



## Some lithodid crabs (Crustacea: Decapoda: Lithodidae) from Taiwan and adjacent waters, with the description of one new species from Guam

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### Abstract

Seven species of Lithodid crabs were collected during cruises off Taiwan and Guam. One new species, *Lithodes paulayi* is described and illustrated. *Neolithodes nipponensis*, *Lithodes* sp., *Paralomis arae*, *P. dofleini* and *P. truncatispinosa* are reported from these islands for the first time, extending the distributional range in each case. *Lithodes paulayi* closely resembles *L. longispina* Sakai, 1971, from off Japan and the central Pacific, but can be differentiated by the branchial region possessing two long dorsal spines and only one long marginal spine, whereas *L. longispina* has only one long dorsal spine, situated at level of cardiac spines, and two long marginal spines. The description of a juvenile of *P. arae* Macpherson, 2001, is also included.

**Key words:** king crab, *Neolithodes*, *Lithodes*, *Paralomis*, new species, Pacific Ocean

### Introduction

The family Lithodidae Samouelle, 1819, in the Western Pacific Ocean, has received some attention during last decades, and it is clear that this area supports a rich fauna, including undescribed species mostly belonging to the genera *Lithodes* Latreille, 1806, *Neolithodes* A. Milne Edwards & Bouvier, 1894 and *Paralomis* White, 1856 (e.g. Dawson 1989; Takeda & Hashimoto 1990; Macpherson 1988b, 1990, 2001, 2003; Ahyong & Dawson 2006; Takeda & Bussarawit 2007).

Only one species, *Lithodes turritus* Ortmann, 1892, has been previously reported from Taiwan, and commercial trawlers collect it infrequently (Wu *et al.* 1998). However, considering that the number of species from the Northern Pacific is relatively high, the occurrence of more species was expected. Recent deep-sea exploratory cruises around Taiwan (the TAIWAN cruises) and ongoing scrutiny of the catches of local deep-sea trawlers has enabled us to obtain numerous specimens of different species of Lithodidae. The present study shows the occurrence of one species of *Neolithodes*, two species of *Lithodes* and three species of *Paralomis* from Taiwan. Another species of *Lithodes* collected recently from Guam, obtained by the second author (TYC) to compare to the Taiwanese species, was itself found to be new to science, and is described here.

The Taiwanese specimens are deposited in the collections of the National Taiwan Ocean University, Keelung (NTOU), while the specimens from Guam are deposited at the University of Florida (UF). The stations (Stn) of the TAIWAN cruises have a prefix which refers to the collecting gear used; otter trawl le Drézén type JUNEUX (CD), 4 m French beam trawl (CP), and 2.5 m French beam trawl (PCP). The measurements given are of carapace length x carapace width, excluding rostrum and lateral spines, respectively. The terminology used follows previous papers, e.g., Macpherson (1988a, 2003) and Ahyong & Dawson (2006).

## Systematic account

### Family Lithodidae Samouelle 1819

#### *Neolithodes nipponensis* Sakai, 1971

(Fig. 5a)

*Neolithodes nipponensis* Sakai, 1971: 7, figs 1a–f, pl. 8. — Sakai 1976: 697, figs 378a–f, pl. 244. — Ikeda 1998: 47, pl. 65. — Macpherson 2001: 799; 2003: 414.

**Material examined.** Taiwan: Stn CD 129, 21.8.2001, 22°5.89'N, 121°5.21'E, 1271–1275 m: 1 ovigerous female 135 × 119 mm, 2 females 68 × 61 mm and 71 × 64 mm. — Stn CD 134, 22.11.2001, 22°16.56'N, 120°6.11'E, 736–1040 m: 1 male ca. LC = 24 mm (broken). — Stn CD 206, 30.05.2003, 22°5.67'N, 121°2.65'E, 1278–1298 m: 1 male 49 × 45 mm. — Stn CD 228, 30.8.2003, 22°8.7'N, 121°0.97'E, 1259–1383 m: 4 males 55 × 49 mm - 73 × 65 mm. — Stn CP366, 25.8.2006, 22°2.872N, 121°10.079E, 1302–1752 m: 1 male 47 × 41 mm.

**Coloration.** Generally reddish. Eye black brown.

**Distribution.** Previously reported from Japan, between 200 and 950 m, Fiji Islands at 1058–1091 and Solomon Islands in 1036–1203 m. The present material was collected between 736 and 1752 m.

#### *Lithodes turritus* Ortmann, 1892

(Fig. 5b)

*Lithodes turritus* Ortmann, 1892: 321, pl. 12, fig. 26. — Balss 1913: 73, figs 42–45, pl. 11. — Sakai 1971: 10, 32, figs 2a, b., pl. 4, fig. 1, pl. 11, fig. 1; 1976: 693, figs 376a, b, pl. 240, pl. 243, fig. 1. — Baba 1986: 211, 306, fig. 156. — Macpherson 1988a: 49; 1988b: 124; 1990: 218. — Ikeda 1998: 152, pl. 66. — Wu *et al.* 1998: 819, figs 1–2. — Komai 2000: 349.

**Material examined.** Taiwan: Dasi fishing port, Yilan County, commercial trawler, 500–600 m, 31.05.1996: 1 male 137 × 143 mm. — 9.04.1997: 1 male 149 × 155 mm, 1 female 134 × 132 mm. — 13.05.1997: 1 female 119 × 119 mm. — 02.1999: 1 male 65 × 67 mm. — 25.04.2003: 1 male 168 × 178 mm. — 18.12.1997: 1 ovigerous female 124 × 128 mm. — no date: 3 males 86 × 87 mm–141 × 159 mm, 1 female 79 × 79 mm.

**Coloration.** Body generally reddish, ventral surface paler to pinkish. Lateral surface of chelipeds somewhat whitish. Eyes black brown.

**Distribution.** Previously known from Japan, East China Sea, Philippines, between 300 and 812 m.

#### *Lithodes paulayi* n.sp.

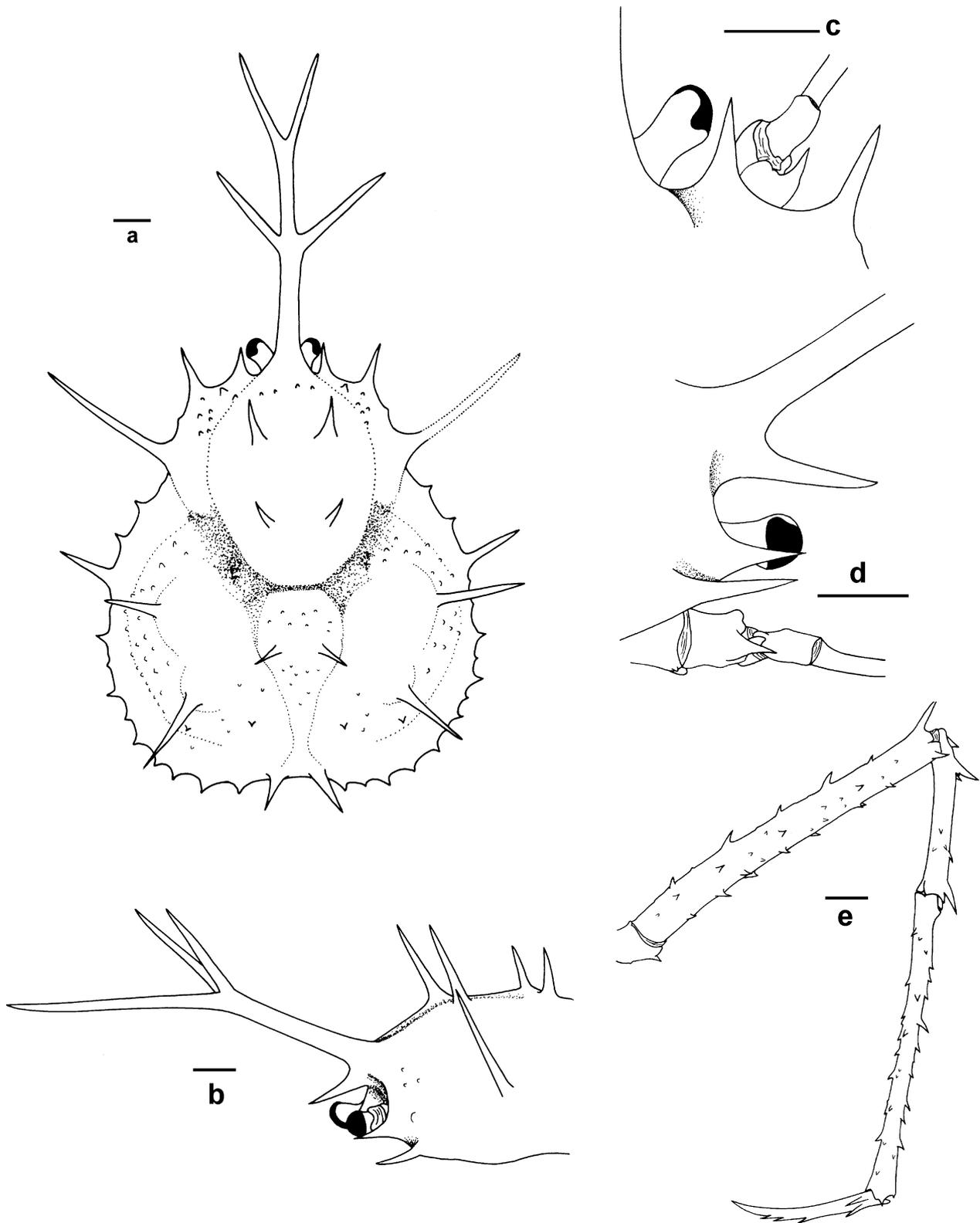
(Figs 1–3, 5c)

**Material examined.** Guam: 3–4 miles South, 27.09.1998, trap, 740 m: male holotype 113 × 102 mm (UF 2283). — 1.5 miles off Maizo, 11.1998, 740 m: 1 male paratype, 45 × 39 mm.

**Etymology.** This new species is named after Gustav Paulay, who kindly entrusted us with the study of his material from Guam.

**Description.** Carapace more or less pyriform, slightly longer than broad. Regions well defined. Gastric region convex, more prominent than other areas, with two pairs of strong spines, the anterior pair being larger than the posterior. Gastric and cardiac regions separated by deep transverse furrow. Cardiac region armed with 2 spines similar in size to posterior pair of gastric spines. Two long spines present on intestinal region. Bran-

chial regions as prominent as cardiac, each with 2 long spines, the anterior spine directed slightly laterally, the second spine, slightly smaller than the anterior one, at a level posterior to the cardiac spines. Each region with numerous small granules.



**FIGURE 1.** *Lithodes paulayi* n.sp., holotype male 113 × 102 mm, Guam. (a) carapace, dorsal. (b) lateral view of anterior carapace and rostrum. (c) dorsal view of right anterolateral carapace and appendages. (d) lateral view of right anterolateral carapace and appendages. (e) right third walking leg, dorsal. Scales = 1 cm.



**FIGURE 2.** *Lithodes paulayi* n.sp., Guam. (a, c) holotype male 113 × 102 mm. (b, d) paratype male 45 × 39 mm. (a–b) dorsal view of carapace. (c–d) lateral view of carapace.



**FIGURE 3.** *Lithodes paulayi* n.sp., Guam. (a–c) holotype male 113 × 102 mm. (d) paratype male 45 × 39 mm. (a) dorsal view of left basal segment of antennal peduncle. (b) lateral view of right chela. (c–d) right third walking leg, dorsal.

Rostrum with anterior projection long and bifid. Two long dorsal spines and one strong and curved basal spine. The anterior projection is directed upward in its proximal part (before dorsal spines), being nearly horizontal in its distal part. The anterior projection is 0.8 times the carapace length.

External orbital spines well developed, not overreaching end of eyes. Anterolateral spines longer than external orbital. Space between anterolateral and hepatic spines without spines. Hepatic spines very long. Each branchial border with one strong spine, clearly smaller than hepatic spine, and 11 or 12 small spines.

Second abdominal segment with a few small spines on the median plate and external edges of plates.

Eyestalks without dorsal spines.

Basal segment of antennal peduncle with spine on outer terminal angle, not exceeding first half of penultimate segment.

Chelipeds with merus bearing strong spines on the terminal border. Carpus with strong spines on dorsal and outer surfaces. Palm armed with several poorly defined rows of thick but short spines on dorsal, outer and ventral borders. Fingers 1.4 times palm length, with numerous tufts of setae. Some small spines scattered on segments.

Walking legs long, third longer than first and second. Third walking leg 3 times carapace length. On third walking leg, coxa with few short spines on ventral side and terminal border, basis-ischium with several short spines on terminal border. Merus slightly longer than carapace length, and 9 times longer than high. Several spines on extensor (dorsal), posterior and flexor (ventral) borders, with some smaller spines scattered in between, distal spine on extensor border strongest than others. Carpus 0.5 times merus length, with long spine on extensor and terminal border and some small spines scattered on extensor and posterior borders. Propodus 0.9 times shorter than merus, about 12.5 times longer than high, and twice length of dactylus, with some spines on extensor border and some smaller ones on outer surface and flexor border. Dactylus rounded in cross section, with some spines on base and along extensor margin.

**Variations.** The male paratype has all spines clearly longer than in the holotype (Figs 2b, d, 3d). Nevertheless, the positions of the largest spines on the carapace are similar in both specimens. The proportions of the articles of the walking legs are also similar.

**Coloration.** Generally reddish.

**Remarks.** *Lithodes paulayi* n. sp. belongs to the group of species possessing a carapace with some long spines, e.g., *L. longispina* Sakai, 1971 from the waters off Japan and the central Pacific, and *L. megacantha* Macpherson, 1991 from French Polynesia (see Sakai 1971; Macpherson 1991; Ikeda 1998). The new species is readily distinguishable from *L. longispina* by the following:

— Each branchial region has two long dorsal spines and only one long marginal spine in the new species. In *L. longispina* each branchial region has only one long dorsal spine, situated at level of cardiac spines, and two long marginal spines.

— The rostrum is longer in the new species than in *L. longispina*, clearly shown when similar sized specimens of the two species are compared.

— The distolateral spine of the basal segment of the antennal peduncle does not exceed the proximal half of the penultimate segment in the new species, whereas it reaches the end of this segment in *L. longispina*.

— The walking legs are more slender in the new species than in *L. longispina*. The merus and propodus of the third walking leg are 9 and 12.5 times longer than high, respectively. In males of *L. longispina* these values are about 7 and 9 times respectively.

— The lateral surface of the walking legs is covered with many small spines in *L. longispina*, whereas these spines are almost absent in the new species.

The second closely related species, *L. megacantha*, has the number and position of the long branchial spines similar to *L. longispina*, and thus, *L. paulayi* is similarly easily distinguished. Furthermore, the spines on the carapace and walking legs are clearly longer in *L. megacantha* than in the new species. The comparison between similar sized specimens of the two species clearly showed this difference (see Macpherson 1991).

### ***Lithodes* sp.**

**Material examined.** Taiwan: Dasi fishing port, Yilan County, commercial trawl, 500–600 m, 6.6.1998: 1 ovigerous female 56 × 54 mm. — Stn PCP 344, 8.3.2006, 22°15.952N, 120°0.11E, 995–1073 m: 1 female 11

× 9 mm.

**Coloration.** Body reddish, eye black brown. Eggs orange.

**Remarks.** This species closely resembles the new species, *Lithodes paulayi*, from Guam, in the general arrangements of the spines on the carapace but the spines are relatively shorter, and there are also other differences. However, the Taiwanese material also appears closely related to another new species from southern Australia currently being described by Ah Yong (in prep.), and thus its status will be further studied in that separate work.

### ***Paralomis arae* Macpherson, 2001**

(Figs 3, 5e)

*Paralomis arae* Macpherson, 2001: 799, figs. 1–3.

**Material examined.** Taiwan: Stn CD 191, 28.08.2002, 21°41.04'N, 118°21.95'E, 1630–1623 m: 1 female 14 × 14 mm (NTOU A-00849).

**Coloration.** Generally reddish pink.

**Remarks.** *Paralomis arae* is only known from the holotype (male, 74.5 × 72 mm) collected in Fiji, at 1058–1091 m. The occurrence of a juvenile specimen of this species in Taiwan widely extends its distribution range and provides new morphological information. The taxonomic status of the two specimens was confirmed by molecular analysis (COI gene, unpublished data). The clear differences between juveniles and adults in lithodid crabs have been pointed out in previous papers (Macpherson, 1988) and their illustration is strongly recommended. The specimen from Taiwan shows important differences compared to the adult holotype, as follows:

— The anterolateral spine of the carapace is much longer than the external orbital spine, whereas it is slightly shorter in the adult.

— Each branchial lateral edge have six strong spines, whereas in the adult specimen these spines are more numerous (8 or 9) and clearly smaller.

— The scaphocerite has more spines in the adult than in the juvenile. The dorsal side is unarmed in the Taiwanese juvenile, but has 3 or 4 spines in the holotype; and furthermore, the lateral margin has 4 or 5 well developed spines in the adult, but only 3 in the juvenile.

**Distribution.** Previously known from Fiji, at 1058–1091 m.

### ***Paralomis dofleini* Balss, 1911**

(Fig. 5d)

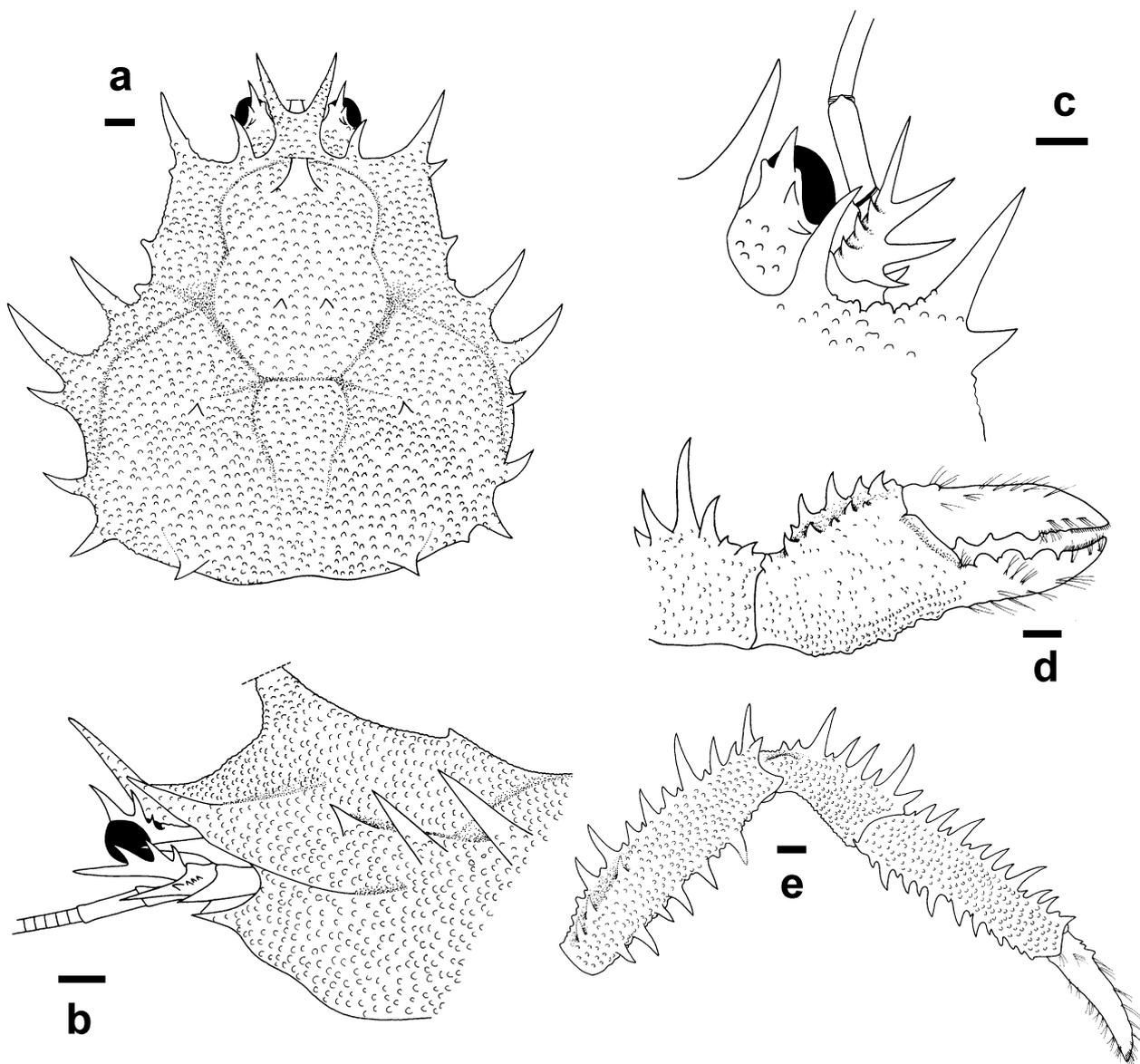
*Paralomis dofleini* Balss, 1911: 8, figs 16, 17 ; 1913: 76, figs 46–48. — Sakai 1971: 18, 39, pl. 7, fig. 1, pl. 17; 1976: 703, pl. 248. — Macpherson 1990: 223, figs 2e, 3c, d. — Ikeda 1998: 164, pl. 72.

**Material examined.** Taiwan: Dasi fishing port, Yilan County, commercial trawler, 500–600 m, 26.09.1998: 1 female 40 × 42 mm. — 05.2000: 1 ovig. female 66 × 64 mm. — 07.2005: 1 male 76 × 72 mm.

**Coloration.** Body generally orange-red. Eye black brown.

**Remarks.** *Paralomis dofleini* is closely related to *P. haigae* Eldredge, 1976 from Guam, Solomon Islands, New Caledonia and Samoa. Several characters appear useful to distinguish both species, i.e. granulation of the carapace and pereopods (Eldredge 1976; Macpherson 1990), but a more thorough analysis of more material is desirable before the separate identity of both species can be conclusively validated.

**Distribution.** Sagami Bay, Japan, at 330–550 m (Bals 1911, 1913; Macpherson 1990; Ikeda 1998), off Kominato, Japan, between 470–780 m (Sakai 1971, 1976).



**FIGURE 4.** *Paralomis arae* Macpherson, 2001. Taiwan, female 14 × 14 mm. (a) carapace, dorsal. (b) anterior carapace, lateral. (c) dorsal view of right anterolateral carapace and appendages. (d) right chela and distal carpus, lateral. (e) right third walking leg, dorsal. Scales = 1 mm.

***Paralomis truncatispinosa* Takeda & Miyake, 1980**

(Fig. 5f)

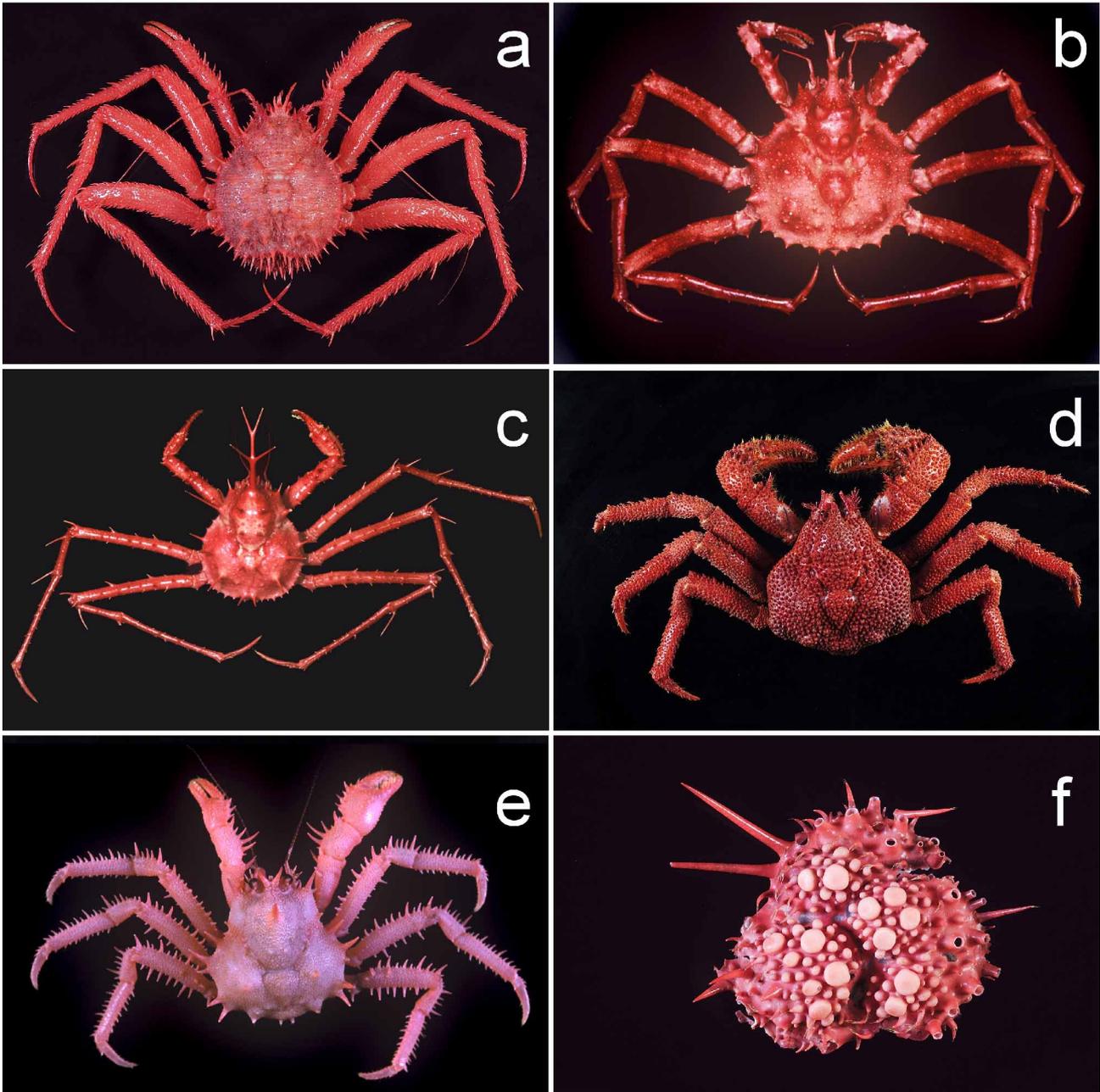
*Paralomis truncatispinosa* Takeda & Miyake, 1980: 42, figs 1–4. — Macpherson 2003: 416.

*Paralomis heterotuberculata* Yumao, Fuzhen & Zhicheng, 1984: 329.

**Material examined.** Taiwan: Stn CD 231, 31.08.2003, 22°14.32'N, 119°58.78'E, 951–1062 m: 1 specimen broken, sex undetermined, ca. LC = 35 mm.

**Coloration.** Carapace pinkish red, large flat tubercles pinkish.

**Distribution.** Previously known from East China Sea, at 642–840 m.



**FIGURE 5.** Dorsal view. (a) *Neolithodes nipponensis* Sakai, 1971, male, Taiwan, Stn CD228. (b) *Lithodes turritus* Ortmann, 1892, male, Taiwan, Dasi fishing port. (c) *Lithodes paulayi* n.sp., holotype male, Guam. (d) *Paralomis dofleini* Balss, 1911, male, Taiwan, Dasi fishing port. (e) *Paralomis arae* Macpherson, 2001, female, Taiwan. f, *Paralomis truncatispinosa* Takeda & Miyake, 1980, broken carapace, Taiwan, Stn CD231.

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