

Rutidermatidae
of Southern California
(Ostracoda: Myodocopina)

LOUIS S. KORNICKER
and
BRAD MYERS

SMITHSONIAN CONTRIBUTIONS TO ZOOLOGY • NUMBER 334

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ABSTRACT

Kornicker, Louis S., and Brad Myers. Rutidermatidae of Southern California (Ostracoda: Myodocopina). *Smithsonian Contributions to Zoology*, number 334, 35 pages, 20 figures, 1981.—Four species of *Rutiderma* that had been described from southern California are more completely described and illustrated: *Rutiderma rostratum* Juday, 1907; *R. loma* (Juday, 1907); *R. rotundum* Poulsen, 1965; and *R. judayi* McKenzie, 1965. A new species, *Rutiderma chessi*, from San Clemente Island, is described and illustrated. A neotype is selected for *R. loma*. A key is presented to species of *Rutiderma* in the study area.

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Introduction

During the past few years many individuals and organizations have been participating in an extensive study of the shelf fauna of southern California. Ostracodes from these collections have provided us with the opportunity to present herein descriptions and illustrations of both males and females of four species of *Rutiderma* that live in the area and previously had been only partly described. A new species of *Rutiderma* collected in the vicinity of San Clemente Island is also described and illustrated.

Most specimens on which we worked have been given USNM numbers (abbreviation for the former United States National Museum) and are now available in the collections of the National Museum of Natural History. Many of the specimens were previously in the personal collection of one of us (Brad Myers), and the BM numbers following USNM numbers refer to the specimens when they were in that collection. Specimens with only BM numbers remain in the collection of Brad Myers.

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revealed that none of these institutions have the types of *Rutiderma rostrata* Juday, 1907, and *Philomedes lomae* Juday, 1907: Scripps Institution of Oceanography (formerly Marine Biological Association of San Diego), San Diego Museum of Natural History, California Academy of Sciences, University of California at Berkeley, Allan Hancock Foundation, and University of Wisconsin. Therefore we must assume that the types of these two species are no longer extant.

ACKNOWLEDGMENTS.—We thank the individuals who have contributed specimens to this study and the institutions with which they were affiliated when the collections were made. Credits are given in the materials section of each description; however, we regret this is not always complete because the information received with some specimens was fragmentary. Mrs. Carolyn Gast rendered the shaded drawings of the carapaces. Mrs. Kathryn Schroeder made many of the initial camera lucida drawings of appendages and then inked the final drawings. We are grateful to Mrs. Anne Cohen for criticizing the manuscript and for assisting in many ways in its completion, and to Don Fisher for final editing and preparation of the manuscript for publication. We thank Dr. Gerd Hartmann for loan of specimens of *Rutiderma* collected in El Salvador and presently in the

Hamburgischen Zoologischen Museum und Institut.

RUTIDERMATIDAE Brady and Norman, 1896

This family contains three genera: *Rutiderma* Brady and Norman, 1896; *Alternochelata* Kornicker, 1958; and *Scleraner* Kornicker, 1975. Only *Rutiderma* is represented in the present collection. For a key to genera of the Rutidermatidae see Kornicker and Caraion (1978:54).

DISTRIBUTION.—Members of the Rutidermatidae are widespread between latitudes of 45°N and 50°S and depths of 1 to 260 m (Kornicker and Caraion, 1978:54). Specimens in the present study are from the coasts of southern and Baja California, and San Clemente and Santa Catalina islands, between latitudes of about 27°40'N–34°20'N. Water depths from which the present collections were obtained are not known for all samples, but depths probably range from intertidal to about 40 m. For distribution data on species of *Rutiderma* from the Southern California continental shelf see Baker (1975).

BEHAVIOR.—Members of this family are carnivorous. They have stout pincer-like chelae on the mandibles of females and juvenile males, which are thought to be used for grasping live prey. Copepods, annelids, nematodes, polychaetes, and crustacean and other fragments have been found in the gut of rutidermatids (Kornicker, 1975:65; Kornicker and Caraion, 1978:60). The maxillae and 5th limbs are reduced on adult males, indicating that adult males may not eat. Adult males are generally less abundant than adult females, suggesting that they live a relatively short time.

Juveniles of both sexes are without natatory hairs on the exopodial bristles of the 2nd antennae, and the bristles are relatively short, indicating that juveniles are incapable of swimming and, therefore, live on the bottom. Adult males and females have natatory hairs on relatively long exopodial bristles of the 2nd antennae, indicating

that they are capable of swimming. Adult males and females of a few species have been collected in plankton nets at the surface (Juday, 1907:142, 149; Poulsen, 1965:41), suggesting that they may rise to the surface during mating. However, many adult males have also been collected on the bottom, suggesting that mating may also take place there. The adult female of *Alternochelata nealei* apparently breaks off some of the exopodial bristles of the 2nd antenna after mating, relegating them to a benthic existence (Kornicker and Caraion, 1978:73). The ability of the adult female to break off exopodial bristles is rare in the Rutidermatidae, but common among the Philomedidae.

The Rutidermatidae bear relatively few eggs per clutch—2 to 4. Lateral eyes may be absent on females, but if present are small with not more than 5 ommatidia. Males have well-developed lateral eyes with numerous ommatidia, and have black pigment between ommatidia.

Rutiderma Brady and Norman, 1896

This genus is represented in the collections by five species: *R. rostratum* Juday, 1907; *R. lomae* (Juday, 1907); *R. rotundum* Poulsen, 1965; *R. judayi* McKenzie, 1965; and *R. chessi*, new species.

DIAGNOSIS OF GENUS.—Carapace of adult female and juveniles of both sexes generally with 2 or 3 horizontal ribs connected at their posterior ends with a vertical rib of various configurations. Rostrum and incisur of adult female and juveniles of both sexes generally small.

Second Antenna: Endopodite of female 1-jointed with 3 or 4 short anterior bristles.

Mandible: 2nd and 3rd endopodial joints of adult female and juveniles of both sexes with a stout chela-like claw having pincer action.

Fifth Limb: 2nd exopodial joint of adult female and juveniles of both sexes with large squarish tooth.

Furca: Each lamella with 6 claws consisting of 3 or 4 main claws followed by 2 or 3 smaller secondary claws.

Key to Species of *Rutiderma* of Southern California

ADULT FEMALES

1. Main lateral rib broadly rounded or subrounded posteriorly (some variability in smoothness of outer edge of rib); incisur minute; each lamella of furca with 3 main claws followed by secondary claws; 7th limb with 6 proximal bristles ***R. rotundum***
 Without broadly rounded or subrounded rib; incisur well defined; each lamella of furca with 4 main claws followed by secondary claws; 7th limb with 4 proximal bristles 2
2. Surface of valves either without horizontal ribs or with 2 weakly developed horizontal ribs (1 above and 1 below central adductor muscle attachments); posteroventral corner of carapace with very narrow caudal process; tip of main claw of 2nd endopodial joint of mandible with prolonged finger-like process ***R. rostratum***
 Surface of valves with 2 or 3 well-developed horizontal ribs; posteroventral corner of carapace with backward projecting caudal process; tip of main claw of 2nd endopodial joint of mandible without finger-like process .3
3. Surface of valves with 2 narrow horizontal ribs with discontinuous vertical rib at their posterior ends having blank space near its middle; additional riblets weakly developed and not visible on some specimens; endopodite of 2nd antenna with minute marginal bristle in addition to longer proximal anterior bristles. (It will be necessary to examine more specimens to determine whether the presence of a minute marginal bristle is a constant character.) ***R. lomae***
 Surface of valves with 2 or 3 horizontal ribs with continuous well-defined vertical rib connecting the posterior ends; additional riblets well developed; endopodite of 2nd antenna without minute marginal bristle .. 4
4. Carapace shorter than 1.10 mm; surface of valves with 2 ribs ventral to central adductor muscle attachments; vertical rib connecting posterior ends of single upper horizontal rib and 2 lower horizontal ribs deeply indented (configuration of vertical rib variable); main claws of 2nd and 3rd endopodial joints of mandible fairly short and stout (see Figure 18g); tip of bellonci organ broadly rounded ***R. judayi***
 Carapace longer than 1.15 mm; surface of valves with 1 rib ventral to central adductor muscle attachments; vertical rib connecting posterior ends of upper and lower horizontal ribs fairly linear; main claws of 2nd and 3rd endopodial joints of mandible relatively long and slender (see Figure 20f); tip of bellonci organ pointed ***R. chessi***

ADULT MALES

(Adult male of *R. chessi* unknown)

1. Main lateral rib broadly rounded posteriorly; each lamella of furca with 3 main claws followed by secondary claws ***R. rotundum***

- Without broadly rounded lateral rib; each lamella of furca with 4 main claws followed by secondary claws 2
2. Surface of valves without horizontal ribs; posteroventral corner of carapace rounded with extremely narrow caudal process ***R. rostratum***
Surface of valves with horizontal ribs; posteroventral corner of carapace with backward projecting caudal process 3
3. Carapace shorter than 1.11 mm; rostrum not overhanging incisur; vertical rib connecting posterior ends of horizontal ribs deeply indented (see Figure 15) ***R. judayi***
Carapace longer than 1.15 mm; rostrum overhanging incisur; vertical rib connecting posterior ends of horizontal ribs only slightly indented (see Figure 8) ***R. lomae***

***Rutiderma rostratum* Juday, 1907, emendation**

FIGURES 1-4

Rutiderma rostrata Juday, 1907:147, pl. 20: figs. 8-13.

Not *Rutiderma rostrata*.—Hartmann, 1959:195, 196, 198, 199 [*≠ R. hartmanni* Poulsen, 1965:32].—Poulsen, 1965:18, figs. 2, 3.—McKenzie, 1965:62, fig. 2, pl. 1: fig. 3.

HOLOTYPE.—Female, length 1.2 mm, height 0.9 mm; unique specimen, not extant.

TYPE-LOCALITY.—Glorietta Bight, San Diego Bay, 30 Jun 1903.

MATERIAL.—USNM 158222 (BM 17), 1 adult female from off Oxnard, California, sta B1-C, Jun 1974, about 22 m; USNM 158228 (BM 17A), 1 adult male from same sample. USNM 158352, 6 specimens including 2 ovigerous females, from off Monticeito, California, sta C + D, Jan 1973, about 11 m (30-40 ft), sand substrate.

SUPPLEMENTARY DESCRIPTION OF ADULT FEMALE (Figures 1, 2).—Carapace more-or-less ovoid in lateral view with overhanging rostrum; caudal process narrow, not projecting posteriorly (Figure 1).

Ornamentation: Two faint horizontal ribs present, one dorsal and one ventral to central adductor muscle attachments (Figure 1); valve surface with abundant small oval fossae; anterior edge of rostrum with minute scallops (Figure 1).

Infold: Infold of rostrum with 7-9 bristles forming row parallel to anterior margin (Figure 2a); 2 short bristles present at inner edge of incisur; anteroventral infold and anterior end of infold of ventral margin with total of about 8

bristles paralleling valve edge; posteroventral infold including caudal process with about 19 bristles (about 12 of these on caudal infold) (Figure 2b); infold of caudal process of left and right valves similar.

Selvae: Wide lamellar prolongation fringed along anterior and ventral margins except along posterior end of latter; prolongation narrower and without fringe along edge of caudal process and posterior margin of valve; selvae divided at inner end of incisur and at minute bristle on edge of caudal process (Figure 2b).

Size: USNM 158222, length 1.32 mm, height 0.91 mm. USNM 158352, 2 specimens: length 1.40 mm, height 0.99 mm; length 1.33 mm, height 0.95 mm.

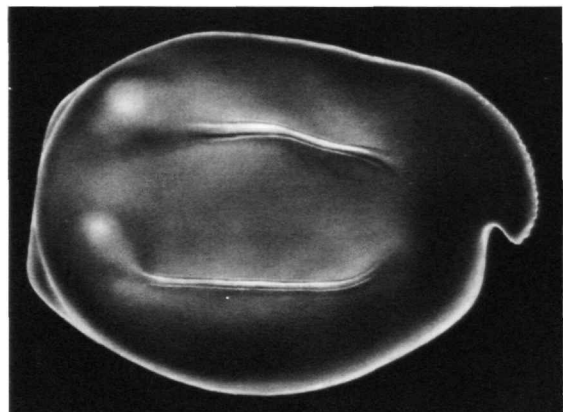


FIGURE 1.—*Rutiderma rostratum*, adult female, USNM 158222, complete specimen, length 1.32 mm.

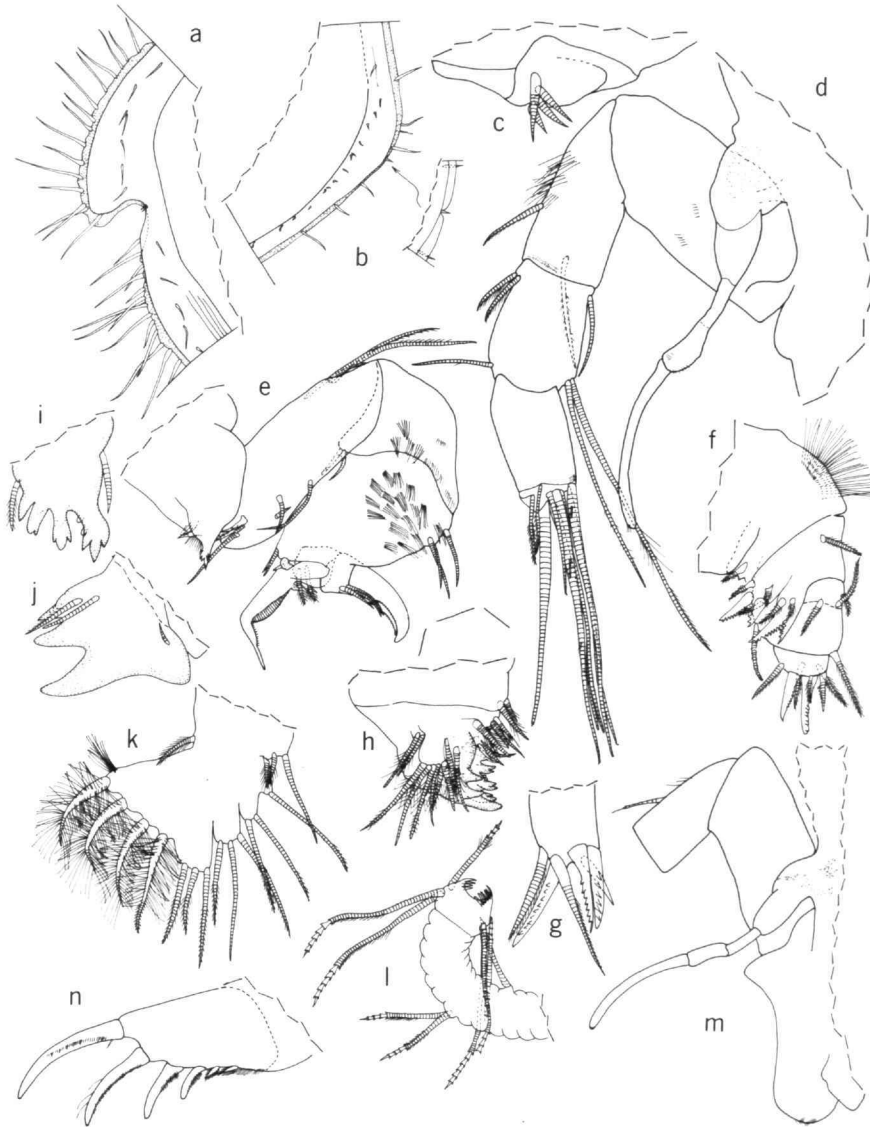


FIGURE 2.—*Rutiderma rostratum*, adult female, USNM 158222, length 1.32 mm: *a*, anterior of right valve, inside view; *b*, posteroventral corner of right valve showing bristles on infold of caudal process, and detail showing division of lamellar prolongation of selvage at small bristle, inside views; *c*, endopodite of right 2nd antenna, medial view; *d*, right 1st antenna (medial view), medial eye, and bellonci organ; *e*, left mandible, medial view; *f*, left maxilla, medial view; *g*, endite I of right maxilla; *h*, left 5th limb, posterior view; *i*, 1st exopodial joint of right 5th limb as seen through 2nd exopodial joint, posterior view; *j*, 2nd exopodial joint of right 5th limb, posterior view; *k*, 6th limb; *l*, 7th limb; *m*, anterior of body showing part of right 1st antenna, medial eye, bellonci organ, and upper lip; *n*, right lamella of furca, medial view.

First Antenna (Figure 2d): 1st joint with few medial and lateral spines forming rows. 2nd joint with 2 spinous bristles (1 dorsal, 1 lateral); medial and lateral surfaces with long hairs forming 3 rows on dorsal margin proximal to dorsal bristle; lateral surface with short spines forming row near distal margin. 3rd joint small, fused to 4th, with 3 bristles (2 dorsal, 1 ventral); long 4th joint with 3 bristles (1 dorsal, 2 ventral; longer of ventral bristles with long hairs near middle). Sensory bristle of long 5th joint with 1 small proximal filament and minute process at tip; small lateral spines near base of bristle. Minute 6th joint with short spinous medial bristle. 7th joint: a-bristle spinous, about same length as bristle of 6th joint; b-bristle longer than a-bristle, with minute process at tip; c-bristle about same length as sensory bristle of 5th joint, with 1 small faint proximal filament and minute process at tip. 8th joint: d- and e-bristles bare with blunt tips not reaching tip of sensory bristle; f-bristle stout, almost same length as d-bristle, with minute process at tip; g-bristle slightly longer than c-bristle, with short proximal filament, a few faint spines near middle, and minute process at tip. [Juday (1907:148) stated that the dorsal margin of the 2nd joint bore 1 large and 2 small setae. His illustration of the limb (pl. 20: fig. 11) has on the dorsal margin of the 2nd joint 1 small proximal seta and 1 longer distal seta. I think it probable that the small seta is a group of hairs.]

Second Antenna: Protopodite bare. Endopodite 1-jointed, with 4 small anterior bristles (Figure 2c). Exopodite: 1st joint elongate with minute medial bristle on distal margin; bristle of short 2nd joint reaching end of stem, with 2 faint spines followed by row of closely spaced blunt spines along ventral margin; bristles of joints 3-5 somewhat longer but with similar ventral spines, no hairs; bristles of joints 6-8 very long, with natatory hairs, no ventral spines; 9th joint with 6 bristles (3 long and 1 medium with natatory hairs, 2 minute, bare); joints 2-8 with spines forming row along distal margins. [The exopodite of the 2nd antenna described by Juday (1907:148) differs somewhat from that described here, but the

differences could be the result of variability within the species or inaccurate observations.]

Mandible (Figure 2e): Coxale endite bifurcate, pectinate, with long hairs near base. Basale: medial side with 4 proximal bristles near ventral margin (2 pectinate, unringed; 2 slender, ringed), and 3 bristles near middle (1 small, 2 long, slender); dorsal margin with 3 bristles. 1st endopodial joint with 2 small ventral bristles and medial spines. 2nd endopodial joint with medial spines, 3 proximal dorsal bristles, 2 small distal ventral bristles, and a stout terminal claw with a small medial process at its base; the stout terminal claw with proximal dorsal tooth, a serrate dorsal flange, and a long produced tip. 3rd endopodial joint with stout claw with smoothly rounded dorsal margin and serrate ventral margin, 1 unringed flat bristle with ventral spines, 3 ringed medial bristles, and 2 ringed lateral bristles (the latter 2 bristles located lateral to base of stout claw of 2nd joint).

Maxilla (Figure 2f,g): Each of 3 endites with 2 or 3 stout pectinate bristles and 2 or 3 ringed spinous bristles (not all shown on illustrated limb). Precoxale with dorsal fringe. Coxale with short dorsal bristle with short marginal spines. Basale with 2 or 3 bristles with short marginal spines. Exopodite obscure on specimen examined but apparently with 1 short and 1 or 2 long bristles. Endopodite: 1st joint with 1 alpha-bristle, bare or with few spines, and 1 beta-bristle with short spines (endopodite is twisted on illustrated limb so that beta-bristle is in anterior position); end joint with 2 stout pectinate unringed bristles and 5 additional spinous bristles.

Fifth Limb (Figure 2h-j): Epipodial appendage with 44 bristles. Endite I with 2 bristles; endite II with 4 bristles; endite III with about 6 bristles. Exopodite: 1st joint with 3 large teeth bearing secondary teeth, followed by a single pointed tooth, and then a ringed bristle; a ringed bristle present on outer margin proximal to teeth (Figure 2i); 2nd joint consisting of large flat tooth with 3 pointed lobes along inner margin; posterior side with 3 bristles (2 near proximal inner lobe, 1 near proximal outer corner of joint) (Figure 2j);

3rd joint with 2 bristles on inner lobe and 2 on outer lobe; 4th and 5th joints fused, with total of 4 bristles.

Sixth Limb (Figure 2k): 1 hirsute bristle in place of epipodial appendage. Endite I with 2 short and 1 long bristles; endite II with 1 bristle; endite III with 2 bristles; endite IV with 3 bristles. End joint with 3 anterior bristles on prominent projection, followed by 1 stout bristle with long proximal hairs and short distal spines and then 3 hirsute bristles.

Seventh Limb (Figure 2l): Each limb with 4 proximal bristles (2 on each side) and 6 distal bristles (3 on each side); each bristle with up to 6 bells and marginal spines. Terminus with opposing combs, one with about 11 teeth, other with about 6. [The 7th limb described by Juday (1907: 149) had 4 proximal and 5 distal bristles.]

Furca (Figure 2n): Each lamella with 4 stout claws followed by 2 weak secondary claws.

Bellonci Organ (Figure 2d,m): Elongate, broadening in middle part, tip broadly rounded (broadened middle part possibly with suture on each end, but could be wrinkles on specimen examined). Spines visible on organ when examined at high magnification (oil immersion, 100× objective).

Eyes (Figure 2d,m): Medial eye tapering anteriorly, lightly pigmented. Lateral eyes not observed.

Posterior of Body: Hirsute dorsal to furca.

Upper Lip (Figure 2m): Simple lobe with spines forming rows.

Y-Sclerite: Typical for genus.

Genitalia: Small oval process on each side of body anterior to furca.

Eggs: USNM 158222 with 2 large unextruded eggs.

DESCRIPTION OF ADULT MALE (Figures 3, 4).—Carapace elongate with greatest height posterior to middle; convex ventral margin and fairly linear dorsal margin except for truncate posterodorsal corner; rostrum well developed; incisur forming right or slightly obtuse angle; posteroventral corner evenly rounded with very narrow caudal process (Figure 3).

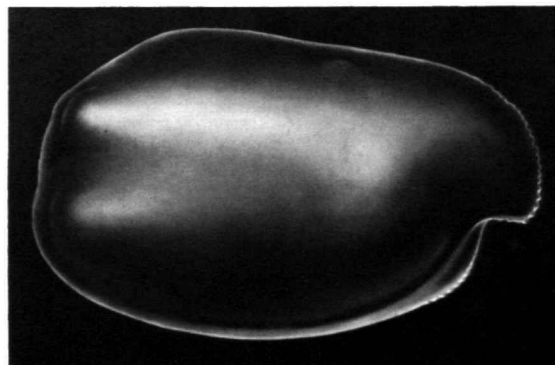


FIGURE 3.—*Rutiderma rostratum*, adult male, USNM 158228, complete specimen, length 1.29 mm.

Ornamentation (Figure 3): Carapace with 2 low but distinct bulges near posterior margin but without horizontal ribs; anterior edge of rostrum with minute scallops.

Infold: Rostral infold with 7 to 9 bristles forming row parallel to anterior margin of rostrum (not all shown in Figure 4a); 2 minute bristles present at inner corner of incisur; anteroventral infold with 7 bristles forming row. Infold with well-defined inner edge but without ridge (list); infold of posterior end of ventral margin and narrow caudal process with about 22 small bristles, about 9 of these on caudal process (not all bristles shown in Figure 4b); caudal process of left and right valves similar.

Selvage (see detail in Figure 4b): Similar to that of adult female.

Size: USNM 158228, length 1.29 mm, height 0.82 mm.

First Antenna (Figure 4c): 1st joint with few spines. 2nd joint spinous on all surfaces, with 2 bristles (1 dorsal, 1 lateral). 3rd joint short, with 3 bristles (2 dorsal, 1 ventral). 4th joint about twice length of 5th joint, with medial spines and 4 bristles (1 dorsal, 3 ventral). 5th joint minute, wedged ventrally between 5th and 6th joint; sensory bristle with numerous filaments at distal end of stout proximal part (not shown on illustrated limb), and minute filament with spine at tip at base of stem just distal to stout proximal



FIGURE 4.—*Rutiderma rostratum*, adult male, USNM 158228, complete specimen, length 1.29 mm: *a*, anterior of right valve, inside view; *b*, posteroventral corner of right valve showing bristles on infold of caudal process, and detail showing division of lamellar prolongation of selvage at small bristle, inside views; *c*, right 1st antenna, medial view; *d*, endopodite of right 2nd antenna, medial view; *e*, right mandible, medial view; *f*, left maxilla, medial view; *g*, 5th limb; *h*, 6th limb; *i*, 7th limb; *j*, right lamella of furca, medial view; *k*, distal end of medial eye and bellonci organ; *l*, left Y-sclerite, anterior towards left.

part of bristle. Long 6th joint with 1 medial bristle near distal dorsal corner. 7th joint: a-bristle smaller than, or about same size as, bristle of 6th joint; b-bristle stout, about 3 times length of a-bristle, with 2 proximal filaments with 1 or 2 spines at tip; c-bristle very long with 11 filaments; tips of filament and stem with 2 minute spines. 8th joint: d- and e-bristles bare with blunt tips, both slightly longer than b-bristle; f-bristle very long with 10 filaments; both tips of filaments and stem with 2 minute spines; g-bristle stouter and longer than b-bristle, with proximal filament with spine at tip. Tips of sensory bristle of 5th joint and b- and g-bristles with minute process.

Second Antenna: Protopodite bare. Endopodite 3-jointed (Figure 4d): 1st joint short with 5 short bristles (4 proximal, 1 distal); 2nd joint elongate with 2 slender ventral bristles (with faint marginal spines) near middle; 3rd joint elongate, reflexed on 2nd joint, with 1 short proximal bristle, 2 short slender distal bristles, and tip with about 4 ridges. Exopodite: 1st joint elongate, with spines forming rows, and with small medial bristle on distal margin; bristle of short 2nd joint reaching 6th joint, with few proximal long hairs on ventral and dorsal margin followed by short slender spines along ventral margin (spines forming groups and becoming shorter distally along bristle); 3rd joint about twice length of 2nd joint; 4th joint about three-fourths length of 2nd joint; remaining joints decreasing in size distally; bristles of joints long, with natatory hairs but no spines; 9th joint with 5 bristles (3 long and 1 medium with natatory hairs; 1 minute, bare); joint 2 with long spines forming rows along distal margin; joints 3–8 with shorter spines forming rows along distal margins.

Mandible (Figure 4e): Coxale endite represented by 2 minute spines. Basale: medial surface and ventral margin spinous; medial side with 6 bristles near ventral margin (1 long and 2 small proximal, 2 proximal to middle, 1 long near middle); dorsal margin with 3 bristles. 1st endopodial joint with medial spines and 2 ventral bristles. 2nd endopodial joint: medial surface and ventral margin spinous; ventral margin with 6

distal bristles; dorsal margin with 3 long proximal bristles. 3rd endopodial joint with long stout spinous claw and 5 short bristles. Exopodite elongate, hirsute.

Maxilla (Figure 4f): Limb reduced. Precoxale and coxale with fringe of long dorsal hairs; coxale with spinous dorsal bristle. 3 endites present, each with several weakly developed bare or spinous bristles, many without rings. Basale with 1 long and 2 short bristles (only 1 shown on illustrated limb). Exopodite with 2 long hirsute bristles. 1st endopodial joint with 1 slender hirsute alpha-bristle and 1 stouter more hirsute beta-bristle (the latter observed only on right limb, but shown as dashed bristle on illustrated left limb). End joint with 7 bristles, some unringed, all weakly developed.

Fifth Limb (Figure 4g): Endite I with 2 bristles, endites II and III each with 4 bristles. Exopodite: 1st joint with 1 proximal ringed bristle and 4 weak flat unringed bristles; 2nd joint with 3 flat unringed bristles and 2 or 3 faintly ringed bristles; inner lobe of 3rd joint with 3 bristles; outer lobe with 2 long stout hirsute bristles; fused 4th and 5th joints with 4 ringed bristles.

Sixth Limb (Figure 4h): Endite I with 3 bristles, endite II with 1 bristle, endites III and IV each with 3 bristles. End joint with 3 bristles on anterior projection followed by 4 stout hirsute bristles. 1 bristle in place of epipodial appendage.

Seventh Limb (Figure 4i): Each limb with 4 bristles in proximal group and 4 in distal group (2 bristles on each side in both groups); each bristle with up to 5 bells and marginal spines. Terminus with opposing combs with 2 or 3 bristles on each side.

Furca (Figure 4j): Each lamella with 4 strong claws followed by 2 weak claws.

Bellonci Organ (Figure 4k): Similar to that of adult female.

Eyes: Medial eye tapering distally, lightly pigmented (Figure 4k). Lateral eye well developed with dark brown or black pigment and about 11 ommatidia (exact number difficult to ascertain because of dark pigment).

Y-Sclerite (Figure 4l): Typical for genus.

REMARKS.—The specimens collected from El Salvador and identified as *Rutiderma rostrata* (as *R. rostrata*) by Hartmann (1959:195) were examined. Adult females are smaller than those from southern California (length 1.00 mm compared to more than 1.25 mm). The tip of the stout terminal claw of the 2nd endopodial joint of the mandible is only slightly prolonged. Therefore, we did not deem it advisable to include the specimens in *R. rostratum* despite the close resemblance of carapaces from both localities. The prominent caudal process on the carapace of the male *R. rostratum* described by Poulsen (1965:18) clearly shows that the species is not conspecific with *R. rostratum*, the male of which is described for the first time herein. We did not examine the specimen collected by Poulsen, and are unable to refer it to another species with certainty. The specimen identified as *R. rostrata* by McKenzie (1965:62) was examined and found not to have the prolongation on the stout terminal claw of the 2nd endopodial joint of the mandible characteristic of the female *R. rostratum*. We are unable to refer the specimen to another species with certainty.

We were unable to locate specimens identified as *Rutiderma rostrata* by Lie (1968:274, 288, 550) and Lie and Kisker (1970:2279) collected off the coast of Washington.

Rutiderma lomae (Juday, 1907)

FIGURES 5–10

Philomedes lomae Juday, 1907:141, figs. 1–6.

Not *Philomedes lomae*.—Kornicker (1958:233, figs. 46:7A,B; 52A–E; 53A–D; 86A,E,I) [= *Rutiderma dinochelatum* Kornicker, 1958].

NEOTYPE.—USNM 158258, adult female on slide and in alcohol (BM 35), selected herein.

TYPE-LOCALITY.—OSCD sta B3, 33°34'15"N, 118°00'45"W, 9 Sep 1976.

SYNTYPES (not extant).—Tow net catches 124, 571, 589, 612 collected between San Pedro and San Diego. Because data on latitude and longitude and collecting vessel are not given by Juday (1907), it is given here from Ritter (1912) and

Michael and McEwen (1915). Catch 124, 24 Jun 1904, 32°36'12"N, 117°21'30"W; catch 571, 27 Jul 1901, 32°41'00"N, 117°14'00"W; catch 589, no station data, but probably in vicinity of San Pedro based on data available on catches 586 and 590 obtained before and after catch 589; catch 612, 30 Jun 1903, 32°40'36"N, 117°10'30"W. Catch 124 was taken from the yacht *Loma* belonging to E. W. Scripps; catch 571 was collected from the launch *Elsie*; catch 612 was probably collected from the small schooner *Laura*.

MATERIAL STUDIED.—Neotype; USNM 158259 (BM 43), adult female collected off Santa Catalina Island by James R. Chess; USNM 158260 (BM 20–3) and USNM 158261 (BM 20–2), 2 adult males collected off Santa Catalina Island by James R. Chess; USNM 158265 (BM 19), 1 instar III female, Oxnard sta C-4-2, 37 m; USNM 158266, 1 late female instar (length 1.32 mm), *Velero IV*, sta 5092, 33°31'09"N, 117°48'03"W, 22 May 1957, sediment temperature 9.8°C.

REMARKS CONCERNING NEOTYPE SELECTION.—Because Juday's specimens are not extant, and it seems unlikely that the male of the species is identifiable from the brief description and few illustrations of Juday (1907), we have designated another specimen—USNM 158258, adult female—as the “neotype” of the species.

DESCRIPTION OF ADULT FEMALE (Figures 5–7e).—Carapace oval in lateral view with convex ventral and dorsal margin, moderately well-developed incisur and small caudal process (Figure 5).

Ornamentation (Figure 5): Each valve with 2 well-developed horizontal ribs, 1 above and 1 below central adductor muscle attachments; posterior end of each rib terminating in small process; posterior end of lower rib curving dorsally and posterior end of upper rib curving slightly ventrally forming vertical rib with space near middle; very faint radial riblets extend from anterior part of upper rib to anterodorsal valve margin, and from lower rib to ventral margin; short undulate ridge present just below posterior end of lower rib in front of caudal process; faint vertical rib present just posterior to incisur; low

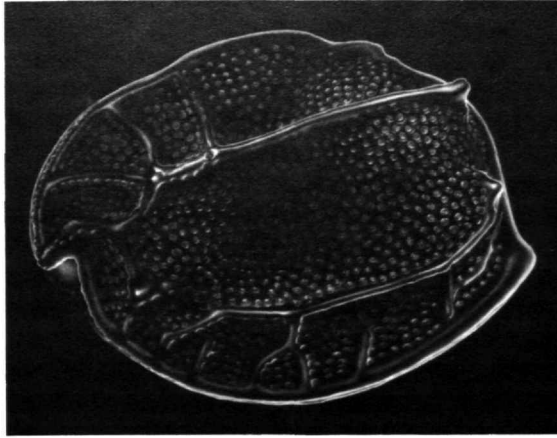


FIGURE 5.—*Rutiderma lomae*, adult female (neotype), USNM 158258, complete specimen, length 1.46 mm.

process present near middle of truncate postero-dorsal margin of each valve; no processes on dorsal margin of either valve. Surface of valves with abundant small fossae. Numerous long bristles present along anterodorsal, anterior, and ventral valve margins and sparsely distributed on valve surface.

Infold (Figure 6a,b): Rostral infold with 10–12 long bristles forming irregular row paralleling valve edge; 2 small bristles present at inner end of incisur; anteroventral infold with 11 bristles; middle part of ventral infold without bristles; posterior one-third of ventral margin anterior to ventral end of ridge on infold of caudal process with 11 short bristles; 8 or 9 bristles forming row just anterior to ridge on infold of caudal process; 3 small bristles present on infold just dorsal to caudal process; 1 bristle present on infold between edge of caudal process and dorsal end of ridge; infold of caudal processes of both left and right valves similar.

Selvage: Wide lamellar prolongation with fringe present on selvage of anterodorsal, anterior, and ventral margins of valves, becoming narrower and bare in vicinity of caudal process and along posterior margin. Selvage divided at inner end of incisur, and also by small bristle at outer edge of caudal process (see detail on Figure 6b).

Central Adductor Muscle Attachments: Consisting of 14 or more individual ovoid attachments.

Size: USNM 158258, length 1.46 mm, height 1.06 mm; USNM 158259, length 1.42 mm, height 1.13 mm.

First Antenna (Figure 6c): 1st joint bare. 2nd joint with 2 spinous bristles (1 dorsal, 1 lateral), a few dorsal hairs, and lateral hairs forming row near distal margin. 3rd and 4th joints fused; short 3rd joint with 3 spinous bristles (2 dorsal, 1 ventral); long 4th joint with 3 spinous bristles (2 ventral, 1 dorsal). Sensory bristle of long 5th joint with 3 small proximal filaments and minute process at tip. 6th joint minute, fused with 5th, with short spinous medial bristle. 7th joint: a-bristle spinous, slightly stouter than bristle of 6th joint; b-bristle about one and three-quarters length of a-bristle, bare except for spine at tip; c-bristle about same length as sensory bristle of 5th joint, with none or one minute proximal filament and spine at tip. 8th joint: d- and e-bristles bare with blunt tips reaching tip of c-bristle; f-bristle stout, slightly shorter than c-bristle, with spine at tip; g-bristle about same length as c-bristle, with 1 short proximal filament with 2 long hairs at tip; tip of g-bristle with minute spine.

Second Antenna: Protopodite bare. Endopodite single jointed, with 4 short anterior bristles and 1 minute bristle near middle of margin (Figures 6d,e, 7d). Exopodite: long 1st joint with short bent medial bristle on distal margin; bristle of 2nd joint reaching to about 7th joint, bare except for short, blunt, ventral spines near tip; bristles of joints 3–5 with stout ventral spines near middle followed by row of smaller blunt spines, no natatory hairs; bristles of joints 6–8 much longer than others, with natatory hairs, no spines; 9th joint with 6 bristles (3 long and 1 medium with natatory hairs; 2 minute, bare).

Mandible (Figure 6f,g): Coxale endite spinous with bifurcate tip (Figure 6g). Basale: medial side with 4 proximal bristles in ventral corner (2 short pectinate, 2 slender ringed); ventral margin with 1 long midbristle; dorsal margin with 3 bristles just distal to middle. 1st endopodial joint with medial spines and 2 short ventral bristles. 2nd



FIGURE 6.—*Rutiderma lomae*, adult female (neotype), USNM 158258, length 1.46 mm: *a*, anterior of right valve, inside view; *b*, posteroventral corner of right valve showing bristles on infold of caudal process, and detail showing division of lamellar prolongation of selvage at small bristle, inside views; *c*, right 1st antenna, medial view; *d*, endopodite of left 2nd antenna, medial view; *e*, endopodite of right 2nd antenna, medial view (drawn at higher magnification than *d*); *f*, left mandible (coxale not shown), medial view; *g*, coxale endite of right mandible; *h*, left maxilla, lateral view; *i*, tip of 7th limb; *j*, right lateral eye, medial eye, and bellonci organ, ventral view.



FIGURE 7.—*Rutiderma loma*, adult female (neotype), USNM 158258, length 1.46 mm: *a*, tip of left 5th limb, posterior view; *b*, 6th limb; *c*, right lamella of furca, medial view. Adult female, USNM 158259, length 1.42 mm: *d*, endopodite of left 2nd antenna, medial view; *e*, anterior of body showing medial eye, bellonci organ, and upper lip. Juvenile female (instar III), USNM 158265, length 0.96 mm: *f*, complete specimen shown diagrammatically; *g*, endopodite and distal end of protopodite of left 2nd antenna, medial view; *h*, bristles of exopodial joints 8 and 9 of left 2nd antenna, medial view; *i*, left 7th limb.

endopodial joint with medial spines, 3 short proximal bristles on dorsal margin, 2 short terminal bristles on ventral margin, and stout terminal claw; small sclerotized process with minute bristle present medial to base of claw; ventral margin of terminal claw with proximal peg and serrate edge (tip of claw not prolonged). 3rd endopodial joint with stout terminal claw with teeth along inner edge (teeth not shown on illustrated limb), stout unringed bristle with teeth along ventral edge, 3 short ringed medial bristles near ventral base of claw, and 2 short hirsute lateral bristles (these being located lateral to terminal claw of 2nd joint).

Maxilla (Figure 6*h*): Endite I with 5 bristles (3 pectinate, 2 ringed, spinous); endite II with 2 pectinate bristles and 2 spinous bristles; endite III with 3 pectinate bristles, 2 or 3 distal ringed bristles, and 1 proximal ringed bristle. Precoxale and coxale with fringed dorsal margin; coxale with spinous dorsal bristle. Basale with 1 spinous dorsal bristle and 1 medial bristle (the latter could be on 1st endopodial joint). Exopodite with 2 bristles (1 about twice length of other). Endopodite: 1st joint with 1 alpha-bristle with faint marginal spines and 1 dorsal bristle with slightly stouter spines; 2nd joint with 2 stout pectinate clawlike bristles, 1 more slender pectinate bristle

on inner edge, 1 pectinate ringed bristle on outer edge, and 2 spinous a-bristles.

Fifth Limb (Figure 7a): Epipodial appendage with 42 or 43 bristles. Endite I with 2 bristles; endites II and III obscure on specimen studied but each with about 6 bristles (not all shown on illustrated limb). Exopodite: 1st joint with main tooth consisting of smooth proximal peg followed by 3 stout teeth with secondary teeth; a bristle probably present just proximal to peg of main tooth but obscure on specimen studied; outer edge of joint with 1 proximal bristle. 2nd joint with large 3-lobed tooth (middle lobe with 1 small secondary tooth); posterior side with 1 small bristle near outer corner and 2 longer bristles near inner edge proximal to proximal lobe of tooth. 3rd joint with 2 bristles on outer lobe and 3 on inner lobe. 4th and 5th joints fused, with total of 5 bristles.

Sixth Limb (Figure 7b): Endite I with 2 bristles; endite II with 1 bristle; endites III and IV each with 2 long bristles; end joint with 3 anterior bristles on protuberance and 4 hirsute posterior bristles (anterior pair of these with short distal spines); 2 short spinous bristles present in place of epipodial appendage.

Seventh Limb: Each limb with 4 proximal bristles, 2 on each side, and 6 terminal bristles (not all shown on illustrated limb), 3 on each side; each bristle with up to 6 bells and distal marginal spines; terminus with opposing combs containing 3-pronged teeth (Figure 6i), one comb with 5 teeth, other with 3 (not all shown on illustrated limb).

Furca (Figure 7c): Each lamella with 4 stout primary claws followed by 2 small secondary claws; claw 1 with anterior distal hairs, both long and short posterior teeth and proximal medial hairs forming row; claws 2 and 3 with anterior distal hairs and posterior teeth much smaller than those of claw 1 (teeth of claws 1 and 2 not shown on illustrated lamella); long hairs on lamellae following claws and medially at bases of claws.

Bellonci Organ (Figures 6j, 7e): Elongate, bulbous near middle, with rounded tip.

Eyes: Medial eye tapering distally, with

brown pigment (Figures 6j, 7e). Lateral eye not observed with certainty; if present, small with 3 ommatidia (Figure 6j).

Posterior of Body: Hirsute.

Upper Lip (Figure 7e): Consisting of rounded lobe.

Eggs: USNM 158258 with 4 eggs in marsupium and also several large unextruded eggs.

DESCRIPTION OF JUVENILE FEMALE (INSTAR III) (Figure 7f-i).—Carapace in general similar to that of adult female (Figure 7f); bristles of infold not studied.

Size: USNM 158265, length 0.96 mm, height 0.72 mm.

First Antenna: Not studied in detail, but general morphology similar to that of adult female.

Second Antenna: Endopodite similar to that of adult female but with only 2 anterior bristles and without minute midbristle (Figure 7g). Exopodite: no bristles with natatory hairs, all fairly short; 9th joint with only 4 bristles (Figure 7h).

Mandible, Maxilla, 5th Limb: Not studied in detail, but general morphology similar to that of adult female.

Sixth Limb: Not studied in detail but with numerous bristles.

Seventh Limb (Figure 7i): Elongate, bare. (In the illustrated limb, the bristles of the 7th limb of instar IV are shown as dashed lines within the limb of instar III.)

Furca: Similar to that of adult female, with 4 stout claws followed by 2 weak claws.

Bellonci Organ: Elongate with short widening central part separated by sutures from the proximal and distal parts; distal part tapering slightly and then widening to broadly rounded tip.

Eyes: Lateral eyes not observed. Medial eye similar to that of adult female, with brown pigment.

Posterior of Body: Hirsute.

SUPPLEMENTARY DESCRIPTION OF ADULT MALE (Figures 8-10).—Carapace elongate with projecting rostrum and deep incisur forming almost right angle; well-developed caudal process with rounded tip (Figures 8, 10b).

Ornamentation: Each valve with horizontal ribs

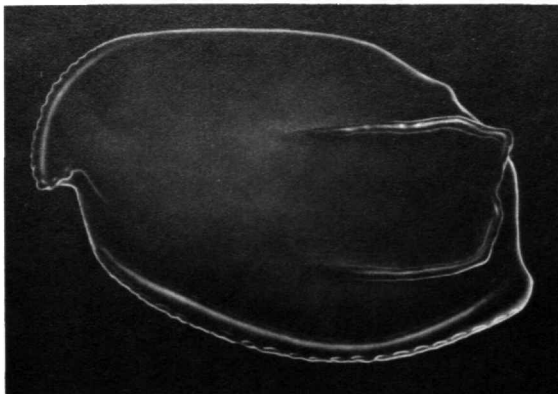


FIGURE 8.—*Rutiderna lomaе*, adult male, USNM 158260, complete specimen, length 1.21 mm.

restricted to posterior half (Figure 8); upper rib more strongly developed than lower rib; posterior ends of each rib connected by sinuous vertical rib; vertical rib tending to be less well developed in middle part; small rib present near inner corner of incisur; faint low rib paralleling ventral margin. Anterior margin of rostrum with small scalloped edge (Figures 8, 9a). Long bristles present along anterior margin; shorter bristles along ventral margin. Shell weakly calcified; small fossae apparent only near ventral margin on specimen examined. Small process present near middle of linear posterodorsal margin; no processes on posterior margin.

Infold: Rostral infold with 8 long bristles forming row; 2 short bristles present near inner corner of incisur (Figure 9b); anteroventral infold with 8 bristles; middle part of ventral infold without bristles; 17 bristles forming row extending along posterior one-third of ventral infold, caudal infold, and posterior infold immediately dorsal to caudal process (one of the bristles on infold of caudal process located slightly posterior to other bristles of caudal infold, Figure 9c); caudal infold without ridge.

Selvage: Wide lamellar prolongation with fringe present on selvage of anterodorsal, anterior, and ventral margins of valves, becoming narrower and bare in vicinity of caudal process and

along posterior margin. Selvage divided at inner end of incisur, and also by small bristle at outer edge of caudal process.

Size: USNM 158260, length 1.21 mm, height 0.76 mm; USNM 158261, length 1.24 mm, height 0.77 mm.

First Antenna (Figure 9d): 1st joint bare. 2nd joint spinous and with 2 bristles (1 dorsal, 1 lateral). 3rd joint small, with 3 bristles (2 dorsal, 1 ventral); medial side of joint much shorter than lateral side. 4th joint with few medial and lateral spines and 4 bristles (1 dorsal, 3 ventral). Sensory bristle of minute 5th joint with numerous proximal filaments and stem with minute spine at tip. Medial bristle of long 6th joint located near dorsal margin. 7th joint: a-bristle about same length as bristle of 6th joint, spinous; b-bristle stout, about 3 times length of a-bristle, with 2 marginal filaments near middle and minute spine at tip; c-bristle extremely long, with 11 short marginal filaments and bifurcate tip. 8th joint: d- and e-bristles bare with blunt tips reaching past tip of b-bristle; f-bristle similar to c-bristle; g-bristle longer than b-bristle, with 1 proximal filament having drawn out tip. (Left limb of USNM 158260 aberrant in having 2nd joint without lateral bristle, 3rd joint with 1 instead of 2 dorsal bristles, and 4th joint with 2 instead of 3 ventral bristles; right limb of USNM 158260 (Figure 9d) and both limbs of USNM 158261 with normal number of bristles.)

Second Antennae (Figure 9e): Protopodite bare. Endopodite 3-jointed: 1st joint with 5 short bristles (4 proximal, 1 distal); 2nd joint elongate with 2 spinous ventral bristles just distal to middle; 3rd joint elongate, reflexed, with 1 short proximal bristle, 2 small slender bristles near ridged tip. Exopodite: long 1st joint with spines forming rows along ventral margin, and small medial bristle on terminal margin; bristle of short 2nd joint reaching 6th joint, with pearl-like blunt spines forming about 7 groups along ventral margin; 3rd joint about same length as 1st joint; bristles of joints 3–8 long, with natatory hairs, no spines; 9th joint with 5 bristles (1 minute, bare, 1 medium length, and 3 long, all with natatory



FIGURE 9.—*Rutiderma loma*, adult male, USNM 158260, length 1.21 mm: *a*, rostrum and incisur of left valve, outside view; *b*, anterior of right valve, inside view; *c*, posteroventral corner of right valve showing bristles on infold of caudal process, inside view; *d*, right 1st antenna, medial view; *e*, endopodite and distal part of protopodite of left 2nd antenna, medial view; *f*, left mandible, medial view; *g*, right maxilla, lateral view; *h*, 5th limb; *i*, *j*, 6th limbs; *k*, 7th limb; *l*, tip of 7th limb; *m*, left lamella of furca, lateral view.

hairs); joints 2–8 with lateral spines forming row along distal margin (those on 2nd joint longer than others).

Mandible (Figure 9f): Coxale endite consisting of 2 minute spines. Basale: medial side spinous with 6 bristles near ventral margin; dorsal margin with 3 bristles (1 near middle, 2 distal). Exopodite well developed, hirsute distally. 1st endopodial joint with medial spines and 2 spinous ventral bristles. 2nd endopodial joint: medial side spinous; dorsal margin with 3 proximal bristles; ventral margin (or close to it) with 6 short distal bristles. End joint with 1 stout claw with ventral spines, and 5 slender bristles.

Maxilla (Figure 9g): Limb reduced. Endite I with 5 weakly developed bristles, mostly bare and unringed, and 1 bristle with long hairs; endite II with 5 weakly developed bristles with long marginal hairs; endite III with 1 proximal bristle and about 6 distal bristles. Coxale with dorsal fringe and 1 plumose dorsal bristle. Basale with 3 distal bristles, 2 ventral and 1 medial near dorsal margin. Exopodite with 2 hirsute bristles (1 about one-half length of other). Endopodite: 1st joint hirsute, with 1 short bare alpha-bristle and 1 longer hirsute beta-bristle; end joint with 7 weakly developed bristles (2 are stouter than others and only weakly ringed).

Fifth Limb (Figure 9h): Endite I with 3 small bristles; endite II with 4 small bristles; endite III with about 8 bristles. Exopodite: 1st joint with 2 long, unringed, bare, finger-like bristles, 1 short, unringed, bare bristle, and 2 ringed proximal bristles; 2nd joint with 2 short, unringed, bare bristles and 3 ringed bristles; inner lobe of 3rd joint with 3 relatively short bare bristles of equal length; outer lobe with 2 long, stout, hirsute bristles; 4th and 5th joints fused, with total of 4 bare ringed bristles. Epipodial appendage with 40 hirsute bristles.

Sixth Limb (Figure 9i,j): Endite I with 3 short bristles; endite II with 1 long and 1 short bristle; endite III with 1 long bristle; endite IV with 2 long bristles. End joint with 3 short spinous bristles on prominent projection, followed by 2 stout bristles with long proximal hairs and 2 stout

bristles with long hairs from bases to tip of bristles. 2 bare bristles in place of epipodial appendage.

Seventh Limb (Figure 9k,l): 4 proximal bristles, 2 on each side, and 4 longer terminal bristles, 2 on each side; proximal bristles with 3 or 4 bells and distal marginal spines; terminal bristles with 5 or 6 bells and distal marginal spines. Terminus with opposing combs having about 3 spinous teeth (not all shown in Figure 9l).

Furca (Figure 9m): Similar to that of female, except teeth of claw 1 about same size.

Bellonci Organ (Figure 10c): Broadening near middle and then tapering to fairly broad non-attenuated pointed tip (tip not rounded).

Eyes (Figure 10c): Lateral eye pigmented black (number of ommatidia difficult to determine, but about 25, possibly more). Medial eye pigmented brown, about same size as lateral eye, without hairs.

Posterior of Body: Without hairs or spines.

Upper Lip (Figure 10c): Consisting of rounded lobe without hairs.

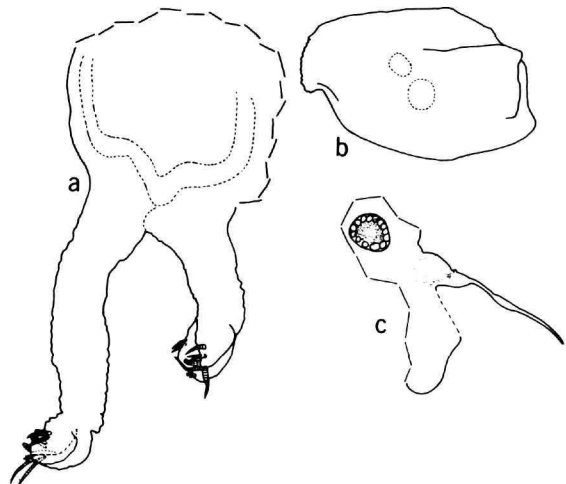


FIGURE 10.—*Rutiderma lomae*, adult male, USNM 158260, length 1.21 mm: a, copulatory organ. Adult male, USNM 158261, length 1.24 mm: b, complete specimen shown diagrammatically showing position of lateral eye and central adductor muscle attachments; c, anterior of body showing right lateral eye, medial eye, bellonci organ, and upper lip.

Genitalia (Figure 10a): Each copulatory appendage elongate with 3 terminal lobes, each with 2 or more small bristles; one of the lobes with sclerotized process.

SEXUAL DIMORPHISM.—In addition to the usual sexual morphological differences in all species of *Rutiderma*, the tip of the bellonci organ of the male *R. loma* tapers to a broad point, and is not widely rounded as on the female.

COMPARISON OF MALE DESCRIBED HEREIN AND THAT DESCRIBED BY JUDAY.—Juday (1907:141, pl. xix: figs. 1, 2, 4–6) did not recognize that the specimens he referred to his new species *Philomedes loma* were actually male rutidermatids. The relationship was clarified by Poulsen (1965:16). It is probable that Juday (1907) included more than 1 species (at least 2) in *P. loma*. He illustrated (pl. xix: fig. 3) the outline of the carapace of a juvenile much smaller than the carapace of the specimen he correctly identified as an adult male (pl. xix: fig. 1). Because juvenile Rutidermatidae resemble the adult female rather than the adult male, the small specimen considered to be a juvenile by Juday is probably an adult male rutidermid and, possibly, not conspecific with the larger adult male. Presumably, the appendages Juday illustrated (pl. xix: figs. 2, 4–6) and the species description (p. 141) are from the larger specimen. Apparent differences between Juday's male and ours are as follows:

<i>Morphological character</i>	<i>Juday's male</i>	<i>Our male</i>
Calcification of carapace	strong	weak
Length of carapace (mm)	1.3	1.21, 1.24
Vertical rib connecting posterior ends of upper and lower horizontal ribs on each valve	not mentioned	present
Fossae or pits on valve surface	abundant	sparse
Number of bristles on 9th joint of exopodite of 2nd antenna	2	5
Number of bristles near ventral margin of mandibular basale	4	6
Number of bristles (excluding claw) on end joint of mandible	3	5

Some of the apparent differences tabulated above could be the result of variation within the

species, especially the degree of calcification of the carapace, the length of the carapace, and the abundance of surface fossae, which may be more visible on strongly calcified carapaces. Other differences could be the result of inaccurate observations by Juday. It is easy to overlook some of the small bristles on the basale and end joint of the mandible.

A major difference between the two specimens is the number of bristles on the 9th joint of the exopodite of the 2nd antenna (2 for Juday's specimen, 5 for ours). Except for Juday's specimen, males of the Rutidermatidae, for which the number of bristles on the 9th joint are known, have 5 or 6 bristles (3 long, 1 medium, 1 or 2 minute). Only the 1 or 2 minute bristles could be easily overlooked. Therefore, we have assumed that Juday (1907:142) either described an aberrant limb or was mistaken in the number of bristles on the 9th joint.

We did not examine specimens identified as *Philomedes loma* by Hartmann (1956:230; 1957:76) from the Pacific coast of El Salvador or from the coast of Chile (1962:171).

Rutiderma rotundum Poulsen, 1965, emendation

FIGURES 11–14

Rutiderma rotunda Poulsen, 1965:35, figs. 9, 10.

Rutiderma californica McKenzie, 1965:66, fig. 4, pl. 1: fig. 1.

HOLOTYPE.—Female, length 1.2 mm, Zoological Museum, Copenhagen.

TYPE-LOCALITY.—La Jolla, California, shallow water between rocks and algae (Poulsen, 1965:35, 37).

MATERIAL EXAMINED.—USNM 110911, holotype of *Rutiderma californica* (shells dry, appendages on 2 slides). Irvine Beach, California, 33°32'20"N, 116°49'00"W, 31 May 1976: USNM 158214 (BM 12), ovigerous female; USNM 158215, adult male; BM 36–39, 41, 5 adult females; BM 40, juvenile male. San Diego, Ocean Beach, 11 Nov 1970, collected by Michael Sweetney: USNM 158356, 4 specimens including 1

ovigerous female, sta 5 C/S, from washings of eel grass growing on sides of pools and channels from south side of pier 70 m from shore, 2.5 cm deep in about 0.5 m of water; USNM 158357, 6 specimens, sta 3 C/S, from vegetation on sides of tide pools with sand-shell bottoms near side of pier about 70 m from shore, about 0.3 m deep in 0.3–0.6 m of water. USNM 158353, 7 specimens including ovigerous females + 1 left valve, exact locality unknown, but from off southern California between Newport Beach and Laguna Beach, collected by personnel of Marine Biological Consultants, Inc.

SUPPLEMENTARY DESCRIPTION OF ADULT FEMALE (Figures 11,12).—Shape and ornamentation as shown in Figure 11, which is right view of whole carapace. (The photograph illustrated by McKenzie (1965:pl. 1: fig. 1) shows the left view of a carapace. The drawing of Poulsen (1965: fig. 9a) shows only the major ridges.)

Infold (Figure 12a,b): Anterodorsal margin dorsal to minute incisur with 7 bristles; anterior margin ventral to incisur with 6–10 bristles (Figure 12a does not show all bristles); caudal process of both left and right valves with anterior ridge bearing 4 or 5 small bristles, and with 1 small bristle posterior to dorsal end of ridge; about 9 small bristles forming row along ventral margin

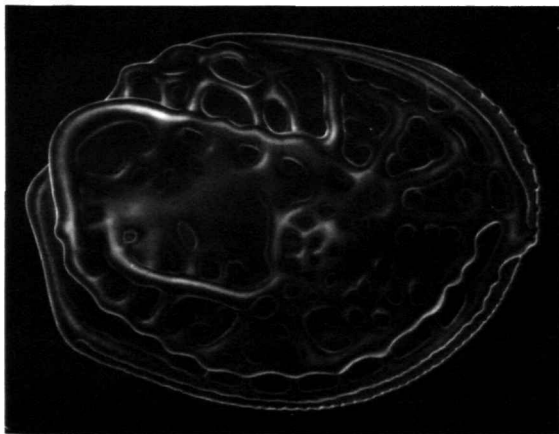


FIGURE 11.—*Rutiderma rotundum*, adult female, USNM 158214, complete specimen, length 1.33 mm.

of valve just anterior to caudal process; 3 small bristles present on posterior infold just dorsal to caudal process (Figure 12b).

Selvae: Wide lamellar prolongation along free margins of each valve; edge of lamellar prolongation with long fringe along anterior margin and anterior part of ventral margin; fringe becoming shorter posteriorly along ventral margin; fringe absent on prolongation around edge of caudal process; prolongation divided at bristle located at edge of caudal process (see detail of Figure 12b).

Central Adductor Muscle Attachments (Figure 12c): Consisting of 15 or 16 individual scars.

Size: USNM 158214, length 1.33 mm, height 1.04 mm. 5 additional specimens (BM 36,37, 38,39,41): length 1.31 mm, height 1.02 mm; length 1.34 mm, height 1.03 mm; length 1.33 mm, height 1.02 mm; length 1.22 mm, height 0.96 mm; length 1.23 mm, height 0.97 mm. USNM 158356, length 1.17 mm, height 0.93 mm. Poulsen (1965:37) gave the length of mature females as 1.10–1.33 mm (mean length 1.24 mm, mean height 0.98 mm). McKenzie (1965:66) gave the measurements of a female as length 1.25 mm, height 0.95 mm.

First Antenna (Figure 12d): 1st joint with few spines on medial and lateral surfaces; 2nd joint with few lateral and medial spines near and along dorsal margin, short lateral spines forming row near distal margin, and 2 short spinous bristles (1 dorsal, 1 lateral). 3rd and 4th joints fused; short 3rd joint with 3 spinous bristles (2 dorsal, 1 ventral); long 4th joint with 3 spinous bristles (1 dorsal, 2 ventral). Sensory bristle of long 5th joint with 3 small proximal filaments. 5th and 6th joints fused; minute 6th joint with 1 short spinous medial bristle. 7th joint: a-bristle short, spinous, slightly longer than bristle of 6th joint; b-bristle only slightly longer than a-bristle, bare; c-bristle slightly shorter than sensory bristle of 5th joint, with 1 short proximal filament. 8th joint: d- and e-bristles bare with blunt tips not quite reaching tip of c-bristle; f-bristle tending to be clawlike, bare, stout, about twice length of b-bristle; g-bristle also tending to be clawlike, longer than f-



FIGURE 12.—*Rutiderma rotundum*, adult female, USNM 158214, length 1.33 mm: *a*, anterior of right valve, inside view; *b*, posteroventral corner of right valve showing bristles on infold of caudal process, and detail showing division of lamellar prolongation of selvage at small bristle, inside views; *c*, tips of central adductor muscles as seen on body with right valve removed; *d*, left 1st antenna, lateral view; *e*, endopodite and distal part of protopodite of left 2nd antenna, medial view; *f*, right mandible, medial view; *g*, right maxilla, lateral view; *h*, left 5th limb, anterior view; *i*, detail of 1st exopodial joint shown in *h*; *j*, tip of right 5th limb, posterior view; *k*, detail of 2nd exopodial joint shown in *j*; *l*, 6th limb; *m*, 7th limb; *n*, right lamella of furca, medial view (left lamella with only 3 secondary claws); *o*, anterior of body showing right lateral eye, medial eye, and bellonci organ; *p*, upper lip, anterior to right; *q*, protists attached to posterodorsal corner of left valve, inside view.

bristle, with 2 short proximal filaments. [The 1st antenna of USNM 158214 differs from that described and illustrated by Poulsen (1965:35, fig. 9d) in having spines on the 1st and 2nd joints, in not having hairs on the dorsal margin of the 5th joint; in having 3 proximal filaments on the sensory bristle of the 5th joint, in having 1 short proximal filament on the c-bristle of the 7th joint, and 2 proximal filaments on the g-bristle of the 8th joint; also, all bristles of joints 2-6 bear marginal spines.]

Second Antenna: Protodipite bare. Endopodite 1-jointed with 4 small anterior bristles (Figure 12e). Exopodite: 1st joint long, with 1 minute curved medial bristle on distal margin; bristles of joints 2-5 with minute pearl-like row of teeth along ventral margins, and 4-7 larger blunt ventral teeth just proximal to recurved tip of bristles; bristles of joints 6-8 with natatory hairs and without ventral teeth or recurved tip; 9th joint with 4 bristles with natatory hairs and 2 minute bare bristles. [The 2nd antenna of USNM 158214 differs from that described and illustrated by Poulsen (1965:37, fig. 9e) in having 4 bristles on the endopodite, in having minute row of pearl-like teeth along ventral margins of bristles on 2nd to 5th exopodial joints, and in having 2 minute as well as 4 long bristles on the 9th exopodial joint. McKenzie (1965, fig. 4e) illustrated an endopodite with 3 bristles, and described (p. 66) the margins of the distal annulated setae of the exopodite as having bluntly serrated extremities. My (LSK) examination of his specimen, USNM 110911, revealed 2 minute bristles on the 9th exopodial joint and minute rows of pearl-like teeth along ventral margins of some bristles; I could not with certainty determine whether the endopodite has 3 or 4 bristles.]

Mandible (Figure 12f): Coxale endite bifurcate, pectinate with hairs near base. Basale: proximal ventral margin with 2 short pectinate bristles and 2 slender bristles (bases actually on medial surface); medial side near middle of ventral margin with 2 slender bristles with faint marginal spines; dorsal margin with 3 bristles; lateral side near middle of ventral margin with 1 short bristle.

1st endopodial joint: short ventral margin with 2 small bristles; medial surface with abundant spines forming rows. 2nd endopodial joint: dorsal margin with 4 small proximal bristles; ventral margin with 1 small subterminal bristle; dorsal margin of terminal claw with small proximal process and minute serrations; tip of claw recurved but not extended; small process with spine present medially at base of claw. 3rd endopodial joint: stout claw with minute teeth along ventral margin and small process at distal curvature of dorsal margin; stout unringed bristle with teeth along ventral margin present just ventral to terminal claw; 3 medial and 2 hirsute lateral bristles present ventral to base of claw. [The mandible of USNM 158214 differs from that illustrated by Poulsen (1965:fig. 9f) in having a small lateral bristle near ventral margin of the basale, in having medial spines on the 1st endopodial joint, and in having 4 proximal bristles on the dorsal margin of the 2nd endopodial joint. I examined the specimen described by McKenzie (1965:66, fig. 4f; USNM 110911) and observed the specimen to have 4 proximal bristles on the dorsal margin of the 2nd endopodial joint, and claws on the 2nd and 3rd endopodial joint similar to those of USNM 158214.]

Maxilla (Figure 12g): 3 endites, each with 2 or 3 stout pectinate bristles and 2 or 3 slender spinous bristles; endite III with 1 proximal bristle on lateral side. Coxale with 1 spinous dorsal bristle. Basale with 1 dorsal and 1 ventral bristle. Exopodite with 3 bristles (2 long, 1 short). 1st endopodial joint with 1 spinous alpha-bristle and 1 spinous beta-bristle. 2nd endopodial joint with 2 spinous alpha-bristles, 2 stout, pectinate, end bristles, and 3 additional spinous bristles. [The maxilla of USNM 158214 differs from that described and illustrated by Poulsen (1965:37, fig. 9g) in having 3 bristles on the exopodite, in having 1 dorsal bristle on the basale, and in not having a proximal bristle on the dorsal margin of the 1st endopodial joint. I could not determine the number of exopodial bristles on the maxilla of the specimen described by McKenzie (1965:

66; USNM 110911), but the appendage is similar to that of USNM 158214.]

Fifth Limb (Figure 12*h-k*): Endite I with 3 bristles (2 missing on illustrated limb); endite II with 4 or 5 bristles; endite III with 6 bristles (Figure 12*h*). Main tooth of 1st exopodial joint consisting of 3 teeth with secondary teeth followed by a smooth peg and then a short bristle; outer margin proximal to distal tooth with 1 short bristle (Figure 12*i*). 2nd exopodial joint forming large tooth with 3 smooth lobes; posterior side of 2nd joint with 1 minute bristle near distal outer corner, and 2 bristles near proximal tooth of inner margin (Figure 12*k*). Inner lobe of 3rd joint with 4 bristles, outer lobe with 2 bristles. Fused 4th and 5th exopodial joints with total of 4 bristles (Figure 12*h*). [It is unusual to have 4 bristles on the inner lobe of the 3rd joint; it is possible that 1 or 2 of the bristles are actually on the inner margin of the 2nd joint; in general, the limb of USNM 158214 resembles fairly closely that described and illustrated by Poulsen (1965:37, fig. 9*h*). I examined the specimen described by McKenzie (1965:66; USNM 110911) and found the teeth of the 1st and 2nd exopodial joints similar to those of USNM 158214.]

Sixth Limb (Figure 12*l*): Endite I with 3 short bristles; endite II with 2 bristles; endite III with 3 bristles; endite IV with 2 or 3 bristles. End joint with 3 anterior bristles with short marginal spines followed by 1 bristle with long proximal hairs and short distal spines, and 2 posterior bristles with abundant long marginal hairs. 2 short bristles present in place of epipodial appendage. [The 6th limbs of USNM 158214 closely resemble that described and illustrated by Poulsen (1965:37, fig. 9*i*) except for not having 2 short bristles on endite II.]

Seventh Limb (Figure 12*m*): Each limb with 6 distal bristles (3 on each side) and 6 proximal bristles (3 on each side); each bristle with up to 5 bells and marginal spines proximal to bells. Terminus consisting of opposing combs, each with about 8 teeth.

Furca (Figure 12*n*): Furca of USNM 158214 with 3 strong and 3 weak claws on left lamella

and 3 strong claws and 4 weak claws on right lamella (Figure 12*n*). Of 5 additional adult females examined (BM 36-39,41), four had 3 strong and 3 weak claws on each lamella, and one had 3 strong claws and 2 weak claws on each lamella. The usual number of claws would appear to be 3 strong claws followed by 3 weak claws. [Poulsen (1965:37, fig. 9*k*) described the furca of *R. rotunda* as having 3 strong claws followed by 2 weak claws. McKenzie (1965:66) stated that the furca was missing on the single specimen in his collection.]

Bellonci Organ (Figure 12*o*): Elongate with suture proximal to middle followed by broad middle part, then tapering to pointed tip.

Eyes (Figure 12*o*): Medial eye with brown pigment and pointed dorsal process; lateral eyes small, pigmented brown, each with 3 ommatidia. [The lateral eye illustrated by Poulsen (1965: fig. 9*a*) has many ommatidia.]

Posterior of Body (Figure 12*n*): Hirsute posterior to furca.

Upper Lip (Figure 12*p*): Simple lobe with few small spines forming rows.

Y-Sclerite: Typical for family.

Eggs: USNM 158214 with 4 eggs in marsupium. [Poulsen (1965:37) reported 2-4 eggs in brood chamber of specimens he examined.]

Epizoa: USNM 158214 with protistans attached to dorsal and posterior sides of left valve. Attachments appear coiled (Figure 12*q*).

DESCRIPTION OF ADULT MALE (Figures 13, 14).—Shell elongate with prominent rostrum and shallow incisur (Figure 13). Posteroventral corner evenly rounded with very narrow caudal process.

Ornamentation: A smoothly rounded alar projection present on posterior part of each valve (Figure 13). A low narrow continuous ridge present just within and parallel to anterodorsal, anterior and ventral margins. Valve surface with minute fossae but appearing smooth. Numerous bristles forming row along anterior and ventral margins.

Infold (Figure 14*a,b*): Rostral infold with 6 or 7 long bristles forming row; 1 small bristle present near outer edge in vicinity of incisur; anteroven-

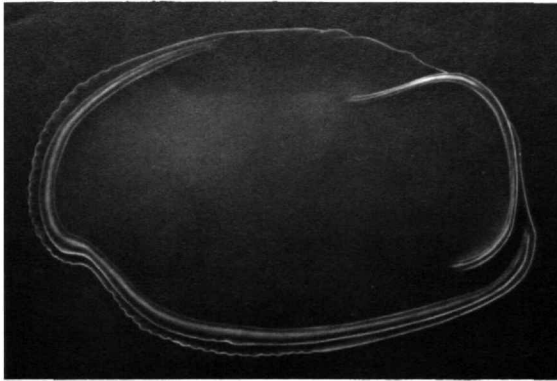


FIGURE 13.—*Rutiderma rotundum*, adult male, USNM 158215, complete specimen, length 1.24 mm.

tral infold including anterior part of ventral margin with 5 short bristles; infold of narrow caudal process of both left and right valves with 4 minute bristles along inner ridge and 1 smaller bristle posterior to dorsal end of ridge; 7 slender bristles forming row along inner edge of infold of ventral margin just anterior to caudal process.

Selva: Wide lamellar prolongation with long marginal fringe present along anterior and ventral margins; prolongation in vicinity of caudal process and along posterior valve margin narrow and without fringe; prolongation divided at inner end of incisur, and also at small bristle located at edge of caudal process (see detail of Figure 14b).

Central Adductor Muscle Attachments (Figure 14c): Consisting of about 17 oval attachments.

Size: USNM 158215, length 1.24 mm, height 0.77 mm.

First Antenna (Figure 14d): 1st joint bare. 2nd joint with 2 short spinous bristles (1 dorsal, 1 lateral), long ventral hairs, distal lateral spines, and proximal medial spines. 3rd joint with 2 dorsal bristles (usual ventral bristle missing on both limbs of USMN 158215, possibly broken off), and long lateral spines forming rows. 4th joint with dorsal and lateral spines and 4 bristles (1 dorsal, 3 ventral). Sensory bristle of minute 5th joint with numerous long proximal filaments followed closely by 1 minute filament; spine at tip

of stem. Long 6th joint with short medial bristle with base close to dorsal margin. 7th joint: a-bristle short, about same length as bristle of 6th joint, with few marginal spines; b-bristle stout, about twice length of a-bristle, with 2 marginal filaments and spine at tip; c-bristle very long with about 12 marginal filaments, each with 2 spines at tip. 8th joint: d- and e-bristles bare with blunt tips, about one-third longer than b-bristle; f-bristle similar to c-bristle; g-bristle with 2 short filaments and spine at tip, about same length as d-bristle.

Second Antenna (Figure 14e,f): Protopodite bare. Endopodite 3-jointed: 1st joint short with 5 small bristles (4 proximal, 1 distal); 2nd joint elongate with 2 ventral bristles; 3rd joint reflexed on 2nd, with 1 short proximal bristle and 2 short slender subterminal bristles; tip of 3rd joint with ridges (Figure 14e,f). Exopodite (Figure 14e): 1st joint long with ventral spines and minute terminal midbristle with blunt tip; 2nd joint small, with bare bristle reaching just past distal end of long 3rd joint; bristles of joints 3–8 with natatory hairs, no spines; 9th joint with 4 long bristles with natatory hairs and 1 minute bare bristle; distal margins of joints 3–8 with lateral spines forming row; distal margin of short 2nd joint with about 4 long stout lateral spines and many shorter lateral spines.

Mandible (Figure 14g): Coxale endite consisting of small tooth with 2 minute bristles near base. Basale: medial side near ventral margin with 3 proximal bristles (1 long, 2 short) followed by 2 medium-length bristles and then 1 or 2 longer bristles; spines forming rows present on medial surface; dorsal margin with 3 bristles. Exopodite elongate, hirsute (no bristles observed). 1st endopodial joint with medial hairs and 2 ventral bristles. 2nd endopodial joint: dorsal margin with 4 proximal bristles; ventral margin with short spines forming rows and 6 distal bristles; medial surface with hairs forming rows. 3rd endopodial joint with 1 long clawlike bristle with faint spines along ventral margin, and 4 short slender ringed bristles.

Maxilla (Figure 14h): Limb reduced. Bristles



FIGURE 14.—*Rutiderma rotundum*, adult male, USNM 158215, length 1.24 mm: *a*, anterior of right valve, inside view; *b*, posteroventral corner of right valve showing bristles on infold of caudal process, and detail showing division of lamellar prolongation of selvage at small bristle; *c*, tips (some may be missing) of central adductor muscles as seen on body with right valve removed, anterior to right; *d*, left 1st antenna, lateral view; *e*, left 2nd antenna, medial view (only proximal parts of exopodial bristles shown); *f*, endopodite of right 2nd antenna, medial view; *g*, left mandible, medial view; *h*, left maxilla, lateral view; *i*, 5th limb; *j*, 6th limb; *k*, 7th limb; *l*, right lamella of furca, medial view; *m*, right lateral eye (only parts of few marginal ommatidia shown), medial eye, and proximal end of bellonci organ.

of 3 endites difficult to discern accurately. Coxale with hirsute dorsal bristle (broken off on illustrated appendage). Basale with spinous dorsal bristle and 1 ventral bristle. Exopodite with 3 spinous bristles (2 long, 1 short). 1st endopodial joint with slender bare alpha-bristle and long stout hirsute beta-bristle. 2nd endopodial joint with 6 or 7 bristles.

Fifth Limb (Figure 14i): Reduced. Endite I with 3 bare bristles; endite II with 4 bare bristles; endite III with 6 faint bristles. 1st exopodial joint with 2 bristles and 3 or 4 weakly developed teeth. 2nd joint with several bristles and weakly developed teeth. Inner lobe of 3rd joint obscure but with at least 2 bristles; outer lobe of 3rd joint with 2 long hirsute bristles. Fused 4th and 5th joints with total of 4 bristles.

Sixth Limb (Figure 14j): 2 short bristles in place of epipodial appendage. Endite I with 3 short bristles; endite II with 2 bristles; endite III with 1 short bristle and 1 or 2 long bristles; endite IV with 2 or 3 bristles. End joint with 2 anterior bristles with short marginal spines followed by 1 bristle with long proximal and short distal spines, and 3 stouter hirsute bristles.

Seventh Limb (Figure 14k): Each limb with 4 distal bristles (2 on each side) and 4 proximal bristles (2 on each side); each bristle with up to 5 bells and marginal spines. Terminus consisting of comb with 3 spinous teeth opposing comb with 2 spinous teeth.

Furca (Figure 14l): Each lamella with 3 strong claws followed by 3 very weak claws.

Bellonci Organ: Elongate, distal part broken off on specimen examined (Figure 14m).

Eyes (Figure 14n): Medial eye with brown pigment and minute dorsal process. Lateral eye with dark pigment and about 22 ommatidia (exact number difficult to determine because of dark pigment; illustrated lateral eye shows only edges of a few ommatidia).

Posterior of Body: Similar to that of female.

Rutiderma judayi McKenzie, 1965

FIGURES 15–18

Rutiderma judayi McKenzie, 1965:64, fig. 3, pl. 1: fig. 2.

HOLOTYPE.—USNM 110916, adult female, dry

separated valves on slide, mounted appendages on slide.

TYPE-LOCALITY.—Scammon Lagoon, Baja California, Mexico.

MATERIAL EXAMINED.—Holotype. San Clemente Island, California, sta D3-73, collected by Mr. Rowe and Mr. Dorsey: USNM 158220 (BM 16a), adult male; USNM 158221 (BM 16), adult female. San Diego, Ocean Beach, 11 Nov 1970, collected by Michael Sweeney: USNM 158354, 4 specimens including 3 ovigerous females, from sta 5 C/S, washings of eel grass growing on sides of pools and channels from south side of pier 70 m from shore, 2.5 cm deep in about 0.5 m of water; USNM 158355, 3 specimens, from sta 3 C/S, from vegetation on sides of tide pools with sand-shell bottoms, near side of pier about 70 m from shore, about 0.3 m deep in 0.3–0.6 m of water.

DESCRIPTION OF ADULT MALE (Figures 15, 16).—Carapace elongate, greatest height posterior to middle, greatest width near middle; rostrum well developed; incisur forming shallow obtuse angle; caudal process projecting posteriorly.

Ornamentation (Figure 15): Anterior edge of rostrum with minute scallops; each valve with 3 horizontal ribs connected posteriorly by vertical rib having indentation between upper 2 ribs; posterior edge of upper rib projecting past posterior edge of valve; anterior end of upper 2 ribs in

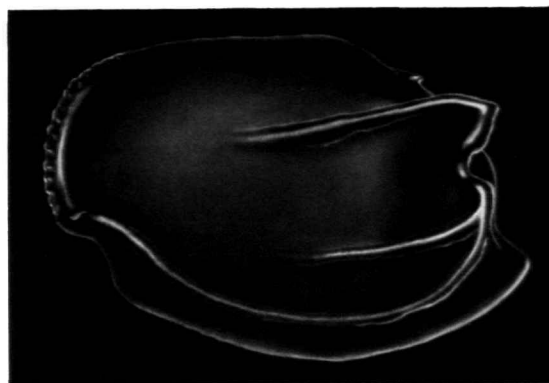


FIGURE 15.—*Rutiderma judayi*, adult male, USNM 158220, complete specimen, length 1.03 mm.



FIGURE 16.—*Rutiderma judayi*, adult male, USNM 158220, length 1.03 mm: *a*, anterior of right valve, inside view; *b*, posteroventral corner of right valve showing bristles on infold of caudal process, and detail showing division of lamellar prolongation of selvage at small bristle, inside views; *c*, posteroventral corner of left valve, inside view; *d*, endopodite and distal part of protopodite of right 2nd antenna, lateral view; *e*, proximal part of 1st endopodial joint and distal part of protopodite of left 2nd antenna, medial view; *f*, right 1st antenna, medial view; *g*, right maxilla, lateral view; *h*, 5th limb; *i*, 6th limb; *j*, 7th limb; *k*, left lamella of furca, lateral view; *l*, medial eye and bellonci organ; *m*, anterior of body showing medial eye and upper lip; *n*, lateral eye (only few ommatidia shown); *o*, left Y-sclerite, anterior to left.

vicinity of central adductor muscle attachments; anterior end of lower rib at ventral end of rostrum.

Infold (Figure 16a-c): Rostral infold with 5 or 6 bristles forming row parallel to anterior margin of rostrum (Figure 16a); 2 minute bristles present at inner corner of incisur; anteroventral infold with 7 bristles forming row. Right valve: anterior ridge of caudal infold not observed except at dorsal end (Figure 16b); ridge and posterior end of ventral margin with about 14 small bristles; 2 small bristles present dorsal to dorsal end of ridge of caudal process, and 1 small bristle present posterior to ridge. Infold of caudal process of left valve similar to that of right valve except for having 16 bristles along anterior ridge and posterior end of ventral margin of valve, and for not having bristle posterior to ridge (Figure 16c).

Selvage: Wide lamellar prolongation with marginal fringe present along anterior and ventral margins becoming narrower in vicinity of caudal process where marginal fringe is absent; selvage divided at inner corner of incisur and at small bristle at posterior end of caudal process (see detail on Figure 16b).

Size: USNM 158220, length 1.03 mm, height 0.63 mm.

First Antenna (Figure 16f): 1st joint bare. 2nd joint with spines and 2 spinous bristles (1 dorsal, 1 lateral). 3rd joint with 3 bristles (1 ventral, 2 dorsal). 4th joint with 4 or 5 bristles (3 ventral, 1 or 2 dorsal). Sensory bristle of minute 5th joint with abundant long proximal filaments, 1 minute filament following long filaments, and 2 minute spines at tip of stem. Long 6th joint with spinous medial bristle. 7th joint: a-bristle about same length as bristle of 6th joint, with faint marginal spines; b-bristle about 3 times length of a-bristle, with 2 proximal filaments and spine at tip; c-bristle extremely long, with 10 marginal filaments. 8th joint: d- and e-bristles bare with blunt tips reaching well past tip of b-bristle; f-bristle extremely long, with 10 marginal filaments; g-bristle slightly longer than d-bristle, with 1 proximal filament and spine at tip.

Second Antenna: Protopodite bare. Endopodite

3-jointed (Figure 16d,e): 1st joint short, with 5 small bristles (4 proximal, 1 distal); 2nd joint elongate, with 2 slender ventral bristles near middle; 3rd joint elongate, reflexed on 2nd joint, with short proximal bristle (tip of bristle broken off on illustrated limb) and 2 slender subterminal bristles; tip of 3rd joint faintly serrate. Exopodite: 1st joint elongate, with slender spines or hairs along ventral margin and small medial bristle on distal margin; bristle of short 2nd joint reaching past distal end of long 3rd joint, and with spines along ventral margin; bristles of joints 3-8 long, with natatory hairs but no spines; 9th joint with 4 long bristles with natatory hairs and 1 minute bare bristle; joint 2 with long lateral spines forming row along distal margin; joints 3-8 with shorter lateral spines forming rows along distal margins.

Mandible: Both limbs lost.

Maxilla (Figure 16g): Limb reduced. Dorsal margins of precoxale and coxale with fringe of long hairs. Coxale with stout hirsute dorsal bristle. 3 endites with weakly developed bristles. Basale with 2 or 3 distal bristles. Exopodite with 2 bristles (1 long, 1 short). Endopodite: alpha-bristle of 1st joint not observed on limb examined, beta-bristle stout, hirsute; end joint with total of 7 bristles, some unringed, all weakly developed.

Fifth Limb (Figure 16h): Endite I with 2 or 3 bristles; endite II with 4 bristles; endite III with about 5 bristles. Exopodite: 1st joint with 4 flat unringed terminal bristles, some hirsute; 2nd joint with 1 flat unringed bristle and 2 ringed bristles. Inner lobe of 3rd joint with 4 bristles (all of these may not be on 3rd joint); outer lobe of 3rd joint with 2 stout hirsute bristles; fused 4th and 5th joints with total of 4 or 5 bristles. [Exact number of bristles on joints difficult to ascertain on mounted limb, and the numbers given above must be considered approximate.]

Sixth Limb (Figure 16i): Endite I with 3 short bristles; endite II with 1 bristle, endite III with 2 bristles; endite IV with 2 bristles; end joint with 3 slender bristles on distinct projection followed by 4 stout hirsute bristles. 1 or 2 bristles in place of epipodial appendage.

Seventh Limb (Figure 16j): 4 bristles in proxi-

mal group (2 on each side) and 4 in distal group (2 on each side); each bristle with up to 6 bells; marginal spines not observed on all bristles. Terminus consisting of opposing combs with 2 or 3 teeth on each side.

Furca (Figure 16k): Each lamella with 4 strong claws followed by 2 weak secondary claws.

Bellonci Organ (Figure 16l): Elongate, broadening in middle part distal to suture, then tapering to narrow rounded tip.

Eyes: Medial eye tapering anteriorly, with dark brown pigment and dorsal projections, some with pigment (Figure 16l,m). Lateral eye larger than medial eye, with black pigment, about 20 ommatidia (exact number difficult to determine because of pigment) (Figure 16n).

Posterior of Body: Spinous dorsal to furca.

Upper Lip (Figure 16m): Simple lobe.

Y-Sclerite (Figure 16o): Typical for genus.

DESCRIPTION OF ADULT FEMALE (Figures 17, 18).—Carapace with well-defined incisur with edge of valve forming right angle when viewed from inside (Figure 18c), and with slight overhang of rostrum laterally (Figure 17). Caudal process forming distinct posterior projection with rounded tip; carapace more rounded in lateral view than that of adult male.

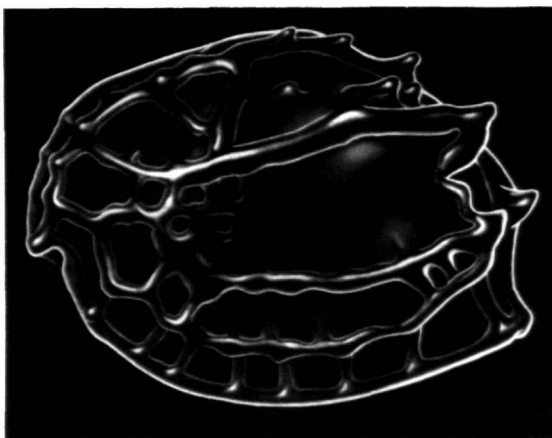


FIGURE 17.—*Rutiderma judayi*, adult female, USNM 158221, complete specimen, length 1.01 mm.

Ornamentation (Figure 17): Each valve with 3 horizontal ribs connected posteriorly by vertical rib having indentation between upper 2 ribs; posterior edge of upper rib projecting past posterior edge of valve; anterior end of ribs continuing anteriorly forming walls of large reticulations; a convex ridge lying just within dorsal margin of valve with 3 small processes along posterodorsal part; a small process projecting past posterior end of valve present near middle of posterior margin; radial riblets present extending from lower horizontal rib to ridge along ventral margin of valve; additional details of ornamentation not shown in Figure 17 are abundant minute fossae on valve surface including ribs.

Infold (Figure 18c,d): Rostral infold with 7 long bristles forming row parallel to anterior margin of rostrum (not all shown in Figure 18c); 2 or 3 minute bristles present at inner corner of incisur; anteroventral infold with 8 bristles forming row. Anterior ridge of caudal process more distinct at posterior end but visible at high magnification (40× objective) at anterior end which extends considerable distance anteriorly along posterior end of ventral margin; ridge with 14 bristles on right valve of USNM 158221 (not all shown in Figure 18d) and 16 on left; 1 small bristle posterior to posterior end of ridge and 3 small bristles forming row dorsal to posterior end of ridge (Figure 18d).

Selvage: Wide lamellar prolongation present along anterior and ventral margins becoming narrower in vicinity of caudal process where marginal fringe is absent; selvage divided at inner corner of incisur and at small bristle at posterior end of caudal process (see detail on Figure 18d).

Size: USNM 158221, length 1.01 mm, height 0.76 mm. Holotype, USNM 110916, length 1.05 mm, height 0.70 mm (from McKenzie, 1965:66). USNM 158354 (3 specimens): length 0.97 mm, height 0.72 mm; length 0.96 mm, height 0.72 mm; length 0.95 mm, height 0.71 mm.

First Antenna (Figure 18e): 1st joint with short spines forming few rows. 2nd joint with 2 bristles (1 dorsal, 1 lateral) and spines forming row along distal lateral margin. 3rd and 4th joints fused;

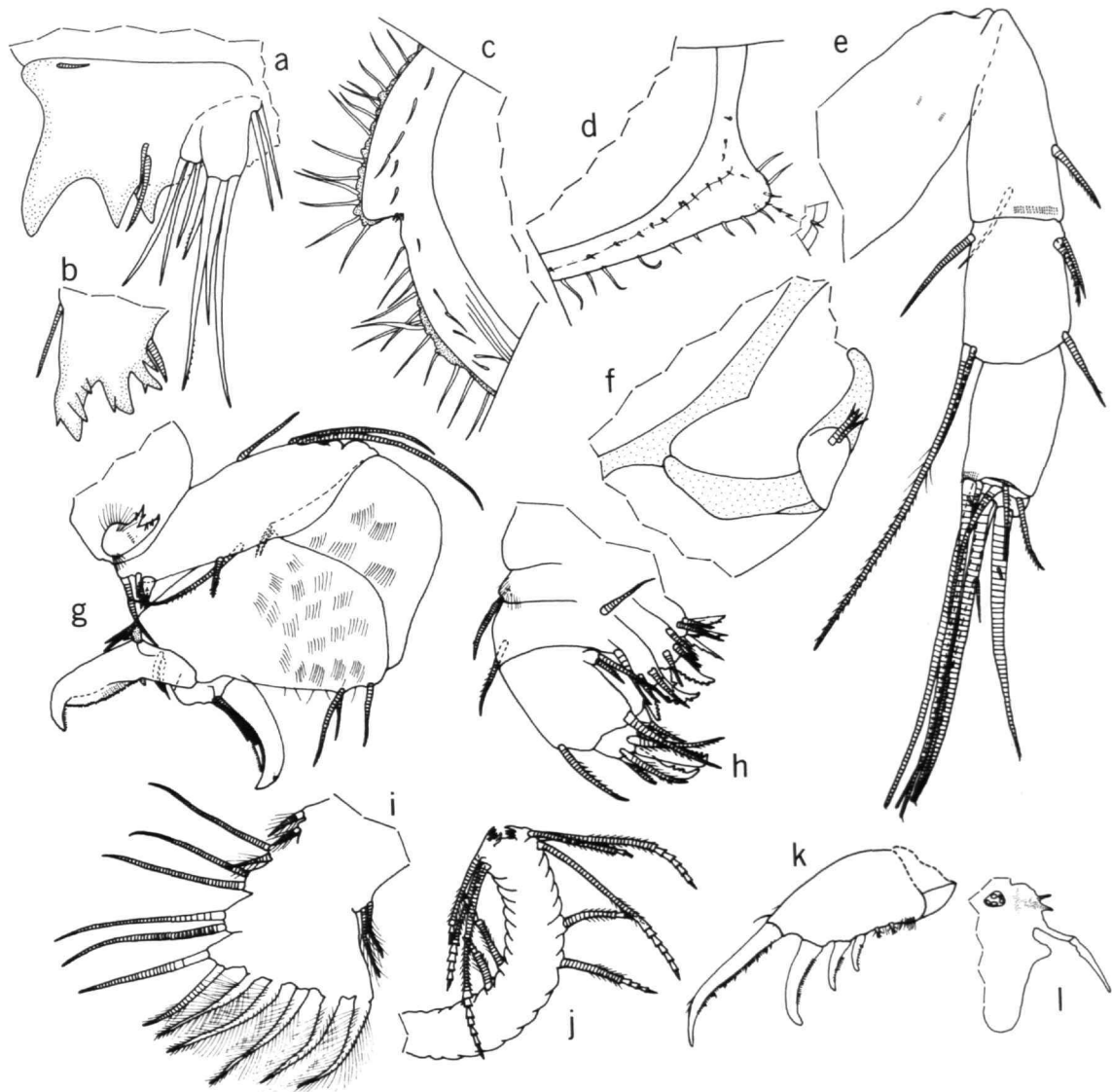


FIGURE 18.—*Rutiderma judayi*, adult female (holotype), USNM 110916, length 1.05 mm: *a*, exopodial joints 2-5 of left 5th limb, posterior view; *b*, 1st exopodial joint of left 5th limb, posterior view. Adult female, USNM 158221, length 1.01 mm: *c*, anterior of right valve, inside view; *d*, posteroventral corner of right valve showing bristles on infold of caudal process, and detail showing division of lamellar prolongation of selvage at small bristle; *e*, left 1st antenna, medial view; *f*, endopodite and distal part of protopodite of left 2nd antenna, medial view; *g*, left mandible, medial view; *h*, left maxilla, lateral view; *i*, 6th limb; *j*, 7th limb; *k*, left lamella of furca, lateral view; *l*, anterior of body showing right lateral eye, medial eye, bellonci organ, and upper lip.

3rd joint short with 3 bristles (2 dorsal, 1 ventral); 4th joint long, with 3 bristles (1 dorsal, 2 ventral). Sensory bristle of long 5th joint with minute proximal filament near base, and spine at tip; lateral spines forming row near base of bristle. Medial bristle of minute 6th joint short, spinous (5th and 6th joints fused). 7th joint: a-bristle spinous, about same length as bristle of 6th joint; b-bristle about twice length of a-bristle, with spine at tip; c-bristle about same length as sensory bristle of 5th joint, with spine at tip. 8th joint: d- and e-bristles slightly shorter than c-bristle, bare with blunt tips; f-bristle about twice length of b-bristle, stout with spine at tip, and with minute proximal filament; g-bristle very slightly shorter than c-bristle, with spine at tip, and proximal filament with long slender tip.

Second Antenna (Figure 18f): Protopodite bare. Endopodite single jointed with 4 short proximal anterior bristles. Exopodite: 1st joint with minute bent medial terminal bristle with blunt tip; bristle of 2nd joint reaching to about distal end of 9th joint, with a few faint proximal short ventral spines followed by row of minute blunt spines; bristles of joints 3–5 longer but with similar spines; bristles of joints 6–8 longer, with natatory hairs, but no spines; 9th joint with 6 bristles (3 long and 1 short with natatory hairs, 2 minute, bare or with few short spines).

Mandible (Figure 18g): Coxale endite well developed, bifurcate, pectinate, with long hairs at base. Basale: dorsal margin with 3 bristles (1 near middle, 2 just distal to middle); medial surface near ventral margin with 4 bristles (2 of these short, pectinate); ventral margin with 2 slender midbristles. 1st endopodial joint with medial spines and 2 small ventral bristles. 2nd endopodial joint: medial surface spinous; ventral margin with 2 short slender subterminal bristles; dorsal margin with 3 short slender proximal bristles; terminal claw stout with curved tip, serrate dorsal margin, and small proximal dorsal process; small process with minute terminal spine present medial to ventral base of terminal claw. 3rd endopodial joint with stout terminal claw with minute dorsal process near tip and spines along ventral

margin; 3 slender ringed bristles and 1 spinous unringed bristle present just ventral to terminal claw and 2 short bristles located lateral to claw of 2nd joint.

Maxilla (Figure 18h): 3 endites present, each with several stout pectinate and slender ringed bristles. Coxale with short dorsal bristle and hairs near dorsal margin. Basale with 1 spinous dorsal bristle, 1 ventral bristle, and 1 lateral bristle. Exopodite with 1 short and 1 long bristle. 1st endopodial joint with 1 alpha-bristle with slender marginal spines, and 1 beta-bristle with pectinate spines proximally and slender spines distally. End joint with 2 stout pectinate bristles and 4 (possibly 5) slender spinous or pectinate ringed bristles.

Fifth Limb (Figure 18a,b): Exopodite: 1st joint with main tooth consisting of proximal small smooth tooth followed by 3 larger teeth bearing 1–3 marginal teeth (Figure 18b); 1 bristle present proximal to small smooth tooth and on edge proximal to large distal tooth. 2nd joint with large squarish tooth with 3 prongs forming inner margin (Figure 18a); posterior surface with 1 small bristle near outer corner and 2 bristles near proximal prong. 3rd joint with 2 bristles on outer lobe and 3 on inner lobe. Fused 4th and 5th joints with total of 4 bristles.

Sixth Limb (Figure 18i): Endite I with 2 short bristles, endite II with 2 bristles (1 long, 1 short), endite III and IV each with 2 long bristles, end joint with 2 long anterior bristles on projection followed by 5 hirsute bristles; 2 bristles in place of epipodial appendage.

Seventh Limb (Figure 18j): One limb with 6 distal bristles (3 on each side) and 4 proximal bristles (2 on each side); bristles spinous and with up to 6 bells; terminus with opposing combs with 3 alate teeth on 1 side and 2 on the other. Other limb obscure but may have only 5 distal bristles (2 on 1 side, 3 on other), otherwise similar to other limb.

Furca (Figure 18k): Each lamella with 4 stout claws followed by 2 small claws; long hairs at base of some stout claws and following claws.

Bellonci Organ (Figure 18l): Elongate, broad-

ening in middle part distal to weak suture, then tapering to narrow rounded tip.

Eyes (Figure 18*l*): Lateral eye small, with light amber pigment and 5 small ommatidia. Medial eye larger than lateral eye, with dark brown pigment and 2 dorsal projections.

Upper Lip (Figure 18*l*): Simple lobe.

Remarks: The appendages on the slide of the holotype prepared by K. G. McKenzie were examined and found to conform with the specimen described above, but the 9th joint of the only 2nd antenna on the slide is missing, and the 6th limb as well as the tip of the 7th limb are obscure.

Rutiderma chessi, new species

FIGURES 19, 20

ETYMOLOGY.—The species is named for James R. Chess, who has supplied the authors with many ostracodes from the west coast.

HOLOTYPE.—USNM 158280, ovigerous female on slide and in alcohol, unique specimen (BM number 18).

TYPE-LOCALITY.—San Clemente Island, sta D-3, collected Sep 1973 by Mr. Roney and Mr. Dorsey.

DESCRIPTION OF ADULT FEMALE (Figures 19, 20).—Carapace with well-defined incisur and overhanging rostrum; caudal process well developed, slender; anterodorsal and ventral margin of each valve with minute processes producing scalloped edge in lateral view (Figure 19).

Ornamentation (Figure 19): 2 well-developed longitudinal ribs present, 1 above and 1 below central adductor muscle attachments; these being connected by vertical ribs at posterior and anterior ends; the posterior vertical rib bears a large process near its dorsal end and a smaller protuberance near its ventral end; a 3rd fairly well-developed rib present just within the anterodorsal and dorsal margins of valve and connected to upper horizontal rib by at least one radial riblet in anterior part of valve; a 4th low rib present along ventral margin and connected to lower horizontal rib by 6 or 7 radial riblets (distal end

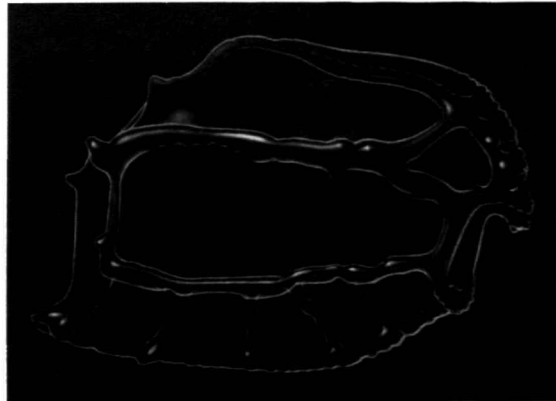


FIGURE 19.—*Rutiderma chessi*, new species, adult female (holotype), USNM 158280, complete specimen, length 1.21 mm.

of the anterior riblet projecting past anteroventral margin of valve, and riblet more strongly developed than remaining riblets; posterior riblet extending onto caudal process); small protuberance present at middle of linear posterodorsal margin of valve and on posterior margin near posterior end of upper horizontal rib.

Infold (Figure 20*a-c*): Rostral infold with 10 bristles parallel to anterior margin; 2 minute bristles at inner end of incisur; anteroventral infold with 12 bristles forming row and about 6 ridges paralleling inner edge of infold (only 4 ridges shown on illustration); posterior end of ventral infold including caudal process with 16 or 17 small bristles forming row along edge of list forming dorsal rim of "pocket" (the anterior part of this list is better defined on left valve of holotype than on right valve); 2 or 3 bristles present ventral to list of caudal process near dorsal edge of process; a small bristle present on infold dorsal to caudal process. Infold of caudal process of left and right valves essentially similar except for well-defined right angle on posterior edge of list of left valve that is not present on right valve, but this could be due to variability within the species.

Selvage: Broad lamellar prolongation with marginal fringe present along anterior and ventral margins of valves; narrow bare lamellar prolongation present along margin of caudal process;



FIGURE 20.—*Rutiderma chessi*, new species, adult female (holotype), USNM 158280, length 1.21 mm: *a*, anterior of right valve, inside view; *b*, posteroventral corner of right valve showing bristles on infold of caudal process, and detail showing division of lamellar prolongation of selvage at small bristle, inside views; *c*, posteroventral corner of left valve, inside view; *d*, left 1st antenna (medial view), medial eye, and bellonci organ; *e*, endopodite, distal part of protopodite, and proximal part of 1st exopodial joint of left 2nd antenna, medial view; *f*, right mandible, lateral view; *g*, detail of tip of left mandible, medial view; *h*, maxilla (exopodite obscure and not shown); *i*, right 5th limb, anterior view; *j*, detail of 1st exopodial joint of 5th limb shown in *i*; *k*, detail of 2nd exopodial joint of 5th limb shown in *i*; *l*, left 5th limb, posterior view; *m*, detail of 2nd exopodial joint of 5th limb shown in *l*; *n*, 6th limb; *o*, tip of 7th limb; *p*, left lamella of furca, lateral view; *q*, right lateral eye, medial eye, and bellonci organ.

lamellar prolongation divided at inner end of incisur and at minute bristle at tip of caudal process (Figure 20b).

Size: USNM 158280, length 1.21 mm, height 0.82 mm.

First Antenna (Figure 20d): 1st joint with medial and lateral spines forming rows. 2nd joint: lateral side with spines forming few proximal rows and row along distal margin dorsal to spinous bristle; medial side with few proximal spines forming rows near dorsal margin; dorsal margin with proximal spines and spinous bristle near middle. 3rd and 4th joints fused; 3rd joint short with 3 spinous bristles, 1 ventral, 2 dorsal; long 4th joint with 3 spinous bristles, 2 ventral, 1 dorsal. Sensory bristle of long 5th joint with 3 short proximal filaments and spine at tip. Medial bristle of minute 6th joint spinous. 7th joint: a-bristle spinous, slightly longer than bristle of 6th joint; b-bristle slightly longer than a-bristle, bare except for a 2 spines at tip; c-bristle with small proximal filament and 2 spines at tip. 8th joint: d- and e-bristles bare with blunt tips not quite reaching tip of sensory bristle of 5th joint; f-bristle stout, shorter than c-bristle, with 2 small proximal filaments and 2 spines at tip; g-bristle about same length as c-bristle, with fairly long proximal filament and 2 spines at tip.

Second Antenna (Figure 20e): Protopodite bare. Endopodite 1-jointed, with 4 short anterior bristles. Exopodite: elongate 1st joint with small medial bristle terminally; bristles of joints 2–5 fairly short, with blunt closely spaced ventral spines but no natatory hairs; bristles of joints 6–8 long, with natatory hairs but no ventral spines; 9th joint with 6 bristles (3 long with natatory hairs, 1 medium with natatory hairs, 2 minute and bare).

Mandible (Figure 20f,g): Coxale endite bifurcate, pectinate. Basale: ventral margin with 4 proximal bristles (2 pectinate unringed, 2 ringed), and 2 bristles proximal to middle; dorsal margin with 1 bristle near middle and 2 distal to middle. 1st endopodial joint with 2 short ventral bristles and medial spines forming rows. 2nd endopodial joint: dorsal margin with 3 short proximal bristles; medial surface with abundant spines; ventral

margin with 1 or 2 minute distal bristles, and small sclerotized process with minute bristle medial to base of stout terminal claw (Figure 20g); dorsal margin of terminal claw with proximal tooth, serrate margin; claw with short curved tip. 3rd endopodial joint with stout terminal claw with short curved tip and serrate ventral margin, 3 slender medial bristles near ventral end of base of stout claw, 1 unringed flat bristle (with serrate ventral margin) ventral to stout claw, and 2 short bristles located lateral to stout terminal claw of 2nd joint.

Maxilla (Figure 20h): Endites I to III with 2 or 3 stout pectinate claws and several ringed bristles. Dorsal margin of precoxale with fringed margin. Dorsal margin of coxale with 1 bristle with slender marginal spines. Basale with dorsal bristle similar to bristle of coxale (not present on illustrated left limb but on right limb), and short bristle near middle of medial margin (on right limb this bristle appears to be placed on 1st endopodial joint near middle of ventral margin of basale). 1st endopodial joint with 1 spinous alpha-bristle and 1 spinous beta-bristle, and hairs forming rows near dorsal margin. 2nd endopodial joint with 2 stout pectinate claws and 5 slender, spinous, ringed bristles. Exopodite small with 2 bristles (not visible on illustrated limb, and obscure on both mounted limbs of specimen).

Fifth Limb (Figure 20i–m): Endite I with 3 bristles; endite II with 5 bristles; endite III with 7 bristles (Figure 20i). Exopodite: 1st joint with 3 stout teeth with secondary teeth distal to 1 smooth smaller tooth and 1 short bristle; outer edge with 1 bristle (Figure 20j). 2nd joint with large 3-lobed tooth (none of the lobes with secondary teeth); posterior side of joint with minute bristle near outer corner; inner margin of joint with 3 proximal bristles (distal of these small) (Figure 20m). 3rd joint with 2 bristles on outer lobe and 3 on inner lobe. 4th and 5th joints fused, with total of 4 spinous bristles.

Sixth Limb (Figure 20n): Endite I with 3 bristles; endites II, III, IV with 2 bristles; end joint with 3 spinous anterior bristles on projection followed by 4 stouter hirsute bristles (the anterior

of the hirsute bristles with short spines replacing hairs near tip); posterior edge of stem with 1 or 2 epipodial bristles with marginal hairs.

Seventh Limb (Figure 20o): Each limb with 4 proximal bristles, 2 on each side, and 6 terminal bristles, 3 on each side; each bristle with up to 5 bells and distal fairly strong marginal spines; terminus with comb of 5 alate teeth opposing 3 teeth (outer 2 of these with long marginal spines).

Furca (Figure 20p): Each lamella with 4 stout primary claws followed by 2 small secondary claws; claw 1 with anterior distal hairs and both long and short posterior teeth; anterior margin of right lamella with slender spines; long hairs on lamellae following claws and medially at bases of claws.

Bellonci Organ (Figure 20d,q): Elongate with short broad faintly striated section proximal to middle (whether short striated section is separated by sutures or merely folds from remaining part of organ cannot be ascertained with mounted specimen; longitudinal striations not shown in illustration); tip of organ tapering to point.

Eyes (Figure 20d,q): Medial eye tapering distally, with brown pigment. Lateral eye small, with 4 light amber colored ommatidia (Figure 20q).

Posterior of Body: Hirsute.

Eggs: USNM 158280 with 4 eggs in marsupium.

Comparisons: The rib structures on the carapace of the new species *R. chessi* differ from those of other species of *Rutiderma* in the vicinity. The species whose carapace resembles it most closely is *R. judayi*, which is smaller, has 3 instead of 2 main horizontal ribs on each valve, has more processes along the posterodorsal margin, and has a less acute caudal process. The main claws on the 2nd and 3rd endopodial joints of the female mandible (Figure 20f) are longer and more slender than those on other species of *Rutiderma* described herein (see Figures 2e, 6f, 12f, 18g).

REMARKS CONCERNING MALE OF *R. chessi*.—It is possible that the 2 males we have referred to *R. lomae* herein are in reality males of *R. chessi*. The latter conclusion would be supported by the shape of the tip of the bellonci organ, which is rounded in the female of *R. lomae* and pointed on both the female of *R. chessi* and the male of *R. lomae*. Also the vertical rib near the posterior end of the carapace of the female *R. lomae* is discontinuous, but it is continuous in both the female *R. chessi* and male *R. lomae*. We identified the males as *R. lomae* rather than *R. chessi* mainly because the caudal processes of the specimens more closely resemble those of the female *R. lomae*. The collecting of the males in the same locality as where females of *R. lomae* were collected was also a factor in our consideration. Additional collections are required to resolve the problem.

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