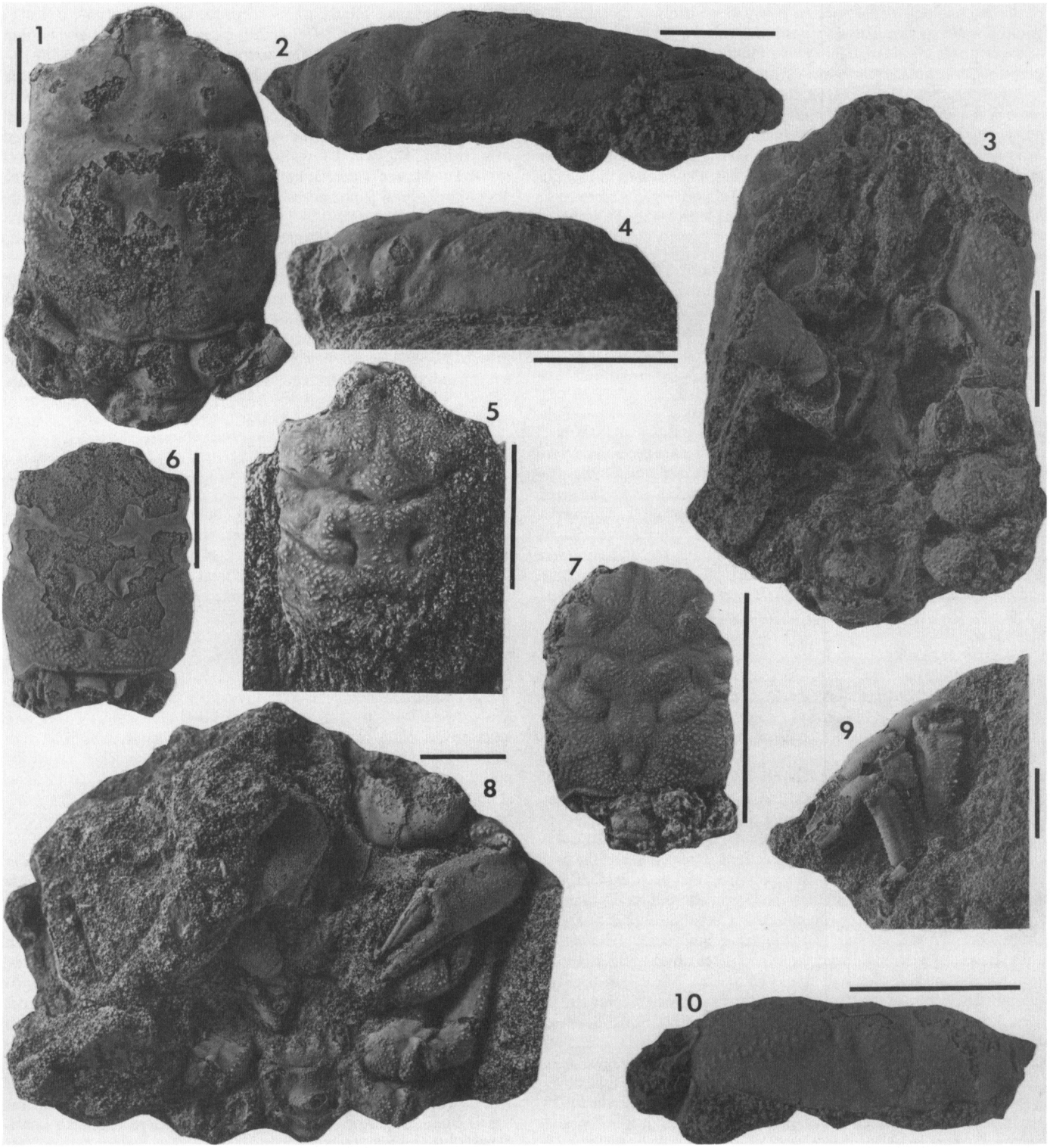


Figure 6. *Homolodromia chaneyi* n. sp. 1-3, Holotype, USNM 404870, dorsal aspect of cephalothorax and proximal segments of abdominal terga, left lateral, and ventral views. 4 and 5, Paratype, USNM 404872, left lateral and dorsal views. 6, 10, Paratype, USNM 404871, dorsal and right lateral views. 7, Paratype, USNM 404873, dorsal aspect of cephalothorax and proximal abdominal terga. 8 and 9, Paratype, USNM 404874, ventral view of abdomen with basal portions of pereiopods 1 through 3 and left cheliped, and dorsal view of left meri and carpi of pereiopods 1 through 3. Bar scales = 1 cm.

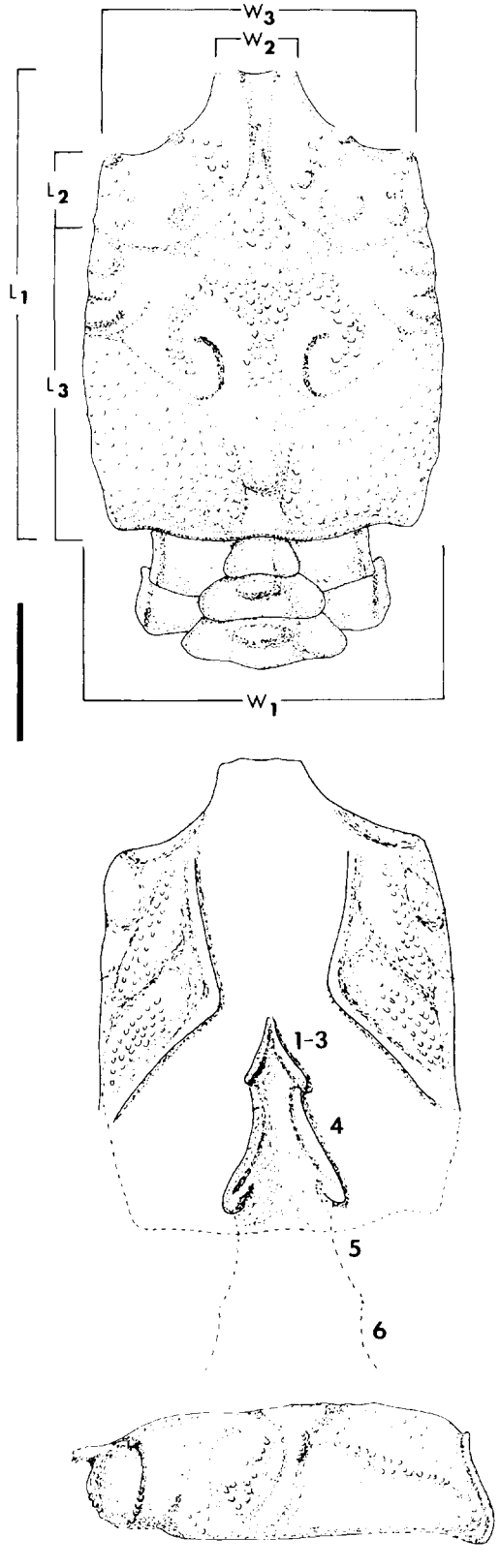


Figure 7. Line drawings of dorsal (upper), ventral (middle), and left lateral (lower) surfaces of the cephalothorax of *Homolodromia chaneyi* showing the positions and orientations of measurements. Bar scale = 1 cm.

First three abdominal somites exposed dorsally, remainder folded ventrally. Width of first three somites increases posteriorly from about one-fifth to nearly one-half the carapace width; width apparently decreases slightly on somites 3 through 6. Length of abdominal somites increases to somite 3 and decreases thereafter. Surfaces of somites pustulose; axial region elevated; pleural regions depressed, margins apparently smoothly rounded; prominent transverse swelling on anterior part of axial regions.

Sternum poorly known; narrow anteriorly, widening posteriorly to approximately maximum width posterior to first pereiopod; depressed axially.

Pterygostomial region large, well defined, triangular surface broadly corrugated, pustulose. Buccal cavity generally quadrate, widens anteriorly.

Thoracic appendages strong. Third maxilliped poorly known, apparently slender. Cheliped wider, thicker, and shorter than second and third pereiopods. Fourth and fifth pereiopods smaller, thinner, dorsal in position. Articles of appendages generally wider than high, ornamented by fine spines, more or less arranged in longitudinal rows, and by a row of somewhat longer spines on leading edges of articles. Meri and carpi with prominent distal ridges and sulci. Cheliped moderately straight, long, slender. Hand apparently ovoid in cross section with nodose ridge on upper surface. Fixed finger with longitudinal sulcus near lower edge. Dacylus with sulcus near upper edge. Denticles unknown. Termination of remaining appendages unknown.

Types. The holotype, USNM 404870, and five paratypes, USNM 404871 through 404875, are deposited in the U.S. National Museum of Natural History, Washington, D.C.

Etymology. The trivial name honors Dan Chaney, U.S. National Museum of Natural History, who collected one of the key specimens referable to this species.

Measurements. Measurements, in millimeters, are given in Table 4.

Geographical and stratigraphical position. Specimens referable to this taxon were collected from Localities 4, 8, 10, and 14 (Fig. 1), in the upper part of the La Meseta Formation on Seymour Island, Antarctica.

Remarks. Five specimens of *Homolodromia chaneyi* were collected from three separate localities, making this the second most abundant decapod in the La Meseta Formation. The lengths of the carapaces range from a minimum of about 11 mm to a maximum of nearly 38 mm, but the relative proportions and general aspect remain similar. Both dorsal and ventral aspects of the cephalothorax are preserved, along with the proximal elements of the abdomen and parts of several pereiopods. Thus, it is possible to make a detailed comparison of this species with Recent forms.

Homolodromia chaneyi seems to be most like *H. paradoxa* A. Milne Edwards, 1880, type species of the genus (Rathbun, 1937, p. 59). The cephalothorax of the Recent species is somewhat more vaulted and less coarsely ornamented than that of *H. chaneyi.* Additionally, the lateral margins on the former tend to be less well calcified and less well defined than on the fossils. A pustulose ridge gives a suggestion of a demarcation between the dorsal and lateral parts of the branchial region.

The pereiopods are smoother and tend to have a more nearly circular cross section on the modern form than on the fossils. The relative proportions of appendages are similar, although those of *H. chaneyi* are somewhat stouter throughout. Unfortunately, dactyli of pereiopods 2 through 5 are not available for comparison.

The form of the abdomen of the two species appears similar, to the

TABLE 4. MEASUREMENTS TAKEN ON SPECIMENS OF *HOMOLODROMIA CHANEYI* FROM THE LA MESETA FORMATION*

Specimen	L1	L2	L3	W1	W2	W3	LA4	WA1	LA2	WA2	LA3	WA3	LA4	WA4	LA5
404870	37.6	6.1	23.9	29.6	7.4	25.8	3.4	6.8	3.8	10.0	6.0	12.9	4.8*	12.8	4.8
404871	20.4*	3.7	13.8	17.4		15.5									
404872	20*	3.6	12.5	16.0	4.9	13.8									
404873	10.9		7.3	8.8											

Specimen†	Merus		Carpus		Propodus		Dactylus	
	L	W	L	W	L	W	L	W
404872-1			5.3	3.6	12.1	3.9		
404874-1	16.3	7.2	11.3	6.3	23.3	7.8	10.7	3.0
404874-2	22.3	5.3	10.7	4.4	10.7*			
404874-3	25.5	4.6	11.0	4.3	6*			
404874-4			6.3	2.6				

Note: All measurements in millimeters. Position and orientation of measurements taken on the cephalothorax are illustrated in Figure 7.
*Indicates an approximated measurement.
†Refers to the USNM catalogue number to which the number of the pereiopod has been appended.

extent that comparison can be made. The tergal regions on both species increase to a maximum width at somite 3, and the pleura are smooth or finely pustulose, gently rounded, and reduced. The abdomen is carried in such a fashion that somites 1, 2, and 3 are visible in dorsal aspect and project above the bases of pereiopods 4 and 5.

On the ventral surface of the cephalothorax, the general quadrate form of the buccal region on both forms results in similar appearance of the anteroventral area. Additionally, the anterior halves of the sternal regions on the two species are comparable. On *H. chaneyi,* the sternum originates as a small triangular anterior element that widens posteriorly to the approximate position of the insertion of the first pereiopod, at which point the sternum narrows and then widens progressively to the point of insertion of the second pereiopod. Although not investigated in detail, the position of insertion of pereiopods on *H. paradoxa* would suggest a similar sternal outline.

In 1983, Birkenmajer et al. published an illustration of a crab fossil collected from the early Miocene glaciomarine Cape Melville Formation on King George Island, approximately the northernmost island on the Antarctic Peninsula. They referred (p. 58) to the crab as a "crab of the section Dromiacea de Haan, 1833." Subsequently, the material formed the basis for description of a new genus and species, *Antarctidromia inflata* Förster, Gazdzicki and Wrona, 1985, of the Homolodromioidea. The branchial regions on the King George Island material are more inflated transversely, the thoracic region is much broader than the cephalic area, and the frontal region is more attenuated than on *H. chaneyi.* Although there are some differences in the relative proportions of regions, as defined by well-developed grooves, the groove patterns are similar. Therefore, it would appear that the Miocene specimens represent a different, but possibly closely related, species.

The only other family of organisms reported from the fossil record that contains species comparable to *H. chaneyi* is the Torynommidae Glaessner, 1980. This family was erected to embrace five genera of Cretaceous crabs, two of which—*Torynomma* and *Eodorippe*—are austral forms and a third—*Dioratiopus*—is cosmopolitan. These genera are characterized (Glaessner, 1980, p. 181) by having a square carapace with a spatulate frontal region, and distinctly defined regions with broad, well-defined grooves, including a branchiocardiac groove. The chelipeds on representatives of the Torynommidae are subequal, and pereiopods 4 and 5, or just pereiopod 5, are reduced and dorsal in position. Applying these, and the remainder of the familial descriptors, to *H. chaneyi* would seem to suggest the possibility of its placement in this taxon with as much confidence as offered by placement in the Homolodromiidae.

Examination of species within the Torynommidae, however, leads to the conclusion that most differ in significant ways from *H. chaneyi.* Most have very broad and deeply impressed carapace grooves or groove patterns that differ significantly from those of the Seymour Island material. The genus with members that most closely resemble *H. chaneyi* is *Dioratiopus* Woods, 1953 (= *Glaessneria* Wright and Collins, 1972; *non Glaessneria* Takeda and Miyake, 1964; = *Glaessnerella* Wright and Collins, 1975). However, careful comparison of trivial characters of the seven species discussed by Wright and Collins (1972) and the two discussed by Glaessner (1980) reveals substantial differences that separate each from *H. chaneyi.* Most representatives of the genus have a more drawn out frontal and anterolateral form, often with a downturned rostrum. In all cases, details of the groove patterns can be considered significant points of distinction. Because most of the species are apparently known only from remains of the cephalothoracic region, no adequate comparison of the abdomen or the walking legs can be made.

Thus, it would appear that the homolodromiid material from Seymour Island may represent the earliest record of the genus *Homolodromia* in the fossil record, extending the range of that genus into the late Eocene. Furthermore, considering *Antarctidromia inflata* as the first fossil record of the Homolodromiidae, *H. chaneyi* represents only the second, and the earliest, occurrence of the family. It is also possible that the Homolodromiidae arose from the Torynommidae, possibly through *Dioratiopus.* A much more detailed examination of the Torynommidae must be made before this suggestion can be confirmed.

Records of the sites from which living representatives of the genus *Homolodromia* have been collected (Rathbun, 1937, p. 58) range from 356 to 472 fathoms in the regions of the West Indies and east Africa.

Guinot (1977, p. 229) noted that the entire range of the superfamily Homolodromioidea (comprising a half-dozen species in two genera, *Homolodromia* and *Dicranodromia*) was in deep-water settings. Specimens have been collected at few, widely separated sites in the east and west Atlantic, the Indian Ocean, and Japan. Therefore, the occurrence of *Homolodromia chaneyi* in shallow-water sediments in Eocene rocks of Antarctica documents the first occurrence of a representative of the superfamily in shallow-water habitats and documents the inshore environments as the site of origin of taxa now known to exist only in bathyal environments.

Subsection ARCHEOBRACHYURA Guinot, 1978
Superfamily RANINOIDEA De Haan, 1839
Family RANINIDAE De Haan, 1839
Subfamily RANININAE Serene and Umali, 1972

Genus *Lyreidus,* De Haan, 1841
***Lyreidus antarcticus* Feldmann and Zinsmeister, 1984**
Figures 8, 9.1–11, 10.1–8

Lyreidus antarcticus FELDMANN and ZINSMEISTER, 1984, p. 1048–1056, Figs. 3A–K, 4A–I, 5, 6B, 7.

Emended Description. With the recent collection of 190 additional specimens of *Lyreidus antarcticus,* some refinements of the original description of the species may be made. These emendations follow in the order of the original description.

Fronto-orbital margin approximately two-fifths the maximum carapace width; frontal width relatively greater in smaller, presumably younger, individuals and more narrow in larger, or mature, specimens. Rostrum subacute, relatively less acute than that of some other species of *Lyreidus;* rostrum 1.2 times as long as wide, postorbital spines slightly divergent and just longer than rostrum. In addition to setal pits, originally described as only feature of ornamentation, carapace possesses prominent cardiac grooves located in posterior one-third, centered on dorsal surface; as in Recent species, grooves present as longitudinal, paired, curved depressions; gastric apodeme pits not found, although typically extremely small and not readily preserved in fossil material.

Sternal elements 1 through 3 fused, apex sharp; anterolateral portion of element 4 acute and upturned, unlike Recent species of *Lyreidus;* sternum attains greatest width across element 5 and narrows abruptly across element 6, gradually tapering posteriorly. Abdomen articulated with sternum between elements 5 and 6, with female specimens exhibiting a small, raised, outwardly curved projection of sternum.

Thoracic appendages, excluding first pereiopod, not commonly preserved completely, previously undescribed. Second pereiopod, described and measured from two complete specimens, much smaller than first; basis rounded; ischium about 0.80 times as long as wide; merus nearly 2.5 times as long as wide, upper and lower surfaces thin and sharp, sides ornamented with minute spines, nodes, or setal pits; carpus nearly twice as long as wide, widens distally; propodus nearly square, flat; dactylus extremely long, nearly 2.5 times as long as wide, blade shaped. Third pereiopod described and measured from three incomplete specimens, longest walking appendage; merus uniformly about 3.5 times as long as wide, merus proportionally longer than merus of second pereiopod, upper surface sharp, lower surface rounded; carpus much stouter than merus, about twice as long as wide, thinning proximally, upper surface sharp; propodus approximately 1.5 times as long as wide, tapers distally, upper and lower surfaces thin and sharp; dactylus blade shaped, stouter than dactylus of second pereiopod, only slightly more than 1.5 times as long as wide, upper and lower surfaces extremely thin and sharp. Fourth pereiopod described and measured from three specimens. Appendage smaller than third pereiopod; merus about twice as long as wide, slightly wider distally, upper surface rounded, surface thin and sharp; carpus stout, just slightly longer than wide; propodus extremely stout, approximately twice as wide as long; dactylus twice as long as wide, very thin in cross section, and elongate chordate shaped. Fifth pereiopod described and measured from three incomplete specimens. Appendage radically reduced, lies in dorsal plane of body, aligned with first abdominal somite; males exhibit greater proportional length of basis, which extends nearly to posterior portion of second abdominal somite; females exhibit comparatively reduced basis, extending posteriorly only to about one-half the length of second abdominal somite; ischium and merus extremely reduced; carpus, propodus, and dactylus unknown.

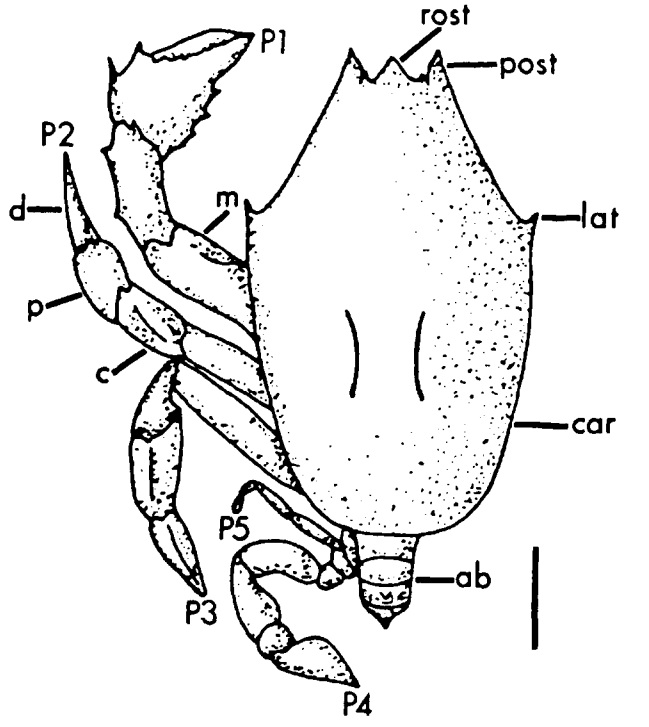


Figure 8. Reconstruction of *Lyreidus antarcticus* with major morphological features labeled. Key: ab = abdomen; car = carapace; c = carpus; d = dactylus; lat = lateral carapace spine; m = merus; Pl = pereiopod 1; P2 = pereiopod 2; P3 = pereiopod 3; P4 = pereiopod 4; P5 = pereiopod 5; post = postorbital spine; p = propodus; rost = rostrum. Bar scale = 1 cm.

Types. The holotype, USNM 365441, paratypes, USNM 365442–365450 and 365454, and hypotypes USNM 404881–404922 are deposited in the U.S. National Museum of Natural History, Washington, D.C. Additional specimens KSU 5038–5048 are deposited at Kent State University, Kent, Ohio.

Measurements. Measurements, in millimeters, of previously undescribed thoracic appendages (pereiopods 2, 3, 4) are given in Table 5. Measurements were derived from maximum lengths and breadths of the individual appendage segments. Measurements for the fifth pereiopod are not presented, as only incomplete ischia and meri are marginally preserved on two specimens and only approximations could be given.

TABLE 5. MEASUREMENTS TAKEN ON THORACIC APPENDAGES OF SPECIMENS OF *LYREIDUS ANTARCTICUS*

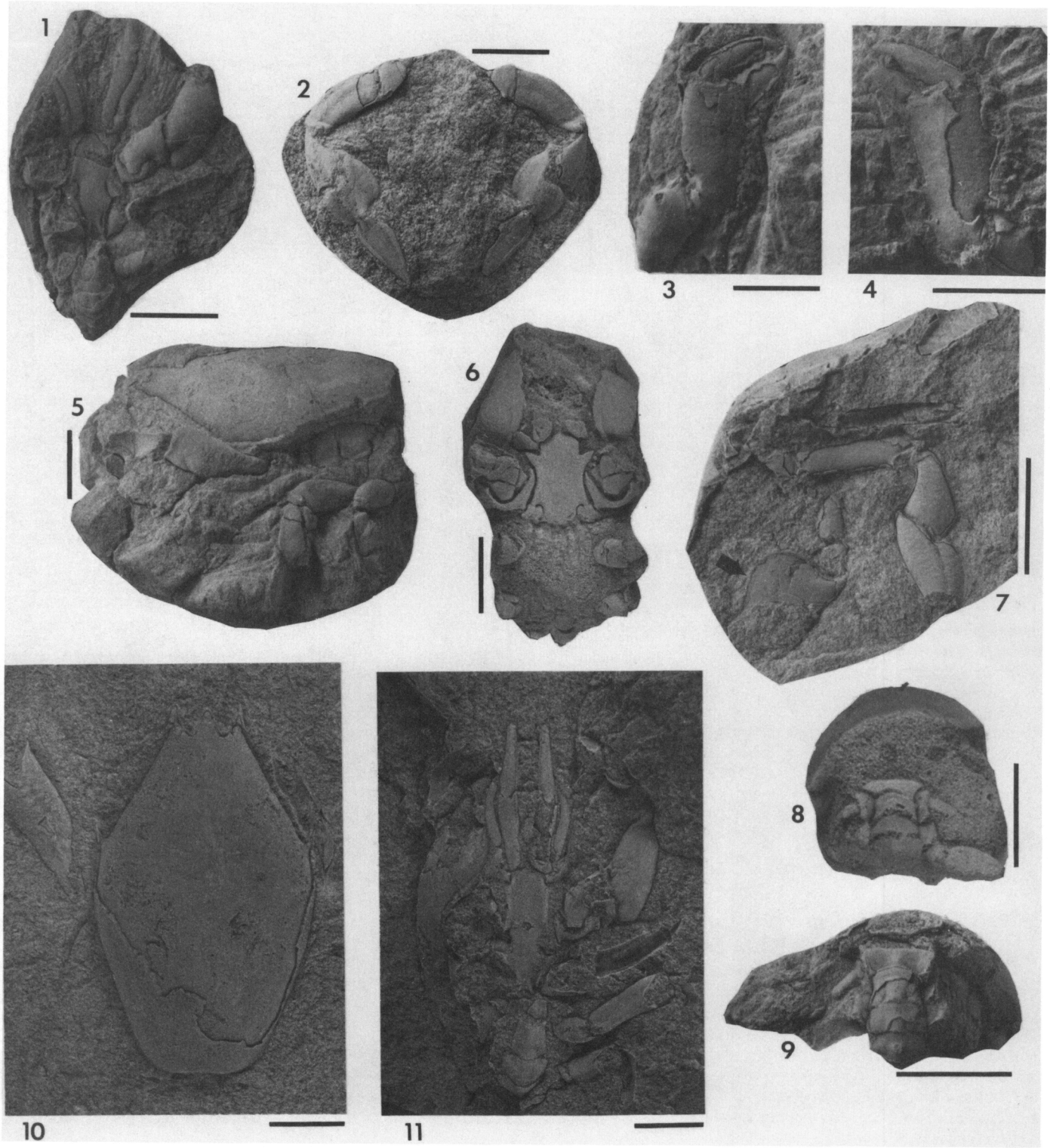
Specimen	Mer-2 L	Mer-2 W	Carp-2 L	Carp-2 W	Prop-2 L	Prop-2 W	Dactyl-2 L	Dactyl-2 W
404882	12.2	5.0	9.5	5.0	9.2	8.1	10.9	5.0
404895	10.0	4.7	8.5	4.5	7.6	—	10.3	4.4
Specimen	Mer-3 L	Mer-3 W	Carp-3 L	Carp-3 W	Prop-3 L	Prop-3 W	Dactyl-3 L	Dactyl-3 W
404883	12.9	4.7	8.8	5.0	—	—	—	—
404886	12.6	3.4	8.5	4.7	11.0	6.8	10.4	6.3
404888	14.9	5.2	—	—	—	—	—	—
Specimen	Mer-4 L	Mer-4 W	Carp-4 L	Carp-4 W	Prop-4 L	Prop-4 W	Dactyl-4 L	Dactyl-4 W
404883	8.8	4.1	7.5	6.5	3.3	6.3	—	—
404886	—	—	—	—	—	—	11.1	5.0
404888	8.9	5.0	8.2	6.4	4.2	7.5	—	—

Note: Measurements in millimeters. Length and width measurements represent the maxima for each segment of each measured appendage. Mer = merus, Carp = carpus, Prop = propodus, Dactyl = dactylus. Numbers beside these abbreviations (2-4) represent the corresponding numbers of each pereiopod.

Remarks. Differentiation of the sexes of *Lyreidus* and some other raninids is very difficult, especially in fossil material. Prior to this study, only Sakai (1937) had described any external feature as part of sexual dimorphism in *Lyreidus.* As there are no obvious external signs of sexual dimorphism, such as claw or carapace size differences, definitive dimorphic characters must be based on analogy with Recent specimens. Sex is easily determined in such specimens by the position and number of pleopods; the male possesses one pair of modified pleopods, the female, two. Sex may also be determined by position of the female genital pore, which is located on the coxa of the third pereiopod; the male genital opening is positioned on the coxa of the fifth pereiopod. Another subtle, but sexually dimorphic feature, is found on the sternum of both sexes. Bourne (1922) noted that *Lyreidus* has the capability to tightly "lock" its abdomen to its sternum, a feature not found in any other raninid. Bourne (1922) referred to these raised, curved features found on the sternum between the fifth and sixth sternal elements as "pterygoid processes." However, he failed to notice that these raised portions of the sternum are sexually dimorphic. The males, in mature Recent species of *Lyreidus* and *Lysirude,* possess straight, bladed, raised flanges; whereas the female possesses notably reduced, outwardly curved projections. Bliss (1982, p. 109) noted that "male crabs have a 'locking device,' consisting of small tubercules on the fifth thoracic segment that secure the triangular or T-shaped abdomen in a depression on the ventral side of the thorax." Bliss (1982) did not describe a locking device in female crabs, but noted that females tightly hold their abdomina within a depression in the sternum. The smaller curved areas in the female sterna of *Lyreidus* are probably lateral extensions of this depression. Another dimorphic aspect was described by Sakai (1937), who noted that the male *L. tridentatus* has a proportionally longer fifth abdominal somite, and the female a proportionally wider one. This dimorphic character is apparent in mature specimens of *L. brevifrons* and *L. stenops.* This relationship is not yet established for *L. antarcticus.*

In addition to the two primary types which have well-preserved abdomina, there are four additional specimens. All six exhibit a relatively broad fifth abdominal somite, indicating that all are female. One last feature may be used to determine the sex of Recent specimens. The basis

Figure 9. *Lyreidus antarcticus* Feldmann and Zinsmeister, 1 through 11 figured hypotypes. 1, USNM 404881, ventral aspect of cephalothorax, including third maxilliped, well-preserved lower sternal elements, and right and left basal segments and left meri of the first three pereiopods. 2, USNM 404882, complete elements of right and left second pereiopod. 3, USNM 404883, carpus, propodus, and dactylus of right cheliped. 4, USNM 404884, propodus and dactylus of left cheliped. 5, USNM 404883, lateral view of cephalothorax, including elements of pereiopods 1 through 4. 6, USNM 404885, complete upper sternal plate, lower elements (5, 6, 7) lacking. 7, USNM 404886, pereiopods 3 and 4, fourth pereiopod on left shows complete dactylus (arrow), third pereiopod on right shows complete merus, carpus, and propodus. 8, USNM 404889, posterior view of carapace edge showing detached abdomen, abdominal somites 1 through 4, right and left ischia and meri of fifth pereiopod. 9, USNM 404881, posterior view of carapace showing attached abdomen, abdominal somites 1 through 4, ischium and merus of left fifth pereiopod. 10, USNM 404887, dorsal view of cephalothorax, with complete rostrum, postorbital spines, lateral carapace spines, and with merus of left cheliped, integument attached to posterior portion of carapace. 11, USNM 404888, ventral aspect of cephalothorax with complete right and left third maxilli, right and left basal segments, and left meri of pereiopods 1 through 4, and abdominal somites 4 through 7. Bar scales = 1 cm.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