along the cephalothorax and abdomen including antennular peduncle and coxae of maxillipeds. Orange-red color also occurs over the stomach and cardiac region. In addition, there is a large amount of yellow on antennal scale, on carapace and dorsally along the abdomen including the telson.

Stage 1 (Pl. 59; A, B: Pl. 61; A, G, H) C.L.: 1.06 mm.

Eyes are sessile. Abdomen is of 5 somites plus telson. There are no supraocular Telson has 7 + 7 terminal spines including the hair-like second. The hind margin of the telson has a triangular notch in the center. Antennule is not segmented. Antennal scale is about 1/3 as wide as long, outer margin fringed with fine hairs instead of plumose setae. Endopod is about 5/7 as long as the scale ending in 3 long plumose setae, with an accessory subterminal seta. There are biramous rudiments of maxilliped 3 and leg 1, but no legs 2-5.

Stage 2 (Pl. 59; C; Pl. 61; B) C.L.: 1.15 mm.

Eyes are stalked. Supraocular spines present. Telson has 8 + 8 spines. The outer flugellum of antennule is segmented off from the peduncle. Antennal scale is fringed with long plumose setae on outer as well as terminal and inner margin. There is a setose exopod on maxilliped 3 and leg 1, and small rudiments of legs 2-5.

Stage 3 (Pl. 59; D: Pl. 61; C) C.L.: 1.41 mm.

Abdominal somite 6 is segmented off from the telson, and is about 1.3 times longer than the latter. Somite 6 ends posteriorly in a pair of ventro-lateral spines. Telson is slightly wider than long and bears 7 + 7 terminal spines. Uropods are free and biramous but not segmented, with endopods bare of setae. Antennal endopod is about 1/3 as long as the scale, ending in a round tip without traces of setae.

Stage 4 (Pl. 59; E: Pl. 61; D) C.L.: 1.52 mm.

Uropods are segmented with setose endopods. Endopod of leg 1 is bifid at tip, and shorter than exopod. There are small pleopod buds on somites 2-5.

Stage 5 (Pl. 59; F: Pl. 61; E) C.L.: 1.87 mm.

Telson is parallel sided. Endopod of uropod reaches well beyond the hind end of the telson. Antennal endopod is about 2/3 as long as the scale, with a basal articulation. Endopod of leg 1 is about as long as the exopod. Pleopod buds are moderately long with small endopods, their length are less than the height of respective abdominal somite.

Stage 6 (Pl. 59; G: Pl. 60; A, B: Pl. 61; F) C.L.: 2.5 mm.

Telson is somewhat narrower behind. Antennular peduncle is divided into two segments. Endopod of leg 1 is by far longer than exopod. Pleopod buds are very long, much longer than the height of respective somite.

MEGALOPA (Pl. 62; A-D) C.L.: 2.7 mm., C.W.: 2.1 mm.

Body, including legs, are covered dorsally with numerous short spinules and stiff setae, except the metabranchial region of carapace. Carapace convex in all directions. Lateral margin is cut into 3 lobes fringed with spinules and stiff setae except the metabranchial corners. There is a fringe of long setae on the posterior margin of carapace. Rostrum is very broad at base and tapers into a 3-lobed front, each ending in a pointed tooth of subequal length. The central lobe is bent down in an obtuse angle and is produced ventrally into a moderately deep lamella with a longitudinal row of 4 small spines. The ventral lamella is locked posteriorly into a bifid anterior tip of epistome, which bears a longitudinal row of 3 spines. Thoracic sternum is not well calcified without traces of segmentations. There is a flap like structure armed with 4-6 spines, outgrown from the sternal surface between the bases of leg 1.

Abdomen is somewhat shorter than the carapace and depressed dorso-ventrally. Somites 2-6 have a pair of lateral spines which are more or less larger than the other spinules covering dorsal surface and lateral margins. Telson has broad, straight hind margin with 6 + 6 setae, angles on each side ending in a pointed tooth, it is about as long as wide. Uropods are much longer than the telson, with well developed exopod and endopod fringed with many setae.

Antenna consists of a peduncle of 4 segments, a long flugellum of 14 segments and a rod like exopod reaching the distal end of the peduncle. Peduncle and the exopod are armed with many spines.

Chelipeds are thick and heavy, chela is somewhat more than half as high as long, fingers curved, with strongly interlocking teeth. Last two pairs of legs are smaller than the preceding pairs, their dactyli hooked and propodi provided a long spine at the distal end. The last leg turned over back and longer than leg 4, with 2-4 long feelers on dactylus. There are 4 pairs of well developed pleopods on somites 2-5, with exopods much longer than the protopods, and small endopods.

Subsection OXYSTOMATA

This is a quite heterogenous group in regard to the characters of the larvae. The known larvae of the three families, Dorippidae, Calappidae and Leucosiidae, which are generally accepted to be contained in this group, have nothing in common but their general Brachyuran characters as will be seen in the following table.

Character	Dorippidae	Calappidae	Leucosiidae
Rostral spine	Very long	Moderate	Rudimentary or moderate
Dorsal spine	Very long	Moderate	Absent or moderate
Lateral spine	Absent	Present	Short or rudimentary
Telson	Fork narrow, very long	Typically forked	Triangular plate
Antenna	Well developed	Well developed	Rudimentary

Family Leucosiidae

Subfamily Matutinae

25. Percephona punctata aquilonaris Rathbun

The purse crab is quite common in the coastal offshore areas around Sapelo Island. Berried females were separated from the trawl catches several times during May through July. A large number of first zoeae were obtained from these females, but none of them had survived beyond the first molt and no later stage were obtained.

ZOEA

All spines present on carapace, all are smooth. Rostral and dorsal spines are moderately long, laterals are also fairly long and are about half as long as the dorsal spine. Dorsal spine is slightly bent near the base. Ventral margin of carapace is smooth.

Abdomen is slightly more than half as long as the distance from spine to spine, with a pair of blunt lateral hooks on somites 2 and 3, but no lateral spines in stage 1. Somites 2-5 are slightly expanded laterally and almost parallel sided.

Telson is greatly expanded laterally to form a triangular plate, somewhat emerginated behind, with 6 setae in the center and a short spine at outer angles on each side.

Antenna is a rudimentary stump. Endopod of maxillule is unsegmented with 4 apical setae, and that of maxilla is slightly divided into 2 lobes with 2 + 2 setae. Endopod of maxilliped 2 is of 2 segments with 0 + 3 setae.

Coloration is generally poor. Black chromatophores are mainly concentrated at bases of antennule and antenna and over the mouth parts. Small amount of black is also occur at bases of maxillipeds 1 and 2 and over stomach extending along the intestine as far back as the somite 2.

Stage 1 (Pl. 63; A-E) From spine to spine: 0.94 mm. There are no rudiments of maxilliped 3 nor legs.

Family Calappidae

26. Hepatus epheliticus (Linnaeus)

Costlow and Bookhout, 1962b

The calico crab is very common in the offshore areas around Sapelo Island. Berried females were found during June through September, and were separated several times from the trawl catches. The resulting first zoeae, however, could not be reared beyond the first molt.

ZOEA

The zoea has all the characters of typical Brachyrhyncha. All spines are present on carapace. Rostral spine is about half as long as carapace. Dorsal spine is about 1.3 times longer than the rostral spine and very slightly curves. Lateral spines are a little less than half as long as the rostral spine in stage 1. Ventral margin of carapace is smooth.

Abdomen is somewhat shorter than the distance from spine to spine, with a pair of lateral hooks on somites 2 and 3, and small lateral spines on somites 3-5.

Telson is typically forked, with 3 outer spines. The first internal seta is about 4/7 as long as the telson fork. Central notch is wide. Telson fork is smooth, its length is a little less than the width of telson in stage 1.

Antenna is about as long as the rostral spine, with spinous process bearing two rows of spinules. Exopod is slightly more than 1/4 as long as the spinous process, ending in a short spine and a long subterminal spine, the latter being somewhat longer than the rest of the exopod.

Endopod of maxillule is of 2 segments with 1 + 6 setae, and that of maxilla is divided into 2 lobes with 2 + 2 setae. Endopod of maxilliped 2 is of 3 segments with 1 + 1 + 5 setae.

Body is transparent with small amount of black chromatophores at rear of the eyes, at bases of antennule and antenna, over the mouth parts, coxae of maxillipeds 1 and 2 and abdominal somites 3-6. There is also a small amount of black over the stomach and along the intestine at articulation between somites 1 and 2.

Stage 1 (Pl. 64; A-C) From spine to spine: 0.93 mm.

Eyes are sessile. Abdomen is of 5 somites plus telson. There are no rudiments of legs. Antenna has no endopod.

Subsection BRACHYGNATHA

Apart from Pinnotheridae in Brachyrhyncha and Hymenosomidae in Oxyrhyncha, the zoeae of Brachygnatha are so much alike that the differences between families are usually very small. There are only 2 zoea stages in Majidae but 4 or more stages in the other families. Direct development is extremely rare except in fresh water family Potamonidae.

Superfamily BRACHYRHYNCHA

Antennal endopod and pleopods usually develop from stage 3 or later. Carapace has no "soie anterieur". Megalopa usually has feelers on leg 5.

Separation of the zoea stages

Stage 1. Eyes are sessile. Abdomen is of 5 somites plus telson. Exopod of maxilliped has 4 setae.

Stage 2. Eyes are stalked. Exopod of maxilliped has 6 or 7 setae.

Stage 3. Abdomen is of 6 somites plus telson. Exopod of maxilliped has 8 or 9 setae. Pleopod buds are small or absent.

Stage 4. Exopod of maxilliped has 9, 10 or 11 setae. Pleopod buds are large, small or absent.

Stage 5. Exopod of maxilliped has 10 or more setae. Pleopod buds are large or small.

Family Portunidae

Subfamily Portuninae

There are 5 or more stages. All spines are present on carapace. Ventral margin of carapace is serrated. Abdomen has a pair of lateral hooks on somites 2 and 3, and lateral spines on somites 3-5. Telson has three outer spines, of which the first is much longer than the others, and the second is hairlike and may disappear in later stages. The central

notch on the hind margin of the telson is moderaly wide, with 1 or 2 extra internal setae in later stages. Antenna is about as long as the rostral spine, with spinous process bearing two rows of spinules, and exopod very small, ending in 2 spines. Endopod of maxillule is of 2 segments, and that of maxilla is unsegmented. Endopod of maxilliped 2 is of 3 segments.

Megalopa has one-spined rostrum, but no dorsal spines nor protuberances on carapace. There is a large hook on ischia of leg 1 and a pair of large sternal spines at the base of leg 4. Leg 5 bears feelers (Lebour, 1928).

27. Callinectes sapidus Rathbun

Churchill, 1942; Hopkins, 1943, 1944; Costlow and Bookhout, 1959

The blue crab is abundant in the sound and coastal offshore areas around Sapelo Island. Berried females were separated several times from trawl catches and kept in the laboratory until the eggs hatched out into the first zoeae, which were reared as far as the young crab in aquarium tanks of various sizes as well as in finger bowls. An example of chronological data of development of the larvae kept in finger bowls are shown in the following table. Development, however, was considerably variable in respect to the number of stages and, accordingly, to the number of days from hatching to reach megalopa depending on the conditions of culture.

Stage	Date	Days after hatching
1	4/21	0
2	4/29-30	8-9
3	5/3-5	12-14
4	5/8-13	17-22
5	5/17-20	26-29
6	5/24-26	33-35
Megalopa	6/1-5	41-45

ZOEA

Rostral spine is straight and moderately long. Dorsal spine is a little longer than the rostral spine and gently curves. Lateral spines

are rather long, about half or slightly less than half as long as the rostral spine in stage 1, but tend to be shorter in later stages in proportion to rostral and dorsal spines.

Abdomen is about 3/4 as long as the distance from spine to spine. The second outer spine disappears from stage 2. Telson fork is smooth and curves dorsally, its length about equals or slightly exceeds the width of the telson. First internal seta is somewhat more than half as long as the telson fork.

Antennal exopod is very small, almost rudimentary except in stage 1 where it is about 1/8 as long as the spinous process, ending in two spines of different length, the longer one is longer than the rest of the exopod. Endopod of maxillule has 0 or 1 + 6 setae, that of maxilla is slightly divided into 3 lobes with 2 + 2 + 2 setae, and that of maxilliped 2 has 1 + 1 + 5 setae.

Coloration is poor and the body is almost transparent with a small amount of diffused yellow tinge and small black chromatophores. The black chromatophores occur in the mouth parts, at distal end of basis of maxilliped 1, and ventrally along abdominal somites 2-5. There is a small amount of black color over the stomach, extending posteriorly along the intestine as far back as somite 2. There are no chromatophores on carapace.

As many as 7 stages were recognized, but it does not necessarily mean that all the larvae pass through every stage. Some larvae may skip some of the described stages, and some others may pass through extra stages before they reach megalopa. The variation mainly occurs in later stages.

Stage 1 (Pl. 65; A, B, I) From spine to spine: 0.85 mm.

Antennal exopod is about 1/8 as long as the spinous process, and there is no endopod. Exopod of maxillipeds 1 and 2 each has 4 setae. There are no leg rudiments.

Stage 2 (Pl. 65; C) From spine to spine: 1.0 mm.

There is a pair of extra internal setae on telson. Exopod of maxillipeds 1 and 2 each has 6 setae. Antennal exopod is reduced in length and becomes almost rudimentary.

Stage 3 (Pl. 65; D) From spine to spine: 1.3 mm.

Exopod of maxillipeds 1 and 2 each has 8 setae. There are very small rudiments of maxilliped 3 and leg 1.

Stage 4 (Pl. 65; E) From spine to spine: 1.4 mm.

There are 9 and 10 setae on exopod of maxillipeds 1 and 2 respectively. Rudiments of legs 1-5 are free.

Stage 5 (Pl. 65; F) From spine to spine: 1.6-1.8 mm.

There is a small antennal endopod. Exopod of maxillipeds 1 and 2 has 10 or 11 and 12 setae respectively. Leg 1 is bifurcated at tip.

Stage 6 (Pl. 65; G) From spine to spine: 2.2 mm.

Antennal endopod is a little more than half as long as the spinous process. There are small pleopod buds. Exopod of maxillipeds 1 and 2 has 11-12 and 12-13 setae respectively.

Stage 7 (Pl. 65; H: Pl. 66; A-E) From spine to spine: 2.6 mm.

Antennal endopod is about 4/5 as long as the spinous process. Pleopod buds are long. There are 3 extra internal setae on telson. Exopod of maxillipeds 1 and 2 has 11 and 13-15 setae respectively.

MEGALOPA (Pl. 67; A-D) C.L.: 1.6 mm.

Rostrum is squarish ending into a long central spine stretching horizontally, when measured for posterior orbital angles, it is about as long as the rest of carapace. Angles of the rostrum are rounded. There

ZOEA

The zoea is closely similar to the above two species both in size and structure. But the dorsal spine is straighter than in the latters. The central notch on the hind margin of telson is somewhat narrower than in C. sapidus and P. gibbesii. Antennal exopod is much shorter than in P. gibbesii and like that of C. sapidus in stage 1, the longer apical spine being about 3 times as long as the rest of the exopod.

Coloration is poor and the body is transparent. A small amount of black chromatophores occur over the mouth parts, at the distal end of maxilliped 1 and ventrally along the somites 3-5. Black color over the stomach extends posteriorly along the intestine as far back as the somite 2.

Stage 1 (Pl. 69: A-C) From spine to spine: 0.86 mm.

There is a very small rudiment of maxilliped 3, but no legs.

Family Xanthidae

There are 4 zoeal stages except in Menippe in which there are 4 or 5 stages. All spimes present on carapace. The rostral spine is straight, moderately or very long. The dorsal spine more or less curves at the end. Laterals are usually short. Telson is typically forked, with or without outer spine. When only one outer spine is present it is seated on dorsal edge of the telson fork. Antenna is well developed with or without spinules on the spinous process, exopod is either long and spinous, rudimentary or even wanting. Mandible has a palp in the last stage. With the exception of Menippe, endopod of maxillule is of 2 segments with 1 + 6 setae, and that of maxilla is divided into 3 lobes with 3 + 2 + 3 setae. In Menippe endopod of maxillule has 1 + 4 setae, and that of maxilla is divided into 2 lobes with 3 + 3 setae. The endopod of maxilliped 2 is of 3 segments in all the

known zoea, with 0 + 1 + 4 setae in Menippe, 1 + 1 + 6 setae in Pilumnus and Eriphia and 1 + 1 + 5 setae in the reminder of the known zoea.

30. Pilumnus sayi Rathbun

The hairy crab is fairly common in the coastal offshore areas of Sapelo Island, Berried females were trawled by Mr. Heard on May 1, 1969 in the Sapelo Sound and were at my disposal. The resulting larvae were reared as far as first young. The chronological data of development are summarized in the following table.

Stage	Date	Days after hatching
1	5/16	0
2	5/19-21	3-5
3	5/24-26	8-10
4	5/27-28	11-12
Megalopa	5/30-31	14-15
Young	6/10	25

ZOEA

Rostral spine is a little more than 1/3 as long as the carapace. Dorsal spine is somewhat longer than the rostral spine and curves. Laterals are short. Ventral margin of carapace is serrated.

Abdomen is slightly longer than the ditance from spine to spine, with lateral hooks on somies 2-5, and short but pointed lateral spines on somites 3-5. There is a fringe of minute spinules on the hind margins of abdominal somites 2-5. Telson is slender and not much wider than abdominal segments, with 3 outer spines. The first outer spine is large and covered with minute spinules, the second is hair-like, the third is small but spinous and seated on dorsal edge of the telson fork somewhat anterior to the second. Fork is slender, covered with minute spinules and slightly curves. The central notch is very narrow but distinct. The first interal seta is somewhat shorter than 1/3 length of the telson fork. There are no extra internal setae.

Antenna is much longer than the rostral spine. Exopod is about as long

as the spinous process and spinous, with 2 short accessory spines about the middle of its outer edge. Both the exopod and the spinous process are armed with spinules on their distal half.

Chromatophores are black and occur at rear of the base of dorsal spine, near ventral margin of carapace, in the region of antennal bases and mouth parts, on coxa of maxilliped 2 and on abdominal somites 3-5. There is a small amount of dark brown color over the stomach, and along the intestine at the articulation between abdominal somites 1 and 2. Carapacial spines and telson are colorless.

Stage 1 (Pl. 70; A, C, G) From spine to spine: 0.91 mm.

The length of telson fork is about 1.3 times greater than the width of telson. There are small biramous rudiments of maxilliped 3, but no legs.

Stage 2 (Pl. 70; D, H) From spine to spine: 0.98 mm.

Antenna has a small endopod. There are small rudiments of legs.

Stage 3 (Pl. 70; E, I) From spine to spine: 1.18 mm.

Antennal endopod is slightly less than half as long as the exopod. There are small pleopod buds.

Stage 4 (Pl. 70; B, F, J-M) From spine to spine: 1.22 mm.

Antennal endopod is more than half as long as the exopod. Rudiments of legs and pleopod buds are large.

MEGALOPA (Pl. 71; A-D) C.L.: 1.04 mm.

Carapace is a little longer than wide. There are no dorsal spines nor protuberances. Rostrum is squarish, bent down in the center into a short blunt tooth which is hardly seen from above, angles of rostrum on each side are rounded.

Abdomen is slightly shorter than the carapace, without spines. Telson is rounded behind, its width at base is about as great as the length of somite 6 and telson combined. Uropod bears 6 setae on exopod.

Antennal flagellum is of 7 segments. Maxilliped 3 has 7-8 small teeth on ischium. Cheliped has 2 small spines on ischium and 1 small spine on merus. Chela is thick, about 2/5 as high as long, fingers about half as long as palm. Dactyli of legs 2-4 are about 1.4 times longer than their propodi, with 3 barbed spines each on the ventral edges. Dactyli of leg 5 has no spines on the ventral edge but has 1 short feeler.

FIRST YOUNG (Pl. 71; E) C.L.: 1.14 mm.

Carapace is about as long as wide armed with sparse stiff setae. Front is bilobed. The inner orbital angles on each side end in a small pointed spine. The orbit is fringed dorsally with several small spines.

31. Pilumnus sp.

Berried females were captured by Mr. Heard on September 2, 1969 at the Sponge Reef off Sapelo Island and were at my disposal. The resulting larvae, however, could not be reared beyond the first molt, and no later stages were obtained. Unfortunately the berried females of two species, P. holosericus Rathbun and P. dasypodus Kingsley, were held together in the same aquarium It is not known to which species does this zoea belongs. The confusion was found when the identification was checked against the identified specimens in the U. S. National Museum by Mr. H. B. Roberts.

ZOEA

The zoea very like P. sayi, but smaller in size. Rostral spine is short and straight. Dorsal spine is longer than the rostral spine and

strongly curves. Laterals are very short. Ventral margin of carapace is denticulated.

Abdomen is about 1.3 times longer than the distance from spine to spine, with a pair of lateral hooks on somites 2-5, and lateral spines on somites 3-5. Somites 2-5 have a fringe of fine spinules on their hind dorsal margins.

Telson like in P. sayi, but the central notch on the hind margin is moderately deep, and deeper than in the latter. Antenna is as in P. sayi.

There are no chromatophores on carapace. Otherwise the chromatophore pattern is quite similar to P. sayi.

Stage 1. (Pl. 72; A-C) From spine to spine: 0.66 mm.

32. Menippe mercenaria (Say)

Porter, 1960

Berried females were trawled by Mr. Heard on May 1 and August 5, 1969 in the Sapelo Sound and were at my disposal. A large number of first zoea were obtained from these females on May 18, August 14 and August 28. Materials for the morphological study were obtained from the May brood reared in a 50 liter plastic tank. The chronological data of development of this brood are summarized in the following table.

Stage	Date	Days after hatching
1	5/18	0
2	5/21-22	3-4
3	5/24-26	6-8
4	5/28-30	10-12
5	6/1-4	13-17
Megalopa	6/8-12	21-25
First Young	6/19-25	32-38

ZOEA

Rostral spine is straight and about 5/7 as long as the carapace. Dorsal spine is somewhat longer than the rostral spine and gently curves. Lateral spines are moderately long, about 1/3 as long as the dorsal spine

in stage 1, but tend to be shorter in later stages in proportion to the rostral and dorsal spines. Ventral margin of carapace is smooth.

Abdomen is somewhat shorter than the distance from spine to spine, with a pair of lateral hooks on somites 2-5, those on somite 4 may be wanting, and those on somite 5 are much larger than the others. Somites 3-5 have a pair of lateral spines accompanied with small accessory spines dorsally in later stages.

Telson is rather robust, with 3 vestigial outer spines. The first and the second spines are on the lateral edge and can only be seen with some difficulties under high magnification, and disappear in later stages. The third spine is on the dorsal edge near the base of telson fork and is distinct in stage 1, but tends to disappear in later stages. The first internal seta is about 3/7 as long as the telson fork. The central notch is wide.

Antenna is about half as long as the rostral spine. The spinous process is armed with spinules in all stages. Exopod is large and ends in a short apical spine with a long accessory spine on the inner edge at the base of the apical spine. The apical spine may be bifid. The accessory spine reaches almost to or somewhat beyond the tip of the spinous process. Exopod (less spines) is 4/7 or 2/3 as long as the spinous process.

There is a good deal of yellow over the stomach and along the abdomen. Chromatophores are black and occur at distal end of maxillipeds 1 and 2, on carapace and on abdominal somites 2-5. Carapacial chromatophores are at rear of the bases of dorsal and lateral spines, near the ventral margin and at about middle of the dorsal spine. Black color over the stomach extends posteriorly along the intestine as far back as somite 2.

Stage 1 (Pl. 73; A, C, H-J) From spine to spine: 1.2 mm.

Abdominal somites have no long lateral spines. Antenna has no endopod. There are no rudiments of legs.

Stage 2 (Pl. 73; D) From spine to spine: 1.6 mm.

Exopod of maxillipeds 1 and 2 each has 6 setae. There is a pair of small lateral spines on somites 3 and 4.

Stage 3 (Pl. 73; E) From spine to spine: 1.9 mm.

Telson has a pair of extra internal setae. Abdomen has an additional pair of lateral spines on somite 5. Antennal endopod is about 1/4 as long as the exopod(less spines). There are small rudiments of legs. Exopod of maxillipeds 1 and 2 each bears 8 setae.

Stage 4 (Pl. 73; F) From spine to spine: 2.3 mm.

Antennal endopod is about as long as the exopod (less spines). There are small pleopod buds. Telson has 2 pairs of extra internal setae. Exopod of maxillipeds 1 and 2 each has 10 setae.

Stage 5 (Pl. 73; B, G) From spine to spine: 3.4 mm.

Antennal endopod is longer than exopod (less spines). Pleopod buds and leg rudiments are large. Exopod of maxillipes 1 and 2 each has 10 setae.

This stage may be skipped in some zoeae. The evidence is obtained from observations of stage 4 zoea changing directly into megalopa but failed to get rid out of the zoeal skin . Some or all of the internal setae of the zoeal telson are frequently retained in these megalopa.

MEGALOPA (Pl. 74; A-E) C.L.: 1.7-1.8 mm.

Carapace is roughly square with eyes extending slightly beyond the lateral margin of carapace. Rostrum is broad, protruded between eyes and bent down in the center into a blunt tooth, angles of the rostrum on each side are also bent down into a pointed tooth. There are no dorsal spines nor protuberances on carapace.

Abdomen is somewhat shorter than the carapace, without spines. Telson is wider than long and rounded or somewhat truncated behind. Uropod has 11 or 12 setae on exopod.

Antennal flagellum is of 8 segments, and moderately long. Maxilliped 3 has about 9 small spines on ischium. The ischia of legs 1-3 has 5-6, 2-3 and 1 small spines respectively. Leg 1 has 2 small spines on the proximal inner edge of merus. Chela is stout and is slightly less than half as high as long, fingers about 2/5 as long as the palm. Dactyli of legs 2-4 are about 1.3 times longer than their propodi, with 4 or 5 spines on their ventral edges. Leg 5 has 3 feelers on dactylus.

FIRST YOUNG (Pl. 74; F) C.L.: 1.9-2.0 mm.

Carapace is transversely oval. The front is wide and bilobed. The anterior lateral margin is cut into 4 lobes fringed with many small granular spinules.

SECOND YOUNG (Pl. 74; G) C.L.: 2.6 mm.

The front is slightly bilobed.

33. Rhithropanopeus harrisii (Gould)

Chamberlain, 1962

Connolly, 1925

Berried females were trawled by Mr. Heard on April 4 and on May 1, 1969 and were at my disposal. On both occasions the resulting larvae were reared as far as young crabs. The chronological data of development are shown in the following table.

	April brood		May brood	
Stage	date	Days after hatching	Date	Days after hatching
1	4/16	0	5/8	0
2	4/19-21	3-5	5/11-12	3-4
3	4/24-26	8-10	5/14-16	6-8
4	4/28-30	12-14	5/17-18	9-10
Megalopa	5/3-6	17-20	5/20-21	12-13
First young	5/10-13	24-27	5/26-27	18-19

ZOEA

Rostral spine is very long, about 2.3 times as long as the carapace, and is covered with sparse minute tubercles. Dorsal spine is also armed with spare minute tubercles, about as long as the carapace and only slightly curves. Lateral spines are very short. Ventral margin of carapace is smooth.

Abdomen is slender and long, almost as long as the rostral spine, with a pair of lateral hooks on somite 2 only, and lateral spines on somites 4 and 5. The lateral spines on somite 5 are very long, exceeding the hind end of somite 6 by the distal 1/3, while those on somite 4 are small. The tips of these lateral spines are rounded.

Telson has one outer spine on the dorsal edge, fork is slender, long and curves strongly at the end, its length is about 1.8 times greater than the width of the telson. Internal setae are short, the first seta being about 1/4 the length of the fork. The central notch is moderately wide and deep. Antenna is as long as the rostral spine with a rudimentary exopod, ending in a hair.

Chromatophores are black accompanied with yellow, and occur on antennular peduncle, at the bases of antennae, in the region of mouth parts, at distal ends of maxillipeds 1 and 2 and ventrally along abdominal somites 2-5. There is a pair of large chromatophores dorsally at the articulation between somites 1 and 2. Carapacial chromatophores occur at the rear of the eyes and of lateral spine, and near the ventral margin.

Stage 1 (Pl. 75; A, B, F) From spine to spine: 2.00 mm.

Antenna has no endopod. There are no rudiments of legs.

Stage 2 (Pl. 75; C) From spine to spine: 2.37 mm.

There are small rudiments of legs. Exopod of maxillipeds 1 and 2 has 6 and 7 setae respectively.

Stage 3 (Pl. 75; D) From spine to spine: 2.9 mm.

Antennal endopod is shorter than the peduncle. There are small pleopod buds. Exopod of maxillipeds 1 and 2 has 8 and 9 setae respectively.

Stage 4 (Pl. 75; E, G-I) From spine to spine: 3.2 mm.

Antennal endopod is about as long as the peduncle. Exopod of maxillipeds 1 and 2 has 9 and 11 setae respectively. Rudiments of legs and pleopod buds are large. There is one short extra internal seta on telson.

MEGALOPA (Pl.76; A-C) C.L.: 1.14 mm., C.W.: 0.95 mm.

Rostrum is squarish, slightly bent, ending in the center in a blunt bifid tooth, angles of the rostrum are rounded. Carapace has small dorsal prominences but no spines. Eyes do not extend beyond the lateral margin of carapace. Abdomen is slightly shorter than the carapace, without spines. Telson is roughly square. Uropod has 3 or 4 setae on exopod.

Antennal flagellum is of 6 segments. Maxilliped 3 has no spines on ischium. Cheliped has a spine on ischium. Chela is a little less than half as high as long. Fingers are somewhat shorter than the palm. Dactyli of legs 2-4 are about 1.5 times longer than their propodi, with one small spine each near the distal end of ventral margin. There are no feelers on leg 5.

YOUNG

Carapace is a little wider than long. The front is slightly bilobed and is about half as wide as the carapace. There are 2 large lateral spines on each side behind the orbits. The outer orbital angles may also be produced into small spines.

Stage 1 (Pl. 76; D) C.W.: 1.4 mm.

Stage 2 (Pl. 76; E) C.W.: 1.8 mm.

34. Neopanope texana sayi (Smith)

Birge, 1883; Hyman, 1925; Chamberlain, 1961

Berried females were trawled by Mr. Heard on May 1, 1969 in the Sapelo Sound, and by myself on April 14, 1969 in the Doboy Sound. On both occasions the resulting larvae were reared as far as the young crab. The following table shows the chronological data of development.

Stage	April brood		May brood	
	Date	Days after hatching	Date	Days after hatching
1	4/28	0	5/3	0
2	5/2-3	4-5	5/7-8	4-5
3	5/5-7	7-9	5/11-12	8-9
4	5/8-11	10-13	5/15-16	12-13
Megalopa	5/13-14	15-16	5/17-20	14-17
First Young	5/22-25	24-27	5/28-30	25-27

ZOEA

Rostral and dorsal spines are very long and much longer than the carapace, while the laterals are short with rounded tip. Dorsal spine is almost subequal in length to the rostral spine in stage 1, but tends to be shorter in later stage in proportion to the latter. Ventral margin of carapace is smooth.

Abdomen is a little longer than half the distance from spine to spine, with a pair of lateral hooks on somites 2 and 3, and lateral spines on somites 3-5. Lateral spines are rounded at tips. Telson has one outer spine on dorsal edge of the telson fork. The fork is smooth, its length is about 1.4 times greater than the width of the telson. The first internal seta is 2/5 as long as the fork. The central notch is wide.

Antenna is as long as the rostral spine. The spinous process is smooth. Exopod is rudimentary, ending in a short hair.

There are black chromatophores in the region of antennae and mouth parts, on coxae and distal ends of bases of maxillipeds 1 and 2, and on

abdominal somites 2-5. There is a small amount of black color over the stomach and along intestine at the articulation between somites 1 and 2. Carapacial chromatophores occur at rear of the base of lateral spines and near the ventral margins.

Stage 1 (Pl. 77; A, B, G-I) From spine to spine: 1.8 mm.

There are no antennal endopod nor the rudiments of legs.

Stage 2 (Pl. 77; C) From spine to spine: 2.3mm.

There are small rudiments of legs. Exopod of maxillipeds 1 and 2 each has 6 setae.

Stage 3 (Pl. 77; D) From spine to spine: 2.8 mm.

Antennal endopod is shorter than the peduncle. There are small pleopod buds. Exopod of maxillipes 1 and 2 has 8 and 9 setae respectively. There are one or two extra internal setae on telson.

Stage 4 (Pl. 77; E, F) From spine to spine: 3.1 mm.

Antennal endopod is longer than peduncle. Leg rudiments and pleopod buds are long. Exopod of maxillipeds 1 and 2 has 9 and 11 setae respectively. Telson has a pair of extra internal setae.

MEGALOPA (Pl. 78; A-C) C.L.: 1.1-1.2 cm.

Carapace is somewhat longer than wide. Rostrum is square, depressed in the center into a blunt bifid tooth, angles of the rostrum on each side ending in a blunt spine. Eyes well extend beyond the lateral margin of carapace. Carapace has no dorsal spines nor conspicuous protuberances.

Abdomen is about 4/5 as long as the carapace, without spines. Telson is rounded behind, much wider than long. Antennal flagellum is of 8 segments.

Maxilliped 3 has 5-6 teeth on ischium. Cheliped has a large hook on ischium. Chela is a little more than half as high as long, fingers about

3/4 as long as the palm. Dactyli of legs 2-4 are about 1.2 times longer than their propodi, each with 3 spines on ventral edge. Leg 5 has only one short feeler.

FIRST YOUNG (Pl. 78; D) C.L.: 1.3 mm.

Carapace is somewhat longer than wide. The front is divided into 2 lobes by a very small central notch. There are 3 spines on each side of carapace behind the outer orbital angles.

35. Eurypanopeus depressus (Smith)

Costlow and Bookhout, 1961b

Berried females were captured by Mr. Heard on March 26, 1969 near Fort Pierce, Florida, and were at my disposal. The resulting larvae were reared as far as the megalopa. The following table shows the chronological data of development.

Stage	Date	Days after hatching
1	4/11	0
2	4/14-15	3-4
3	4/16-17	5-6
4	4/20-24	9-13
Megalopa	4/25-27	14-16

ZOEA

Rostral and dorsal spines are long, somewhat longer than the carapace, while the laterals are very short. Dorsal spine strongly curves at the end. Ventral margin of the carapace is finely serrated.

Abdomen is about 3/4 as long as the distance from spine to spine, with lateral hooks on somites 2 and 3, and lateral spines on somites 3-5. The lateral spines are rounded at tip .

Telson has one outer spine on the dorsal edge of telson fork. Telson fork is smooth, curves dorsally, its length slightly exceeds the width of telson. The first internal seta is about 2/5 as long as the telson fork.

The central notch is very wide but shallow.

Antenna is about as long as the rostral spine, with a rudimentary exopod ending in a hair. The spinous process is armed with a few spinules in all stages, though the spinules tend to decrease both in number and size in later stages.

Chromatophores are black accompanied with a small amount of yellow, and occur on front of eyes, at distal end of protopod of maxillipeds 1 and 2 and ventrally along the abdomen. There is a large amount of black color ventrally along the cephalothorax around the bases of appendages.

Stage 1 (Pl. 79; A, C, G, I, J) From spine to spine: 1.44 mm., C.L. (less spines): 0.51 mm.

Antenna has no endopod. There are no rudiments of legs.

Stage 2 (Pl. 79; D) C.L. (less spines): 0.66 mm.

There are small rudiments of legs. Exopod of maxillipeds 1 and 2 has 6 and 7 setae respectively.

Stage 3 (Pl. 79; E) C.L. (less spines): 0.74 mm.

Antennal endopod is shorter than the peduncle. Telson has a pair of extra internal setae. Exopod of maxillipeds 1 and 2 has 8 and 9 setae respectively. There are small pleopod buds.

Stage 4 (Pl. 79; B, F, H) C.L. (less spines): 0.85 mm.

Antennal endopod is longer than the peduncle. Pleopod buds and leg rudiments are long. Lateral spines on somite 5 exceed the hind end of somite 6.

MEGALOPA (Pl. 80; A-C) C.L.: 0.88 mm., C.W.: 0.70 mm.

Rostrum is bent obliquely in the center into a slightly bifid tooth,

angles of rostrum are rounded. Carapace has no dorsal spines nor conspicuous protuberances. Abdomen is about as long as the carapace, without spines. There are 5 or 6 setae on uropod.

Antennal flagellum is of 7 segments. Cheliped has no spine on ischium. Dactyli of legs 2-4 are about 1.5 times longer than their propodi, each with 2 ventral spines. There are no feelers on leg 5.

36. Leptodius floridanus (Gibbes)

Berried females were captured by Mr. Heard on March 21-23, 1969 at Pigeon Key, Florida and were at my disposal. A large number of first zoeae were obtained from these females on April 2, 5, 6 and 8. But none of them could be reared beyond the first molt, and no later stages were obtained.

ZOEA

Rostral spine is about 2/3 as long as the rest of the carapace. Dorsal spine is somewhat longer than the rostral spine, and slightly curves. Laterals are short. Ventral margin of carapace is somewhat irregularly serrated.

Abdomen is a little more than half as long as the distance from spine to spine, with a pair of lateral hooks on somites 2 and 3, and lateral spines on somites 3-5. Somites 2-5 have a fringe of fine spinules on the hind margin.

Telson has 3 outer spines, all the spines are distinctly spinous. Telson fork is smooth and slightly curves, its length is about 3/4 the width of the telson. The first internal seta is about 5/7 as long as the telson fork. The central notch is moderately wide.

Antenna is nearly as long as the rostral spine. The spinous process is armed with 4 rows of spinules. Exopod is very small, ending in 2 short spines.

The zoea has a large amount of red color over the stomach, extending posteriorly along the intestine as far back as the somite 2. Red chromatophores occur on coxae of maxillipeds 1 and 2, abdominal somites 2-5 and on telson. Carapace has red chromatophores at rear of the lateral spines and near the ventral margin.

Stage 1 (Pl. 81; A-E) From spine to spine: 1.34 mm.

Antenna has no endopod. There are no rudiments of legs.

37. Panopeus herbstii H. Milne-Edwards

Hyman, 1925; Costlow and Bookhout, 1961a

The mud crab is very common in the estuaries of Sapelo Island.. Berried females were captured by Mr. Heard on March 26, 1969 near Fort Pierce, Florida and by myself on April 28, May 1 and July 27, 1969 in the estuaries of Sapelo Island. At each time the resulting larvae were reared as far as the young crab. The following table shows the chronological data of development.

Stage	First brood	Second brood	Third brood	Fourth brood
1	4/9	5/5	5/8	7/29
2	4/13-15	5/8-10	5/11-12	8/2-4
3	4/19-21	5/11-13	5/14-16	8/8-10
4	4/25-28	5/15-17	5/18-19	8/13-15
Megalopa	5/2-5	5/19-20	5/22-24	8/19-20
First young	5/16-20	5/29-31	6/1-3	9/1-3

ZOEA

Rostral spine is long, almost as long as the rest of carapace. Dorsal spine is somewhat longer than the rostral spine and strongly curves at the end. Lateral spines are about 1/4 as long as the dorsal spine. Ventral margin of the carapace is smooth.

Abdomen is about 2/3 as long as the distance from spine to spine, with a pair of lateral hooks on somites 2 and 3, and lateral spines on somites 3-5. The tips of the lateral spines are rounded. Telson has 3 outer spines in all stages, of which the second is hairlike. The telson fork is smooth and curves, its length slightly exceeds the width of the telson. The first internal seta is slightly shorter than half the length of the telson fork. The central notch is wide but shallow.

Antenna is nearly as long as or slightly longer than the rostral spine. Spinous process is armed distally with spinules in all stages, though the number of spinules tends to decrease in later stages. Exopod is rudimentary and ends in a short hair.

Chromatophores are black and occur in front of eyes, in the region of mouth parts, at distal end of protopods of maxillipeds 1 and 2, and ventrally along the abdominal somites 2-5 and telson. Carapace has small chromatophores in front and rear of the base of dorsal spine, at rear of the lateral spines and near the ventral margin. The intestine is colored for a short distance at the articulation between somites 1 and 2.

Stage 1 (Pl. 81; A, B, G) From spine to spine: 1.5 mm.

Antenna has no endopod. There are no rudiments of legs.

Stage 2 (Pl. 82; C) From spine to spine: 1.94 mm.

There are small rudiments of legs. Exopod of maxillipeds 1 and 2 has 6 and 7 setae respectively.

Stage 3. (Pl. 82; D) From spine to spine: 2.13 mm.

Antennal endopod is shorter than the peduncle. There are small pleopod buds. Lateral spines on somite 5 exceed the hind margin of somite 6. Telson has a pair of extra internal setae. Exopod of maxillipeds 1 and 2 has 8 and 9 setae respectively.

Stage 4 (Pl. 82; E, F, H-K) From spine to spine: 2.59 mm.

The base of rostral spine expands laterally to form a pointed prominence on each side. Antennal endopod is longer than the peduncle. Leg rudiments and pleopod buds are large. Exopod of maxillipeds 1 and 2 has 9 and 11 setae respectively.

MEGALOPA (Pl. 83; A) C.L.: 1.04 mm., C.W.: 0.77 mm.

Rostrum is square, depressed in the center into a bifid tooth. Angles of the rostrum on each side end in a prominent horn, which extends forward well beyond the tip of the central tooth. Eyes extend laterally beyond the margin of carapace by their cornea. There are no dorsal spines nor conspicuous prominences on carapace. Abdomen is somewhat shorter than the carapace, without spines. Telson is rounded behind, its width is about as great as the length of somite 6 and telson combined. Uropod bears 7 or 8 setae on exopod.

Antennal flagellum is of 7 segments. Maxilliped 3 has 3 small teeth on ischium. There is a large hook on ischium of cheliped, one spine each on coxae of legs 2-4. Dactyli of legs 2-4 are about 1.5 times longer than their propodi, each with 3 barbed spines on ventral edge. Leg 5 has 3 short feelers.

FIRST YOUNG (Pl. 83; B) C.L.: 1.22 mm., C.W.: 1.13 mm.

Front is about half as wide as the carapace, and bilobed. There are 2 lateral spines on each side of carapace behind the outer orbital angles.

38. Panopeus occidentalis Saussure

A berried female was trawled by Mr. Heard on May 1, 1969 in the Sapelo Sound and was at my disposal. The resulting larvae were reared as far as the young crab. The following table shows the chronological data of development of these larvae in the laboratory.

are no dorsal spines nor protuberances on carapace.

Abdomen is somewhat shorter than the carapace. Somite 5 is produced posteriorly into a pair of lateral spines which well exceed the posterior end of somite 6. Telson gradually tapers to a rounded posterior end and is almost as long as or slightly longer than wide. Uropod has 11 setae on exopod. Antennal flagellum is of 8 segments.

Maxilliped 3 has no spines on ischium. There is a large hook on ischium of leg 1, but no coxal nor ischial spines on other legs. Dactyli of leg 2-4 are a little more than 1.5 times as long as their propodi, bearing 6-8 spines on the ventral edge. Dactylus of leg 5 is paddle-shaped with 7 long feelers, ending in a short spine.

Chela is rather slender, about 3 times as long as high, fingers about as long as the palm.

YOUNG

Stage 1 (Pl. 67; E). C.L.: 1.7-1.8 mm., C.W.: 1.9 mm.

Carapace has a bilobed front. There is a large lateral spine on each side. Antero-lateral margin is cut into 8 teeth, each accompanied with small accessory spines.

Stage 2 (Pl. 67; F) C.L.: 2.1 mm., C.W.: 2.8 mm.

Antero-lateral spines on carapace assume form of lobes fringed with many minutes granular spinules. There is a transverse row of small granules on each side near the base of the lateral spine.

28. Portunus gibbesii (Stimpson)

This swimming crab was quite common in the trawl catches in the coastal offshores around Sapelo Island. Berried females were observed during May through August, and were separated from trawl catches several

Stage	Date	Days after hatching
1	5/10	0
2	5/14-15	4-5
3	5/18-19	8-9
4	5/21-26	11-16
Megalopa	5/26-28	16-18
First Young	5/28-6/2	18-23

ZOEA

Rostral and dorsal spines are long and subequal, while the laterals are short with rounded tip . Dorsal spine is almost straight or slightly curves at the end. Ventral margin of carapace is smooth.

Abdomen is about 3/5 as long as the distance from spine to spine, with a pair of lateral hooks on somites 2 and 3, and lateral spines on somites 3-5. These lateral spines are not pointed but rounded at tip .

Telson has no outer spines. Fork is smooth, its length slightly exceeds the width of the telson. The first internal seta is about 2/5 as long as the fork. The central notch is wide with 1 or 2 extra internal setae in later stages.

Antenna is about as long as the rostral spine. The spinous process is smooth without spinules. Exopod is rudimentary ending in a short hair.

Chromatophores are black and occur on the eyestalks, in the region of antennae and mouth parts, at distal end of maxillipeds 1 and 2, and abdominal somites 2-5. Intestine is colored for a short distance at articulation between somites 1 and 2.

Stage 1 (Pl. 84; A, B, G-I) From spine to spine: 1.47 mm.

Antenna has no endopod. There are no rudiments of legs.

Stage 2 (Pl. 84; C) From spine to spine: 1.9 mm.

Exopod of maxillipeds 1 and 2 has 6 and 7 setae respectively. There are small rudiments of legs.

Stage 3 (Pl. 84; D) From spine to spine: 2.3 mm.

Telson bears a pair of extra internal setae. Antennal endopod is shorter than the peduncle. There are small pleopod buds. Exopod of maxillipeds 1 and 2 has 8 and 8-9 setae respectively.

Stage 4 (Pl. 84; E, F) From spine to spine: 3.1-3.2 mm.

Antennal endopod is about as long as the peduncle. Leg rudiments and pleopod buds are large. Exopod of maxillipeds 1 and 2 has 9 and 11 setae respectively. There are usually 3 extra internal setae on telson.

MEGALOPA (Pl. 85; A-C) C.L.: 1.1 mm., C.W.: 0.9 mm.

Rostrum is squarish, depressed in the center into a blunt, bifid tooth, angles of the rostrum on each side ending in a spine. There are no dorsal spines nor conspicuous prominences on carapace. Eyes extend slightly beyond the lateral margin of carapace.

Abdomen is somewhat shorter than carapace, without spines. Telson is rounded behind, wider than long. Uropod has 8 setae on exopod. Antennal flagellum is of 7 segments.

Maxilliped 3 has a small tooth on ischium. Cheliped has a large hook on ischium. Chela is a little less than half as high as long, fingers somewhat shorter than the palm. Dactyli of legs 2-4 are a little longer than their propodi, each has 3 barbed spines on the ventral edge. Leg 5 has 3 feelers.

FIRST YOUNG (Pl. 85; D) C.L.: 1.5 mm.

Carapace is about as long as wide. The front is broad and slightly bilobed. There are 3 large lateral spines on each side of carapace including the one at the outer orbital angle. Each spine may be accompanied

with one or more accessory spines. Front and the lateral margin of carapace is fringed with small granular spines. There is a curved row of similar granules on each side of carapace defining the branchial region anteriorly.

39. Panopeus sp.

A berried female was captured by Mr. Heard on March 21-23, 1969 at Pigeon Key, Florida, and was at my disposal. When checked against the identified specimens in the U. S. National Museum, no reasonable distinctions were found between this female and females of P. occidentalis. Mr. H. B. Roberts identified this female as a variety of P. occidentalis. However, the zoea is distinctly different from that of P. occidentalis described above. The identification of this species await further studies.

The resulting larvae were reared as far as megalopa. The following table shows the chronological data of development.

Stage	Days	Days after hatching
1	3/28	0
2	4/4-5	7-8
3	4/8-11	11-14
4	4/14-15	17-18
Megalopa	4/16-20	19-23

ZOEA

Rostral and dorsal spines are moderately long, while the laterals are short. Dorsal spine gently curves. Ventral margin of carapace is smooth. Abdomen is about 3/4 as long as the distance from spine to spine, with a pair of lateral hooks on somites 2-5, and lateral spines on somites 3-5.

Telson has 3 outer spines in all stages. Telson fork is smooth, its length is slightly less in stage 1, but slightly greater in later stages,

than the width of the telson. Antenna is somewhat longer than the rostral spine. The spinous process is armed with spinules in all stages. Exopod is very small, ending in a short hair.

Chromatophores are black or dark brown, and occur in the region of mouth parts, at distal ends of protopod of maxillipeds 1 and 2, on abdominal somites 2-5 and on telson. The carapacial chromatophores are at rear of the base of lateral spines, near the ventral margin and at the tip of dorsal spine. The intestine is colored for a short distance at articulation between somites 1 and 2.

Stage 1 (Pl. 86; A, C, G) From spine to spine: 1.3 mm.

Antenna has no endopod. There are no rudiments of legs.

Stage 2 (Pl. 86; D) From spine to spine: 1.4 mm.

There are small rudiments of legs. Exopod of maxillipeds 1 and 2 has 6 and 7 setae respectively.

Stage 3 (Pl. 86; E) From spine to spine: 1.8 mm.

Antennal endopod is shorter than the peduncle. Exopod of maxillipeds 1 and 2 has 8 and 9 setae respectively. There are small pleopod buds. Telson has a pair of extra internal setae.

Stage 4 (Pl. 86; B, F, H-J) From spine to spine: 2.1 mm.

Antennal endopod is longer than the protopod. Leg rudiments and pleopod buds are large. Exopod of maxillipeds 1 and 2 has 9 and 10 setae respectively. Telson has 3 extra internal setae.

MEGALOPA (Pl. 87; A-C) C.L.: 1.2 mm.

Rostrum is somewhat depressed in the center into a large bifid tooth. Angles of the rostrum on each side end in a large pointed horn, which do not exceed the central tooth in the dorsal view. Carapace has no dorsal spines but has an inconspicuous gastric, cardiac and posterior prominences.

Abdomen is a little more than 2/3 as long as the carapace, without spines. Telson is rounded behind, its width is as great as the length of somite 6 and telson combined. Uropod bears 7 setae on exopod.

Maxilliped 3 has 3-4 teeth on ischium. Cheliped has a large hook on ischium. There is a spine on coxae and ischia of legs 2-4. Chela is about half as high as long, fingers as long as the palm. Legs 2-5 are covered dorsally with small spines in addition to setae. Dactyli of legs 2-4 are about 1.5 times longer than their propodi, each with 3 barbed spines on ventral edge. Leg 5 has 3 feelers.

40. Eurytium limosum (Say)

Kurata and Heard (in preparation)

This crab is common on the tidal flat of Sapelo Island. The rearing of the larvae as far as the young crab was carried out by Mr. Heard. The preserved specimens of each developmental stage were at my disposal. The following table shows the chronological data of development at the temperatures of 26-28°C, and salinity of 25 o/oo.

Stage	Days after hatching
1	0
2	2-4
3	4-6
4	7-9
Megalopa	9-14
First young	16-19

ZOEA

Rostral spine is long, about as long as the rest of carapace. Dorsal spine is somewhat longer than the rostral spine, and curves at the end. Laterals are short. Ventral margin of carapce is smooth.

Abdomen has a pair of lateral hooks on somites 2 and 3, and lateral spines of subequal length on somites 3-5. Telson has 3 outer spines in stage 1, the second is hairlike and disappears from stage 2. The first and the third are distinct in all stages though the former tends to be smaller in later stages. The telson fork is slender, smooth and curves at the end. The central notch is wide. The first internal seta is about half as long as the telson fork.

Antenna is almost as long as or slightly longer than the rostral spine. The spinous process is armed with a few spinules in stage 1 but becomes smooth from stage 2. The exopod is vestigial, ending in a short hair.

Stage 1 (Pl. 88; A, B, F) From spine to spine: 14-15 mm., C.L. (less spines): 0.45 mm.

Antenna has no endopod. There are no rudiments of legs.

Stage 2 (Pl. 88; C) C.L. (less spines): 0.61 mm.

There are small rudiments of legs. Exopod of maxillipeds 1 and 2 has 6 and 7 setae respectively.

Stage 3 (Pl. 88; D) C.L. (less spines): 0.80 mm.

Antennal endopod is shorter than the peduncle. There are small pleopod buds. Telson has a pair of extra internal setae.

Stage 4 (Pl. 88; E, G) C.L. (less spines): 0.96 mm.

Antennal endopod is longer than the peduncle. Telson has 2 pairs of extra internal setae. Exopod of maxillipeds 1 and 2 has 8-9 and 10-11 setae respectively. Leg rudiments and pleopod buds are large.

MEGALOPA (Pl. 89; A) C.L.: 1.06 mm., T.L.: 2.01 mm.

Carapace is slightly longer than wide, with inconspicuous gastric and cardiac prominences and the posterior dorsal process. Rostrum, when measured in front of eyes, is about 1/3 as wide as the carapace, depressed

in the center into a blunt, bifid tooth, angles of the rostrum ending on each side in a strong horn which does not extend beyond the central tooth. Eyes extend laterally beyond the margin of carapace by their cornea.

Abdomen is slightly shorter than the carapace, without spines. Telson is rounded behind, wider than long. Uropod has 8 or 9 setae on exopod. Antennal flagellum is of 7 segments. Maxilliped 3 has no teeth on ischium. Cheliped has a large hook on ischium. There are no other spines on coxae and ischia of legs. Dactyli of legs 2-4 are about 1.5 times longer than their propodi, each with 3 spines on ventral edge. Leg 5 has 2 short feelers.

FIRST YOUNG (Pl. 89; B) C.L.: 1:33 mm.

Body and legs are covered dorsally with numerous minute hairs and sparse long setae. Carapace is about as long as wide. The front is about half as wide as the carapace, and slightly bilobed. There are 2 lateral spines on each side of the carapace behind the outer orbital angles.

Family Pinnotheridae

Zoeae are very variable. The only characteristic feature that they have in common is the great reduction of the antenna. However, Costlow and Bookhout (1966b) described a moderately long antenna in Pinnotheres maculatus. One or more of the spines on carapace tend to lose. Telson is trilobed, or more or less normally forked. A species of the family from Georgia has direct development as will be described below.

41. Pinnotheres sp.

A berried female was captured by Mr. Heard on September 2, 1969 at the Sponge Reef off Sapelo Island, and was at my disposal. The larvae

emerged from the brood pouch of the female on September 9, and were found to have characters of the adult in every respects. Unfortunately this species is not yet identified owing to the great difficulty in the identification of female pinnotherid crabs, which is due to the fact that many of the species of the family have been described based only on the males.

Rathbun (1914) reported that in Paranaxia serpulifera the young were hatched in the form of parent. This is another case of direct development so far known among marine Brachyura (excluding Dromiacea).

FIRST YOUNG (Pl. 90; A, B) C.L.: 0.69 mm.

Carapace is slightly longer than wide. The front is about half as wide as the carapace, and slightly bilobed. Carapace has a large gastric and cardiac prominence. Antennule is much larger than antenna. Abdomen is folded under the body, without traces of pleopods. All the somites are fused together, but the telson is segmented off from the rest of abdomen and is rounded behind.

Family Grapsidae

Carapace usually lacks lateral spines. Antenna is about as long as the rostral spine, spinous process armed with spinules, exopod about half as long as the spinous process ending in 2 spines, or rudimentary. Telson is forked.

Subfamily Grapsinae

42. Pachygrapsus transversus (Gibbes)

A berried female was captured by Mr. Heard in April at Molasses Key, Florida and was at my disposal. A large number of first zoeae were obtained from this female but none of them could be reared beyond the first molt.

ZOEA

Carapace has no lateral spines. Rostral spine is stout, straight and about half as long as the carapace. Dorsal spine is about as long as the rostral spine and slightly curves.

Abdomen is somewhat shorter than the distance from spine to spine, with broad lateral hooks on somites 2-4. Lateral edges of somites 3-5 are expanded and produced posteriorly into blunt processes. The width of abdomen is greatest at the fourth somite.

Telson is almost parallel sided including comparatively short forks. The length of telson fork is a little less than the width of telson. There are no outer spines. The first internal seta is about 4/5 as long as the telson fork. Central notch is very narrow but distinct in stage 1 at least.

Antenna is as long as the rostral spine with a vestigial exopod. Spinous process is armed with several spinules. Endopod of maxillule is of 2 segments with 1-5 setae, and that of maxilla is divided into 2 lobes with 2 + 2 setae. Endopod of maxilliped 2 is of 3 segments with 0 + 1 + 5 setae.

There is a large amount of black chromatophores over the stomach, which extends posteriorly along the intestine as far back as the somite 5. A considerable amount of black also occurs on front of eyestalks, over the mouth parts, near the ventral margin of carapace and along the abdomen. There is a reddish brown color at tip of rostal spine.

Stage 1 (Pl. 91; A-E) From spine to spine: 0.77 mm.

Antenna has no endopod. There are no rudiments of legs.

Subfamily Sasarminae

43. Sesarma cinerium (Bosc)

Costlow and Bookhout, 1960

The wharf crab is very common on Sapelo Island near the tidal creeks. It is sometimes found even in the laboratory crawling about in the passage,

page 203 inadvertently omitted; see back of book

times during this period. But every attempt to rear the zoea up to megalopa were unsuccessful. In one occasion a few zoea had survived as far as the third stage.

ZOEA

The zoea is very like that of C. sapidus. But antennal exopod is distinctly longer than in the latter. There observed a tendency toward the reduction in the number and size of setae on maxillule and maxilla. Thus, the endopod of maxillule has 0 + 5 setae, and that of maxilla has 5 setae of which 2 are moderately long but the remaining 3 are vestigial. Endopod of maxilliped 2 has 1 + 1 + 3 setae. Second telson spine remains distinct until stage 3 at least.

Body is mostly transparent with a small amount of black chromatophores over the stomach extending behind as far as the somite 2, over the mouth parts, at distal end of protopod of maxilliped 1 and on the abdominal somites 2-5.

Stage 1 (Pl. 68; A-C) From spine to spine: 0.83 mm.

There are no rudiments of maxilliped 3 nor those of legs.

Stage 2 (Pl. 68; D) From spine to spine: 1.18 mm.

There is a small rudiment of maxilliped 3, but no legs. Telson has a pair of extra internal setae.

Stage 3 (Pl. 68; E) From spine to spine: 1.31 mm.

Leg rudiments are present but very small. There are no pleopod buds nor the antennal endopod.

29. Portunus sayi (Gibbes)

A berried female was trawled on June 23, 1969 about one mile off the Big Hole, Sapelo Island. The eggs hatched out on June 24 into the first zoea which, however, could not be reared beyond the first molt and no later stages were obtained.

especially in the summer months when the spawning activity seems to be highest. A berried female was captured on August 27, 1969 on the lawn near the laboratory. The resulting first zoeae were reared as far as megalopa. The following table gives chronological data of development in the laboratory.

Stage	Date	Days after hatching
1	8/28	0
2	8/31	3
3	9/6-7	9-10
4	9/9-12	12-15
Megalopa	9/14-16	17-19

ZOEA

There are no lateral spines on carapace. Rostral spine is straight, smooth and is about half as long as the carapace. Dorsal spine gently curves, it is about as long as the rostral spine in stage 1 but tends to be shorter in later stages in proportion to the latter. Ventral margin of carapace is smooth.

Abdomen is somewhat longer than the distance from spine to spine, with a pair of lateral hooks on somites 2 and 3,and small lateral spines on somites 3-5. The lateral hooks on somite 3 are very small.

Telson is slender and not much wider than abdominal somites, without outer spines. Telson fork is armed with minute spinules, its length is somewhat greater than the width of the telson. The first internal seta is about 2/5 as long as the telson fork. The central notch is wide. There are no extra internal setae in all stages.

Antenna is slightly shorter than the rostral spine, with spinous process armed with sparse spinules, and exopod about half as long as the spinous process, ending in 2 spines of different length, the longer (inner) one being a little more than half as long as the rest of the exopod.

Mandible has no palp in all stages. Endopod of maxillule is of 2 segments with 1 + 5 setae, and that of maxilla is slightly divided into 2 lobes with 2 + 3 setae. Endopod of maxilliped 1 has an outer seta only on the terminal segment in stage 1, but there appears an additional outer seta each on second and third segments in stages 3 and 4. All the outer setae are long and plumose. Endopod of maxilliped 2 is of 3 segments with 0 + 1 + 5 setae.

The zoea is rich in coloration. There is a large amount of black color accompanied with orange-red on carapace, over the stomach, in the region of mouth parts, at the bases of maxillipeds and along the abdominal somites 1-5.

Stage 1 (Pl. 92; A, B, G) From spine to spine: 0.72 mm.

Lateral spines on abdominal somites 3 and 4 are obscure and those on somite 5 are minute. Antenna has no endopod. There are no rudiments of legs.

Stage 2 (Pl. 92; C) From spine to spine: 0.90 mm.

There are small rudiments of legs.

Stage 3 (Pl. 93; D) From spine to spine: 1.10 mm.

Antennal endopod is as long as the exopod. There are small pleopod buds.

Stage 4 (Pl. 93; E, F, H-K) From spine to spine: 1.23 mm.

Antennal exopod is longer than the exopod. Leg rudiments and pleopod buds are large.

MEGALOPA (Pl. 93; A-D) C.L.: 0.8 mm.

Carapace is 1.3 times longer than wide, without spines nor conspicuous protuberances. Rostrum is broad, bent down in the center into a blunt

tooth which is hardly visible from above.

Abdomen is about 4/5 as long as the carapace. There are small lateral prominences at the hind margin of somites 2-4, and a ventro-lateral one on somite 5, but no spines. Uropod has 6 or 7 setae on exopod. Antennal flagellum is of 6 segments with long setae on the terminal and antepenultimate segments.

There are no spines on ischium of maxilliped 3. Legs 1-5 have no spines on their coxae and ischia. Chela is about 2/5 as high as long, fingers being a little shorter than the palm. Dactyli of legs 2 and 3 are about as long as their propodi, while those of legs 4 and 5 are distinctly shorter than their propodi. Leg 5 has 3 long feelers.

Megalopa is reddish brown in color with walking legs almost colorless except a small amount of diffused orange.

Family Ocypodidae

Lateral spines on carapace are present in Ocypode but absent in Uca. Antenna is much shorter than the rostral spine, exopod is less than half as long as the spinous process ending in 3 or more spines of varied length. Endopod of maxillule is of 2 segments with 0 + 4 setae, and that of maxilla is unsegmented but divided into 2 lobes with 1 + 2 setae. Endopod of maxilliped 2 is of 3 segments with 0 + 0 + 5 setae.

44. Ocypode quadrata (Fabricius)

The ghost crab is quite common on sandy beaches of Sapelo Island. Berried females were captured by Mr. Heard on August 7, 1969 on the beach. The first zoeae were hatched by him in the laboratory. Subsequent rearing of the zoeae was, however, said to be unsuccessful and the preserved speimens of the first zoea were at my disposal.

ZOEA

All spines are present on carapace. Rostral spine is smooth and straight, it is about half as long as the carapace. Dorsal spine is bent near the base and is armed with sparse granular spinules, it is about as long as the rostral spine. Lateral spines are a little more than half as long as the dorsal spine and directed ventrad.

Abdomen is somewhat depressed dorso-ventrally and is about 3/4 as long as the distance from spine to spine, with a pair of flat lateral hooks on somites 2 and 3. Somites 4 and 5 are more or less expanded laterally, ending posteriorly in a blunt lateral spine. The width of abdomen is greatest at somite 4.

Telson is not much wider than general outline of abdomen, with one minute outer spine on each side. Telson fork is almost straight and covered with minute spinules, its length is about 4/5 as great as the width of the telson. The first internal seta is about half as long as the telson fork. The central notch is moderately wide, but not so wide as in the typical Xanthidae.

Antenna is much shorter than the rostral spine, and is somewhat longer than the antennule. Spinous process is armed with two rows of minute spinules. Exopod is slightly more than 1/4 as long as the spinous process, ending in 3 spines of varied length, of which the middle spine is the longest and is about twice as long as the rest of the exopod, the outer spine is about half as long as the middle, while the inner spine is rudimentary.

There is a very dense distribution of black chromatophores almost all over the body and appendages including the alimentary tracts.

Stage 1 (Pl. 94; A-E) From spine to spine: 1.12 mm.

Antenna has no endopod. There are no rudiments of legs.

45. Uca pugnax (Smith)

Hyman, 1920

The mud fiddler is quite abundant on Sapelo Island. Berried females were captured on the tidal flat near the laboratory on May 14, 1969. The eggs hatched out in the laboratory and the resulting larvae were reared beyond metamorphosis. The chronological data of development are summarized in the following table.

Stage	Date	Days after hatching
1	5/18	0
2	5/23-24	5-6
3	5/25-26	7-8
4	5/27-29	9-11
5	5/31-6/1	13-14
Megalopa	6/3-6	16-19
First young	6/13-15	26-28

ZOEA

There are no lateral spines on carapace. Rostral spine is straight, smooth and about half as long as the carapace. Dorsal spine curves gently and about as long as the rostral spine, though in the later stages it tends to be shorter in proportion to the latter. Ventral margin of the carapace is fringed with fine spinules on the posterior half.

Abdomen is about as long as the distance from spine to spine, with lateral hooks on somites 2 and 3, and lateral spines on somites 2-5. The lateral hooks on somite 3 are very small, and the lateral spines on somites 2 and 3 are obscure in stage 1.

Telson is not much wider than the general outline of abdomen, without outer spines. Fork is smooth, its length is about as great as the width of the telson. Central notch is moderately wide but very shallow. The first internal seta is a little more than half as long as the telson fork.

Antennal spinous process has two rows of fine spinules in all stages. Exopod is about 1/3 as long as the spinous process, ending in 4 spines of varied length. The third spine from outside is by far the longest and almost as long as or longer than the rest of the exopod.

Endopod of maxilliped 1 has an outer seta on the terminal segment only in stage 1, but an additional seta each also on second and third segments in later stages.

Chromatophores are black and occur at rear and on front of the eyes, in the region of mouth parts, at distal end of basis of maxilliped 1 and along the abdominal somites 2-5.

Stage 1. (Pl. 95; A, B, H) From spine to spine: 0.69 mm.

Antenna has no endopod. There are no rudiments of legs. Lateral spines on abdominal somites 2 and 3 are obscure.

Stage 2 (Pl. 95; C) From spine to spine: 0.80 mm.

Lateral spines on somites 3-5 are more or less distinct. There are rudiments of maxilliped 3.

Stage 3 (Pl. 95; D) From spine to spine: 0.88 mm.

There is a small antennal endopod. Lateral spines are distinct on somites 2-5. Leg rudiments are present. Telson has one or one pair of extra internal setae.

Stage 4 (Pl. 95; E) From spine to spine: 1.02 mm.

Antennal endopod is longer than the exopod but shorter than the

spinous process. There is a pair of extra internal setae on telson. Rudiment of maxilliped 3 is biramous, and that of leg 1 chelate. Pleopod buds are present but small.

Stage 5 (Pl. 95; F, G, I-K) From spine to spine: 1.23 mm

Antennal endopod is longer than the spinous process. Pleopod buds are large with small endopod.

MEGALOPA (Pl. 96; A-C) C.L.: 0.94 mm., B.L.: about 1.8 mm.

Rostrum is broad at base, bent obliquely down in the center into a blunt process, with a longitudinal depression dorsally. Carapace has no dorsal spines nor prominences. Eyes extend laterally beyond the lateral margin of carapace by its cornea. Abdominal somites 2-5 have small lateral process and somites 3-5 have ventro-lateral spines on the posterior margins, ventro-lateral spines on somite 5 not reaching the posterior end of somite 6. Telson is rounded behind and wider than long. Uropod has 8 setae on exopod. Antennal flagellum is of 7 segments with long setae on the distal 3 segments.

Maxilliped 3 has no spines on ischium. There is a small spine on coxa of leg 4. Chelae are symmetrical, a little more than half as high as long, fingers about as long as the palm. Dactyli of legs 2-4 are about as long as their propodi, with 1 simple spine each near the proximal end of their ventral edges. Leg 5 has 3 long feelers.

FIRST YOUNG (Pl. 96; D) C.L.: about 1.13 mm.

Carapace is about as long as wide, with a slightly bilobed front. Lateral margin of carapace is fringed with small granular spinules. The outer orbital angles on each side end in a blunt tooth.

46. Uca pugilator (Bosc)

Hyman, 1920

The sand fiddler is also quite abundant on Sapelo Island. Berried females are captured several times during the summer months on the tidal flat near the laboratory. But every rearing was unsuccessful and no megalopa were obtained.

ZOEA

The zoea very like that of U. pugnax in almost every details. The only reliable character which distinguishes the U. pugilator zoea from U. pugnax zoea is in the arrangement of black chromatophores on abdominal somite 5. In U. pugnax a pair of chromatophores occur ventrally on the somite, while in U. pugilator one chromatophore occurs dorsally on the somite. Another difference, though very slight, is in the relative length of exopod of antenna in proportion to their protopods. In U. pugnax the exopod (less apical spines) is as long as or slightly longer than protopod measured from the insertion of exopod to its base, while in U. pugilator the exopod is somewhat shorter than the protopod, at least, in stage 1.

Stage 1 (Pl. 97; A-C) From spine to spine: 0.66 mm.

Stage 3. From spine to spine: 0.96 mm.

Antennal endopod is as long as the exopod (less apical spines). Telson has a pair of extra internal setae.

47. Uca minax (le Conte)

Hyman, 1920

The red-jointed fiddler is common on Sapelo Island, though not so abundant as U. pugilator and U. pugnax. A berried female was captured on

June 26, 1969 near the laboratory. The eggs hatched on June 26 into first zoea but none of them survived beyond the first molt.

ZOEA

The zoea is closely similar to, but distinctly smaller than corresponding stage of those of U. pugnax and U. pugilator. In respect to the chromatophores on abdominal somite 5, it is like U. pugilator and differs from U. pugnax. Exopod of antenna is longer than the protopod but the longest apical spine is distinctly shorter than the rest of the exopod. In this character the zoea of U. minax can be distinguished from those of both U. pugilator and U. pugnax, in which the longest apical spine is longer than the rest of the exopod.

Stage 1 (Pl. 97; D-F) From spine to spine: 0.56 mm.

Superfamily OXYRHYNCHA

In Majidae there are only 2 zoeal stages and the zoea has a characteristic "soie anterieur" at anterior ventral margin on each side (Bourdillon-Casanova, 1966). Antenna has an endopod more or less developed and there are rudiments of legs from stage 1. But in Parthenopidae the zoea does not share these characters and shows a close resemblance to the typical Brachyrhyncha, though it is distinguished from the latter by the form of rostral spine, which is distinctly upturned. Hymenosomidae, on the other hand, may be related to Leucosiidae and Pinnotheridae in having a rudimentary antenna (Kurata, 1969).

Family Majidae

Subfamily Pisinae

48. Libinea dubia H. Milne-Edwards

This spider crab was fairly common in the trawl catches taken in the

coastal offshore around Sapelo Island. A berried female was separated from the trawl catch on May 30, 1969 about 1 mile off the Big Hole, Sapelo Island. The eggs hatched in the laboratory into the first zoeae which were reared as far as the first young. The following table shows the chronological data of development.

Stage	Date	Days after hatching
1	6/10	0
2	6/13-14	3-4
Megalopa	6/17-18	7-8
First young	6/23-25	13-15

ZOEA

There are no lateral spines on carapace. Rostral spine is short, somewhat less than 1/3 as long as the carapace. Dorsal spine is longer than the rostral spine, and bent at about the half way, with sparse, small granular spinules. Ventral margin of carapace is smooth.

Abdomen is about 1.3 times longer than the distance from spine to spine, with a pair of lateral hooks on somite 2 only, and small lateral spines on somites 3-5. Telson is slender with 2 outer spines, of which the first is large while the second is minute. Telson fork is almost straight and covered with minute spinules, its length is about 1.5 times greater than the width of the telson. The first internal seta is about 2/5 as long as the telson fork. The central notch is almost wanting. There are no extra internal setae.

Antenna is much longer than the rostral spine, with spinous process bearing 2 rows of spinules on the distal half. Exopod is large and ends in a long, pointed apical spine, which is about half as long as the rest of the exopod and reaches somewhat beyond the tip of the spinous process.

There are 1 or 2 inner and 1 outer accessory spines at the base of the apical spine. The apical spine and the longer inner accessory spine are armed with fine spinules.

Mandible has small palp in stage 2. Endopod of maxillule is of 2 segments with 1 + 4 setae, and that of maxilla is slightly divided into 2 lobes with 3 + 2 setae. Endopod of maxilliped 2 is of 3 segments, of which the first is very short, with 0 + 1 + 4 setae.

The zoea is considerably rich in coloration. Chromatophores are reddish brown and occur in the region of mouth parts, on coxae of maxilliped 1 and 2 and ventrally along the abdomen. There is a large chromatophore at rear of the base of the dorsal spine.

Stage 1 (Pl. 98; A, B, D) From spine to spine: 1.23 mm.

Antennal endopod is about half as long as the exopod (less spines). There are small rudiments of legs but no pleopods.

Stage 3 (Pl. 98; C) From spine to spine: 1.32 mm.

Antennal exopod is about 5/6 as long as the exopod (less spines). Rudiments of legs and pleopods are large.

MEGALOPA (Pl.99; A) C.L.: 1.22 mm., C.W.: 0.8 mm.

Rostrum is moderately broad at base and bent in an obtuse angle in the center into a blunt central tooth. Angles of the rostrum are rounded. There are inconspicuous prominences on carapace but no spines nor long processes. Eyes extend slightly beyond the lateral margin of the carapace.

Abdomen is about 3/4 as long as the carapace and has no spines. Uropod has 4 or 5 setae on exopod. Antennal flagellum is of 4 segments with long setae on distal 2 segments.

The maxilliped 3 has 3 teeth on ischium. There is a small spine each on coxa of cheliped and on sternal surface near the base of cheliped. a moderately large spine is present on coxa and ischium of leg 2. Chela is slightly less than 3 times as long as high, fingers slender, curved and as long as the palm. There are 2 teeth on the fixed finger. Dactyli of legs 2-5 are somewhat longer than their propodi and end in a strong apical claw, with 3 (legs 2 and 3) or 2 (legs 4 and 5) barbed spines on ventral edge. There are no feelers on leg 5.

FIRST YOUNG (Pl. 99; B) C.L.: 1.6 mm., C.W.: 1.2 mm.

There is a large bicornuated rostrum, each cornu provided with an accessory spine on the inner edge near the tip. Rostrum, as well as the rest of body and legs, is armed with many balloon-like hairs and sparse long, curved hairs. There are 2 spines on each side at angles of rostrum just in front of the eyes. The outer orbital angles also end in spines. There is a small spine on each side at posterior lateral corners of carapace.

Subfamily Mithracinae

49. Mithrax pleuracanthus Stimpson

This crab was fairly common on the offshore Sponge Reef where the berried females were captured by Mr. Heard on September 2, 1969. Many berried females were at my disposal. The resulting larvae were reared as far as megalopa. The chronological data are shown in the following table.

Stage	Date	Days after hatching
1	9/4	0
2	9/7-9	3-5
Megalopa	9/9-10	5-6

ZOEA

There are no lateral spines on carapace. Rostral spine is very short, about half as long as the antennules. Dorsal spine is longer than the rostral spine and strongly curves. Ventral margin is smooth.

Abdomen is slender and long, about twice as long as the distance from spine to spine, with a pair of lateral hooks on somite 2 only, and lateral spines on somites 3-5.

Telson is slender with 1 outer spine on the lateral edge. Telson fork is almost straight, covered with minute spinules, its length is a little more than 1.5 times greater than the width of the telson. The first internal seta is somewhat more than 1/3 as long as the telson fork. Central notch is hardly seen. There are no extra internal setae.

Antenna is by far longer than rostral spine and antennules. There is an endopod from stage 1. The spinous process is armed with 2 rows of spinules on the distal half. Exopod is spinous and as long as the spinous process, with a pair of lateral spines at about distal 1/4.

Mandible has a palp in stage 2. Endopod of maxillule is of 2 segments with 1 + 6 setae, and that of maxilla is unsegmented with 5 terminal setae. Endopod of maxilliped 2 is of 3 segments with 0 + 1 + 5 setae.

Zoea is colorful. Chromatophores are black and occur over the stomach, in the region of mouth parts, at distal end of basis of maxilliped 1, on coxa and basis of maxilliped 2 and along the abdominal somites 3-5. There is also a good deal of yellow mostly occurring on dorsal spine, and abdominal somites 1-3, while orange-red occurs on abdominal somites 3-5 and along the intestine accompanying with black.

Stage 1 (Pl. 100; A-C) From spine to spine: 0.91 mm.

Antennal endopod is less than half as long as the exopod. There

are small leg rudiments but no pleopod buds.

Stage 2 (Pl. 100; D-F) From spine to spine: 1.04 mm.

Antennal endopod is more than half as long as the exopod. Rudiments of legs and pleopods are large.

MEGALOPA (Pl. 100; G) C.L.: 1.1 mm., C.W.: 0.85 mm.

Rostrum is bent obliquely in the center into a pointed tooth, angles of the rostrum are rounded. There are small protuberances on carapace, but no spines nor long processes.

Abdomen is somewhat shorter than the carapace, and has no spines. Pleura of somite 5 is produced posteriorly, reaching the hind end of somite 6. Uropod has 5 setae on exopod. Antennal flagellum is of 4 segments.

There is a spine on coxa and ischium of leg 2 and coxa of leg 3. Chela is about 3 times as long as high and curves, fingers about as long as the palm. Dactyli of legs 2-5 are somewhat longer than their propodi, ending in a strong claw. Leg 5 has no feelers.

50. Macrocoeloma trispinosum (Latereille)

Berried females were captured by Mr. Heard on September 2, 1969 at Sponge Reef off Sapelo Island and were at my disposal. A few normal first zoeae were obtained from the eggs carried by these females. No later stages were obtained.

ZOEA

Zoea like Mithrax pleuracanthus, but smaller in size, dorsal spine on carapace is not so strongly curved as in the latter, and abdomen is

relatively shorter in proportion to the distance from spine to spine. Telson has one outer spine on the lateral edge. Endopod of maxillule has 1 + 5 setae, and that of maxilla is divided distally into two lobes with 3 + 3 setae. Antenna is similar in M. pleuracanthus.

Chromatophores are black only, and occur over the stomach, in the region of mouth parts, at the base of maxillipeds 1 and 2, at distal end of protopod of maxilliped 1, and ventrally to the abdominal somites 3 and 4. Intestine is colorless.

Stage 1 (Pl. 101; A-C) From spine to spine: 0.9 mm.

Eyes are sessile. Abdomen is of 5 somites plus telson and is about 1.3 times longer than the distance from spine to spine. Antennal endopod is a little less than half as long as the spinous process. There are small rudiments of legs but no pleopods.

Subfamily Inachinae

51. Stenorynchus seticornis (Herbst)

Yang, 1967

The rearing of the larvae as far as megalopa was made by Mr. Heard. The preserved specimens of each stage were at my disposal.

ZOEA

Carapace has dorsal spine only, and no rostral nor laterals. Dorsal spine is about 3/4 as long as the carapace and slightly curves. There is a prominent dorsal tubercle just behind the eyes. Ventral margin of carapace is smooth.

Abdomen is somewhat more than twice as long as the carapace, with a pair of strong hooks on somites 2 and 3, and small lateral spines on somites 3-5. Somite 4 may also have a pair of or only one lateral hook,

of which the frequencies are shown in the following table.

Presence of Lateral Hooks on Abdominal Somite 4		
Right side	Left side	Frequency (No. of larvae)
yes	yes	2
yes	no	4
no	yes	1
no	no	32
Total		39

Telson has a large outer spine on lateral edge. Telson fork is covered with minute spinules, its length is about 1.3 times greater than the width of the telson. The first internal seta is a little less than 1/3 as long as the telson fork. The central notch is moderately wide.

Antenna is about as long as the dorsal spine. The spinous process is armed with 2 rows of spinules at about distal half. Exopod is spinous and slightly shorter than the spinous process, with a pair of short lateral spines at slightly more than half way up from the base. There is an endopod from stage 1.

Endopod of maxillule is of 2 segments with 4 apical setae, and that of maxilla is unsegmented with 4 apical setae. Endopod of maxilliped 2 is of 2 segments with 1 + 3 setae.

Stage 1 (Pl. 102; A-C) From spine to spine: 0.97 mm.

Antennal endopod is small. There are small rudiments of legs but no pleopods.

Stage 2 (Pl. 102; D) From spine to spine: 1.22 mm.

Antennal endopod, rudiments of legs and pleopod buds are all large.

MEGALOPA (Pl. 103) C.L.: 1.33 mm., C.W.: 0.8 mm.

Rostrum is narrow, slightly bent in the center into a blunt tooth,

angles of the rostrum are rounded. There are 3 small but somewhat elongated dorsal prominences behind eyes, and a large dorsal spine behind, which is bent posteriorly near the base.

Abdomen is nearly as long as the carapace, and is of 6 somites plus telson. The somites 1-5 are subequal, slender and very long, while the somite 6 is very short, almost hidden under the hind end of somite 5, and can be recognized with some difficulties. Telson is also very short but distinctly larger than the somite 6, and is much wider than long. Uropod is very small with 2 setae on exopod.

Antennal flagellum is of 4 segments and moderately long. There are no coxal nor ischial spines on legs. Chela is slender and long, about 6 times as long as high, fingers much thicker, but somewhat shorter, than the palm. Legs 2-4 are very long and slender, about 3 times as long as the carapace. There are no feelers on leg 5.

52. Podochela riisei Stimpson

Yang, 1967

A berried female was captured by Mr. Heard on September 2, 1969 at Sponge Reef off Sapelo Island, and was at my disposal. Unfortunately the female died before the eggs hatched. Some of the normal eggs were then detached from the pleopods and placed in filtered sea water which was aerated vigorously. A few first zoeae were obtained from these eggs, but none of them were reared beyond the first molt.

ZOEA

Zoea very much like Stenorynchus seticornis, but the anterior dorsal tubercle on carapace is not so prominent as in the latter, and there are

only one pair of lateral hooks on abdominal somite 2. Carapacial spines, antenna, telson, mouth parts and endopod of maxilliped 2 are similar in S. seticornis.

Chromatophores are red, and occur over the stomach, in the region of mouth parts, at distal end of protopod of maxilliped 2, dorsal to the abdominal segment 1, lateral to the somites 2-4, and ventral to the somite 5. There are dorso-lateral, lateral and ventro-lateral red chromatophores along the posterior margin of carapace, and anterior and posterior ones on the eye stalks.

Stage 1 (Pl. 104, A-C) From spine to spine: about 1.0 mm.

Eyes are sessile. Abdomen is of 5 somites plus telson, and is about 1.8 times longer than the distance from spine to spine. There are small rudiments of legs but no pleopods.

Family Parthenopidae

53. Heterocrypta granulata (Gibbes)

A berried female was trawled by Mr. Heard on May 1, 1969 in the Sapelo Sound and was at my disposal. The rearing of the resulting larvae was unsuccessful and no later stages were obtained.

ZOEA

All spines are present on carapace and all are smooth. Rostral spine is somewhat shorter than the carapace and distinctly upturned in the distal half. Dorsal spine is slightly shorter than the rostral spine and curves posteriorly. Lateral spines are about half as long as the dorsal spine in stage 1. Ventral margin of carapace is denticulated.

Abdomen is about 3/4 as long as the distance from spine to spine, with

a pair of lateral hooks on somites 2 and 3, and lateral spines on somites 3-5. Telson is much wider than the rest of abdomen, with one outer spine on dorsal edge near the base of the telson fork, its length is somewhat less than the width of the telson. The first internal seta is a little less than half as long as the telson fork. The central notch is moderately wide.

Antenna is about half as long as the rostral spine. Exopod is somwhat less than half as long as the spinous process, ending in 2 spines of different length, the inner spine much longer than the outer and slightly longer than the rest of the exopod.

Endopod of maxillule is of 2 segments with 0 + 6 setae, and that of maxilla is divided into 2 lobes with 2 + 4 setae.. Endopod of maxilliped 2 is of 3 segments with 0 + 1 + 4 setae.

The body is transparent with moderately large black chromatophores on the eye stalks, in the region of mouth parts, on coxa of maxilliped 1 and on abdominal somite 2-5. Carapace has black chromatophore at the rear of the base of dorsal spine and of lateral spines, and near the ventral margins.

Stage 1 (Pl. 105; A-E) From spine to spine: 0.78 mm.

Antenna has no endopod. There are no rudiments of legs nor pleopod buds.

KEY TO THE BRACHYURAN ZOEA DESCRIBED IN THIS REPORT

1. Antennal exopod is foliaceous with a fringe of setae 2
   Antennal exopod is not foliaceous but reduced to a spine, rod or hair, or wanting 3

2(1). Large dorsal spine present on carapace. Abdomen is spiny. Telson is armed laterally with 5 immovable teeth on each side . . Ranilia muricata
   Dorsal spine absent on carapace. Abdomen is not spiny. Telson is not armed laterally with immovable teeth . . . . . Dromia antilensis

3(1). Antenna is a rudimentary stump. Telson is of a triangular plate. . . . . Persephona punctata aquilonaris
   Antenna is well developed. Telson is typically forked 4

4(3). Antenna is much longer than rostral spine 5
   Antenna is as long as or shorter than rostral spine 11

5(4). Soie anterieur absent. Lateral spines present on carapace. Lateral hooks present on abdominal somite 5. Hind margins of somites 2 - 5 fringed with spinules 6
   Soie anterieur present. Lateral spines absent on carapace. Lateral hooks absent on abdominal somite 5. Hind margins of somites 2 - 5 are smooth (Majidae) 7

6(5). Dorsal spine gently curves, smooth. Distance from spine to spine is 0.9 mm. in stage 1 . . . . . Pilumnus sayi
   Dorsal spine strongly curves, with a few granular spinules. Distance from spine to spine is 0.65 mm. in stage 1 . . . . . Pilumnus sp.

7(5). Rostral spine present. Hind central notch on telson is wanting . . 8
   Rostral spine absent. Hind central notch on telson is moderately wide 10

8(7). Telson with 2 outer spines . . . . . Libinia dubia
   Telson with 1 outer spine. 9

9(8). Dorsal spine strongly curves. Abdomen is about twice as long as the distance from spine to spine . . . . . .Mithrax pleuracanthus

Dorsal spine is gently curved. Abdomen about 1.3 times as long as the distance from spine to spine . . . . . .Macrocoeloma trispinosum

10(7). Anterior dorsal tubercle on carapace is prominent. Lateral hooks present on abdominal somite 3 . . . . . .Stenorynchus seticornis

Spinous process of antenna armed with 2 rows of spinules. Hind margins of somites 2-5 smooth 16

Anterior dorsal tubercle on carapace is not so prominent. No lateral hooks on abdominal somite 3 . . . . . Podochela riisei

11(4). Antenna is nearly as long as rostral spine. 12

Antenna is distinctly shorter than rostral spine. 25

12(11). Lateral spines absent on carapace. 13

Lateral spines present on carapace 14

13(12). Antennal exopod is a rudimentary spine. Abdominal somites 3-5 expanded laterally . . . . . Pachygrapsus transversus

Antennal exopod is of good size, more than half as long as spinous process. Abdomen is not expanded laterally. . . . Sesarma cinereum

14(12). Antennal exopod is of considerable size or very small ending in 2 spines. 15

Antennal exopod is very small ending in 1 spine, or the whole structure is reduced to a hair. 19

15(14). Spinous process of antenna armed with 4 rows of spinules. Hind margins of somites 2-5 fringed with spinules. .Leptodius floridanus

16(15). Antennal exopod (less apical spines) is as long as protopod . . . . . Hepatus epheliticus

Antennal exopod (less apical spines) is distinctly shorter than protopod. 17

17(16). Antennal exopod (less apical spines) is a little more than half as long as protopod. . . . . Portunus gibbesii

Antennal exopod (less apical spines) is ½ or less as long as protopod. 18

18(17). Dorsal spine is almost straight distally. In stage 1, the longer apical spine on antennal exopod is about 3 times length of rest of exopod . . . . . Portunus sayi

Dorsal spine curves distally. In stage 1, the longer apical spine on antennal exopod is about 1.5 times length of rest of exopod . . . . . Callinectes sapidus

19(14). Lateral hooks present on abdominal somite 5 . . . Panopeus sp.

Lateral hooks absent on abdominal somite 5 20

20(19). Lateral hooks and lateral spines absent on somite 3. Lateral spines on somite 5 very long, much longer than those on somite 4 . . . . . Rhithropanopeus harrisii

Lateral hooks and lateral spines present on somite 3. Lateral spines on somite 5 not longer than those on somite 4 21

21(20). Telson without outer spines . . . . . Panopeus occidentalis

Telson with outer spines 22

22(21). Telson with 1 (third) outer spine 23

Telson with 2(first and third) or 3 outer spines. The hairlike second may or may not be present 24

23(22). Spinous process of antenna armed with spinules. Dorsal spine strongly curves at end . . . . . Eurypanopeus depressus

Spinous process of antenna smooth, without spinules. Dorsal spine slightly curves at end. . . . . Neopanope texana sayi

24(22). Spinous process of antenna armed with spinules. Second, hairlike spine present on telson . . . . . Panopeus herbstii

Spinous process of antenna smooth, without spinules. Second hairlike spine absent on telson . . . . Eurytium limosum (except stage 1*)

*Foot note: First zoea of E. limosum is so much like Panopeus herbstii that it is so far impossible to tell them apart.