

Four Species of Giant Crustaceans from the Indonesian Depths, with Description of a New Species of the Family Lithodidae

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Abstract Four species of decapod crustaceans are recorded from the depths of the Ceram Sea, Indonesia, 1,000–1,500 m deep: *Acanthacaris tenuimana* Bate, 1888 (Nephropidae), *Lithodes ceramensis* sp. nov. and *L. richeri* Macpherson, 1990 (Lithodidae), and *Chaceon karubar* Manning, 1993 (Geryonidae). The new species is distinguished from the closest congener, *L. mamillifer* Macpherson from the adjacent seas of Madagascar and South Africa, by having swollen mammary tubercles on the carapace.

Key words: *Acanthacaris*, Ceram Sea, *Chaceon*, Geryonidae, Indonesia, *Lithodes*, Lithodidae, Nephropidae

Many fishermen in the area of Ceram Island, the Moluccas, Indonesia, are engaged in fishing for deep-sea sharks to get liver oil. Although it seems to be rather difficult to land the crustaceans by fishing with bait of head or guts of bonito on a hook, some crabs of enormous size are not uncommon in their catches. Some of these by-products were dried and sent to the junior author through Mr. B. Teriנגgono, and then to the senior author for definite identification. The viscera and muscles had been removed, and the shells were not always in good condition, with some detached or disjointed chelipeds and ambulatory legs. The specimens were restored and kept in 70% ethanol following the method for restoring dried crustacean specimens with ethylene glycol reported by Thompson *et al.* (1966).

The specimens at hand were collected by local fishermen in the sea off Wahi, Ceram Island, the Moluccas, 1,000–1,500 m deep, in October, 1993, and identified with *Acanthacaris tenuimana* Bate, 1888 of the Nephropidae (1 ♂), *Lithodes richeri* Macpherson, 1990 (1 ♀) and a

new species of *Lithodes* of the Lithodidae (1 ♂), and *Chaceon karubar* Manning, 1993 of the Geryonidae (2 ♂). All the specimens are preserved in the collection of the National Science Museum, Tokyo (NSMT).

Taxonomic Accounts

Nephropidae

Genus *Acanthacaris* Bate, 1888

Acanthacaris tenuimana Bate, 1888

(Figs. 1, 2)

Material examined. Male (NSMT-Cr 15691). Total length, 421.5 mm (rostrum, 50.5 mm; postorbital carapace in median line, 131 mm; abdomen+telson, 240 mm); total length of right cheliped, 460 mm (movable finger, 165 mm; palm, 86.5 mm; carpus, 35.5 mm; merus+ischium, 145 mm; basis+coxa, 30 mm).

Remarks. The genus *Acanthacaris* is at present known by three species from the ocean depths of several hundreds meters: *A. caeca* (A. Milne Edwards, 1881) from the West Atlantic



Fig. 1. *Acanthacaris tenuimana* Bate, male (NSMT-Cr 1561). Total length from tip of rostrum to posterior margin of telson, 421.5 mm, and total length of right cheliped, 460 mm.

(West Indies to off French Guiana); *A. tenuimana* Bate, 1888 (type species) from the Indo-West Pacific (Japan to Arabian Sea); *A. opipara* Burkovsky et Musij, 1976 from the southwestern Indian Ocean. All of the three are so rare that the record of occurrence is worth noting to get additional information about the size and morphological variation and also the geographical and bathymetrical distribution.

The present specimen of enormous size, the biggest known, is without doubt identified with *Acanthacaris tenuimana* based on the important contributions with excellent notes and figures by the original author (Bate, 1888: 171 as *Phoberus tenuimanus*, pl. 21 as *Acanthacaris tenuimana* and pl. 22 as *Acanthocaris tenuimana*), Alcock (1901: 156 as *P. caecus* var. *tenuimanus*), Alcock and McArdle (1902: pl. 60 as *P. caecus* var. *tenuimanus*), Bruce (1974: 303, figs. 1, 2 as *A. tenuimanus*), Holthuis (1974: 752), and Hayashi and Ogawa (1985: 220, fig. 1). *Phoberus caecus* var. *sublevis* Wood-Mason, 1891 (in Wood-Mason & Alcock, 1891: 197) was reduced to a synonym of *P. caecus* var. *tenuimanus* by Alcock (1901) without comments.

Some important diagnostic characters, i.e. proportional length of the palm and fingers, and armature of the pleura of the second to fifth abdominal somites and also that of the telson, clearly agree with the notes on the male from Japanese waters given by Hayashi and Ogawa (1985). In the specimen at hand, each abdominal pleuron ends in a sharp point, the ratio of the

length of the palm to the movable finger of the first cheliped is slightly more than two thirds, and the posterolateral spine of the telson is smaller than the penultimate, differing distinctly from the figures of *A. opipara*. In addition, it is noted that the posterolateral corner of each endopod of the sixth somite is unarmed in the present specimen.

In the National Science Museum, Tokyo, there is a big male specimen (NSMT-Cr 15692) from the depths of the Balabac Strait, south of Palawan, the Philippines. The detailed data is unrecorded, but there is no doubt of the fact that it was obtained from the catch of local fishermen. The measurements of this specimen are as follows. Total length, 415 mm (length of rostrum, 65 mm; postrostral carapace, 140 mm; abdomen+telson, 190 mm); total length of right cheliped, 490 mm (movable finger, 185 mm; palm, 85 mm; carpus, 45 mm; merus+ischium, 155 mm; basis+coxa, 20 mm). Compared with the Indonesian male recorded above, this Philippine male has a proportionally shorter abdomen and longer chelipeds, with a similar proportion of the movable finger and palm.

Distribution. Previous records: Southwest of Kyushu, Japan, 700–750 m (Hayashi & Ogawa, 1985); Southern South China Sea, 810–820 m (Bruce, 1974); Makassar Strait, Indonesia, 2,161 m (Holthuis, 1974); South of New Guinea, 1,440 m (Bate, 1888); Arabian Sea, 990–1,675 m (Wood-Mason in Wood-Mason & Alcock, 1891; Alcock, 1901).

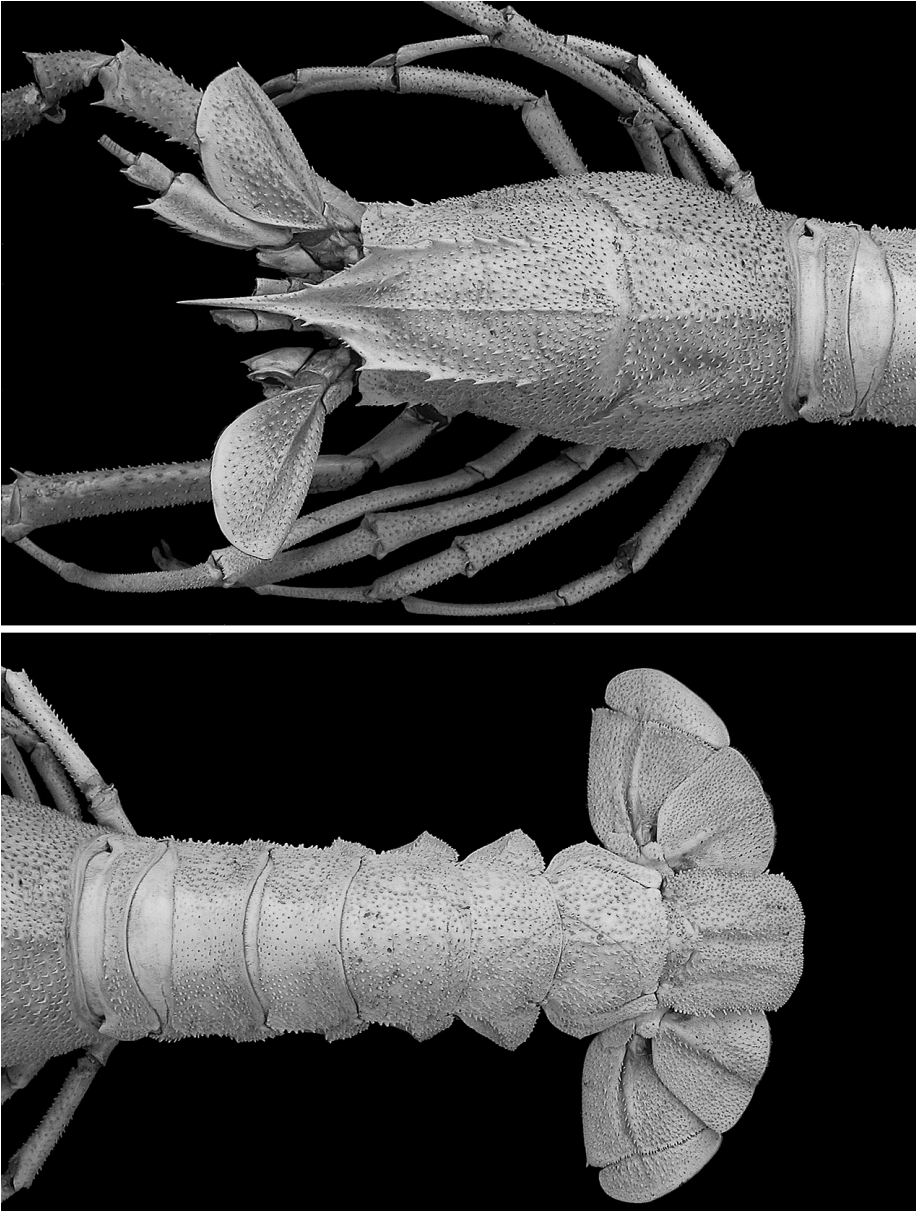


Fig. 2. *Acanthacaris tenuimana* Bate, male (NSMT-Cr 1561). Cephalothorax (upper), and abdomen and telson (lower).

Lithodidae

Genus *Lithodes* Latreille, 1806

Lithodes ceramensis sp. nov.

(Figs. 3, 4)

Material examined. Male (holotype, NSMT-Cr 15693). Length of postrostral carapace, 155

mm; length of rostrum, 50 mm; breadth of carapace excluding lateral tubercles, 155 mm; greatest breadth of carapace including lateral tubercles, 170 mm. Length of ambulatory meri of first to third pair along anterior margins, 145, 155 and 150 mm in right side, and 130, 155 and 150 mm in left side, respectively); total length of left sec-

ond ambulatory leg along anterior margin, 335 mm (ischium+merus, 165 mm; carpus, 85 mm; propodus, 120 mm; dactylus, 65 mm).

Description of holotype (male). Carapace as long as broad, evenly convex as a whole, covered with swollen mammary tubercles like dugs symmetrically disposed and each tipped with a sharp spine, with a more or less asteroid outline. Gastric, cardiac, branchial and intestinal regions defined, with flattened or rather depressed interspaces uniformly covered with minute warty granules, making a rough appearance; gastric region longitudinally elliptical, smooth, more prominent than other regions, armed with two pairs of strong spiniform tubercles; anterior pair slightly longer than the posterior, directed strongly forward and weakly outward; posterior pair suberect, with distance of both spines narrower than that of the anterior. Cardiac region separated from gastric region by deep transverse furrow, armed with a pair of mammary tubercles tipped by a suberect spine; anterior part in front of mammary tubercles two times as long as the posterior, gradually inclined toward gastro-cardiac furrow, nearly smooth, with a pair of low mounds; posterior part of cardiac region steep, narrowed posteriorly, continuing to intestinal region without boundary. Intestinal region longitudinally ridged, enlarged toward posterior margin of carapace, with a pair of submarginal mammary tubercles that are only slightly smaller than cardiac tubercles, distance between tips of both tubercles slightly wider than cardiac tubercles; branchial region armed with two large, swollen mammary tubercles arranged obliquely back and forth, each tipped with a spine; anterior one the largest of all the dorsal and marginal tubercles, weakly directed anterolaterally as a whole; posterior one suberect, slightly smaller than the anterior but larger than cardiac tubercles, on a level with posterior part of cardiac region; in addition, brachial region with three small, obtuse tubercles, viz., one close to gastric region between posterior gastric and anterior branchial tubercles, and two side by side close to posterior branchial tubercle and posterior end of cardiac region.

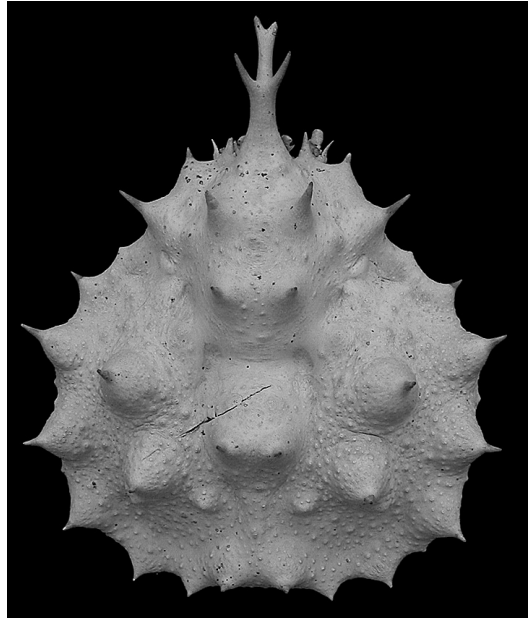


Fig. 3. *Lithodes ceramensis* sp. nov., carapace of holotype male (NSMT-Cr 15693). Postrostral carapace length, 155 mm.

Rostral spine tuberculated, bifid at tip, armed with a pair of prominent dorso-lateral spines on median part; each distal branch half as long as dorso-lateral spine; proximal half before dorso-lateral spines directed obliquely upward, distal half almost horizontal and weakly depressed; basal spine straight, directed obliquely downward.

External orbital spine of right side well developed, directed forward, overreaching end of eye; left one apparently shorter than the right, with broken and recovered tip. Antennal basal segment angulated at outer angle; second segment armed with a slender, weakly curved spine at its outer angle.

Anterolateral spine of left side directed forward, with a broad base, almost reaching median part of external orbital spine; that of right side slightly smaller, with rounded tip. Hepatic spine directed obliquely forward, with broad, weakly swollen base; hepatic and branchial margins isolated by a wide, deep interruption. Branchial margin armed with seven equidistant spines; the first not spiniform, but only angulated; other

spines with broad bases; the second and the last two smaller than the lateral three (third to fifth), the basal parts of which are swollen and of distinctly mammary appearance; very small tubercle seen between main branchial spines.

Chelipeds thick, armed with strong spines on ischium, merus and carpus; left cheliped massive, much larger than the right. Outer surface of ischium armed with three tuberculate spines, viz., two upper smaller and one larger spines. Merus about twice as long as ischium; inner surface armed with two spines, the lower of which is very prominent; upper margin armed with four subequidistant spines, distalmost (terminal) spine longer than the others, directed forward, first (proximalmost) smallest, median two subequal. Both carpi different in size, but similar to each other in armature; three spines in a line each on outer upper and lower parts, respectively, and on distal margin. Three of them, viz., proximalmost of upper line, distalmost of lower line, and lowermost of margin, smaller than the others. Palm of left chela heavy, high, with small tubercles; some tubercles of various sizes on outer surface arranged in two longitudinal lines. In left (larger) chela, movable finger half as long as palm; fingers curved inward and excavated on its inner surfaces as usual, with many tufts of bristles arranged in longitudinal lines along margins and molar teeth. Right (smaller) chela slender, with fingers longer than palm; arrangement of tubercles on outer surface of palm similar to that of left (larger) chela, only with small obtuse teeth of equal size on prehensile edge.

Ambulatory legs long, stout; second pair longer than the others, third pair longer than the first. Anterior margin of each merus armed with four tuberculated spines weakly curved and directed obliquely forward; distance of first (proximalmost) and second spines shorter than that of second and third spines, and also that of third and fourth (terminal) spines; first spine the smallest, and fourth spine the longest; upper surfaces of meri of first two pairs armed with three small spines on its proximal half; third pair armed with an additional spine distally; posterior margin of

each merus armed with two or three small spines. Carpus armed with three equidistant tuberculate spines of same size on anterior margin, and two spines on dorsal surface (in Fig. 4A, this segment is so twisted that two spines look just like the marginal spines). Each propodus tapers distally, armed with four and six spines on anterior and posterior margins, respectively; size of first (proximalmost) and third spines of anterior margin larger than second and fourth spines; spines of posterior margin also basically alternate in size; upper surface armed with two distant spines, viz., proximal larger and distal smaller spines. Dactylus weakly curved, more or less bulging in the middle, with elliptical cross section, armed with two depressed mammary tubercles tipped with a spine, two each on its upper and lower proximal surfaces, respectively; terminal claw depressed antero-posteriorly.

Abdomen missing.

Remarks. The holotype male is left-handed. This is rather rare in the right-handed family Lithodidae, with some examples reported only by Kurata (1959) in *Paralithodes brevipes*, Campodonico (1978) in *Paralomis granulosa*, Watabe (1996) in *Paralomis japonica* and *P. multispina*, Zaklan (2000) in *Lithodes maja*, and Motoh (2002) in *Lithodes camtschaticus*. There is no problem in the identification of the species and thus the designation as holotype.

This species is without doubt close to *Lithodes mamillifer* described by Macpherson (1988) from off Madagascar, 550–800 m deep, and off the Natal coast, South Africa, 600–810 m deep. As generally known in the lithodid crabs and also correctly mentioned in the original description of *L. mamillifer*, the shape of the carapace, length of the rostrum and spines show individual and developmental variations. Comparing the type specimens (holotype female; allotype male; paratypes—1 male, 1 female and 3 ovigerous females) of *L. mamillifer* ranging from 40 to 158 mm carapace length, it was mentioned that the carapace in the larger specimens is more rounded than in the small ones, the distal part of the rostrum is almost horizontal in the larger specimens,

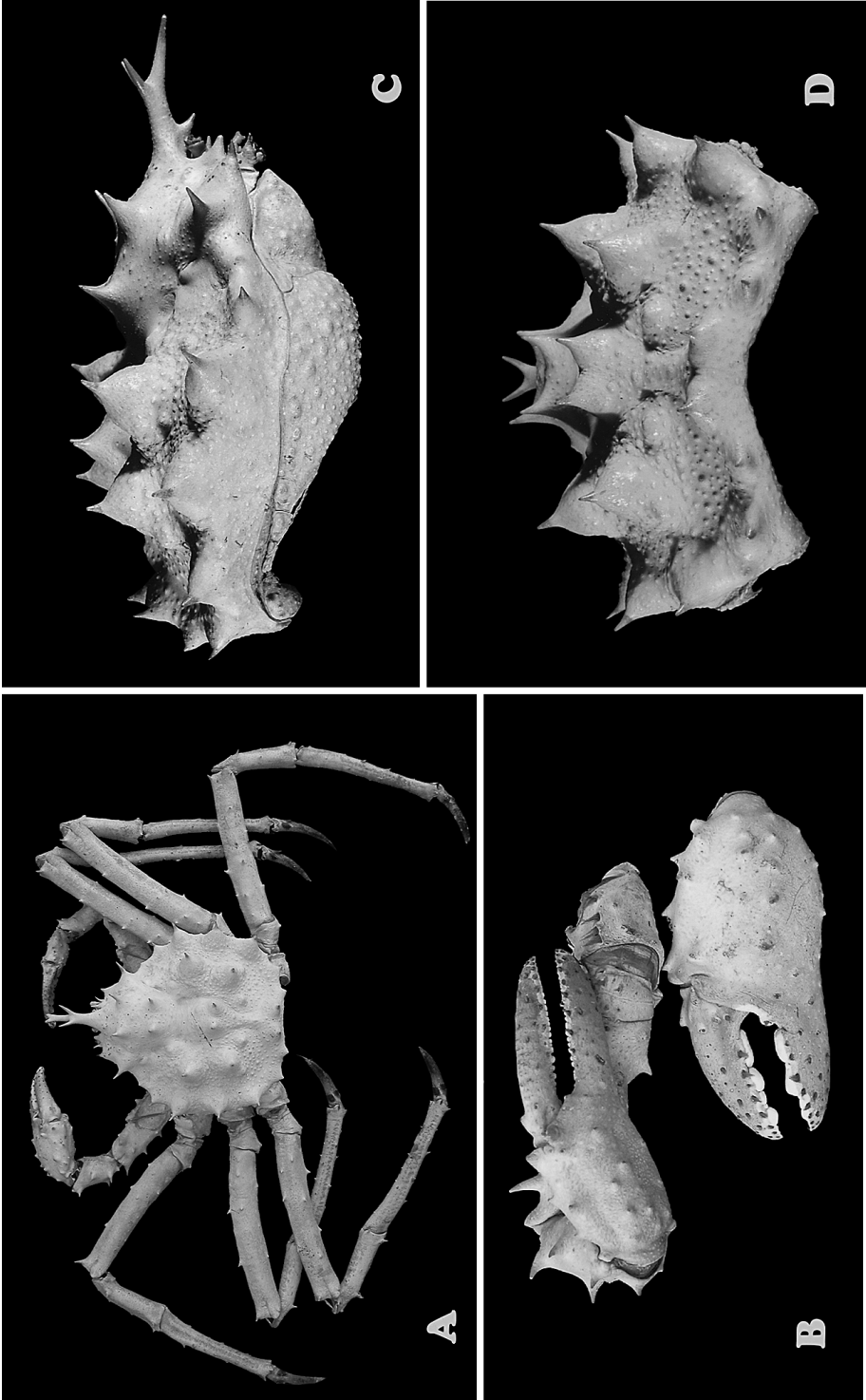


Fig. 4. *Lithodes ceramensis* sp. nov., holotype, male (NSMT-Cr. 15693) in dorsal view (A); carapace in outer view (B); carapace in lateral and posterior views (C, D).

and clearly turned downward in the smaller ones, the ambulatory legs are longer and have the articles more slender in the males than in the females, the smaller spines on the ambulatory legs can disappear in the large specimens, and the granules on the dorsal surface of the carapace are more apparent in the large specimens.

The holotype of the present new species is comparable with the big specimens of *L. mamillifer*, viz., two ovigerous females (156×140 mm, 158×145 mm). The carapace of the present species is exactly as long as wide, with the dorsal surface thickly and uniformly covered with numerous minute granules. The arrangement of the dorsal and marginal tubercles is similar in both species, but in the new species most of the tubercles, especially branchial and marginal ones, are remarkably swollen and look like dugs. The spinulation of the ambulatory legs is also an important character to distinguish the species. In the new species both margins and the upper surfaces of the ambulatory legs are armed with fewer numbers of spines, without minute granules and spinules.

Etymology. This species is named after the type locality, Ceram Sea.

***Lithodes richeri* Macpherson, 1990**

(Figs. 5, 6)

Material examined. Female (NSMT-Cr 15694). Length of postrostral carapace, 175 mm; length of rostrum, 135 mm; breadth of carapace excluding lateral spines, 165 mm; greatest breadth of carapace including lateral spines (between second branchial spines), 175 mm. Total length of left first and second ambulatory legs, 415 mm (ischium+merus, 155 mm; carpus, 75 mm; propodus, 120 mm, dactylus, 65 mm) and 445 mm (ischium+merus, 165 mm; carpus, 75 mm; propodus, 135 mm; dactylus, 70 mm), respectively.

Description of the female (NSMT-Cr15694). Postrostral carapace length equal to greatest breadth of carapace between anterior branchial spines of both sides; carapace rather pyriform with strong constriction at boundary of hepatic

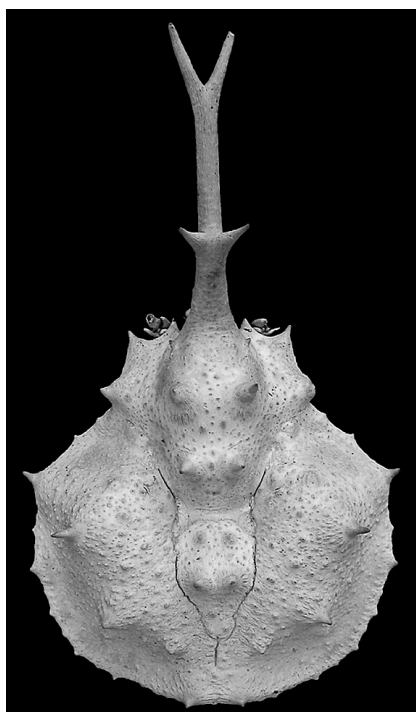


Fig. 5. *Lithodes richeri* Macpherson, carapace of female (NSMT-Cr 15694). Postrostral carapace length, 175 mm.

and branchial margins; hepatic margin nearly longitudinal, or only weakly divergent toward hepatic tubercle; anterior part of branchial region straight obliquely divergent toward second branchial spine; posterior parts of branchial margins of both sides and intestinal margin form a distinct semicircular outline.

Gastric, hepatic, cardiac and branchial regions convex, with small warty, uniformly scattered granules of various sizes giving appearance of a rough surface. Gastric region prominent, as high as branchial regions, oblong, armed with two pairs of stout tubercles; anterior pair slightly larger than the posterior; left of anterior pair abnormal, making a mammary appearance tipped with a minute tubercle: tubercle of right side directed obliquely forward and outward; posterior pair suberect, or only slightly directed outward and backward; distance between two tubercles of posterior pair narrower than that of anterior pair. Cardiac region isolated from gastric region by a

deep transverse depression on one side and a longitudinal linear furrow on the other; the lateral margins on both sides parallel to each other, strongly converging behind main tubercles side by side toward intestinal region; main tubercles conical, or only slightly mammary in shape, tipped each with a sharp spine; anterior slope of cardiac region in front of main tubercles with a gentle ascent, with a pair of obtuse low tubercles; in lateral view, these tubercles side by side are not visible behind brachial tubercle. Brachial region prominently inflated at anterior spine on dorsal surface, being surrounded and isolated from branchial margin of carapace by a submarginal furrow; anterior spine directed obliquely outward, arising from a broad, inflated base and looking like a dug; posterior spine short, with a small base, being placed at posterior one third of branchial region, obliquely behind anterior spine; third tubercle placed close to posterior end of cardiac region. Intestinal region raised as a whole, not distinctly demarcated, with a pair of submarginal tubercles each tipped with a small spine; distance between tips of both spines wider than that of cardiac tubercles, and subequal to that of posterior pair of gastric spines.

Rostrum rod-like, more than two thirds as long as carapace, directed obliquely upward, bifid and armed with a pair of dorso-lateral spines; proximal part before dorso-lateral spines more strongly directed upward; distal branch about one and half times as long as dorso-lateral spine; basal spine as long as dorso-lateral spine, straight, directed obliquely downward. A small spine at each side of base of rostrum.

External orbital spine tuberculated, directed forward. Anterolateral spine directed obliquely forward, with tip reaching slightly behind level of tip of external orbital spine. Right hepatic margin armed with a big swell, without distal spine; left branchial tubercle swollen, tipped with a small spine, directed laterally. Brachial margin distinctly thickened for whole length, armed with several, rather equidistant tubercles; anterior straight part with a small tubercle in the middle, and an additional smaller one close to constriction

between hepatic and branchial margins; main tubercle tipped with a distinct spine at anterolateral angle of branchial margin, taking a greatest breadth of carapace; other marginal tubercles distinct, but small and obtuse.

Both chelipeds slender, with the right being slightly larger. Ischium armed with two strong tubercles arranged fore and aft along lower margin, the former being twice as long as the posterior; lower margin of ischium slightly longer than the lower margin of merus, and about half as long as upper margin of merus. Merus armed with one strong terminal and three or four small tubercles on upper margin, two indistinct tubercles on outer surface, and one strong and some accessory tubercles on lower margin. Carpus as long as lower margin of merus, with several tubercles; two on distal margin and two on outer part stronger, the outer proximal one being longest. Palm armed with some small tubercles on upper margin and on median part of outer surface; those on outer surface more or less arranged in two rows. In right (larger) chela upper margin of palm two thirds as long as upper margin of movable finger; fingers weakly curved inward, with excavated inner surfaces, armed with two or three sharp teeth on cutting edges and many tufts of bristles along cutting edges. In left (smaller) chela, movable finger twice as long as upper margin of palm; fingers armed with a series of minute teeth, without large teeth.

Ambulatory legs slender, second pair being longest. Each ischium armed with two tubercles, one on outer surface and the other on subdistal part of lower margin. Each merus armed with three tubercles on upper margin, the proximalmost being smaller and becoming obsolete; terminal spine of upper margin strongly developed; outer surface armed with several scattered small tubercles mainly on proximal half. Carpus slender, widens distally, armed with three small distant tubercles on upper margin, the distalmost being submarginal; outer surface armed with a small tubercle close to proximalmost one of upper margin and a long submarginal spine that is directed obliquely outward and forward and as

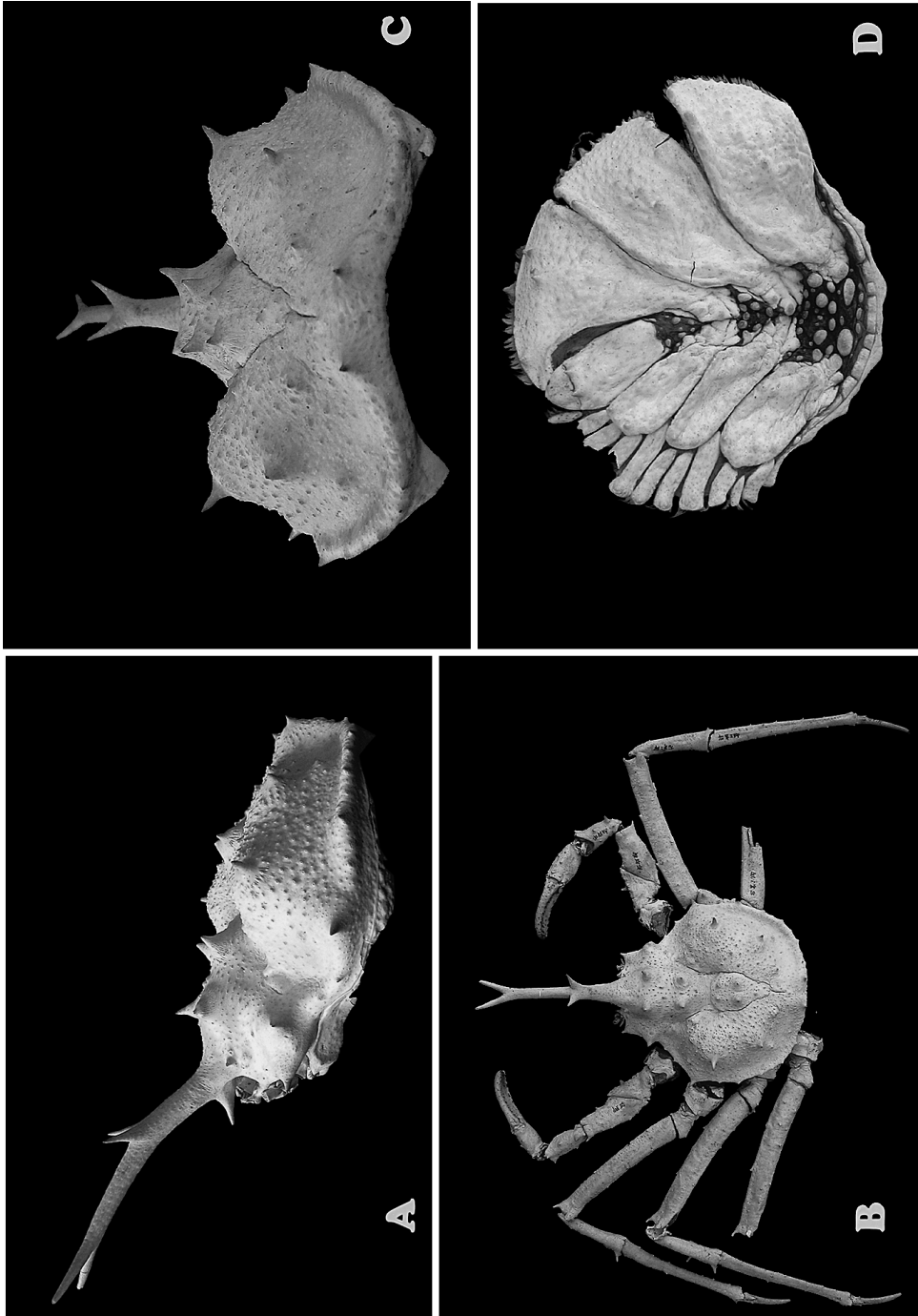


Fig. 6. *Lithodes richeri* Macpherson, female (NSMT-Cr 15694) in dorsal view (B); carapace in lateral and posterior views (A, C); abdomen (D).

long as terminal spine of upper margin of merus. Propodus slender, only slightly narrowing distally, armed with three or four small tubercles on upper margin and several on lower margin. Two or three tubercles each on upper and lower surfaces; terminal tubercle of upper margin distinct. Dactylus slender, weakly curved, with anteroposteriorly depressed distal claw; four proximal tubercles, viz., two on upper and two on lower surfaces weakly developed so as to be tuberculated and directed distally.

Abdomen well developed so as to cover whole sternal surface, twisted as usual, as represented in Fig. 6D.

Remarks. The female specimen (175×175 mm) described above in detail is much larger than the known specimens, four males (64×58 mm to 102×102 mm) in the type series of *Lithodes richeri* from New Caledonia. As known in the other lithodid species, it is highly probable that the size of spines of the carapace and the ambulatory legs, the proportions of the carapace, and the convexity of the dorsal areolae of the carapace are variable with growth, and also with sex. In the original description of *L. richeri*, it was noted that the carapacial spines are longer in the small specimens, and that the rostrum of the smallest specimen is slightly longer than the postrostral carapace and is different from the others, in which the rostrum is slightly shorter. Other variations were not mentioned in the original description; the rostrum may be variable not only in the total length, but also in the distal bifurcation. This means that the distal branch of the rostrum is short, and so the distal bifurcation seems to be smaller in the large specimens.

There are some discrepancies between the female specimen at hand and the descriptions and photographs of the holotype male (81×89 mm). The holotype with a slender chela may attain a larger size; the carapace is typically pyriform, with weakly and generally convex and concave lateral and posterior margins, respectively; the median part of the branchial margins on both sides forms the greatest breadth of the carapace. In the specimen at hand, the branchial anterolat-

eral margin is straight, retreating toward the third branchial spine; the branchial margin is angulated at this spine, and the distance between the tips of the spines on both sides forms the greatest breadth of carapace at about anterior one third of the branchial margin; the posterior margin of the carapace is not concave at all, or rather convex as an extension of the branchial margin. In the specimen at hand, the dorsal and marginal spines of the carapace are apparently smaller, and the anterior pair of gastric spines are not the same size as the posterior pair, but distinctly larger; the rostrum is stout and tapering distally, with smaller distal bifurcation compared with that of the holotype.

In the present paper, the differences mentioned above refer to growth variation in individuals, and therefore the specimen at hand was rather tentatively identified with *L. richeri*. In due time the large specimens from New Caledonian deep sea and small specimens from the Ceram Sea will contribute to the definite identification of this species.

Distribution. *Lithodes richeri* was reported from outside of coral reef in New Caledonia. The specimen at hand from the Ceram Sea was obtained from the deep sea, 1,000–1,500 m.

Geryonidae

Genus *Chaceon* Manning et Holthuis, 1989

Chaceon karubar Manning, 1993

(Fig. 7)

Material examined. Two males (NSMT-Cr 15695, 15696). Breadth of carapace including lateral teeth, 205 and 200 mm; length of carapace in median line (excluding frontal teeth), 180 mm in the smaller male. In the larger male, the frontal part is somewhat deformed after injury to its left two thirds.

Remarks. *Chaceon karubar* is known only by the holotype male (170×190 mm) from off the Tanimbar Islands, Indonesia, 552–549 m deep. As mentioned in the original description and as readily understood from the key to nine Pacific species of *Chaceon* given by Ng and Manning

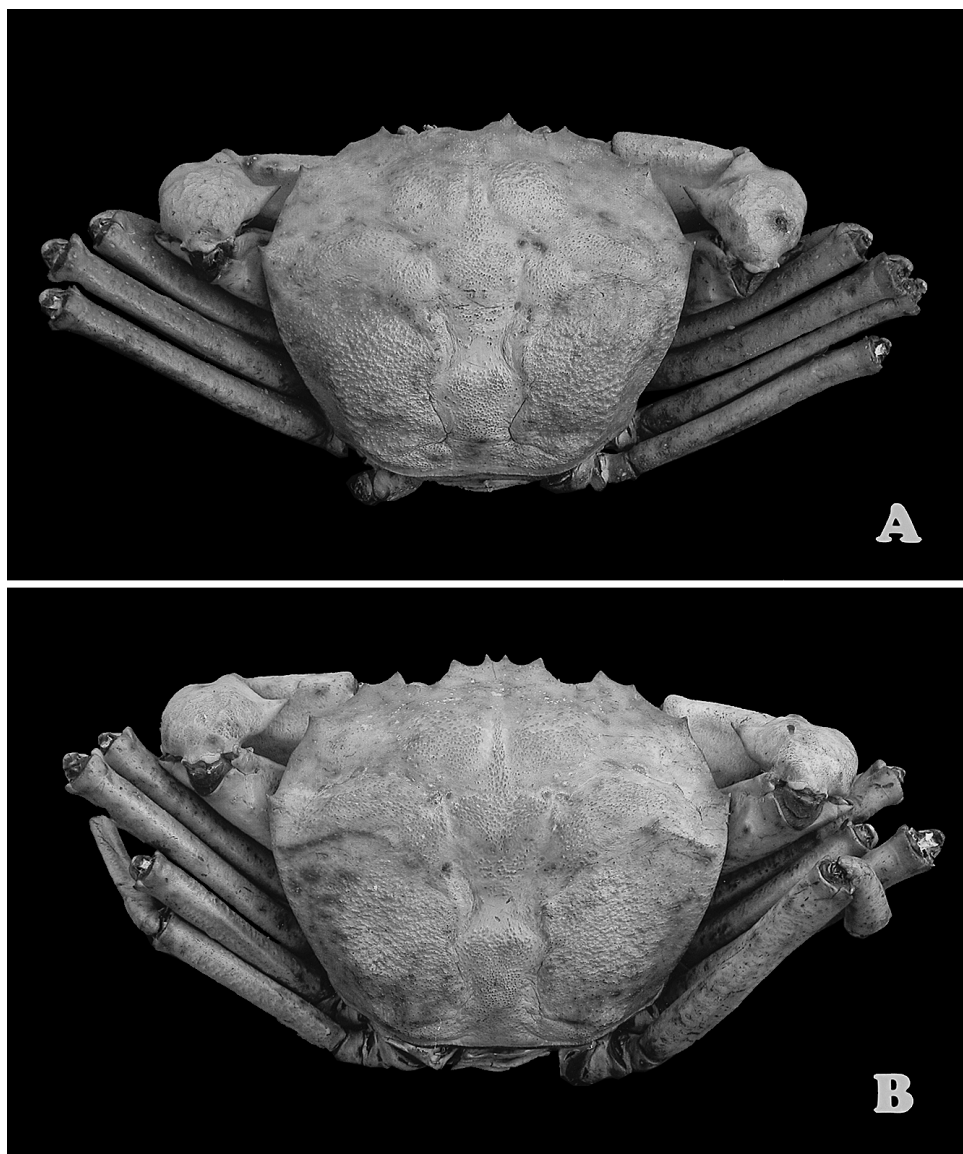


Fig. 7. *Chaceon karubar* Manning, males (NSMT-Cr 15695 and 15696) in dorsal view. Breadth of carapace, 205 and 200 mm, respectively.

(1998), this species belongs to the *C. granulatus* species group, viz. *C. granulatus* (Sakai, 1978) ranging from Japan to Taiwan (cf. Ng *et al.*, 1998), *C. manningi* Ng, Lee et Yu, 1994 from northern South China Sea, and *C. micronesicus* Ng et Manning, 1998 from the Palau Islands. This species group is most characteristic in having the laterally flattened ambulatory dactyli distinct from the other species having the dorsoven-

trally flattened dactyli. In the original description, it was noted that this species differed from *C. granulatus* in having longer legs, a distal dorsal spine on each ambulatory merus, an outer spine or projection on the carpus of the cheliped, and in having fewer granules on the carapace.

In the specimens at hand which are bigger than the holotype, the spine projection on the outer surface of chelipedal carpus is worn out, and the

distal dorsal spines of the ambulatory meri are also not distinct but only angulated. It may be readily understood that these characters indicate developmental variation rather than individual variation.

Distribution. Previous record: Off Tanimbar Islands, Indonesia, 552-549 m deep.

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