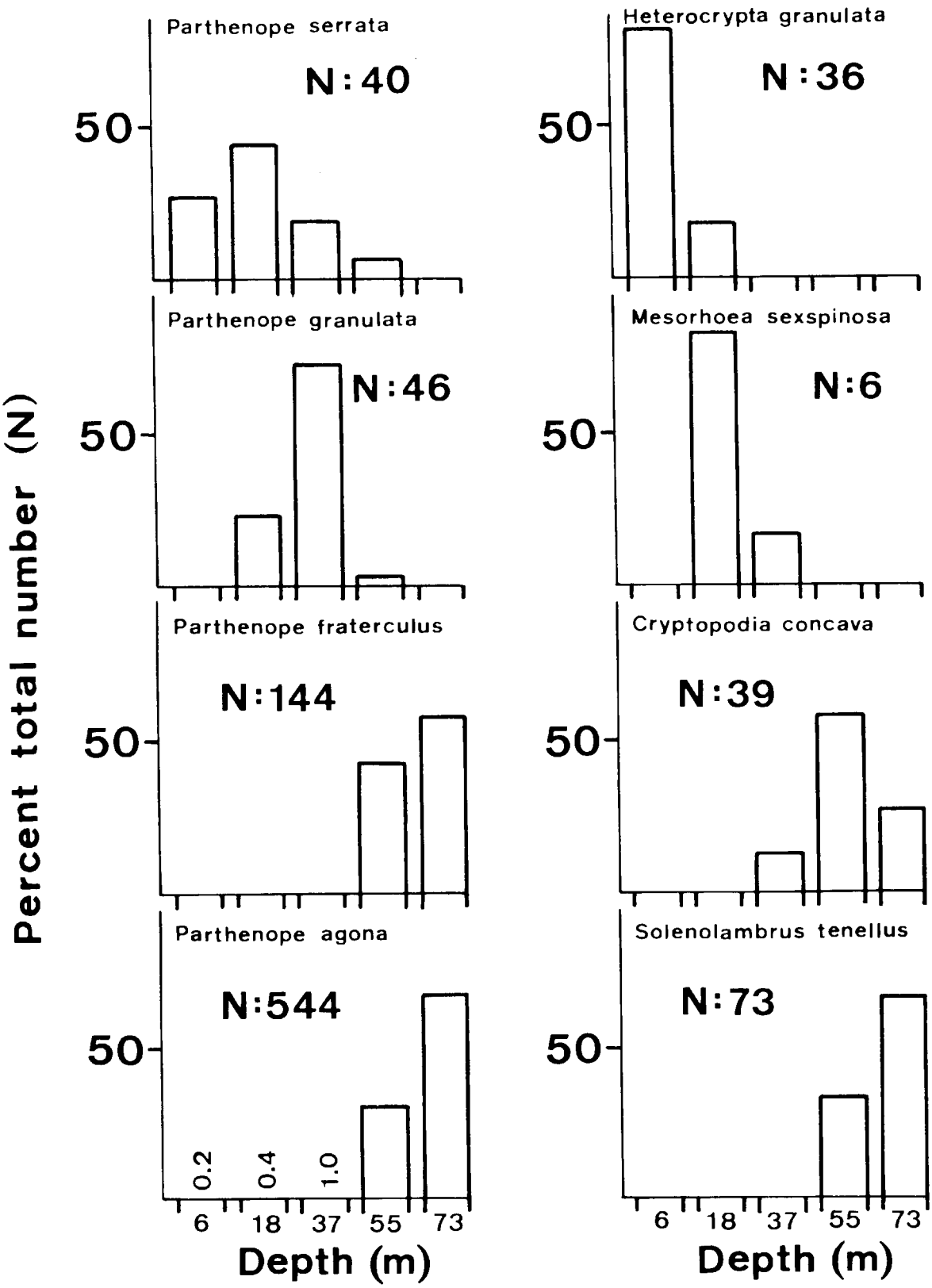
APPENDIX I

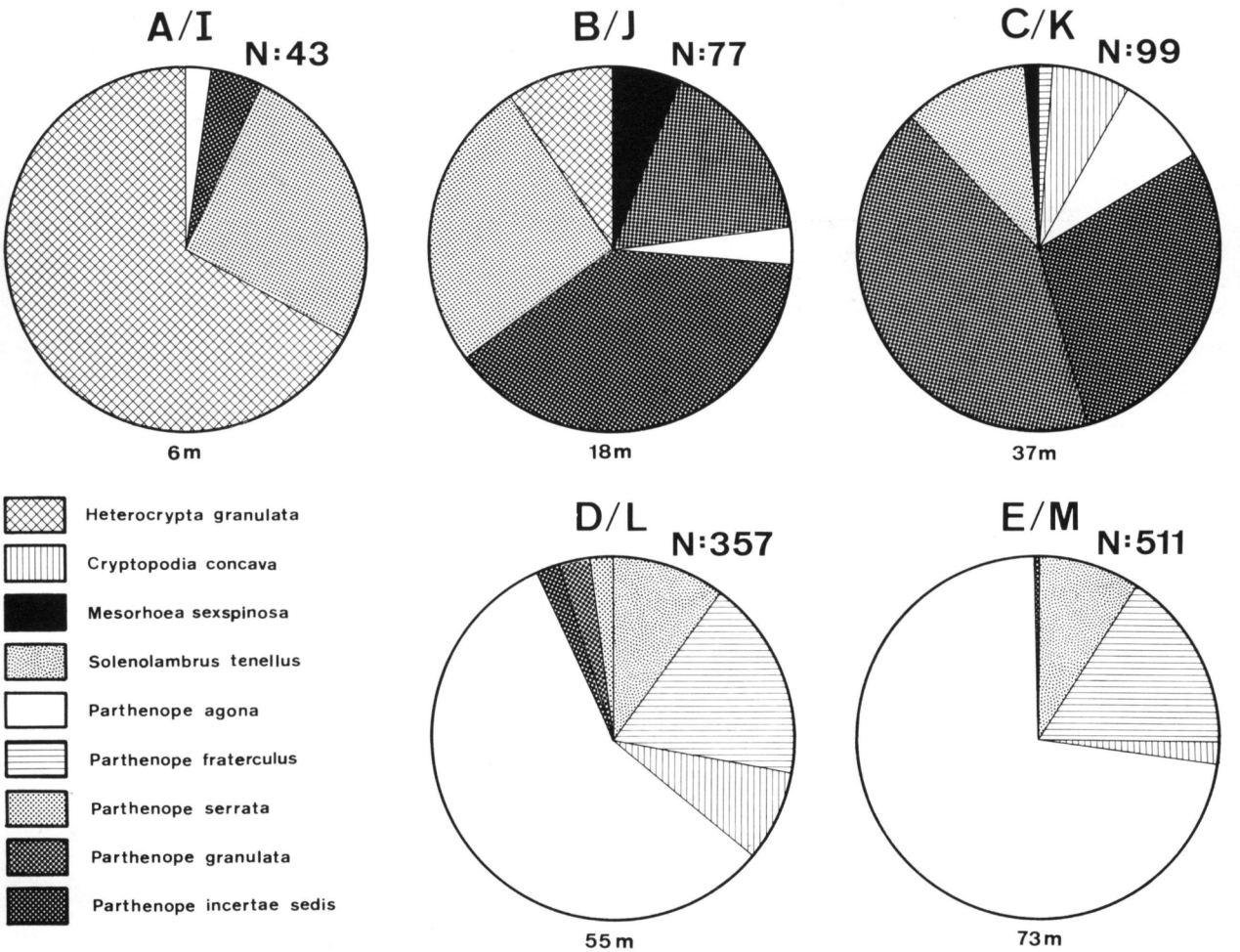
Hourglass Stations A/I, B/J, C/K, D/L, and E/M were made in about 6, 18, 37, 55, and 73 m depths, respectively (Joyce and Williams, 1969), and marked allocations of these depth zones by Hourglass species were noted (Appendix Figure 1). Among species of *Parthenope*, *P. serrata* was most common at 18 m and was also common at 6 m depths, whereas *P. granulata* appeared most common at 37 m. *Parthenope fraterculus* and *P. agona* occurred almost exclusively at 55 and 73 m, both primarily at the latter depth where sampling terminated. Whether these species attained even greater relative abundances at greater depths remains unknown. The remaining four species, all in separate genera, were similarly partitioned by depth. *Heterocrypta granulata* occurred primarily at 6 m depths. *Mesorhea sexspinosa,* never common, was collected almost exclusively at 18 m stations. *Parthenope granulata* was most abundant at 37 m stations. Although these depths also marked the initial appearance of *Cryptopodia concava*, this was the only species to occur most frequently at 55 m. *Solenolambrus tenellus* was most abundant at 73 m stations.

Hourglass parthenopid species were also arranged according to their comparative interspecific abundances at each depth zone. Discarded *Parthenope agona* and a separate category (*Parthenope incertae sedis*) for discarded specimens of "*Parthenope serrata*" were included, thereby illustrating relative numerical dominance for these species (Appendix Figure 2).

As can be seen, little significant change is apparent in the previously discussed species (see Figure 34). However, those discarded forms labelled *Parthenope incertae sedis* exhibit a noticeable effect on overall relative dominance. In general, *Heterocrypta granulata* remains the dominant species at 6 m. Relative numerical dominance by all species at 18 m stations is reduced considerably by insertion of *Parthenope incertae sedis*, but that apparent reduction actually consists of additional relative abundances of both *Parthenope granulata* and *P. serrata*. It is reasonable to assume, as retained specimens indicate, that the two species are about equally abundant at these depths, which are intermediate between those where each of the two species exerts individual dominance. Together, the two species comprise about 82% of all parthenopids at these stations. Also at 18 m depths may now be included records for single discarded specimens twice taken at Station J and identified previously as *Parthenope agona*. It will be recalled that this species assumed increasing importance at deeper stations. The situation is similar at 37 m stations, with *Parthenope incertae sedis* diminishing the overall relative abundance of both *P. serrata* and *P. granulata* to some degree (compare Figure 34). Proportions of retained specimens, however, suggest that most discarded crabs were *P. granulata*. If so, that species would contribute more than 50% of all parthenopids at 37 m, as indicated in Figure 34. Inclusion of discarded data also slightly increases the relative dominance of *P. agona* at 37 m. At deepest stations (55 and 73 m), inclusion of data from discarded specimens shows decreasing effect on overall dominance percentages. What is important to note, as previously indicated (Figure 34), is that *P. agona* has now become the dominant species at both 55 and 73 m depths. At 73 m stations, inclusion of the discarded specimen of "*P. serrata*" would bring the total number of species to five instead of the four noted in the previous analysis which did not consider discarded specimen data. In summary, inclusion of discarded specimen data shows an increased, though less well defined, relative numerical dominance of *P. serrata* and *P. granulata* at shallower stations. The inclusion of a single molted carapace of *P. agona* at 6 m, the discarded data on this species at 18 m, and the increasing numerical dominance of *P. agona* as depth increases, all suggest that it may be considered the dominant parthenopid species in the Hourglass study area.



Appendix Figure 1. Intraspecific relative abundance by depth of species of Hourglass Parthenopidae, including discarded specimens.



Appendix Figure 2. Interspecific relative dominance by depth of species of Hourglass Parthenopidae, including discarded specimens.

APPENDIX II

Monthly catches of all parthenopid crab species at Hourglass stations. Subscripts 1, 2, and sp. represent regular (night), post (day) and supplementary (45 ft trawl) cruises.

Cryptopodia concava

STA	1965					1966													1967											TOT
	A	S	O	N	D	J	F	M	A	M	J	J	J sp	A	S	O	N	D	J	J sp	F	M	A	M	J	J	A	S	O	N	
A																														
B_1																														
B_2																														
C_1						1																		1	1			1		4
C_2																									2					2
D_1														3			1					2								6
D_2												1									1			1		4					7
E																		2						2			2		1		7
I																														
J																														
K																									1					1
L												3			4	1			1		2	2	2					1	1	17
M															2			1				1								4
TOT						1						4		3	6	1	1	3	1		3	5	2	3	1	8	2		3	1	48

Heterocrypta granulata

STA	1965					1966													1967											TOT
	A	S	O	N	D	J	F	M	A	M	J	J	J sp	A	S	O	N	D	J	J sp	F	M	A	M	J	J	A	S	O	N	
A						1					3			1		2									2		1		1		11
B_1																						1		2						2	5
B_2																															
C_1																															
C_2																															
D_1																															
D_2																															
E																															
I				1							4	2				1							1			2	1	3	2	1	18
J																														2	2
K																															
L	1*																														1*
M																															
TOT	1*			1		1					7	2		1		3						1	1	2	2	2	2	3	3	5	36

*Record questioned in text; not used in calculations

Mesorhoea sexspinosa

STA	1965					1966													1967										TOT
	A	S	O	N	D	J	F	M	A	M	J	J	J sp	A	S	O	N	D	J	J sp	F	M	A	M	J	J	A	S	O	N	
A																														
B_1											1					1					1									1	4
B_2																														
C_1																														
C_2																														
D_1																														
D_2																														
E																														
I																														
J															1															1
K																												1		1
L																														
M																														
TOT											1				1	1					1							1		1	6

Parthenope agona

STA	1965					1966													1967										TOT
	A	S	O	N	D	J	F	M	A	M	J	J	J sp	A	S	O	N	D	J	J sp	F	M	A	M	J	J	A	S	O	N	
A																													1*	1*
B_1																														
B_2																														
C_1																												1		1
C_2														(1)																(1)
D_1	(1)	(1)	(2)			2				2	2 (1)	6 (1)		11		24 (12)	1				2	2	8	1	3	2	12	12	14	14	122 (18)
D_2	(2)											9 (5)		(4)	(1)	3			1		2			7	1	4		1		4	39 (12)
E		(1)			6	7	3	1	10 (9)		(17)	7 (5)		44 (37)	(5)	35 (10)	8	73			5	17	1	23	2	2	9	3	16	11	306 (84)
I																														
J									(1)			(1)																			(2)
K															(3)			2						1							6 (3)
L											1	2		3 (1)	1								1	5	2	1	10	2	6	11	45 (1)
M			1						3 (1)		8 (6)	6 (3)		5 (4)	14 (1)		2		4			6	2	1	2	4	1		2		61 (15)
TOT	(3)	(2)	3 (2)		6	9	3	1	14 (11)	2	28 (24)	31 (15)		68 (47)	24 (10)	62 (22)	11	75	5		9	25	12	38	10	13	32	18	39	41	584 (136)

( ) = Discarded specimens; * = Molt only

Parthenope fraterculus

STA	1965					1966													1967											TOT
	A	S	O	N	D	J	F	M	A	M	J	J	J sp	A	S	O	N	D	J	J sp	F	M	A	M	J	J	A	S	O	N	
A																															
B_1																															
B_2																															
C_1																															
C_2																									1						1
D_1																2	4				2		2	4		6	1		6	1	28
D_2																								1				1		2	4
E											6			3								5		4			8		1	1	28
I																															
J																															
K																															
L														2	3				1		1		2	3	2	2	4	3	2	7	32
M			2	2							1			1	35	1		1							3	7		3			56
TOT			2	2							7			6	38	3	4	1	1		3	5	4	12	5	16	13	7	9	11	149

Parthenope granulata

STA	1965					1966													1967											TOT
	A	S	O	N	D	J	F	M	A	M	J	J	J sp	A	S	O	N	D	J	J sp	F	M	A	M	J	J	A	S	O	N	
A																															
B_1						1															1			1	2	1			1		7
B_2										1							1														2
C_1																1	1	2					2	1			1	1		1	10
C_2			1																						2	1	2		2	1	9
D_1																							2								2
D_2																1			1				2		1					2	7
E																															
I																															
J																													1	3	4
K																3	1							1	3	1		3	7	4	23
L																															
M																															
TOT			1			1				1						5	3	2	1		1		6	3	8	3	3	4	11	11	64

Parthenope serrata

STA	1965					1966													1967											TOT
	A	S	O	N	D	J	F	M	A	M	J	J	J sp	A	S	O	N	D	J	J sp	F	M	A	M	J	J	A	S	O	N	
A																														1	1
B_1														1																3	4
B_2																1	1														2
C_1				2	1																1	2									6
C_2																		1						1						1	3
D_1																					1										1
D_2			1																				2								3
E																															
I		2												3							1								1	1	2	10
J				2			2									4	3							1						1	1	14
K																		1								1					2
L															1						1										2
M																															
TOT		2	1	4	1		2							4	1	5	4	2			4	2		3	1	1		1	2	8	48

*Parthenope incertae sedis**

STA	1965					1966													1967											TOT
	A	S	O	N	D	J	F	M	A	M	J	J	J sp	A	S	O	N	D	J	J sp	F	M	A	M	J	J	A	S	O	N	
A																															
B_1			2	2			1				1	1																			7
B_2												2																			2
C_1	2			2							2	2		2	2	1															13
C_2											2	2			1																5
D_1						1								5																	6
D_2														1	1																2
E							1																								1
I				1	1																										2
J		3		1	3	5						1	1		3	4															21
K	1				1	2								4		3															11
L																															
M																															
TOT	3	3	2	6	5	8	2				5	8	1	12	7	8															70

**Parthenope serrata* or *Parthenope granulata*; all discarded as *P. serrata*

Solenolambrus tenellus

STA	1965					1966													1967											TOT
	A	S	O	N	D	J	F	M	A	M	J	J	J sp	A	S	O	N	D	J	J sp	F	M	A	M	J	J	A	S	O	N	
A																															
B_1																															
B_2																															
C_1																															
C_2																															
D_1														3							1			1	2			4	3		14
D_2												3		1							1			1		2				1	9
E												1		12		2		1				4		1			4		2		27
I																															
J																															
K																															
L														1	6						1			1	1				1		11
M									2	2	1				13		2									1					21
TOT									2	2	1	4		17	19	2	2	1			3	4		4	3	3	4	4	6	1	82