

A PICTORIAL KEY AND ANNOTATED SPECIES LIST OF THE MANTIS SHRIMPS
OF THE INDIAN RIVER REGION OF FLORIDA
(CRUSTACEA, STOMATOPODA)¹

by

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INTRODUCTION

The mantis shrimps (Crustacea: Stomatopoda) are a small but important part of the invertebrate assemblage in the Indian River and offshore areas. The morphology of this group of crustaceans is quite unusual: laymen consider them as "lobster-like" or "shrimp-like". Their common name of mantis shrimps alludes to the resemblance of the raptorial claws to those of the praying mantis, an insect. Because the raptorial claw can inflict a painful wound when an individual is aggravated, stomatopods are usually treated with much care. Thus, another common name, thumbsplitter is amply descriptive in this respect. Although of no commercial value in the United States, some species are known to be edible (i.e., Lysiosquilla scabricauda) or are used as bait for fishing. Scientifically, mantis shrimp biology has been studied little and the taxonomy is "still at the alpha, or descriptive, level" (Manning, 1969:1).

This report is designed to assist participants of the Indian River Coastal Zone Study and other interested persons in the identification of stomatopods that may be collected on the central eastern Florida coast. The report is basic in that it was written so that non-crustacean or non-invertebrate specialists could use it with relative ease.

The species listed are those which have been collected so far within the latitudinal boundaries of the Indian River lagoon from Jupiter Inlet to Ponce de Leon Inlet and from the adjacent offshore continental shelf (to depths of 400m). Other species will undoubtedly be collected which do not fit the key, or do not compare with those specimens actually catalogued into the museum at Link Port. In such a case, the monographs by Manning (1969) and Camp (1973) provide a nearly complete listing of the

mantis shrimps known from the Gulf of Mexico and the western Atlantic.

MATERIALS AND METHODS

From 1971 through 1975, 362 identifiable specimens of stomatopods were collected either in the lagoonal estuary, or from offshore using the R/V HERNAN CORTEZ (Florida Department of Natural Resources), R/V GOSNOLD (on loan from Woods Hole Oceanographic Institution), R/V JOHNSON (HBFL), R/V SEA DIVER (HBFL), and R/V SEA HUNTER II (Florida Institute of Technology). Within the boundaries of the lagoon, many mantis shrimps were taken on the grassflats, mudflats, floating along on an ebbing tide, or in phragmatopomid worm reefs. The biotope types sampled offshore were not as easily ascertained, for the types of gear used were employed over large and often variable bottoms. Substrates included sand, mud, coquinoid and other shell hash, and coral-line rubble. All identifications were made based on the keys, drawings, photographs and descriptions provided in Manning, 1969.

A glossary of terms is provided to be used in conjunction with Tables 1 and 2. The definitions, some of which have been modified for use in this particular report, were assembled from Christiansen (1969), Felder (1973), Manning (1969) and Williams (1965).

The key used in this report is modified from those appearing in Manning (1969) and incorporates the same morphological terminology as in that study. Unless otherwise indicated, the generalized mantis shrimp (Text-figure 1) and the drawings in the key are the basic outlines as modified from Manning, 1969.

In Tables 1 and 2, telson width vs telson length is measured along the widest and longest parts of the telson (including submedian teeth). These tables incorporate morphological characteristics both as discussed in

Manning (1969) and those made by personal observations, so that these same characteristics could be compared for each of the species.

Synonymies are restricted to the original description, the first use of the taxon in its presently accepted sense, references to illustrations and descriptions in Manning (1969), and to Gore and Becker, 1976.

Each species account includes range, distribution and measurements. The range encompasses the Indian River area in which the animals were collected, and the depth. The general distribution of the species is included for comparison. The size ranges include the number and sex of animals. The two measurements selected for use in this report are total length (TL), and rostral-carapace length (Rcl). Total length was measured on a flattened animal from the tip of the rostrum along the median line, to an imaginary, transverse line uniting the tips of the submedian teeth on the telson. Rcl was measured along the median line from the tip of the rostrum to the posterior margin of the carapace. TL was rounded off to the nearest millimeter. The actual measurements for each identifiable specimen are on file at the Smithsonian Institution, Fort Pierce Bureau (SIFP).

Table 3 indicates the various zones in which each species was collected, as restricted by the boundaries of the Indian River Coastal Zone Study (IRCZS). Also included in the table are those species which may be found in this area. The appropriate zones marked for these species are based on the distribution of the animals as determined from the literature, but may not be completely accurate for this vicinity.

For more detailed information regarding the animals catalogued into the Invertebrate Reference Museum, SIFP; Reference Museum, Florida Department of Natural Resources, Marine Research Laboratory, St. Petersburg, Florida; and the National Museum of Natural History, Washington, D.C., one is referred to the files at SIFP or to Gore and Becker (1976).

SELECTED GLOSSARY

ABDOMEN:	The segmented posterior part of the body consisting of six articulated somites.
BASAL PROLONGATION:	Flattened, ventral projection of the uropod.
BOSS:	Raised, rounded protuberance found on the telson.
CARAPACE:	The hardened, dorsal covering of the thorax.
CARINA:	A keel-like ridge or prominence.
COXA:	First or proximal article of a leg or maxilliped.
DACTYLUS:	Terminal article of a thoracopod pereopod.
DENTICLES:	Small teeth, or tooth-like projections.
DENTICULAR FORMULA:	The number of submedian, intermediate and lateral denticles appearing, respectively, on each side of the midline of the telson.
DORSAL PIT:	Median pore on the carapace (conspicuous in species with median carina).
EPIPODS:	Non-calcified coxal appendages, primarily on the maxillipeds.
ISCHIOMERAL ARTICULATION:	Juncture of the ischium (third proximal segment) and the merus (fourth proximal segment) of the raptorial claw.
MAXILLIPEDS:	First 5 uniramous pairs of 8 pairs of thoracic appendages.
OCULAR SCALES:	Paired, erect processes on the dorsal surface of the ophthalmic somite.
OPHTHALMIC SOMITE:	Somite bearing the paired, stalked eyes.
PEREIOPOD:	Last 3 pairs of the 8 pairs of thoracic appendages; walking legs with two branches.

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RAPTORIAL CLAW (CLAW): The second and largest maxilliped.

ROSTRAL PLATE: Median, articulated, anterior plate on the carapace.

SOMITE: A body segment.

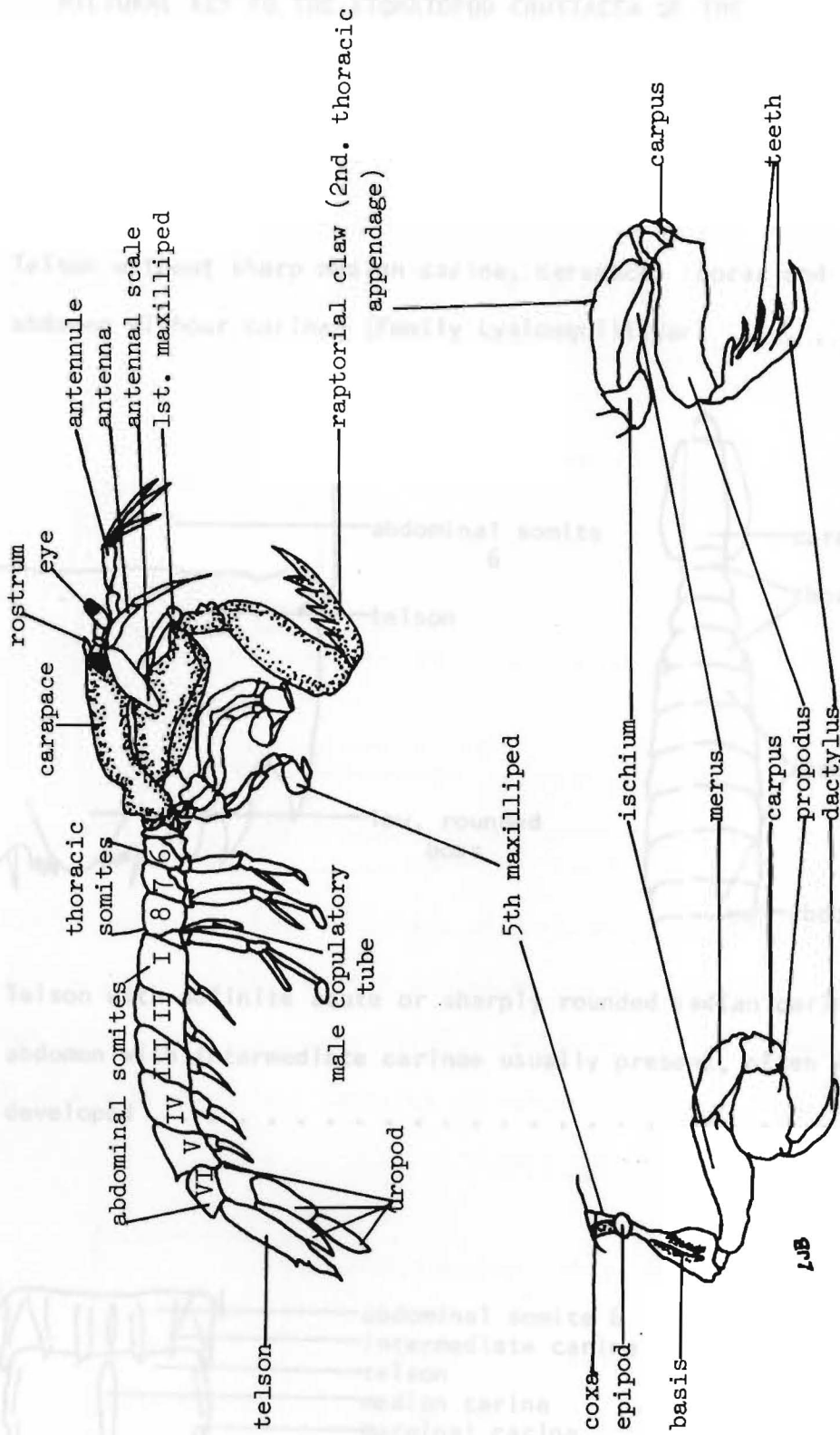
SPINULOSE: Having very small spines or sharp granules.

TELSON: Flattened, terminal body segment.

THORAX: The first eight somites (last four usually exposed).

UNIRAMOUS: Unbranched.

UROPOD: The last pair of abdominal appendages on the sixth somite.

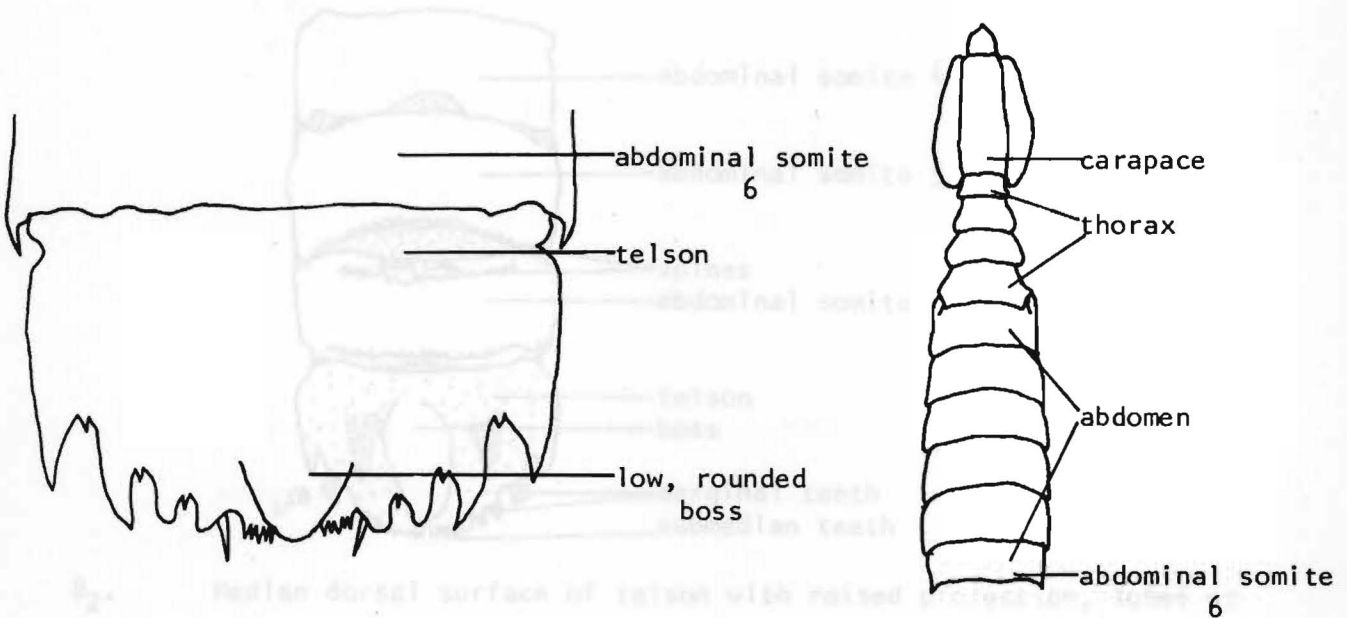


TEXT-FIGURE 1: Schematic outline of lateral view of a stomatopod with detailed figures of the raptorial claw and the 5th maxilliped indicating the location of the epipod.

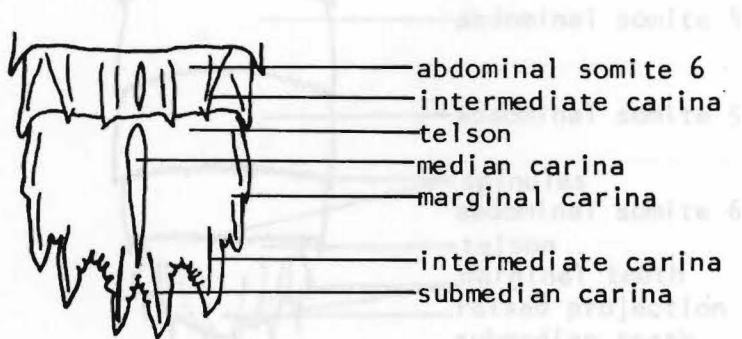
PICTORAL KEY TO THE STOMATOPOD CRUSTACEA OF THE
INDIAN RIVER LAGOON

(After Manning, 1969)

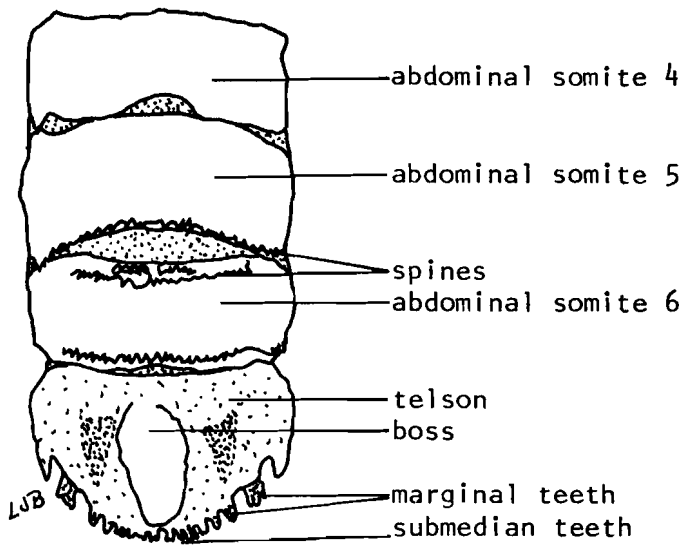
- A₁. Telson without sharp median carina; carapace, thorax and abdomen without carinae (Family Lysiosquillidae) B



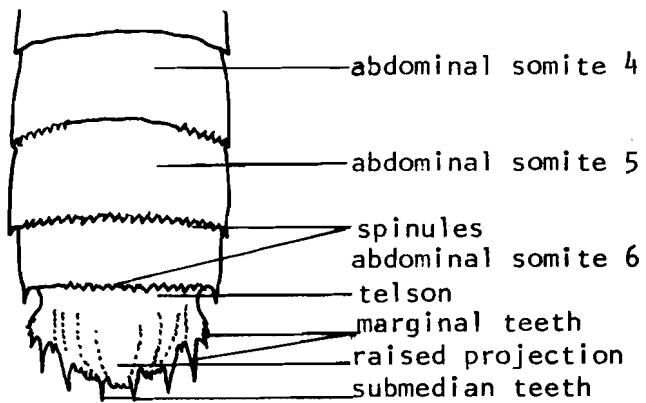
- A₂. Telson with definite acute or sharply rounded median carina; abdomen with intermediate carinae usually present, often well developed C



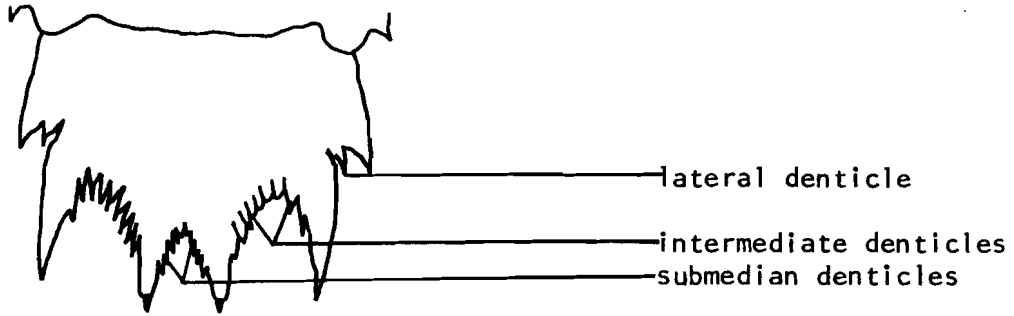
B₁. Median dorsal surface of telson with unarmed, rounded, low, flat oblong or triangular boss; movable submedian teeth never present; marginal teeth usually fused (Genus Lysiosquilla). Abdominal somite 6 rough or eroded dorsally; posterior margin abdominal somites 5 and 6, dorsal surface of telson, spinulose; dactylus of raptorial claw with 8-11 teeth
 Lysiosquilla scabricauda (Lamarck, 1818)



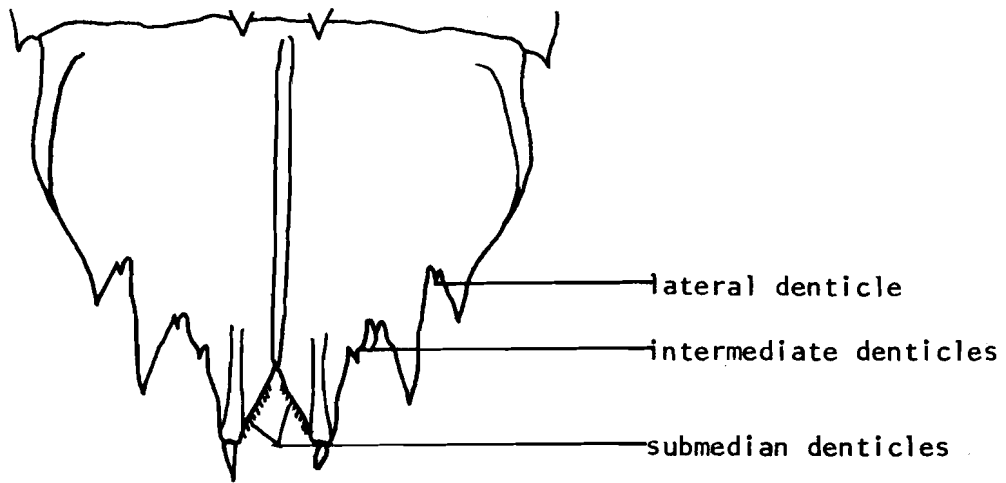
B₂. Median dorsal surface of telson with raised projection, lobed or spined posteriorly; movable submedian teeth present; marginal teeth not fused (Genus Heterosquilla). Posterior margin abdominal somites 4 to 6 with spinules; dactylus of raptorial claw with 10-11 teeth
 Heterosquilla armata (Smith, 1881)



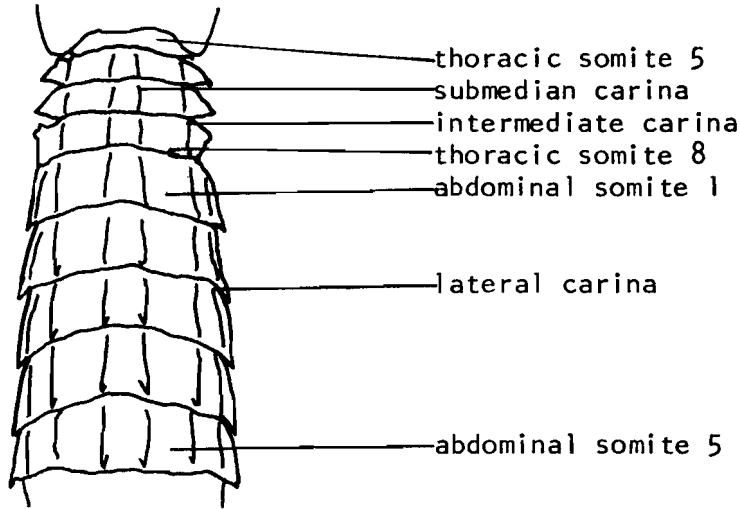
C₁. Telson with 4 or more intermediate denticles (Family Squillidae) . . . D



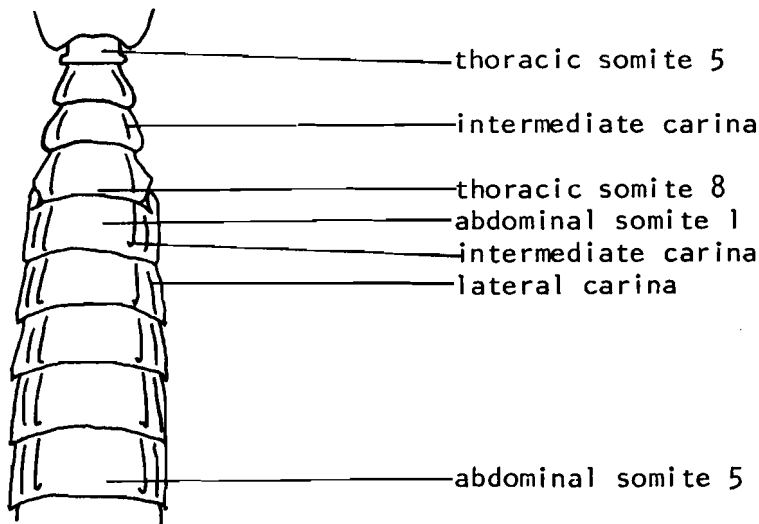
C₂. Telson with 2 or less intermediate denticles (Family
Gonodactylidae) L



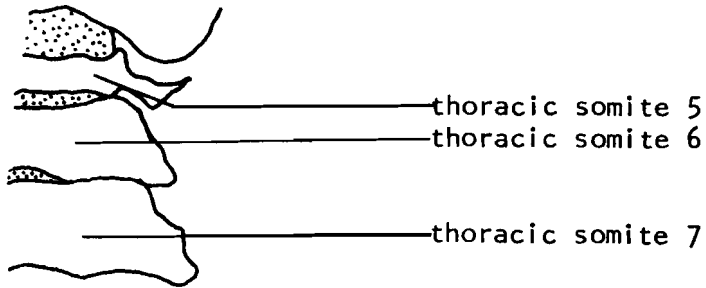
D₁. Submedian carina usually present on all thoracic and abdominal somites, except thoracic somite 5, but may be reduced or low on thoracic somites E



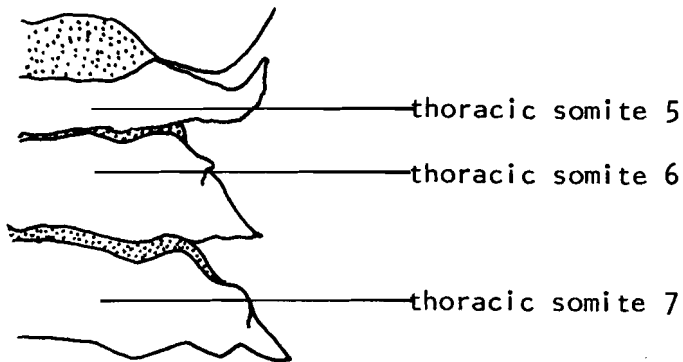
D₂. Submedian carina absent on thoracic somites 5 to 8, and abdominal somites 1 to 5 (Genus Meiosquilla) J



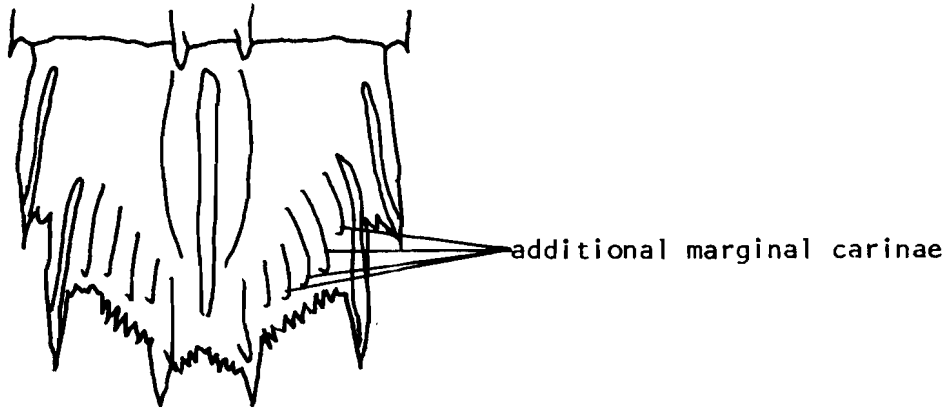
E₁. Lateral process thoracic somite 6 rounded; 3 epipods present . .
 Cloridopsis dubia (H. Milne Edwards, 1837)



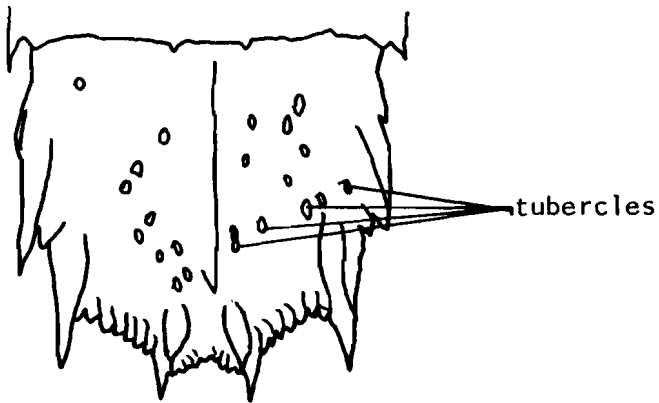
E₂. Lateral process thoracic somites 6-7 acute, bilobed; more
 than 3 epipods present (Genus Squilla) F



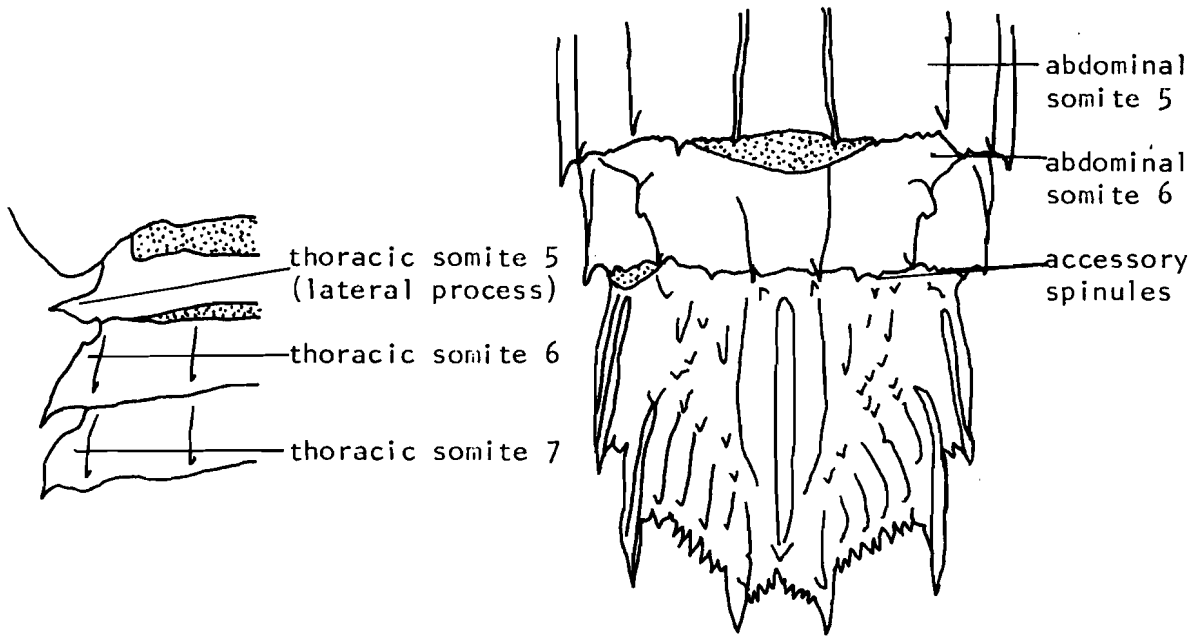
F₁. Dorsal surface of telson with numerous thin longitudinal carinae in addition to carinae of marginal teeth G



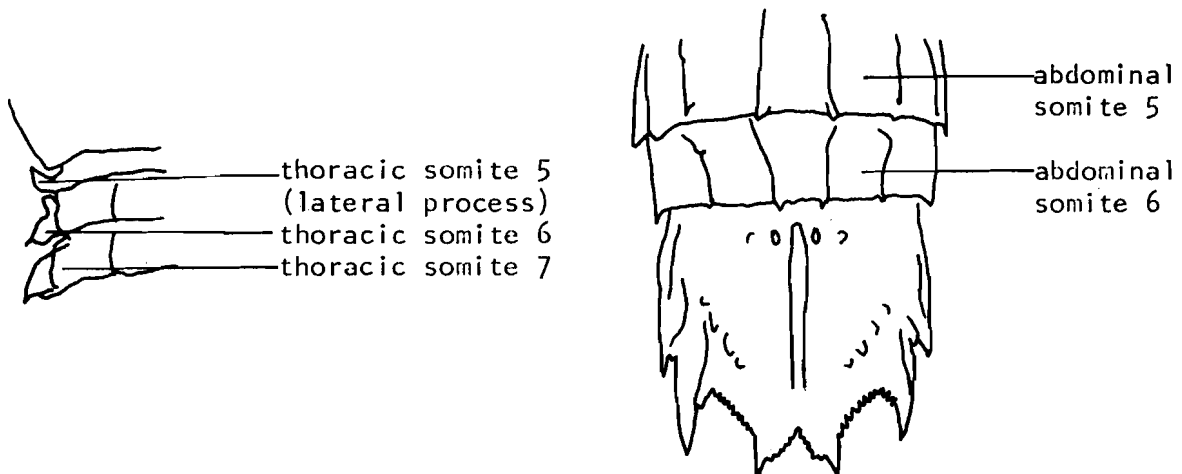
F₂. Dorsal surface of telson without numerous thin longitudinal carinae H



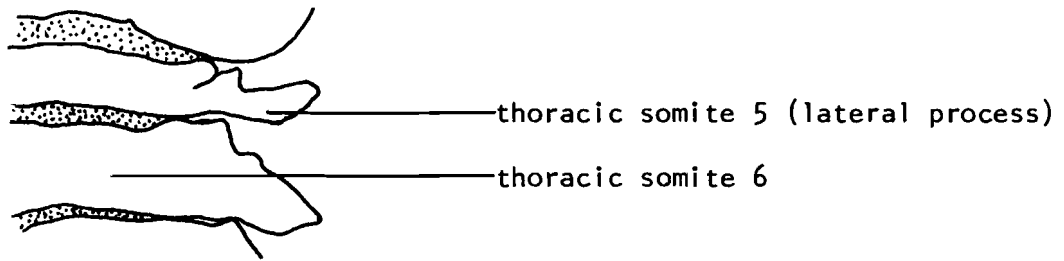
- G₁. Lateral process thoracic somite 5 a broad, acute lobe directed laterally; carinae of thoracic somites 6-7 produced posteriorly into spines; posterior margin abdominal somites 5-6 usually with accessory spinules Squilla rugosa Bigelow, 1893



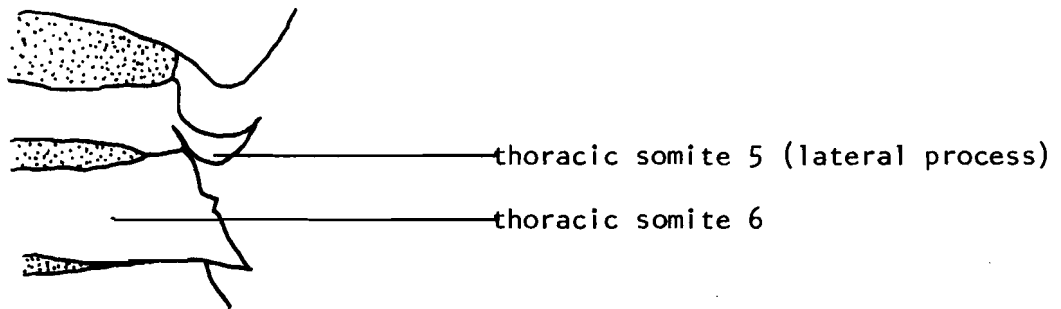
- G₂. Lateral process thoracic somite 5 a distinct, anteriorly-curved spine; carinae of thoracic somites 6-7 not produced posteriorly into spines; posterior margin abdominal somites 5-6 without accessory spinules Squilla deceptrix Manning, 1969



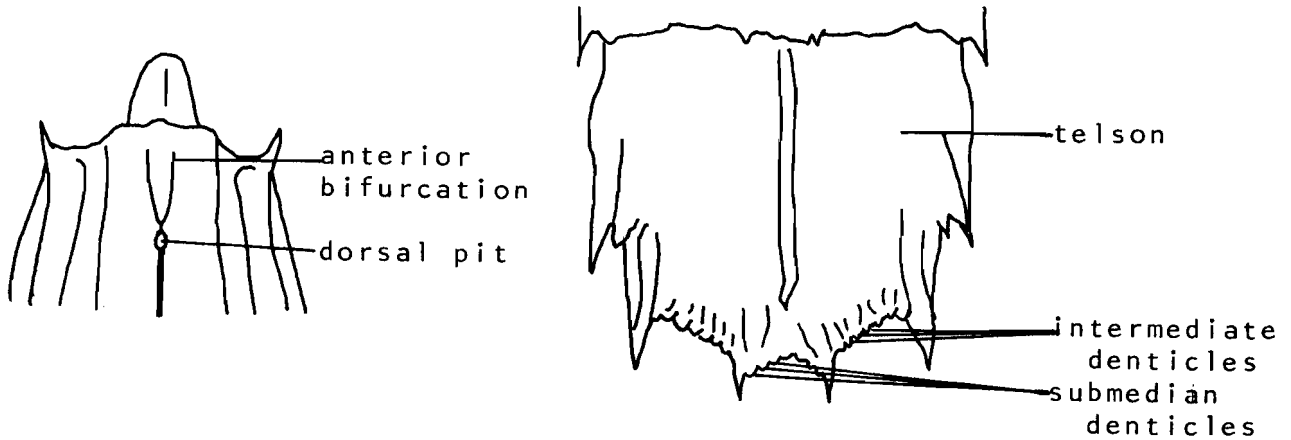
H₁. Dactylus of raptorial claw with 5 teeth; lateral margin thoracic somite 5 with a laterally directed spatulate lobe
 Squilla neglecta Gibbes, 1850



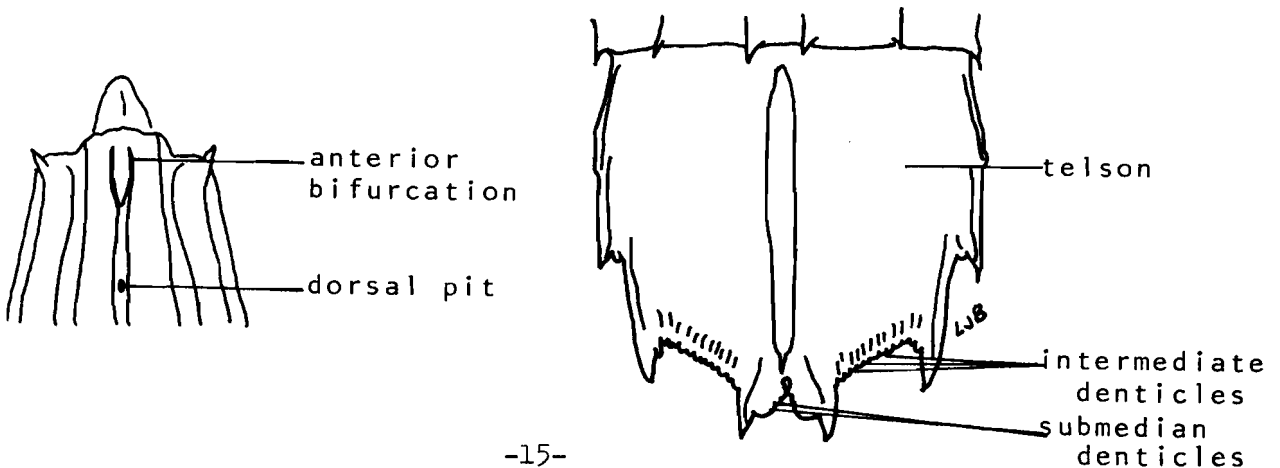
H₂. Dactylus of raptorial claw with 6 teeth; lateral margin thoracic somite 5 with an anteriorly curved spine I



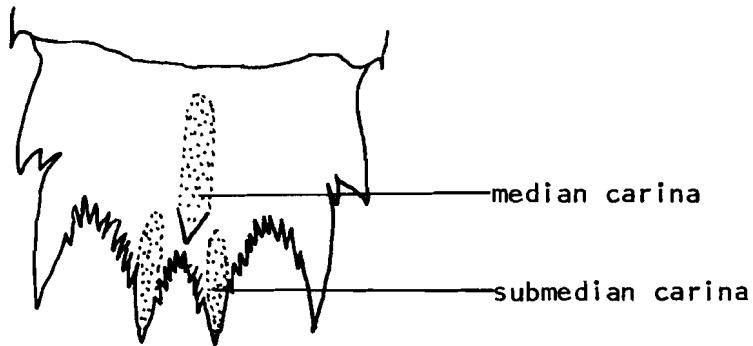
I₁. Distance from dorsal pit to anterior bifurcation of median carina of carapace less than 1/5 distance from bifurcation to anterior margin; telson as broad as long; intermediate denticles on telson 6-9; submedian denticles of telson usually subequal
 Squilla empusa Say, 1818



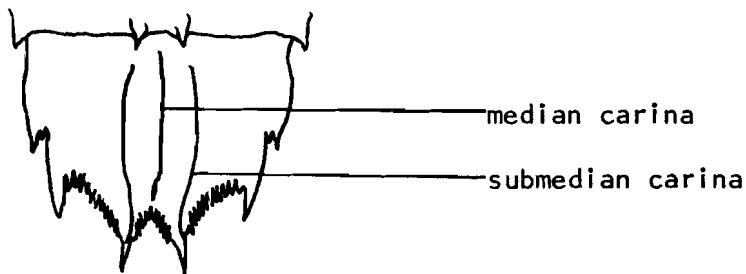
I₂. Distance from dorsal pit to anterior bifurcation of median carina of carapace greater than 1/5 distance from bifurcation to anterior margin; telson nearly as broad as, or broader than long; intermediate denticles of telson 11 or more; outer submedian denticle of telson largest and rounded
 Squilla edentata edentata Lutz, 1937



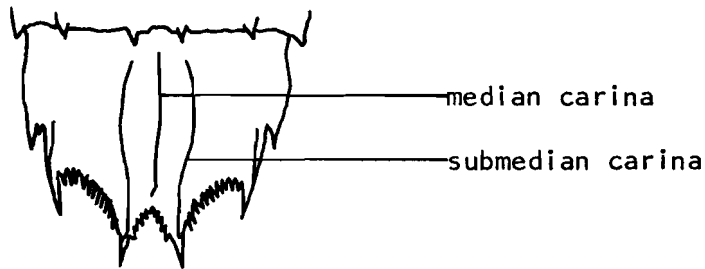
- J₁. Submedian carinae of telson short, not extending anteriorly past base of spine of median carina
 Meiosquilla quadridens (Bigelow, 1893)



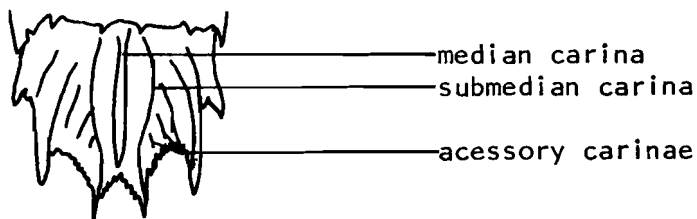
- J₂. Submedian carinae of telson long, extending anteriorly almost to base of median carina K



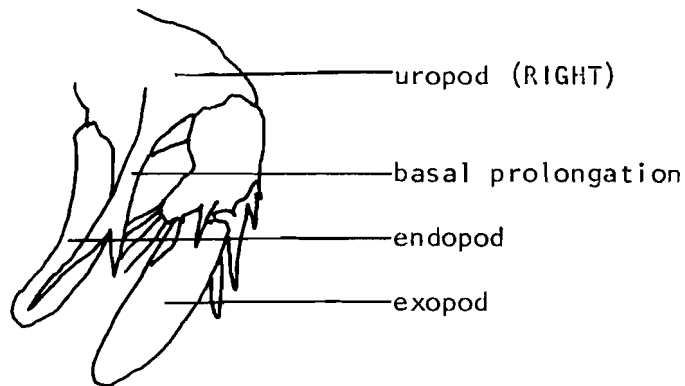
- K₁. Accessory carinae on dorsal surface of telson absent; 4 epipods present Meiosquilla schmitti (Lemos de Castro, 1955)



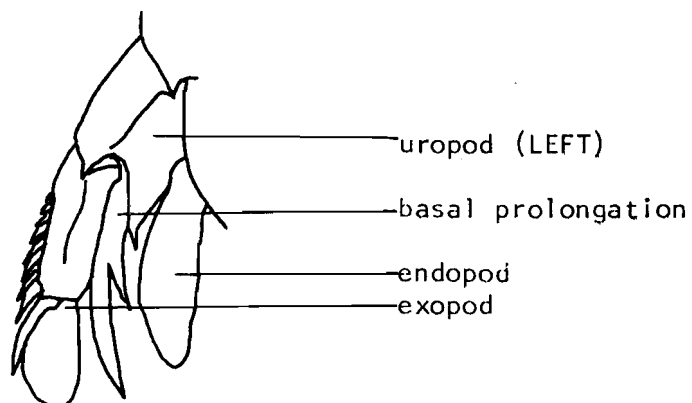
- K₂. Accessory carinae on dorsal surface of telson present; 2 epipods present Meiosquilla tricarinata (Holthuis, 1941)



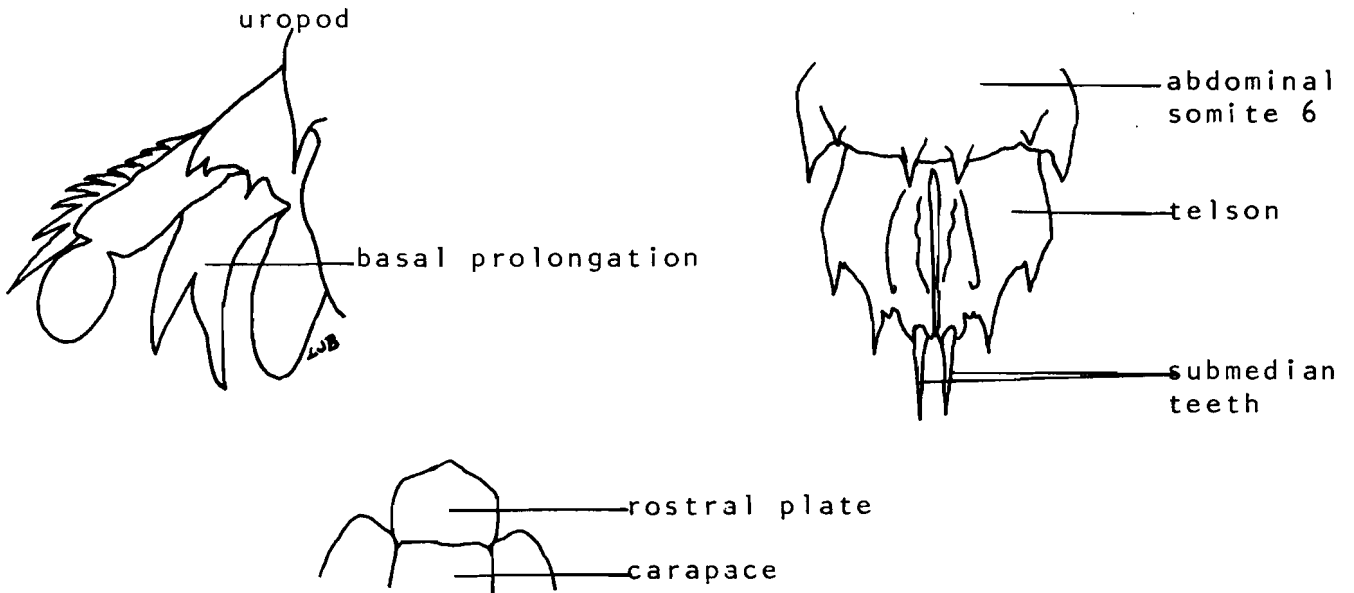
- L₁. Ischiomeral articulation on raptorial claw terminal; dactylus of raptorial claw armed M
- L₂. Ischiomeral articulation on raptorial claw subterminal, merus projecting posteriorly beyond articulation; dactylus of raptorial claw unarmed (Genus Gonodactylus) 0
- M₁. Dactylus of raptorial claw with 9 teeth; outer spine on basal prolongation of uropod shorter than inner
 Eurysquilla plumata (Bigelow, 1901)



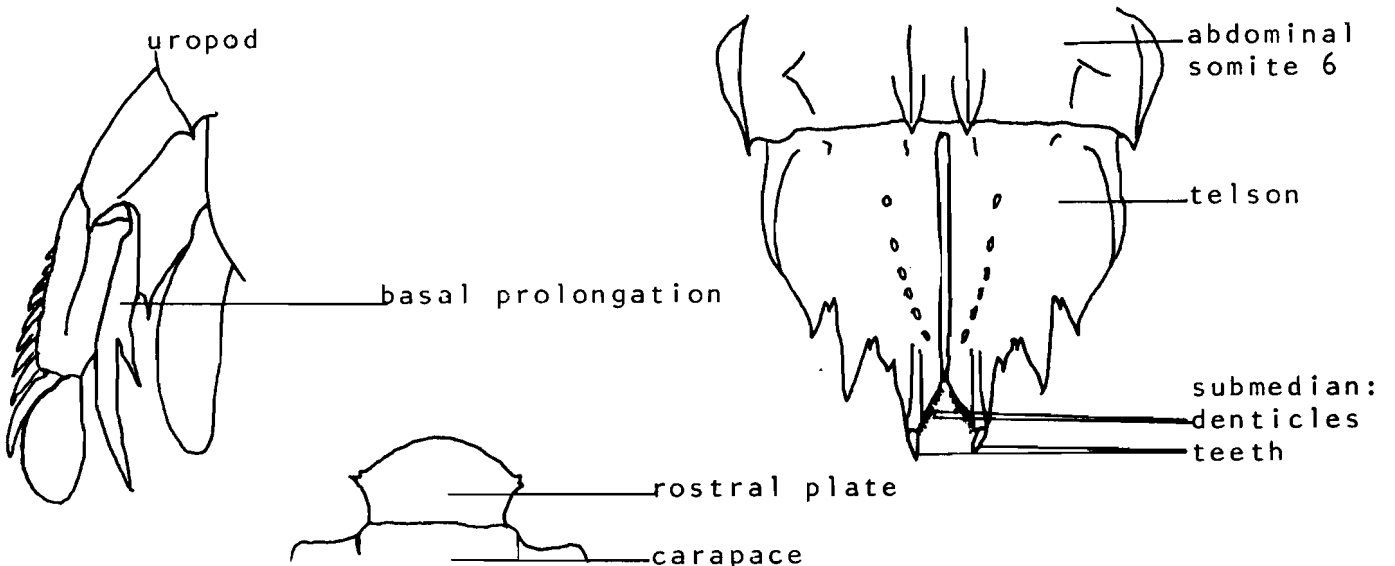
- M₂. Dactylus of raptorial claw with 3 teeth; outer spine on basal prolongation longer than or subequal to inner N



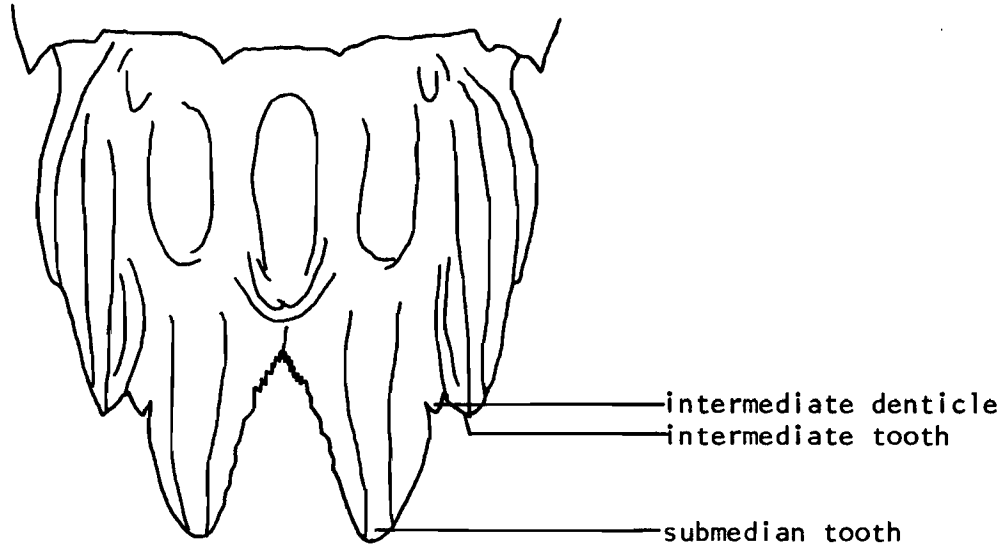
- N₁. Basal prolongation of uropod with 2 spines, inner margin unarmed; abdominal somites 1-5 without sharp carinae; submedian denticles on telson absent; rostral plate ovate, with distinct apex, without apical spine, anterolateral angles rounded
 Pseudosquilla ciliata (Fabricius, 1787)



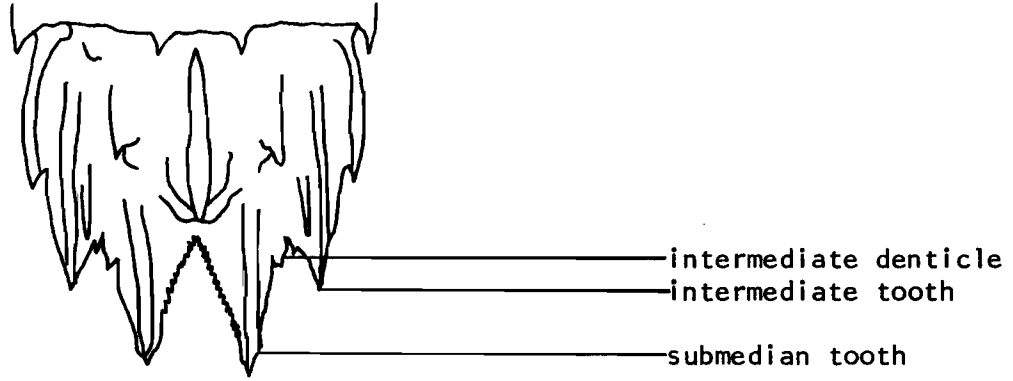
- N₂. Basal prolongation of uropod with 3 spines; abdominal somites 1-5 with prominent carinae; telson with submedian denticles; rostral plate trapezoidal or pentagonal, apex unarmed, with antero-lateral spines
 Parasquilla coccinea Manning, 1962



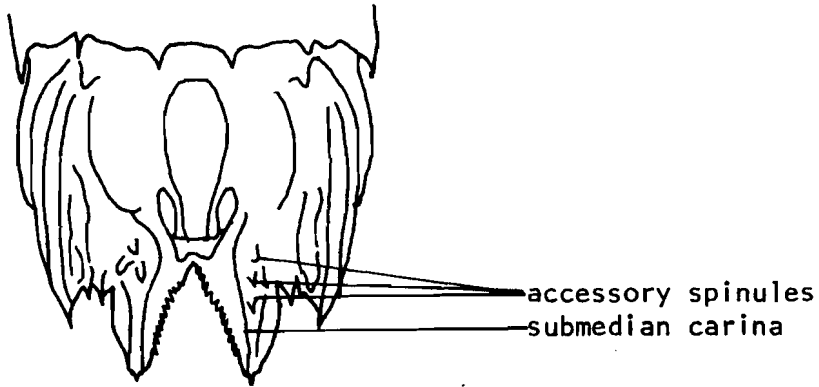
- 0₁. Intermediate marginal teeth of telson not widely separated from the submedian teeth; apex of intermediate denticles at level of, or slightly posterior to apex of intermediate tooth
 Gonodactylus bredini Manning, 1969



- 0₂. Intermediate teeth widely separate from submedian teeth; apex of intermediate denticles noticeably anterior to apex of intermediate teeth P



P₁. Dorsal surface of telson with accessory spinules
. Gonodactylus spinulosus Schmitt, 1924



P₂. Dorsal surface of telson without accessory spinules
. Gonodactylus oerstedii Hansen, 1895

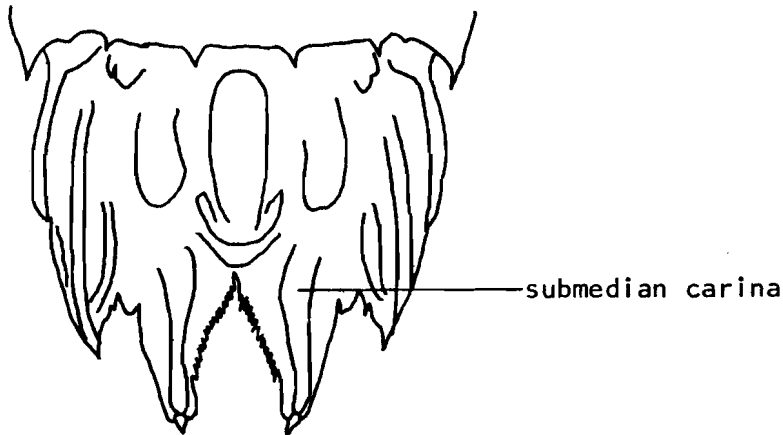


TABLE 1.

COMPARATIVE MORPHOLOGICAL FEATURES IN THE FAMILIES LYSIOSQUILLIDAE AND GONDACTYLIDAE COLLECTED FROM THE INDIAN RIVER REGION OF FLORIDA

	LYSIOSQUILLIDAE		GONDACTYLIDAE					
	HETEROSQUILLA ARMATA	LYSIOSQUILLA SCABRICAUDA	EURYQUILLA PLUMATA	BREDINI	GONDACTYLUS OERSTEDII	SPINULOSUS	PARASQUILLA COCCINEA	PSEUDOSQUILLA CILIATA
ROSTRUM: WIDTH X LENGTH	W ≈ L	W > L	W ≈ L	W ≈ L	W ≈ L	W ≈ L	W > L	W > L
CARAPACE: MEDIAN CARINA	None	None	None	None	None	None	None	None
ANTERIOR BIFURCATION	None	None	None	None	None	None	None	None
EPIPODS	5	5	4-5	5	5	5	5	5
RAPTORIAL CLAW: NO. TEETH, DACTYLUS	10-11	8-11	8-9	0	0	0	3	3
ISCHIO-MERAL ARTICULATION	terminal	terminal	terminal	sub-terminal	sub-terminal	sub-terminal	terminal	terminal
THORACIC SOMITES (LATERAL PROJECTION):								
5th	Sharp spine	Rounded lobe	None	None	None	None	None	None
6th	Rounded lobe	Same	Rounded lobe	Rounded lobe	Rounded lobe	Rounded lobe	Sharp lobe	Rounded lobe
7th	Same	Same	Same	Same	Same	Same	Same	Same
ABDOMINAL SOMITES: CARINAE	None	None	1-4 (5) none (5)-6 present	1-5 none 6 present	1-5 none 6 present	1-5 none 6 present	Present	1-5 none 6 present
ACCESSORY SPINULES OR TUBERCLES ON 5th & 6th	Present	Present	None	None	None	None	Present	None
POSTERIO-LATERAL SPINE ON 5th	Present	Present	Present	None	None	None	Present	Present
TELSON: TYPE	Oerstedii	---	Bredini	Bredini	Oerstedii	Oerstedii	Oerstedii	Oerstedii
WIDTH X LENGTH	W > L	W > L	W > L	W > L	W > L	W > L	W > L	W > L
DORSAL ARMATURE*	spinules	tubercles	tubercles	None	tubercles	spinules	carinae	carinae
MEDIAN CARINA	None	None	spined	unspined	unspined-adult spined-juvenile	spined	spined	spined
DENTICLE FORMULA	8-12,4,1	None	0,2,1	∞,1,0**	∞,2,0***	∞,2,0**	7-11,2,1	0,2,1
SUBMEDIAN DENTICLES	Subequal	None	None	Subequal	Subequal	Subequal	Subequal	None
LATERAL TEETH	Pointed	None	Pointed	Blunt	Blunt	Blunt	Pointed	Pointed
UROPOD: BASAL PROLONGATION	Spines	Spinules	Spines	Spines	Spines	Spines	Spines	Spines

*This armature is in addition to the standard armature on the median carina of these families.

** ∞ stands for numerous.

TABLE 2 .

COMPARATIVE MORPHOLOGICAL FEATURES IN THE FAMILY SQUILLIDAE
COLLECTED FROM THE INDIAN RIVER REGION OF FLORIDA

	CLORIDOPSIS DUBIA	QUADRIDENS	MEIOSQUILLA SCHMITTI	TRICARINATA	DECEPTIX	EDENTATA EDENTATA	SQUILLA EMPUSA	NEGLECTA	RUGOSA
ROSTRUM: WIDTH X LENGTH	W < L	W ≈ L	W < L	W ≈ L	W > L	W > L	W > L	W > L	W ≈ L
CARAPACE: MEDIAN CARINA	defined	None	None	None	ill-defined	well-defined	well-defined	well-defined	defined
ANTERIOR BIFURCATION	None	None	None	None	None	Present	Present	Present	None
EPIPODS	3	4	4	2	5	5	5	5	5
RAPTORIAL CLAW: NO. TEETH, DACTYLUS	5-6	4	4	4	6	6	6	5	6
ISCHIONERAL ARTICULATION	terminal	terminal	terminal	terminal	terminal	terminal	terminal	terminal	terminal
THORACIC SOMITES (LATERAL PROJECTION):									
5th	Curved spine	Lobe or spine	Spatulate lobe	Rounded lobe	Curved spine	Curved spine	Curved spine	Spatulate lobe	Accuminate lobe
6th	Rounded lobe	Rounded lobe	Rounded lobe	Same	Sharp, bilobed	Sharp, bilobed	Sharp, bilobed	Blunt, bilobed	Sharp, bilobed
7th	Same	Same	Same	Same	Sharp lobe	Sharp, bilobed	Same	Same	Sharp lobe
ABDOMINAL SOMITES: CARINAE	Present	Present	Present	Present	Present	Present	Present	Present	Present
ACCESSORY SPINULES OR TUBERCLES ON 5th & 6th	Present	None	None	None	Present	Present	None	None	Present
POSTERIO-LATERAL SPIRACLE ON 5th	Present	Present	Present	Present	Present	Present	Present	Present	Present
TELSON: TYPE	Oerstedii	Oerstedii	Oerstedii	Oerstedii	Oerstedii	Oerstedii	Oerstedii	Oerstedii	Oerstedii
WIDTH X LENGTH	W > L	W > L	W > L	W > L	W > L	W > L	W > L	W ≈ L	W ≈ L
DORSAL ARMATURE*	Tubercles	None	None	Carinae	Tubercles	Unarmed	Unarmed	Unarmed	Carinae
MEDIAN CARINA	Spined	Spined	Spined	Spined	Spined	Spined	Unspined	Spined	Spined
DENTICLE FORMULA	1-4, 3-6, 1	4-6, 6-10, 1	4-7, 8-12, 1	4-6, 4-9, 1	5-7, 8-11, 1	2-5, 11-15, 1	3-5, 6-9, 1	2-4, 5-7, 1	4-6, 7-12, 1
SUBMEDIAN DENTICLES	Inner largest Pointed	Subequal	Subequal	Subequal	Outer largest Pointed	Outer largest Pointed	Subequal	Inner largest Pointed	Subequal
LATERAL TEETH	Pointed	Pointed	Pointed	Pointed	Pointed	Pointed	Pointed	Pointed	Pointed
UROPOD: BASAL PROLONGATION	Spines	Spines	Spines	Spines	Serrated	Serrated	Serrated	Dentate	Spines

*This armature is in addition to the standard armature on the median carina of this family.

Family LYSIOSQUILLIDAE Giesbrecht, 1910

Genus Heterosquilla Manning, 1963

Heterosquilla (Heterosquilloides) armata (Smith, 1880)

Lysiosquilla armata Smith, 1880: 446.

Heterosquilla (Heterosquilloides) armata.--Manning,

1963: 321; 1969: 7[listed], 45[key], 52, fig. 11.--

Gore & Becker, 1976; 148[listed], 160, 178[discussion],

fig. 16, tab. 2.

IRCZS Range.-- Atlantic Ocean off St. Lucie Inlet, Martin County; 210 m.

Distribution.-- New England to the central, east coast of Florida; 96-
218 m.

Measurements.-- 1♀: 43 mm (TL), 9.5 mm (Rcl).

Remarks.-- H. armata, a deepwater continental slope species is rare in south Florida (Gore & Becker, 1975). It is easily distinguishable from Lysiosquilla scabricauda, a relatively shallow water form, by the presence of spinules on the posterior margin of the fourth abdominal somite. The same species is armed on the last three somites, the latter only on the last two.

Genus Lysiosquilla Dana, 1852

Lysiosquilla scabricauda (Lamarck, 1818)

Squilla scabricauda Lamarck, 1818: 188.

Lysiosquilla scabricauda.--Miers, 1880: 7.-- Manning,

1969: 7[listed], 24, figs. 2-4, 5a, b.--Gore &

Becker, 1976: 160, figs. 3, 16, tab. 1.

IRCZS Range.-- Jupiter Island, Martin County to Sebastian Inlet, Indian River County; subtidal to 18 m, occasionally at surface.

Distribution.-- Bermuda to southern Brazil, and west Africa; intertidal zone to 55 m.

Measurements.-- 3♂♂: 234 to 269 mm (TL), 46.2 to 52.0 mm(Rcl); 3♀♀: 131 to 148 mm (TL), 25.1 to 29.4 mm (Rcl); 1 ovigerous: 148 mm (TL), 29.3 mm (Rcl).

Remarks.-- L. scabricauda, the Queen Mantis Shrimp, is a large impressive species which is often captured on a hook and line by fisherman. It also may be found at night on a outgoing tide, especially during those periods when the penaeid shrimp swarm. The roughness and minute projections on the 6th abdominal somite and the telson are very characteristic of this species. The unusually large number of teeth on the raptorial claw, 8-11, are equally specific. The specimens from Florida and the Gulf of Mexico exhibit sexual dimorphism which should be kept in mind while identifying such animals. There is no denticular formula, particularly because there are no lateral teeth on the telson. This is the only species collected in this area with spinules on the basal prolongation of the uropod.

Family SQUILLIDAE Latreille, 1803

Genus Cloridopsis Manning, 1968

Cloridopsis dubia (H. Milne Edwards, 1837)

Squilla dubia H. Milne Edwards, 1837: 522.

Cloridopsis dubia.--Manning, 1969: 7[listed], 141, figs.

39b, 41.--Gore & Becker, 1976: 148[listed], 161,

figs. 4, 16, tab. 1.

IRCZS Range.-- Big Mud Creek, Hutchinson Island, St. Lucie County to
Wabasso, Indian River County; intertidal.

Distribution.-- Charleston, South Carolina to Brazil; intertidally.

Measurements.-- 1♂: 139 mm (TL), 29.7 mm (Rcl); 5♀♀: 68 to 143 mm (TL),
14.1 to 30.0 mm (Rcl).

Remarks.-- This is the only species of this genus known from American
waters. Although C. dubia was only collected six times in
the IRCZS area, it is considered to be a common mudflat
species and should be found in larger quantities. It is
recognizable by the pastel blue and green body color ac-
cented with crimson markings on the abdominal carinae.
C. dubia is the only species collected so far in the
Indian River area with three epipods.

Genus Meiosquilla Manning, 1968

Meiosquilla quadridens (Bigelow, 1893)

Squilla quadridens Bigelow, 1893: 101.

Meiosquilla quadridens.--Manning, 1969: 7[listed],
103[key], 106, figs. 31, 33a.—Gore & Becker,
1976: 148[listed], 162, 180[discussion], figs. 5,
16, tab. 2.

IRCZS Range.-- Atlantic Ocean off Sebastian Inlet, Indian River County
to Cape Canaveral, Brevard County; 50 to 64 m.

Distribution.-- Bahamas to Surinam; littoral zone to 137 m.

Measurements.-- 1♂: 27 mm (TL), 7.7 mm (Rcl); 2♀♀: 29 to 30 mm (TL),
6.8 to 8.1 mm (Rcl).

Remarks.-- The three specimens collected were caught by means of otter
trawls. Although the species is common in this area, the
iridescent green and brown chromatophores provide a good
field character for identification. The short submedian
carinae on the telson also seem to distinguish this species
from M. schmitti and M. tricarinata, both of which have long
carinae extending anteriorly beyond the base of the spine
of the submedian carinae.

Meiosquilla schmitti (Lemos de Castro, 1955)

Squilla quadridens.--Holthuis, 1941: 32.

Squilla schmitti Lemos de Castro, 1955: 8, text - figs.

5-8, pl. 1 figs. 32-33.

Meiosquilla schmitti.--Manning, 1969: 7[listed], 103

[key], 111, figs. 32, 33b.--Gore & Becker, 1976:

148[listed], 163, fig. 16, tab 2.

IRCZS Range.-- Atlantic Ocean off Sebastian Inlet, Indian River County;
20 m.

Distribution.-- Disjunct, continental distribution: southeastern Florida (as
far north as Sebastian Inlet), southwestern Florida, Texas,
Yucatan Peninsula, Columbia, Venezuela, and Brazil; sub-
littoral to 40 m.

Measurements.-- 1♂: 31.1 (TL), 8.0 mm (Rcl).

Remarks.-- A single specimen collected during one of the last biological
cruises on the R/V GOSNOLD after 2 years of service, in-
dicates that it is not a common species off the central
eastern coast. It is characterized by the lack of acces-
sory dorsal carinae on the telson, as is found in M.
tricarinata.

Meiosquilla tricarinata (Holthuis, 1941)

Squilla tricarinata Holthuis, 1941: 32, fig. 1.

Meiosquilla tricarinata.--Manning, 1969: 7[listed],
103[key], 114, figs. 33c, 34.--Gore & Becker,
1976: 148[listed], 163, figs. 6, 16, tab. 2.

IRCZS Range.-- Atlantic Ocean off Jensen Beach, Martin County; 15 m.

Distribution.-- Off Jensen Beach, Florida to Brazil, Fernando de Noronha,
Mogiquicaba, and Abrolhos Islands; sublittoral to 48 m.

Measurements.-- 1♀: 31 mm (TL), 7.5 mm (Rcl).

Remarks.-- The only species collected during this study which had
2 epipods was M. tricarinata. Like the other species of
Meiosquilla, M. tricarinata is not very common to this
area.

Genus Squilla Fabricius, 1787

Squilla deceptrix Manning, 1969

Squilla deceptrix Manning, 1969: 7[listed], 151[key],
165, figs. 44c, 46.--Gore & Becker, 1976: 164,
180[discussion], figs. 7, 16, tabs. 2, 3.

IRCZS Range.-- Atlantic Ocean off Jupiter Inlet, Palm Beach County to
Cape Canaveral, Brevard County; 37 m to 100 m.

Distribution.-- North Carolina to Tobago; 37 to 346 m.

Measurements.-- 18♂♂: 29 to 55 mm (TL), 7.8 to 13.5 mm (Rcl); 18♀♀:
27 to 63 mm (TL), 6.9 to 14.5 mm (Rcl).

Remarks.-- As suggested by the species name, S. deceptrix is a de-
ceiving and difficult species to identify. There seems
to be a great deal of variation within this species, more
so than in any other member of the genus Squilla. Morpho-
logical features which distinguish S. deceptrix from the
other species in this area are an ill-defined median carina
on the carapace, and accessory tubercles on the telson.
There did not appear to be a large amount of variation in the
specimens collected by the IRCZS; however, the possibility
of extensive variation should be kept in mind while making
identifications.

Squilla edentata edentata (Lunz, 1937)

Squilla intermedia Bigelow, 1893: 102 [in part].

Chloridella edentata Lunz, 1937: 14, text-figs. 7-10.

Squilla edentata.--Chace, 1954: 449.--Manning, 1969:

7[listed], 152[key], 229, figs. 61c-d.--Gore &
Becker, 1976: 164, 178[discussion], figs. 8, 16,
tabs. 2, 3.

IRCZS Range.-- Atlantic Ocean off Jupiter Inlet, Palm Beach County to Eau
Gallie, Brevard County; 148 to 215 m.

Distribution.-- Disjunct Carolinian distribution: South Carolina to Jupiter
Inlet, Florida, and Gulf of Mexico from Cape George, Florida
to Texas; 55 to 319 m.

Measurements.-- 21♂♂: 68 to 135 mm (TL), 15.5 to 30.8 mm (Rcl); 54♀♀:
57 to 143 mm (TL), 13.8 to 31.5 mm (Rcl).

Remarks.-- S. edentata edentata is the second most abundant species
in the collection at SIFP. This primarily deep-water species
is easily discernible by its live color pattern including
iridescent green eyes, on the telson orange spots
lateral to median carinae, as well as iridescent blue
color on median carina and anterior part of telson. The
orange markings on the telson, remain discernible after
preservation. The well defined median carina on the cara-
pace is actually composed of two subparallel rows of pits
(Manning, 1969: 224), a feature not common to other Squilla.

Squilla empusa Say, 1818

Squilla empusa Say, 1818: 250.--Manning, 1969:

7[listed], 151[key], 201, figs. 57a, 58, 59.--

Gore & Becker, 1976: 168, 178, 180[discussion],
figs. 9, 16, tabs. 2, 3.

Cloridella empusa.--Sumner, et al., 1913: 662.

IRCZS Range.-- Atlantic Ocean off Jupiter Inlet, Palm Beach County to Cape Canaveral, Brevard County; intertidal to 100 m.

Distribution.-- Maine to Surinam, a questionable record from Bermuda; intertidal to 154 m.

Measurements.-- 28♂♂: 72 to 115 mm (TL), 16.8 to 33.9 mm (Rcl); 66♀♀:
56 to 141 mm (TL), 14.8 to 34.3 mm (Rcl).

Remarks.-- This species is the only member of Squilla which was collected both within the boundaries of the Indian River lagoon, as well as offshore. The other species primarily inhabit offshore zones. Not only is S. empusa the most common species of American stomatopod but it is also the most abundant in this area. As a numerous component of the "trash" fishery, the dactyli of S. empusa are used as ornamental jewelry in Florida (Manning, 1969: 214). The anterior bifurcation on the median carina of the carapace is very characteristic for S. empusa. The bifurcation is open most of the distance from the dorsal pit anteriorly (Manning, 1969: 211). As in Lysiosquilla scabricauda, this species also exhibits sexual dimorphism.

Squilla neglecta Gibbes, 1850

Squilla neglecta Gibbes, 1850: 200.--Manning,
1969: 7[listed], 151[key], 181, figs. 50b,
51.--Gore & Becker, 1976: 148[listed], 169,
180[discussion], figs. 10, 16, tabs. 1-3.

IRCZS Range.-- Atlantic Ocean off Jupiter Inlet, Palm Beach County to Cape
Canaveral, Brevard County; 10 to 28 m.

Distribution.-- Disjunct distribution: North Carolina to Jupiter Inlet,
Florida, Gulf of Mexico from western Florida to Texas, and
southern Brazil; littoral zone to 64 m.

Measurements.-- 7♂♂: 55 to 105 mm (TL), 13.8 to 27.5 mm (Rcl); 3♀♀: 87 to
100 mm (TL), 21.7 to 23.8 mm (Rcl).

Remarks.-- Of the 17 species collected in this study, S. neglecta is
the only one with a dentate margin on the basal prolongation
of the uropod. However, the presence of only five teeth on
the dactylus of the raptorial claw, a spatulate lobe on the
5th thoracic somite, the blunt tipped 6th and 7th thoracic
somites and the fact that the inner submedian denticles on
the telson are the largest, allow separation of S. neglecta
from the other four species of Squilla known from this area.

Squilla rugosa Bigelow, 1893

Squilla rugosa Bigelow, 1893: 102.--Manning, 1969:

7[listed], 151[key], 155, figs. 43, 44a.--Gore &
Becker, 1976: 148[listed], 170, figs. 11, 16,
tabs. 2, 3.

IRCZS Range.-- Atlantic Ocean off Melbourne, Brevard County to Cape Canaveral,
Brevard County; 26 to 43 m.

Distribution.-- Little Bahama Bank, and Florida to Surinam; littoral to
71 m.

Measurements.-- 2♂♂: 62 to 76 mm (TL), 13.9 to 19.7 mm (Rcl); 5♀♀: 23 to
79 mm (TL), 6.1 to 19.7 mm (Rcl).

Remarks.-- S. rugosa is the least common Squilla in this area. However,
it is easily separated from the other Squilla by the acces-
sory spinules present on the last two abdominal somites
(Manning, 1969: 160).

Family GONODACTYLIDAE Giesbrecht, 1910

Genus Eurysquilla Manning, 1963

Eurysquilla plumata (Bigelow, 1902)

Lysiosquilla plumata Bigelow, 1902: 156, text-figs. 6-9

Eurysquilla plumata .--Manning, 1966: 378, figs.

8c-e; 1969: 7[listed], 250[key], 251, fig.

70.--Gore & Becker, 1976: 148[listed], 171,

fig. 16, tab. 2.

IRCZS Range.-- Atlantic Ocean off Sebastian Inlet, Indian River County;

41 m.

Distribution.-- Disjunct Antillean distribution: Sebastian Inlet to

Florida Keys, Puerto Rico, and Brazil; shallow water to

55 m.

Measurements.-- 1♀: 31.9 mm (TL), 6.4 mm (Rcl).

Remarks.-- This species is rather rare in this area. The single specimen collected extended the range northward from the Florida Keys (Gore & Becker, 1976: 171). Eurysquilla plumata is the only species in the genus which exhibits dark patches on the fifth abdominal somite and which has one spine on the basal prolongation of the uropod (Manning, 1969: 253).

Genus Gonodactylus Berthold, 1927

Gonodactylus bredini Manning, 1969

Gonodactylus bredini Manning, 1969: 7[listed],

298[key], 315, figs. 87, 88.--Gore & Becker,

1976: 171, 178[discussion], figs. 12, 16,

tabs. 1, 2, 4.

IRCZS Range.-- St. Lucie Inlet, Martin County to Cape Canaveral, Brevard County both in the river and in the Atlantic Ocean; intertidal to 40 m.

Distribution.-- Bermuda, Carolinas to Gulf of Mexico, and the Caribbean to Aruba, Curaçao, and Bonaire; littoral zone to 73 m.

Measurements.-- 43♂♂: 10 to 57 mm (TL), 2.9 to 15.5 mm (Rcl); 27♀♀: 11 to 56 mm (TL), 3.0 to 15.5 mm (Rcl); 2 ovigerous: 53 to 66 mm (TL), 14.0 to 15.5 mm (Rcl); 7 juveniles: 9 to 15 mm (TL), 2.4 to 4.2 mm (Rcl).

Remarks.-- This species, third most numerous in the collection, occurs in a variety of biotopes, including offshore and nearshore benthos, phragmatopomid worm reefs, and within the boundaries of the Indian River lagoon (Table 3). In the latter, it is usually associated with oyster shell clumps or around growths on artificial hard substrate such as pilings and wrecks. Manning notes that G. bredini is known especially from sponges, rocks and on coral reefs (1969: 325). That author provides data on the various coloration types exhibited by G. bredini, as does Camp (1973), and Gore & Becker (1976). The juvenile forms might be difficult to identify, for there

is a great deal of morphological variation among the younger stages of G. bredini. In some cases, based on telsonal characteristics, a juvenile G. bredini could look very much like a G. oerstedii. As indicated by the variations mentioned and others stated by Manning (1969: 322), there are at least five distinct populations of G. bredini in the western Atlantic. It is possible that these populations are distinct species or subspecies, but more information and work is needed on the situation.

Gonodactylus oerstedii Hansen, 1895

Gonodactylus chiragra.-- Brooks, 1892: 337,353,
fig. on pl. 1, pls. 3, 14, 15 [biology and
larvae; colored figure].

Gonodactylus oerstedii.-- Hansen, 1895: footnote,
p. 65 [in part].--Manning, 1969: 7[listed],
298[key], 325, fig. 89.--Gore & Becker, 1976:
148[listed], 173, figs. 13, 16, tabs. 1, 2, 4.

IRCZS Range.-- Jupiter Inlet, Palm Beach County to Cape Canaveral,
Brevard County both in the Indian River lagoon and in
the Atlantic Ocean; intertidal to 105 m.

Distribution.-- Central east Florida through the Caribbean to Curaçao;
littoral zone to 105 m.

Measurements.-- 10♂♂: 12 to 55 mm (TL), 3.2 to 15.5 mm (Rcl); 12♀♀: 12 to
67 mm (TL), 3.1 to 17.5 mm (Rcl); 1 juvenile: 12 mm (TL),
3.2 mm (Rcl); 1♀(?): 10 mm (TL), 2.7 mm (Rcl).

Additional Material Examined.-- Caribbean Sea, Galeta Island off Panama

Canal Zone; 1♀; intertidal.

Remarks.--

Although Manning (1969: 333) states that G. oerstedii is the most common littoral stomatopod in the western Atlantic, it is by no means the more common species found in the Indian River area, based on the variety of collecting techniques and periodicity of collections carried out over the past three years. However, G. oerstedii, as its congener G. bredini, is found at all four zones listed in Table 3. In this study, the former has been found predominantly in the surf-zone phragmatopomid worm reefs at Walton Rocks and Seminole Shores. In the Caribbean, G. oerstedii is most likely to be found in "coral reefs, Porites flats, Phragmatopoma clumps, sponges, and rocks" (Manning, 1969: 334). This species is characterized by the Oerstedii-type telson (intermediate teeth widely separate from submedian teeth; apex of intermediate denticles noticeably anterior to apex of intermediate teeth (key: O₂, p. 20) and the lack of accessory spinules on the telson.

Gonodactylus spinulosus Schmitt, 1924

Gonodactylus oerstedii var. spinulosus Schmitt,

1924: 96, pl. 5, fig. 5.

Gonodactylus spinulosus.--Manning, 1961: 41, pl. 11,

figs. 3-4; 1969: 7[listed], 298[key], 299, fig.

8a.--Gore & Becker, 1976: 148[listed], 176, fig.

16, tabs. 1,4.

IRCZS Range.-- St. Lucie Inlet, Martin County to Walton Rocks, Hutchinson Island, St. Lucie County; intertidally on sabellarid worm reef.

Distribution.-- Bermuda, Bahamas, central east Florida to Aruba, and off northeastern South America; intertidal to 10 m.

Measurements.-- 2♂♂: 12 to 26 mm (TL), 2.9 to 6.7 mm (Rcl); 3♀♀: 19 to 37 mm (TL), 5.0 to 9.0 mm (Rcl).

Remarks.-- Manning states (1969: 304) that G. spinulosus is primarily found in clumps of the flat finger coral Porites, coral reefs or rocks. However, this species has been collected by the IRCZS only on the worm reefs located on the coast of Hutchinson Island. It was found associated with G. bredini and G. oerstedii, during a two year faunal survey. The two prime characters that distinguish G. spinulosus from the other species of this genus are the accessory spinules on the dorsal surface of the telson and the "patches of black chromatophores that are found on the sixth thoracic and first abdominal somites" (Manning, 1969: 303).

Genus Parasquilla Manning, 1961

Parasquilla (Parasquilla) coccinea Manning, 1962

Parasquilla (Parasquilla) coccinea Manning, 1962:

181, fig. 1; 1969: 8[listed], 279, fig. 77.--

Gore & Becker, 1976: 148[listed], 176, figs.

14, 16, tab. 2.

IRCZS Range.-- Atlantic Ocean off Ft. Pierce Inlet, St. Lucie County to Cape Canaveral, Brevard County; 64 to 72 m.

Distribution.-- Central eastern coast of Florida to the Gulf of Campeche, Mexico; 55 to 382 m.

Measurements.-- 3♂♂: 52 to 101 mm (TL), 13.8 to 26.9 mm (Rcl); 6♀♀: 50 to 110 mm (TL), 13.4 mm to 26.3 mm (Rcl).

Remarks.-- As was indicated by Manning (1969: 279) and confirmed by this study, P. coccinea is a rather rare species, and only 9 specimens were collected from 1973-1974 during surveys either by the IRCZS or the Florida Department of Natural Resources. The anterolateral spines on the rostrum are good field characters for identifying this species. Although Parasquilla coccinea resembles some members of the genus Pseudosquilla, the species is not likely to be confused with Pseudosquilla species because it is normally found at depths greater than 55 m. Pseudosquilla ciliata, for example, is collected generally in more shallow waters, i.e., grassflats.

Genus Pseudosquilla Dana, 1852

Pseudosquilla ciliata (Fabricius, 1787)

Squilla ciliata Fabricius, 1787: 333 [not Atlantic].

Pseudosquilla ciliata.--Brooks, 1886: 53, pl. 15,

fig. 10.--Manning, 1969: 7[listed], 263[key],

264, fig. 74.--Gore & Becker, 1976: 148[listed],

177, figs. 15, 16, tab. 1.

IRCZS Range.-- St. Lucie Inlet, Martin County to Ft. Pierce Inlet, St. Lucie County; intertidal.

Distribution.-- Bermuda to northern Brazil, and west Africa; littoral to 110 m.

Measurements.-- 1♂: 59 mm (TL), 13.2 mm (Rc1); 1♀: 54 mm (TL), 13.3 mm (Rc1).

Remarks.-- Even though P. ciliata is relatively cosmopolitan, it appears to be rather rare off central, eastern Florida. There are only two species of Pseudosquilla in the western Atlantic. P. ciliata can be distinguished from P. oculata by the unarmed rostral plate and only three pairs of accessory carinae on the telson. The latter species is easily identified in the field by the pair of dark spots surrounded by a lighter colored ring on the lateral margins of the carapace.

TABLE 3.

 DEPTH AND OCCURRENCE OF STOMATOPODA
 KNOWN OR EXPECTED IN THE INDIAN RIVER REGION OF FLORIDA *

	MUDFLAT/ GRASSFLAT	NEARSHORE: LITTORAL LINE TO 20m	OFFSHORE: DEPTHS GREATER THAN 20m	WORM REEF
(<u>Alima hyalina</u>)	(+)	(+)		
<u>Cloridopsis dubia</u>	+			
<u>Eurysquilla plumata</u>		+	+	
<u>Gonodactylus bredini</u>	+	+	+	+
<u>Gonodactylus oerstedii</u>	+	+	+	+
<u>Gonodactylus spinulosus</u>		+		+
(<u>Gonodactylus torus</u>)		(+)	(+)	
<u>Heterosquilla armata</u>			+	
(<u>Heterosquilla insolita</u>)			(+)	
(<u>Lysiosquilla glabriuscula</u>)	(+)	(+)		
<u>Lysiosquilla scabricauda</u>	+	+	+	
<u>Meiosquilla quadridens</u>		+	+	
<u>Meiosquilla schmitti</u>		+	+	
<u>Meiosquilla tricarinata</u>		+	+	
<u>Parasquilla coccinea</u>			+	
<u>Pseudosquilla ciliata</u>	+	+	+	
(<u>Squilla chydaea</u>)		(+)	(+)	
<u>Squilla deceptrix</u>			+	
<u>Squilla edentata edentata</u>			+	
<u>Squilla empusa</u>	+	+	+	
(<u>Squilla intermedia</u>)			(+)	
<u>Squilla neglecta</u>		+	+	
<u>Squilla rugosa</u>		+	+	

* Those species expected from the IRCZS area but not yet collected by the IRCZS are listed in parenthesis.

DISCUSSION

Of the 23 species of stomatopods already known from this area, 17 species were collected during the past three years. The remaining six species (Lysiosquillidae: Heterosquilla insolita, Lysiosquilla glabriuscula Squillidae: Alima hyalina, Squilla chydaea, S. intermedia; Gonodactylidae: Gonodactylus torus), although not included in the key, might be found in the Indian River lagoon and/or offshore region. The four most abundant species collected, regardless of depth or biotope, were Squilla empusa, S. endentata endentata, Gonodactylus bredini, and S. deceptrix with 91, 75, 57 and 36 specimens respectively. Thus, it is quite evident that the stomatopod fauna on the central eastern Florida coast is rather rich.

As is indicated in Table 3, stomatopods occur in several biotopes within the Indian River lagoonal estuary and adjacent Atlantic Ocean. Depths greater than 20 m (Offshore) appear to harbor the largest number of species, 19, in the Indian River area. Most of these species also can be found near shore (Littoral line to 20 m). The mudflat/grassflat biotopes are populated by a richer fauna than the phragmatopomid worm reef biotope. The latter appears to support only three species in one genus.

Additional references and discussion of the zoogeography of the Stomatopoda of the Indian River Coastal Zone Study may be found in Gore and Becker, 1976.

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