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A REVIEW OF THE HERMIT-CRAB (DECAPODA: ANOMURA: PAGURIDEA) FAUNA OF SOUTHERN THAILAND, WITH PARTICULAR EMPHASIS ON THE ANDAMAN SEA, AND DESCRIPTIONS OF THREE NEW SPECIES

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ABSTRACT

The hermit-crab fauna of Thailand has received very little systematic attention, and what has been done, has dealt primarily with shallow-water species. As one element of the Workshop on Biodiversity of Crustacea in the Andaman Sea, an examination of the hermit-crab fauna collected by the Phuket Marine Biological Center during its BIOSHELF Program was undertaken. These collections were supplemented by additional sampling during the Workshop and by materials available through other institutions. As a result, species diversity has been substantially augmented. Four of the five families of the Paguridea are presently recognized from Thai environs. Through a nomenclatorial correction, three, rather than four species of the semiterrestrial genus *Coenobita* have been identified. The family Diogenidae now accounts for 39 species, 12 each in the genera *Clibanarius* and *Diogenes*, seven in the genus *Dardanus*, and five in *Calcinus*, while the genus *Paguristes*, with three species, was recorded in the area only recently. The Paguridae is currently represented by eight genera, seven of which are new records for Thailand. These include *Alainopaguroides*, *Catapaguroides*, *Nematopagurus*, and *Pylopaguropsis* each with one species, *Catapagurus* and *Spiropagurus* each represented by two species, and *Pagurus* by three species. The species of *Alainopaguroides* and one species each of *Catapagurus* and *Pagurus* are being described for the first time. The genus *Pagurixus* also just recently reported may be represented by one or possibly two species. Additionally, the occurrence of one species of the genus *Oncopagurus,* family Parapaguridae, is documented.

INTRODUCTION

Alcock's (1905b) monographic treatment of hermit-crabs in the collections of the Indian Museum, Calcutta, provided the basis for our knowledge of the Indo-Pacific fauna, and little additional information pertaining to the fauna of Thailand has been added since. The only modern systematic study of Thai hermit-crabs was the Master's thesis work of Pitagsalee (1980, unpublished), which enabled Naiyanetr (1980) to include 24 species in his checklist of the crustacean fauna of Thailand. Nateewathana *et al.*'s (1981) inventory of the collections of the Phuket Marine Biological Center (PMBC) cited only three hermit-crab species. Forest (1984) reported the occurrence of *Aniculus retipes* Lewinsohn, 1982 on the basis of a specimen he examined from the Phuket aquarium, from an unknown locality. In a recently updated check list, Naiyanetr (1998) increased the number of hermit-crab species occurring in the Gulf of Thailand and/or Andaman Sea to 29; however *A. retipes* was not included. It is not certain that Lewinsohn's (1982a) species actually occurs in Thai waters, and therefore has not been included in the present account; however the genus has been included in the generic key, in the event that it actually is present. The citation by Rahayu (2000) of Thailand in the general distribution of *A. retipes* was based on Forest's (1984) report.

Although studies from other Indo-Pacific areas have brought about more accurate species identifications, some of which are applicable to

Thai species, the overall species representation has been affected only in the reduction of the number of semiterrestrial species from four to three. An additional seven species, not reported by Naiyanetr, have just been identified from the Phuket area (Rahayu and Komai, 2000), and representatives of most have been deposited in the PMBC reference collection. Rahayu and Komai also indicated that two species of the pagurid genus *Pagurixus* Melin, 1939, were found in the area, but their taxonomic status had not been established. Only one specimen of a presumed *Pagurixus* species is represented in the current material.

During 1996–98 (B.E. 2539–2541), the Phuket Marine Biological Center, in cooperation with the Zoological Museum of the University of Copenhagen, Denmark (ZMUC) and DANIDA (the Danish foreign aid organization) conducted a biological survey of the Andaman Sea offshore shelf region (PMBC–ZMUC–DANIDA BIOSHELF Program). The hermit-crabs from that program, together with collections made during the Workshop on Crustacean Biodiversity (29 November – 20 December, 1998) held at the Phuket Marine Biological Center, the by-catch from local fishing trawlers in the adjacent Andaman Sea, and several miscellaneous collections have provided a number of additional species for a total now of 56 or 57 species. One taxon, described as *Pagurus* sp. in Pitagsalee's (1980) thesis, has proved to be *Pagurus kulkarnii* Sankolli, 1962, while a second taxon identified as *Pagurus* cf. *boriaustraliensis* Morgan, 1990, by Rahayu and Komai (2000) actually represent a new species of *Pagurus*. Two additional new species, one in the genus *Alainopaguroides* McLaughlin and one in the genus *Catapagurus* A. Milne-Edwards are described from the BIOSHELF collections. It would not be surprising to find that with additional reef and off-shore sampling efforts the present list of species would be enhanced still further.

Species of Paguridea from Thailand

Coenobita brevimanus Dana
Coenobita rugosus H. Milne Edwards
Coenobita violascens Heller
Paguristes monoporus Morgan
Paguristes longirostris Dana
Paguristes hians Henderson
Clibanarius infraspinatus Hilgendorf
Clibanarius ransoni Forest*
Clibanarius cruentatus H. Milne Edwards
Clibanarius virescens Krauss
Clibanarius merguiensis De Man
Clibanarius arethusa De Man
Clibanarius longitarsus (De Haan)
Clibanarius clibanarius (Herbst)
Clibanarius antennatus Rahayu and Forest
Clibanarius demani Buitendijk
Clibanarius padavensis De Man
Clibanarius danai Rahayu and Forest
Calcinus elegans (H. Milne Edwards)*
Calcinus gaimardii (H. Milne Edwards)
Calcinus pulcher Forest
Calcinus laevimanus (Randall)*
Calcinus latens (Randall)*
Diogenes stenops Morgan*
Diogenes guttatus Henderson
Diogenes goniochirus Forest
Diogenes rectimanus Henderson
Diogenes costatus Henderson
Diogenes avarus Heller
Diogenes klaasi Rahayu and Forest
Diogenes serenei Forest
Diogenes tumidus Rahayu and Forest
Diogenes planimanus Henderson
Diogenes mixtus Lanchester
Diogenes dubius (Herbst)
Dardanus callichela Cook
Dardanus pedunculatus (Herbst)
Dardanus hessii (Miers)
Dardanus lagopodes (Forskål)
Dardanus setifer (H. Milne Edwards)
Dardanus aspersus (Berthold)
Dardanus megistos (Herbst)
Catapaguroides sp.
Alainopaguroides andamanensis n. sp.
Nematopagurus cf. *australis* (Henderson)
Catapagurus sp. of Haig and Ball
Catapagurus danida n. sp.
? *Pagurixus anceps* (Forest)
Pylopaguropsis lewinsohni McLaughlin and Haig
Pagurus cavicarpus (Paul'son)
Pagurus pitagsaleei n. sp.
Pagurus kulkarnii Sankolli
Spiropagurus spiriger De Haan
Spiropagurus profundorum Alcock
Oncopagurus monstosus (Alcock)

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MATERIALS AND METHODS

For the purpose of this review, the marine areas of southern Thailand are defined on the Andaman Sea side as extending from Ranong in the north to Satun in the south, and on the Gulf of Thailand side, from Prachuap Khirikhan and Rayong in the north to Narathiwat in the south. The primary material for this study comes from collections of the PMBC–ZMUC–DANIDA BIOSHELF Program, supplemented by materials obtained during the Workshop. These collections have been further enhanced by specimens from the PMBC reference collection and from supplemental shore collections and samplings of the by-catch of the Andaman fishing fleet based in Phuket, now in the collections of the Raffles Museum, National University of Singapore, Republic of Singapore (ZRC), or the personal collection of the author (PMcL), as well as by specimens collected and reported on by C. Pitagsalee (1980), currently in the collections of Chulalongkorn University Museum of Zoology (CUMZ), Bangkok, and hermit-crabs collected during the Fifth Thai–Danish Expedition of 1966 and recently added to the PMBC reference collection. Additional materials from the California Academy of Sciences, San Francisco, California, U.S.A. (CAS); the Marine Reference and Resource Collection Centre, University of Karachi, Karachi, Pakistan (MRCRC), the Nationaal Natuurhistorisch Museum, Leiden, The Netherlands (RMNH), and the International Indian Ocean Expedition (IIOE) of 1963, currently deposited in collections of the National Museum of Natural History, Smithsonian Institution, Washington, D.C., U.S.A. (USNM) also have been examined. As necessary, identifications have been confirmed by comparisons with type materials from the collections of the Nationaal Natuurhistorisch Museum, Leiden, The Natural History Museum, London, England (NHM), the Naturhistorisches Forschungsinstitut Museum für Naturkunde zu Berlin, Berlin, Germany (ZMB), and the Naturhistorisches Museum Wien (NHMW), Vienna, Austria. All species actually recorded for southern Thailand are included in this report. Those not personally examined are marked with an asterisk. Holotypes and paratypes have been deposited in the reference collection of the Phuket Marine Biological Center. Additional non-type specimens, as available, have been deposited in the Chulalongkorn University Museum of Zoology collection and the National Museum of Natural History, Smithsonian Institution. Borrowed specimens have been returned to their lenders.

Restricted synonymies for the species include the reports of regional authors, illustrated works, synonyms, inaccurate spellings, clarifications of systematic problems, and incorrect identifications, but should not be interpreted as inclusive of all such existing references. General morphological terminology is that of McLaughlin (1974). The terms semi- and subchelate, in reference to the structure of the fourth pereopod, are used according to the definition of McLaughlin (1997), and gill type as defined by McLaughlin and de Saint Laurent (1998). Shield length (sl), as measured from the tip of the rostrum, or midpoint of the rostral lobe, to the midpoint of the posterior margin of the shield provides an indication of animal size. The abbreviation, ovig. indicates ovigerous female, and coll. is used to denote the collector. Keys to the local taxa are provided. The presentation of taxa follows the keys to those taxa, and is not intended to have any phylogenetic implication.

SYSTEMATICS

Section Paguridea

Key to the Superfamilies

1. Third maxillipeds basally approximate or nearly so.....Coenobitoidea
— Third maxillipeds basally widely separated.....Paguroidea

Superfamily Coenobitoidea

Key to the regional families

1. Antennules with flagella 'stick-like' (semiterrestrial).....Coenobitidae
— Antennules with flagella not 'stick-like' (marine and/or brackish waters).....Diogenidae

Family Coenobitidae

Coenobita Latreille, 1829

Key to the regional species

1. Palms of both chelae with brush of setae on upper margins.....2
— Palm of left chela without brush of setae on upper margin.....*C. brevimanus*
2. Upper outer surface of left chela with ridge of tubercles forming stridulatory mechanism.....*C. rugosus*
— Upper outer surface of left chela without ridge of tubercles forming stridulatory mechanism.....*C. violascens*

Coenobita brevimanus Dana, 1852c

Cenobita clypeata.– H. Milne Edwards, 1837: 239 (in part).

Cenobita clypeata.– Dana, 1852c: 473; 1855: pl. 30, fig. 4a. Not *Coenobita clypeatus* (Fabricius, 1787).

Cenobita clypeata var. *brevimanus* Dana, 1852c: 473; 1855: pl. 30, fig. 4b.

Coenobita clypeata.– Ortmann, 1892: 316, pl. 12, fig. 20.– Fize and Serène, 1955: 7, pl. 1, fig. 1. Not *Coenobita clypeatus* (Fabricius, 1787).

Coenobita clypeatus.– Hilgendorf, 1869: 98, pl. 6, figs 3c, 4a.– Alcock, 1905b: 142, pl. 15, figs 1, 1a. Not *Coenobita clypeatus* (Fabricius, 1787).

Coenobita hilgendorfi Terao, 1913: 388.– Frith and Alexander, 1978: 2.– Naiyanetr, 1998: 46 (list).

Coenobita clypeata var. *Puerto-galera* Yap-Chiongco, 1938: 213.

Coenobita brevimanus.– Rathbun, 1910: 314.– Nakasone 1988: 174, figs 8, 9F.

Coenobita brevimana.– Frith and Alexander, 1978: 2.– Naiyanetr, 1998: 46 (list).

Material examined

PMBC 3969, 1 male, sl = 13.7 mm, Kradan Island, Andaman Sea, Fifth Thai–Danish Expedition, supralittoral, coll. Gallardo, 11.02.1966; CUMZ 1369, CUMZ1370, PMcL, 3 males, sl = 17.4–29.8 mm, Surin Island, Phang-nga, coll. Naiyanetr, 1995.

Diagnosis

Shield narrow, convex, surface punctate. Ocular peduncles subcylindrical, extending just beyond proximal margin of ultimate antennal peduncular segment; ocular acicles with anterior margin serrate or tuberculate. Antennal acicle not usually fused to second segment of peduncle.

Meri of chelipeds transversely rugose. Outer surfaces of carpi with irregularly scattered, low tubercles, becoming spinulose near upper margin. Chelae similarly armed, but tubercles often worn or lacking on central outer face of palm of left; no stridulatory ridge on upper outer surface. Upper margin of palm of right (only) cheliped with thick brush of coarse setae. Ambulatory legs with rugose and punctate lateral faces. Upper surfaces of carpi, propodi and dactyls with numerous small corneous-tipped, spinulose tubercles, most abundant on dactyls.

Coxae of males slightly separated, stout, posteriorly directed, no sexual tube developed from either coxa.

Colour in life.– Purplish-pink; in preservative, dusky violet or livid purple.

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Habitat

Leaf litter and debris, rotting wood, in sandy burrows, and crevices in tree trunks. Frequenting forested areas as far as approximately 50 m inland (Frith and Alexander, 1978).

Records for southern Thailand.– Kradan Island, Trang, Andaman Sea.

Distribution

East coast of Africa, Andaman Sea to Line Islands and Tuamotu Archipelago, including southern Ryukyus, Japan.

Remarks

One of the principal diagnostic characters setting *C. brevimanus* apart from other coenobitid species is the lack of fusion of the antennal acicle with the second peduncular segment (cf. Nakasone, 1988). However in one of the specimens from Sirin Island, the acicle was separated on the left, but entirely fused on the right side. Consequently, the lack of a brush of setae on the upper margin of the left chela is a more reliable character.

Coenobita rugosus H. Milne Edwards, 1837

Cenobita rugosa H. Milne Edwards, 1837: 241.– Dana, 1852c: 471; 1855, pl. 30, fig. 1.

Caenobita clypeata Owen, 1839: 85, pl. 25, fig. 3. Not *Coenobita clypeatus* (Fabricius, 1787).

Cenobita rugosus.– De Haan, 1850: 212.

Coenobita rugosus.– Ortmann, 1892: 317, pl. 12, fig. 22.– Alcock, 1905b: 143, pl. 14, figs 3, 3a.– Holthuis, 1954: 16, figs 4c, d; 1978: 28.– Miyake, 1956: 333, figs 22, 23a, b; 1978: 68, fig. 25.– Lewinsohn, 1969: 93, fig. 17.– Nakasone, 1988: 168, fig. 3A–G.

Coenobita rugosa.– Fize and Serène, 1955: 12, figs 2, 3A, pl. 1, figs 3, 5, 7–10.– Frith and Alexander, 1978: 3.– Pitagsalee, 1980: 23, figs 12, 13.– Naiyanetr, 1980: 23 (list); 1998: 46 (list).– Sakai, 1999: 12, pl. 3G.

Coenobita rugosa var. A. *granulata*.– Bouvier, 1890: 146.

Coenobita var. B. *compressa* Bouvier, 1890: 147. Not *Coenobita compressus* H. Milne Edwards, 1837.

Coenobita compressus.– De Man, 1902: 742, pl. 24, fig. 45. Not *Coenobita compressus* H. Milne Edwards, 1837.

Not *Cenobita rugosa*.– Heller, 1861a: 254; 1861b: 24.– Paul'son, 1875: 92; 1961: 98.– Kossman, 1880: 79. [= *Coenobita scaevola* (Forskål, 1775)].

Not *Coenobita rugosa*.– De Man, 1880: 185 [= *Coenobita scaevola* (Forskå1, 1775)].

Not *Coenobita rugosus*.– Krukenberg, 1887: 154, pl. 2, figs 3–5.– Riddell, 1911: 262 [= *Coenobita scaevola* (Forskå1, 1775)].

Not *Coenobita rugosus*.– Rathbun, 1911: 595 (= *Coenobita compressus* H. Milne Edwards, 1837).

Material examined

PMBC 3971, 1 male, sl = 15.9 mm, 3 females, sl = 7.2–11.2 mm, Kradan Island, east side, Fifth Thai–Danish Expedition, supralittoral, coll. Gallardo, 11.02.1966; PMBC 15457, Numerous, not sexed or measured, Phuket area, Andaman Sea.

Diagnosis

Ocular peduncles reaching beyond middle of ultimate segment of antennular peduncles; ocular acicles narrow, sharply acuminate. Antennal acicle fused to second peduncular segment.

Chelae both with dense tuft of stiff setae on upper surface. Stridulatory mechanism composed of series of oblique laminar tubercles on upper outer surface of palm of left chela; strong longitudinal ridge on middle of inner surface of palm of left chela below brush of setae. Mesial face of merus of right cheliped without dense tuft of setae. Lateral surfaces of propodus and dactyl of left third pereopod flattened and separated from dorsal surface by distinct ridge or crest. Ventromesial surfaces of dactyls of left second and third pereopods each with longitudinal ridge of closely-set, regular tubercles, forming part of stridulatory mechanism.

Coxae of male fifth pereopods asymmetrical, produced posteriorly as short sexual tubes.

Colour in preservative.– Cream or pinkish, usually with dark brownish or reddish patch on outer surface of left chela.

Habitat

Supralittoral zone of sandy beaches; daytime aggregations found under bushes and among debris. Among leaf litter, rotting wood, in sand burrows, crevices of tree trunks, and under bark in mature forests to approximately 50 m inland (Frith and Alexander, 1978).

Records for southern Thailand.– Kradan Island, Trang, Phuket, Andaman Sea.

Distribution

East Africa, Madagascar, Mascarenes, and Seychelles, Andaman Sea to Line Islands and Tuamotu Archipelago; Chichijima and Anijima Islands and Okinawa, Japan.

Coenobita violascens Heller, 1862

Coenobita violascens Heller, 1862: 524; 1865: 82, pl. 7, fig. 1.

Coenobita violascens.– Hilgendorf, 1869: 99, pl. 6, fig. 3b.– Nakasone, 1988: 172, fig. 7.

Coenobita cavipes.– Stebbing, 1917: 24.– Yap Chiongco, 1938: 211.– Barnard, 1950: 470.– Pitagsalee, 1980: 27, figs 14, 15.– Naiyanetr, 1980: 23 (list); 1998: 46 (list).– Nateewathana *et al*., 1981: 51 (list). Not *Coenobita cavipes* Stimpson, 1858.

Material examined

Syntypes: NHMW 194, 3 males, sl = 11.5–16.5 mm, Nicobar Islands.

PMBC 14847, 1 large male, 1 juvenile male, not measured, 1 female, sl = 17.9 mm, PMBC grounds, along rock bed, 01.04.1987; PMcL, 1 male, sl = 18.6 mm, CUMZ 1371, 1 male, sl = 23.0 mm, Tang Khen Bay, mangroves, coll. P. Ng, 24.08.1999.

Diagnosis

Dorsal surface of shield with scattered granules and punctations, tip of anterolateral margin produced into spinule. Ocular peduncles compressed, reaching almost to mid-length of ultimate antennal segment. Antennal acicle fused with second peduncular segment.

Left cheliped without stridulating ridge on upper outer surface of palm; upper half of outer face with numerous scattered granules, fewer in lower half and nearly smooth in lower central region; lower margin of palm straight or slightly concave, lower proximal angle produced into lobe-like projection. Left third pereopod with lateral surface of propodus nearly smooth, separated from dorsal surface by well-marked longitudinal crest; inner margin of propodus strongly projected inwardly, surface concave; ventral surface with very small, almost indistinct ridge. Dactyl of third left pereopod broad, short, with dorsolateral margin distinctly angular.

Coxae of males subequal, approximate, both thick and short; no sexual tube developed; sternal protuberance very small.

Colour in life.– Entire body violaceus, but varying from light lavender to dark violet; dark patch of brown on outer lower surface of palm of left cheliped.

Habitat

Supralittoral; juveniles, at least, frequent mangrove forests; in Tanzania adults found on beach under cliffs.

Records for southern Thailand.– Phuket, Krabi, Trang, Satun, Andaman Sea; Chanthaburi, Gulf of Thailand.

Distribution

Tanzania; Nicobar Islands; Andaman Sea and Gulf of Thailand; Cebu Island, Philippines; Miyako and Yaeyama Islands, Japan.

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Family Diogenidae

Key to the regional genera

1. Males with paired first and usually second pleopods; females usually with paired first pleopods, all modified as gonopods.....*Paguristes*
— No paired pleopods in either sex.....2
2. Dactyls and fixed fingers of chelae opening generally in horizontal plane.....*Clibanarius*
— Dactyls and fixed fingers of chelae opening obliquely or almost vertically.....3
3. Dactyls and fixed fingers of chelae calcareous-tipped; females with biramous pleopods 2–4.....4
— Dactyls and fixed fingers of chelae corneous-tipped; females with triramous pleopods 2-4.....5
4. Rostrum triangular; without moveable rostriform process developed between ocular acicles.....*Calcinus*
— Rostrum rounded or obsolete; with movable rostriform process, well developed or reduced, between ocular acicles.....*Diogenes*
5. Rostrum broadly rounded or obsolete; chelipeds and ambulatory legs without ring-like transverse striae; females without brood pouch(es).....*Dardanus*
— Rostrum triangular; chelipeds and ambulatory legs with ring-like transverse striae; females with brood pouch(es).....*Aniculus*

Paguristes Dana, 1851

Key to the regional species

1. Males with paired gonopores on coxae of fifth pereopods; females with paired gonopores on coxae of third pereopods or single gonopore on coxa of left third pereopod.....2
— Males with gonopore on coxa of right fifth pereopod only; females with single gonopore on coxa of left third pereopod.....*P. monoporus*
2. Dorsal surfaces of chelae covered with squamiform tubercles; males with paired first and second pleopods; females with paired gonopores.....*P. longirostris*
— Dorsal surfaces of chelae not covered with squamiform tubercles; males without paired second pleopods; females with single left gonopore.....*P. hians*

Paguristes monoporus Morgan, 1987

Paguristes monoporus Morgan, 1987a: 379, figs 1–3.– Jones and Morgan, 1994: 122, 2 unnumbered figs.– Rahayu and Komai, 2000: 30.

Material examined

PMBC 16612, 1 male, sl = 1.5 mm, Cape Promthep, Andaman Sea, rocky intertidal, coll. T. ,Komai, 08.11.1995.

Diagnosis

Shield longer than broad. Rostrum triangular, slightly exceeding lateral projections. Ocular peduncles long, slightly longer than width of anterior margin of shield; acicles distally slender, separated slightly. Antennular peduncles similar in length to or slightly longer than ocular peduncles; antennal peduncles reaching to distal 0.50 to 0.35 of ocular peduncles. Antennal acicle terminating in bifid spine; antennal flagella much shorter than carapace.

Chelipeds subequal. Dactyl and fixed finger with hiatus; dorsal and lateral surfaces of fixed finger and palm with irregularly-sized tubercles and spines, randomly distributed or in very irregular rows and obscured by long, plumose setae. Carpi with scattered spines on dorsal surfaces, large spine near distal articulation with propodus. Ambulatory legs with dactyls similar in length to propodi; dorsal row of spines on each propodus. Carpi each with dorsal row of large spines and distinct lateral groove, both segments with dense, long setae.

Male with gonopore on right fifth coxa only; first pleopods with left reduced; second left absent. Female with left gonopore only; brood pouch absent. Telson with posterior lobes separated by medial cleft, left lobe largest. Lateral and posterior margins of both lobes with large spines, 7–12 spines on left lobe, 6–9 on right.

Colour in life.– Ocular peduncles white or cream with ventral, mesial, dorsal and lateral red-brown longitudinal stripes continuing onto cornea. Antennular peduncles with penultimate segment brown, ultimate segment distally bright blue; flagella orange. Antennal peduncles cream and pale brown; flagella banded in cream and brown. Chelipeds mottled cream and brown, finger tips cream. Pereopods 2 and 3 with meri and carpi cream mottled with red-brown and with thin longitudinal lateral red-brown stripe; propodi similar, but also with diffuse red-brown bands proximally and subdistally; dactyls similar to propodi but longitudinal lateral line sometimes obsolete. Occasionally vague ventrolateral line on propodus and carpus (Morgan, 1987a).

Habitat

Relatively shallow coastal waters, associated with coral or soft sandy bottoms; 4–17 m.

Records for southern Thailand.– Phuket, Andaman Sea.

Distribution

Northern Territory, Australia; New Guinea; south-eastern Indonesia; western Thailand; Cebu, Philippine Islands.

Paguristes longirostris Dana, 1852

Paguristes longirostris Dana, 1852c: 436.– Alcock, 1905b: 36, pl. 1, fig. 5.– Thomas, 1989: 60, fig. 1a–e, pl. 1A.

Material examined

CUMZ 1372, 1 male, sl = 8.2 mm, from fishing trawler, west of Phuket, 40–80 m, 07–08.12.1998; PMBC 15436, 4 males, sl = 6.9–10.2 mm, from fishing trawler, west of Phuket, Andaman sea, 40–80 m, 10–11.12.1998; PMBC 3972, 1 ovig. female, sl = 5.8 mm, Fifth Thai–Danish Expedition, 06°40.14´N, 99° 29. 24´E, coll. Gallardo, 05.02.1966.

Diagnosis

Carapace longer than broad. Rostrum reaching to mid-length of ocular acicles. Ocular peduncles moderately slender, overreaching both antennular and antennal peduncles; ocular acicles with 2–4 terminal spines. Antennular peduncles reaching approximately to bases of corneas; antennal peduncles reaching only to approximately mid-length of ocular peduncles. Antennal acicle reaching beyond middle of terminal peduncular segment, spinose and setose; antennal flagellum shorter than length of carapace.

Chelipeds subequal. Meri with spinose dorsal and distal margins. Carpi each with row of spines on dorsomesial margin, partially obscured by dense setae. Entire dorsal surfaces of carpi, palms and fingers covered with flat, scale-like, imbricating tubercles, with anterior margins spinose or tuberculate and fringed with very short setae. Dactyls and fixed fingers without hiatus. Ambulatory legs with dactyls longer than propodi, dorsal margins spinulose and with long stiff setae. Dorsal margins of meri, carpi, and propodi all with dense setae obscuring spinose dorsal margins; mesial and lateral surfaces of carpi, propodi, and to lesser extent, meri and dactyls with faint squamiform markings.

Telson with asymmetrical subtriangular posterior lobes, terminal margins each with few small spines obscured by long setae.

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Colour in life.– Ocular peduncles yellowish-brown; ocular acicles brown with white spines. Antennular peduncles with bluish-brown penultimate and basal segments; ultimate segment and flagella bluish-brown. Antennal peduncles with proximal three segments tan, fourth segment bluish-tan, fifth segment blue with dorsal tan longitudinal stripe; flagella blue. Chelipeds with chelae dirty-white; carpi dirty-white grading to tan; meri tan, each with blue patch on mesial and lateral faces; mesial patch with vertical red streak and white anteriorly, lateral face blue. Ambulatory legs with lateral faces generally tan to brown; dactyls each with one lighter median band and two darker longitudinal stripes; propodi and carpi solidly coloured; meri mottled in distal half, whitish-tan to cream proximally, with small red patch proximally on dorsal margin. Mesial faces of dactyls with white ventrally and light reddish-brown dorsally (third) and white medially and at distal tip, with light reddish-brown proximally and subdistally (second); propodi of both second and third mottled white and light tan; carpi primarily white with faint tan tinge dorsally; meri white with faint tan in distal third and dorsally. Setae light yellow.

Habitat

Wide-mouthed shells.

Records for southern Thailand.– Andaman Sea, south and west of Phuket.

Distribution

East coast of India; Andaman Sea; Singapore.

Remarks

The colour patterns of the Thai specimens agree more closely with those given for *P. balanophilus* Alcock, 1905b, by Miyake (1978) than those given by Thomas (1989) for *P. longirostris*. However, in having squamiform tubercles, rather than spines on the dorsal surfaces of the carpi of the chelipeds, the Thai specimens agree better with Dana's (1852c) and Alcock's (1905b) descriptions of *P. longirostris*.

Paguristes hians Henderson, 1888

Paguristes hians Henderson, 1888: 79, pl. 8, fig. 4.– Alcock, 1905b: 40, pl. 3, fig. 2.– McLaughlin and Clark, 1997: 46, fig. 14.

Diogenes desipiens Lanchester, 1902: 366, pl. 34, figs 1, 1a.

Not *Paguristes hians*.– Grant and McCulloch, 1906: 33.– McCulloch, 1913: 346 (= *Paguristes monoporus* Morgan, 1987a).

Material examined

PMBC 15444, 1 male, sl = 4.8 mm, from fishing trawler west of Phuket, Andaman Sea, 08–09.12.1998.

Diagnosis

Shield considerably longer than broad. Rostrum broadly triangular, with very small terminal spinule, not produced to level of terminal spinules of obtusely triangular lateral projections. Ocular peduncles long and slender, overreaching antennular peduncles and approximately 0.5 own length longer than antennal peduncles; acicles elongate with large terminal spine and smaller accessory spine laterally. Subquadrate calcified lobe on anterior margin part of, or articulating with interocular lobes. Antennal acicle long, reaching nearly to mid-length of ultimate peduncular segment; antennal flagellum shorter than carapace.

Chelipeds similar and subequal. Dactyls and fixed fingers with distinct hiatus; dorsal surfaces of palms with few spinules proximally, stronger spines distally. Dorsal surfaces of carpi each with irregular row of spinules, becoming strong spines at distal margin. Ambulatory legs with dactyls slightly longer than propodi. Propodi and carpi of second each with row of spines on dorsal margins, partially obscured by long setae. Propodi of third unarmed. Carpi with spine at dorsodistal margin.

Males lacking paired second pleopods; first paired, but consisting of short, broad, uniramous 2-segmented appendages. Females with single left gonopore. Telson with posterior lobes nearly symmetrical, terminal margins rounded, armed with 5 or 6 spines.

Colour in preservative.– Ocular peduncles reddish-brown proximally, fading to reddish-tinted

cream distally, with very thing longitudinal iridescent line in distal half of dorsal midline; ocular acicles mottled reddish-brown. Antennular peduncles with basal and penultimate segments reddish-brown, distal segment darker reddish-brown proximally fading to reddish-cream distally. Antennal peduncles and acicles mottled reddish-brown. Chelipeds mottled reddish-brown; meri white with red-brown spots at distal margin and adjacent dark brown-red band, mottled proximally. Ambulatory legs with reddish-brown dactyls, lightest at bases of claws; propodi, carpi, and meri mottled red-brown, each with irregular cream-white band at distal margin.

Habitat

In algae and on coral reefs; 6–51 m.

Records for southern Thailand.– Andaman Sea, west of Phuket.

Distribution

Red Sea; Oman; Indian coasts; Andaman Sea; Singapore; Philippines.

Clibanarius Dana, 1852a

Key to the regional species

1. Meri of chelipeds each with prominent spine or tubercle on ventral surface proximally [ambulatory legs each with 2 longitudinal blue stripes bordered in red on lateral faces of distal 3 segments].....*C. infraspinatus*
— Meri of chelipeds each without prominent spine or tubercle on ventral surface proximally.....2
2. Dactyl of left third pereopod distinctly shorter than propodus.....3
— Dactyl of left third pereopod approximately equal to or longer than propodus.....6
3. Carpi of chelipeds each with single distal spine on dorsal margin.....4
— Carpi of chelipeds each with more than single spine on dorsal surface [ambulatory legs with longitudinal lateral light stripe extending full length of appendage].....*C. ransoni**
4. Antennal acicle considerably overreaching proximal margin of fifth peduncular segment [shield, chelipeds and ambulatory legs with splotches of white or light colour on dark background].....*C. cruentatus*
— Antennal acicle not quite reaching to or only slightly overreaching proximal margin of fifth peduncular segment.....5
5. Antennal peduncles reaching only to distal 0.35 of ocular peduncles [meri, carpi and propodi of ambulatory legs dark-coloured, dactyls orange-white, with or without median dark band].....*C. virescens*
— Antennal peduncles reaching at least to bases of corneas [ambulatory legs with longitudinal light lateral stripe variable in length, but not extending as continuous stripe over full length of appendage].....*C. merguiensis*
6. Dactyls of ambulatory legs approximately equaling (slightly shorter to slightly longer than) propodi [ambulatory legs solidly coloured].....*C. arethusa*
— Dactyls of ambulatory legs (at least third left) distinctly longer than propodi.....7
7. Palms of chelipeds with numerous spines or spinulose tubercles on dorsolateral surfaces.....8
— Palms of chelipeds without, or with very few small spines or spinulose tubercles on dorsolateral surfaces.....11
8. Carpi of chelipeds each with more than 1 prominent spine on dorsal margin.....9
— Carpi of chelipeds each with only dorsodistal spine prominent [lateral faces of dactyls propodi, and carpi of ambulatory legs each with 2 longitudinal dark stripes, meri each with broad lateral and ventrolateral stripes].....*C. longitarsus*

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9. Antennular peduncles overreaching distal margins of corneas by approximately 0.5 length of ultimate segment [ocular peduncles with line dark longitudinal stripe; ambulatory legs dark, with thin longitudinal lighter stripes].....*C. clibanarius*
— Antennular peduncles overreaching distal margins of corneas little, if at all.....10
10. Antennal acicles short, not reaching to proximal margin of fifth peduncular segment [ocular peduncles with thin, interrupted, dark stripe medianly; ambulatory legs with longitudinal dark stripes].....*C. antennatus*
— Antennal acicles long, reaching to or overreaching proximal margin of fifth peduncular segment [ocular peduncles without stripes; ambulatory legs with coloured stripes outlined with darker margins] .....*C. demani*
11. Ocular peduncles elongate, only slightly shorter than length of shield [ocular peduncles each with narrow longitudinal stripe on mesial and lateral surface; ambulatory legs each with 2 longitudinal dark stripes visible on lateral faces of each segment].....*C. padavensis*
— Ocular peduncles robust, 0.20–0.25 shorter than length of shield [ocular peduncles solidly-coloured; chelae and carpi of chelipeds and ambulatory legs all with longitudinal stripes].....*C. danai*

Clibanarius infraspinatus Hilgendorf, 1869

Clibanarius infraspinatus Hilgendorf, 1869: 97.– Fize and Serène, 1955: 77, fig. 10.– Pitagsalee, 1980: 33, figs 16, 17.– Naiyanetr, 1980: 23; 1998: 47 (list).– Tirmizi and Siddiqui, 1982: 26, fig. 20.– Rahayu and Komai, 2000: 25.

Material examined

CUMZ 107, 1 male, sl = 13.1 mm, Pattani, Gulf of Thailand, coll. C. Pitagsalee, 1977.

Diagnosis

Ocular peduncles long, slender, approximately as long as anterior margin of shield; ocular acicles multidenticulate. Antennular peduncles equal to or slightly longer than ocular peduncles; antennal peduncles shorter, not reaching to bases of corneas. Antennal acicles reaching beyond base of ultimate peduncular segment.

Chelipeds generally equal, or right chela slightly smaller. Palms with numerous spiniform tubercles on dorsal surface. Carpi each with 3 strong spines on dorsomesial margin and scattered smaller spines on dorsal surface. Meri each with prominent blunt spine on ventromesial margin proximally. Ambulatory legs with dactyls longer than propodi, dorsal surfaces each with slightly raised but smooth dorsolateral margin, ventral margins each with 7–10 small corneous spines in distal half. Carpi each with row of spines on dorsal surface (second) or single dorsodistal spine (third).

Telson with median cleft barely detectable; posterior lobes markedly asymmetrical, left considerably larger; terminal margins with 5 or 6 prominent, corneous-tipped spines, partially obscured by long stiff setae.

Colour in preservative.– Ocular peduncles orange, with longitudinal reddish-white stripe extending from proximal margin to bases of corneas. Chelipeds orange-red with some white tubercles. Ambulatory legs orange; dactyls, propodi, and carpi each with 2 orange-blue stripes bordered in red and 1 median longitudinal whitish-blue stripe on lateral surface; meri each with 2 whitish-blue stripes (Rahayu and Forest, 1993).

Habitat

Fine sand substrate near river outlets.

Records for southern Thailand.– Phuket, Krabi, Satun, Andaman Sea; Surat Thani, Songkhla, Pattani, Gulf of Thailand.

Distribution

Red Sea; Indian Ocean; Andaman Sea and Gulf of Thailand; Vietnam; Singapore; Indonesia; northern Australia; and Philippine Islands.

Clibanarius ransoni Forest, 1953*

Clibanarius ransoni Forest, 1953a: 446, figs 2, 6.– Fize and Serène, 1955: 150, fig. 23.– Rahayu and Komai, 2000: 26.

Diagnosis

Ocular peduncles longer than anterior margin of shield, but slightly shorter than antennular peduncles; ocular acicles with 3 terminal spinules. Antennal peduncles reaching beyond bases of corneas. Antennal acicles reaching distal margin of fourth peduncular segments or very slightly beyond.

Chelipeds subequal, covered with small tubercles, slightly more prominent on mesial margin of palms and on dactyls and fixed fingers. Carpi each with 3 spines on dorsal surfaces, distalmost largest. Ambulatory legs with dactyls shorter than propodi, ventral margins each with 5 or 6 small corneous spines; left third with lateral face of propodus slightly carinate at dorsolateral margin; carpi each with single dorsodistal spine.

Colour in preservative.– Shield yellowish-white, smudged with red. Ocular peduncles red-orange. Chelipeds red with tubercles and fixed finger white like those of the dorsal and ventral surfaces of the dactyls. One large broad stripe of bluish-white laterally on entire, or nearly length of segments of ambulatory legs, dorsal margins of dactyls and dorsal and ventral surfaces of propodi and carpi intense red like that of ventral margins of meri (Forest, 1953a).

Habitat

Pools in coral reefs.

Records for southern Thailand.– Phuket, Andaman Sea.

Distribution

Andaman Sea coast of Thailand; Vietnam; Indonesia; Tahiti.

Clibanarius cruentatus (H. Milne Edwards, 1848)

Pagurus cruentatus H. Milne Edwards, 1848: 62

Clibanarius cruentatus.– Fize and Serène, 1955: 123, fig. 16.– Pitagsalee, 1980: 48, figs 26, 27.– Naiyanetr, 1998: 47 (list).– Rahayu and Komai, 2000: 23.

Clibanrius cruentatus.– Naiyanetr, 1980: 23 (list); misspelling of *Clibanarius.*

Material examined

PMBC 16606, 2 males , sl = 4.0, 4.9 mm, beach in PMBC, Cape Panwa, Phuket, Andaman Sea, intertidal, coll. T. Komai, 23.11.1995; CAS 04654, 1 female, sl = 3.5 mm, I Mao Island, off Sattahip, intertidal, Gulf of Thailand, coll. Randolf, 03.02.1972.

Diagnosis

Ocular peduncles long, thin, slightly longer than anterior margin of shield; ocular acicles with prominent terminal spine and 1 or 2 smaller spinules on lateral margin. Antennular peduncles reaching to bases of corneas; antennal peduncles much shorter, reaching approximately to mid-length of ocular peduncles. Antennal acicles reaching beyond proximal margins of fifth peduncular segments.

Chelipeds with carpi armed with single spine at dorsomesial distal angle. Chelae similar, with dorsal surfaces approximately twice as long as broad; dorsal surfaces of palm and fixed finger with scattered spines. Ambulatory legs with dactyls shorter than propodi, each with row of 6–8 equidistantly-spaced corneous spines on ventral margins; propodus of left third with lateral face somewhat flattened. Carpi of second and third each with single dorsodistal spine.

Telson without median cleft in Thai specimens; terminal margin with numerous small spines, strongest laterally.

Colour in life.– Ocular peduncles brownish-yellow, ocular acicles yellow. Antennular peduncles blue. Antennal peduncles dark brown, flagella orange. Chelipeds dark brown with yellow tubercles. Ambulatory legs dark brown with patches of yellow (after Rahayu and Forest, 1993).

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Habitat

Sand, reef and seagrass substrates; intertidal to 3 m.

Records for southern Thailand.– Phuket, Andaman Sea; Sattahip; Surat Thani, Gulf of Thailand.

Distribution

Mergui Archipelago; Andaman Sea and Gulf of Thailand; Vietnam; Indonesia; Philippine Islands.

Remarks

Rahayu and Komai (2000), like virtually all earlier authors, cited the type locality of *C. cruentatus* as New Zealand. However, Forest and McLaughlin (2000) have demonstrated that this was a *lapsus calami* by H. Milne Edwards (1848); it should have been given as New Guinea. *Clibanarius cruentatus*, according to Forest and McLaughlin (2000), does not occur in New Zealand.

Clibanarius virescens (Krauss, 1843)

Pagurus virescens Krauss, 1843: 56, pl. 4, fig. 3.
Pagurus (*Clibanarius*) *virescens*.– Hilgendorf, 1869: 95; 1879: 821, pl. 3, fig 11.
Clibanarius virescens.– Dana, 1852c: 466.– McCulloch, 1913: 346, 351, pl 11, fig. 2.– Fize and Serène, 1955: 138, fig. 21.– Miyake, 1956: 315, figs 8, 9; 1978: 50; l982: 101, pl. 34, fig. 2.– Pitagsalee, 1980: 56, figs 32, 33.– Naiyanetr, 1980: 23 (list); 1998: 48 (list).– Tirmizi and Siddiqui, 1982: 77, fig. 40.– Rahayu and Komai, 2000: 27.
Clibanarius aequabilis.– Stebbing, 1920: 258. Not *Clibanarius aequabilis* Dana, 1852c.
[?] *Clibanarius philippinensis* Yap-Chiongco in Estampador, 1937: 501.
Clibanarius bimaculatus.– Ortmann, 1892: 291.– Balss, 1913: 41, fig. 28. Not *Clibanarius bimaculatus* (De Haan, 1849).

Material examined

PMcL, 1 ovig. female, sl = 2.7 mm, Reef off Kalim Beach, Patong, Andaman Sea, low tide, Coll. S. Ahyong, 26.11.1999.

Diagnosis

Ocular peduncles moderately long, 0.80 shield length; ocular acicles with 2–4 spinules terminally. Antennular peduncles varying from slightly shorter to slightly longer than ocular peduncles. Antennal peduncles reaching no further than bases of corneas. Antennal acicles reaching to or slightly beyond distal margins of fourth peduncular segments.

Chelipeds subequal, right somewhat longer. Dorsal surfaces of palms and fixed fingers with several moderately strong, corneous-tipped spines. Dorsal margins of carpi each with dorsodistal spine. Ambulatory legs with dactyls of third pereopods shorter than propodi; dorsolateral margins defined by distinct, tuberculate ridge, much better developed on left, lateral surfaces flattened or slightly convex (right) or slightly concave (left); ventral margins each with row of 6 or 7 corneous spines. Propodi also with distinct dorsolateral, tuberculate ridge, left strongest, lateral face with median longitudinal row of tubercles (right) or unarmed but slightly concave (left). Carpi each with single dorsodistal spine.

Telson with slightly asymmetrical posterior lobes; terminal margins each with several rather widely-spaced small spines, strongest on left.

Colour in life.– Ocular peduncles solid olive drab, dark brown, or greenish-black, with narrow white ring at base of cornea. Chelipeds olive drab, brown, or bluish-black, tips of dactyls and fixed fingers orange or whitish. Ambulatory legs with meri, carpi and propodi olive drab, dark brown, or bluish-black; dactyls orange-white or white, with or without median dark brown or bluish-black band (after Haig and Ball, 1988, and Rahayu and Forest, 1993).

Habitat

Sand and rock or coral; intertidal to shallow subtidal.

Records for southern Thailand.– Phuket, Andaman Sea.

Distribution

East coast of Africa to Indonesia; Japan; Fiji Islands.

Clibanarius merguiensis De Man, 1888

Clibanarius aequabilis var. *merguiensis* De Man, 1888a: 247.

Clibanarius merguiensis.– Forest, 1953a: 446, fig. 7.– Fize and Serène, 1955: 145, fig. 22.– Pitagsalee, 1980: 53, figs 30, 31.– Rahayu and Forest, 1993: 774, fig. 7.– Naiyanetr, 1998: 48 (list).– Rahayu and Komai, 2000: 26.

Not *Clibanarius merguiensis*.– Kamezaki *et al*., 1988: unnumbered fig. (= *Clibanarius striolatus* Dana, 1852a).

Material examined

PMBC 3973, 1 male, sl = 3.4 mm, 1 female, sl = 2.2 mm, Kwang Island, Fifth Thai–Danish Expedition, intertidal, coll. Gallardo, 10.02.1966; PMBC 3974, USNM 266377, USNM 266385, 8 males, sl = 2.0–3.0 mm, 5 females, sl = 1.5–2.3 mm, 3 ovig. females, sl = 2.2–2.4 mm, Tapou Yai Island, intertidal, Fifth Thai–Danish Expedition, coll. Gallardo, 04.02.1966; PMBC 16608, 2 ovig. females, sl = 2.1, 2.6 mm, Tang Khen Bay, intertidal, coll. T. Komai, 09.10.1995; PMcL, 1 male, sl = 3.2 mm, Reef off Kalim, Patong, Andaman Sea, low tide, coll. S. Ahyong, 26.11.1999; CUMZ 808, 1 male, sl = 4.0 mm, Rayong, Gulf of Thailand, coll. C. Pitagsalee, 1977.

Diagnosis

Ocular peduncles moderately short, not much longer than anterior margin of shield; ocular acicles multidenticulate. Antennular peduncles usually reaching only to bases of corneas. Antennal peduncles reaching not quite or nearly to distal margins of corneas. Antennal acicles reach to distal margins of fourth peduncular segments or very slightly beyond.

Chelipeds with dorsal surfaces of chelae covered with tubercles or spines, more numerous and acute on dactyls and fixed fingers. Carpi each with dorsomesial distal spine. Ambulatory legs smooth, but with small pits from which setae arise. Dactyls shorter than propodi, ventral margins each with 5 or 6 corneous spines, lateral faces convex, except flattened or slightly concave left third. Propodi unarmed, second and right third cylindrical, with lateral faces convex, left third with flattened lateral face and acutely ridged dorsolateral margin. Carpi each with only dorsodistal spine.

Telson with shallow median cleft; posterior lobes subequal to distinctly asymmetrical; terminal margins each with 5–10 spines, extending onto lateral margins and partially obscured by stiff setae.

Colour in life.– Shield black with 1 longitudinal band of light grey. Ocular peduncles orange with one broad blue band on dorsal surface. Antennular peduncles blue with orange flagella. Antennal peduncles orange. Chelipeds black with lighter coloured tubercles. Second pereopods with one longitudinal band of blue on dactyls extending onto distal half of propodi. Third pereopods black with longitudinal band of yellowish-white on dactyls propodi and meri (after Rahayu and Forest, 1993).

Habitat

Intertidal.

Records for southern Thailand.– Phuket, Kwang Island, Tapou Yai Island, Andaman Sea; Rayong, Surat Thani, Nakhon Si Thammarat, Gulf of Thailand.

Distribution

Mozambique; Mergui Archipelago; Andaman Sea and Gulf of Thailand; Vietnam; Malaysia and Indonesia.

Clibanarius arethusa De Man, 1888

Clibanarius arethusa De Man, 1888a: 252.– Alcock, 1905b: 48, pl. 4, fig. 3.– Fize and Serène, 1955: 114, fig. 16.– Pitagsalee, 1980: 51, figs 28, 29.– Naiyanetr, 1980: 23 (list); 1998.– 47 (list).

Material examined

CUMZ 777, 1 male, sl = 7.1 mm, Surat Thani, Gulf of Thailand, coll. C. Pitagsalee, 1977.

Diagnosis

Ocular peduncles slender, longer than anterior margin of carapace, little shorter than antennular peduncles and clearly longer than antennal peduncles; ocular acicles approximate, with 2 or 3 terminal spines. Antennal acicles extending very

little beyond proximal margins of ultimate peduncular segments.

Chelipeds equal, with sparsely scattered, small, conical spines on palms. Carpi each with 1 spine at dorsomesial distal margin. Ambulatory legs smooth. Propodus of left third slightly flattened on lateral face but still convex. Dactyls of second and third pereopods approximately as long as propodi, ventral margins each with 7 or 8 corneous spines. Carpi each with single dorsodistal spine.

Telson with very small median cleft; posterior lobes asymmetrical; terminal margins each with 7 or 8 spines, largest on left.

Colour in preservative.– Ocular peduncles and acicles reddish-orange, with narrow white band at base of corneas. Appendages all intense red-orange (Fize and Serène, 1955).

Habitat

Coral reef zone.

Records for southern Thailand.– Surat Thani, Rayong, Gulf of Thailand.

Distribution

Mergui Archipelago; Gulf of Thailand; coast of Arakan and East Indies; Vietnam.

Clibanarius longitarsus (De Haan, 1849)

? *Pagurus asper* H. Milne Edwards, 1848: 62.

Pagurus longitarsus De Haan, 1849: 211, pl. 50, fig. 3.

Clibanarius longitarsis.– Dana, 1852c: 464.

Pagurus (*Clibanarius*) *longitarsis*.– Hilgendorf, 1869: 96.

Clibanarius longitarsus.– Fize and Serène, 1955: 83, fig. 11, pl. 3, figs 1, 7, 10, 13.– Dechancé, 1964: 31, fig. 4.– Pitagsalee, 1980: 42, figs 22, 23.– Naiyanetr, 1980: 23 (list); 1998: 47 (list).– Ajmal Khan and Natarajan, 1984: 8, fig. 6.– Rahayu and Forest, 1993: 762, figs 4b, 5b, 6b.– Rahayu and Komai, 2000: 25

Material examined

PBMC 15454, 1 male, sl ~ 7.0 mm, damaged, Nam Bor Bay, Phuket, upper mud bank, intertidal, coll. Davie, 12–13.12.1998; PMBC 14848, 1 male, sl = 7.2 mm, 2 females, sl = 4.6, 6.3 mm, mangroves, intertidal, coll. P. Davie, 12.12.1998; PMBC 14881, 1 female, sl = 7.5 mm, Tang Khen Bay, upper beach at night, intertidal, coll. P. Davie, 13.12.1998; PMBC 15446, 2 males, sl = 1.2, 2.7 mm, PMBC north beach, Andaman Sea, intertidal, coll. T. Jansen and G. Dinesen, 13.12.1998; CUMZ 518, 1 female, sl = 11.0 mm, Chachoengsao, Gulf of Thailand, coll. C. Pitagsalee.

Diagnosis

Ocular peduncles approximately 0.80 length of shield; ocular acicles terminating in simple or bifid spine. Antennular peduncles not quite reaching or slightly overreaching distal margins of corneas. Antennal peduncles reaching base of corneas or just slightly beyond. Antennal acicles short, not reaching distal margins of fourth peduncular segments.

Chelipeds subequal, right slightly longer and more robust. Dorsomesial margin of left palm with row of 4 spines, dorsal surface with 1 or 2 irregular rows of sometimes corneous-tipped spines. Dorsomesial margin of carpus with 1 prominent corneous-tipped spine distally. Ambulatory legs with dactyl of left third approximately 1.5 times length of propodus, ventral margins each with short row of very small, closely-spaced, corneous spinules (10–12) in distal half. Carpi each with single dorsodistal spine.

Telson with asymmetrical posterior lobes separated by very slender median cleft; terminal margins of each with few, very small spinules and 1–3 larger, corneous-tipped spines laterally, but not extending onto lateral margins.

Colour in life.– Ocular peduncles dorsally olive- green, ventrally very pale green or cream (no distinct stripes). Antennular peduncles green or blue-green, darker on lateral and mesial surfaces; flagella orange or pale brown. Antennal peduncles olive-brown, ultimate segment with dorsal and ventral cream stripes; flagella green-brown, darker laterally and mesially. Chelipeds olive or brown with irregular rows of paler, blue or blue-green tubercles and spines, many with corneous tips on dactyl and propodus. Second and third pereopods with dactyls and propodi blue-green with two longitudinal olive or brown stripes on lateral and mesial surfaces,

propodi also with fainter dorsal brown line; carpi similar in colour to propodi, but mesial stripes diffuse; meri green dorsally and blue or blue-green ventrally, with broad dorsal, lateral and ventrolateral olive-brown stripes.

Habitat

Mud or sand substrate around rivers and mangroves; 0–2 m.

Records for southern Thailand.– Ranong, Phuket, Krabi, Trang, Satun, Andaman Sea; Chumphon, Surat Thani, Nakhon Si Thammarat, Songkhla, Pattani, Narathiwat, Gulf of Thailand.

Distribution

Indo-West Pacific; Red Sea; Indian Ocean; Thailand; Japan; northern Australia.

Remarks

Although the specimen from Pitagsalee's collection came from the northern Gulf of Thailand, he reported this species from numerous localities in both the Gulf and Andaman Sea.

Clibanarius clibanarius (Herbst, 1791)

Cancer clibanarius Herbst, 1791: 20, pl. 23, fig. 1.
Pagurus clibanarius.– Latreille, 1803: 167.
Clibanarius vulgaris Dana, 1852b: 122 (footnote).
Clibanarius clibanarius.– Alcock, 1905b: 43, pl. 4, fig. 1.– Sakai, 1999: 10, pl. 2C.

Material examined

Lectotype: by subsequent selection by Sakai (1999), ZMB 2493, 'East Indies', not sexed as glued in place, sl = 18.2 mm; ZMB 2494, unsexed paralectotype, sl = 18.8 mm; ZMB 2495, unsexed paralectotype, sl = 16.8 mm; ZMB 2495a, 1 male, sl = 18.0 mm; PMBC 14849, 1 ovig. female, sl = 16.5 mm, from fishing trawler west of Phuket, 40–80 m, 09.12.1998; ZRC 1999.1438, 1 female, sl = 12.3 mm from fishing trawler west of Phuket, Andaman Sea, coll. P. Ng, 04.1999.

Diagnosis

Ocular peduncles long and slender; ocular acicles with pair of prominent terminal spines and smaller spine laterally. Antennular peduncles overreaching ocular peduncles by approximately 0.50 length of ultimate segment. Antennal peduncles reaching at least to bases of corneas, sometimes equaling or slightly exceeding length of ocular peduncles. Antennal acicles reaching beyond proximal margin of fifth peduncular segment.

Chelipeds equal and similar. Carpi and palms each with row of spines on dorsomesial margin, dorsal surfaces all with blunt or acute tubercles or spines. Dactyls and fixed fingers sometimes with hiatus. Ambulatory legs with segments all subcylindrical and with numerous tufts of stiff setae. Dactyls 1.35–1.50 length of propodi; second pereopods with prominent protuberances on dorsal surfaces of propodi; carpi each with row of spines. Propodi of third pereopods nearly smooth; carpi with only dorsodistal spine.

Telson with very weak median cleft; posterior lobes with left slightly larger; terminal margins each with 6 or 7 corneous tipped spines ventrally directed and at least partially obscured by thick setae.

Colour in preservative.– Shield reddish-brown with slightly cream mottling, anterior and lateral margins reddish-cream. Ocular peduncles light reddish-brown with darker thin longitudinal stripe; ocular acicles dark reddish-brown with white spines. Antennular and antennal peduncles reddish-brown, lighter dorsally. Chelipeds with reddish-brown base colour, fingers lighter; palms with lighter stripe laterally and medianly and lighter coloured spines on dorsomesial margins; carpi with lighter coloured spines and striped on dorsomesial margin. Ambulatory legs red-brown with tips of dactyls lighter and with light longitudinal stripe laterally, dorsally and ventrally; propodi each with one longitudinal thin light stripe dorsally, laterally and mesially, broader stripe ventrally; carpi each with longitudinal thin light stripe dorsally and laterally, ventral surface with light patch; meri each with dorsal and ventral longitudinal stripe, lateral faces each with short oblique thin stripe distally and very thin stripe parallel to ventral margin, beginning at proximal margin but not extending to distal margin.

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Habitat

Unknown.

Records for southern Thailand.– Andaman Sea off Phuket.

Distribution

Southeast Africa to Hong Kong.

Remarks

This is the first record of *Clibanarius clibanarius* in Thai waters.

Clibanarius antennatus Rahayu and Forest, 1993

Clibanarius striolatus.– Pitagsalee, 1980: 39 (in part), fig. 20, not fig. 21.– Naiyanetr, 1998: 48 (list). Not *Clibanarius striolatus* Dana, 1852a.

Clibanrius striolatus.– Naiyanetr, 1980: 23 (list); (misspelling of *Clibanarius*.) Not *Clibanarius striolatus* Dana, 1852a.

Clibanarius antennatus Rahayu and Forest, 1993: 755, figs 2c, 3e, f.

Material examined

CUMZ 303, 1 male, sl = 7.5 mm, Pattani, Gulf of Thailand, coll. C. Pitagsalee, 1977.

Diagnosis

Ocular peduncles shorter than shield; corneas slightly delated; diameter included approximately 3.5 times in length of peduncle; ocular acicles with 1 or 2 terminal spinules. Antennular peduncles reaching to middle of corneas or slightly beyond distal margins. Antennal peduncles reaching to middle of corneas. Antennal acicles short, reaching slightly beyond mid-length of fourth peduncular segment.

Right cheliped somewhat longer and broader than left. Dactyl, at least of left, slightly longer than palm. Dorsolateral face of palm covered, but not densely, by small, conical, corneous-tipped, spines, stronger on dorsal margin. Carpus with 3 acute spines on dorsal margin. Ambulatory legs with dactyls notably arched, longer than propodi, ventral margins each with row of 10–15 small corneous spines in distal 0.65. Propodi with sparse tufts of setae, ventrodistal margins each with small spine. Carpi each with dorsodistal spine.

Colour in preservative.– Ocular peduncles yellowish-white with one thin, interrupted, orange coloured, median stripe. Chelipeds orange, with conical white tubercles. Ambulatory legs bluish-white with longitudinal red stripes over entire lengths; dactyls each with two interrupted stripes; propodus with three red stripes, one very narrow stripe on dorsal margin, next, broader median stripe and more narrow third, with distal and proximal parts broadened; carpi and meri each with two red stripes laterally (Rahayu and Forest, 1993).

Habitat

Muddy bottom near river mouth.

Records for southern Thailand.– Pattani, Gulf of Thailand, probably also Nakhon Si Thammarat, Phatthalung, and Narathiwat.

Distribution

Gulf of Thailand; Barombong, Indonesia.

Remarks

Pitagsalee (1980) recorded *Clibanarius striolatus* from Pattani, Nakhon Si Thammarat, Phatthalung and Narathiwat. The only specimen available for my examination, of the 38 specimens Pitagsalee reported for this species, has proved to represent C. *antennatus*. The specimen no longer has any trace of colour; however, the colour patterns of the ambulatory legs given by Rahayu and Forest (1993) for *C. antennatus* are similar to the species described as *C. striolatus* by Fize and Serène (1955). It is Fize and Serène's figure (1955: 13) that Pitagsalee (1980, fig. 21) used to illustrate his taxon. Fize and Serène's specimens were shown by Rahayu and Forest (1993) to actually represent *C. demani*; however, the very short antennal acicles and arched pereopodal dactyls of Pitagsalee's specimen from Pattani clearly exclude it from *C. demani*. Considering the care with which Pitagsalee conducted his research, it is quite probable that all of his material similarly represent *C. antennatus*. However, until all have been reexamined, the distribution of this species in the Gulf of Thailand can only be considered tentative.

Clibanarius demani Buitendijk, 1937

Clibanarius demani Buitendijk, 1937: 252, figs 1, 2.– Rahayu and Forest, 1993: 759, figs 4a, 5a, 6a.– Rahayu and Komai, 2000: 25.

Clibanarius striolatus.– Fize and Serène, 1955: 97, fig. 13.– Pitagsalee, 1980 (in part), fig. 21. Not *Clibanarius striolatus* Dana, 1852a.

Clibanarius padavensis.– Nateewathana, *et al*., 1981: 51 (in part) (list). Not *Clibanarius padavensis* De Man, 1888a.

Material examined

PMBC 3767, 1 male, sl = 5.2 mm, 4 females, sl = 1.7–4.3 mm, Yao Yai Island, coll. P. Tantichodok, 1979–80; USNM 266376, 5 males, sl = 2.4–4.6 mm, 4 females, 3.6–4.2 mm, Phuket, Fifth Thai–Danish Expedition, intertidal, coll. Gallardo, 06.02.1966; PMBC 3975, 5 males, sl = 5.7–8.2 mm, 1 female, sl = 6.2 mm, Mak Island, Andaman Sea, Fifth Thai–Danish Expedition, intertidal, coll. Gallardo,17.02.1966.

Diagnosis

Ocular peduncles moderate to quite long, nearly same length as shield in large specimens, diameter of the corneas included approximately 0.20 in length of peduncle; ocular acicles with 3 or 4 distolateral spines. Antennular peduncles reaching to bases of corneas, occasionally reaching slightly beyond distal margins. Antennal peduncles reaching distal 0.35 of ocular peduncles. Antennal acicles long, reaching to, or more frequently overreaching, base of fifth segment.

Chelipeds subequal, right usually somewhat larger. Chelipeds each with 2 or 3 prominent spines on dorsomesial margin of carpus. Palms with dorsal surfaces tuberculate or spinulose, dorsomesial margins each with 4 or 5 prominent spines. Ambulatory legs with dactyls longer than propodi, ventral margins each with row of 9–15 small spines. Carpi each with single dorsodistal spine.

Telson with narrow, shallow median cleft; posterior lobes somewhat asymmetrical; terminal margins each with row of small spines, largest on left.

Colour in preservative.– Ocular peduncles reddish white with red spot proximally on dorsal face. Chelipeds reddish-white with two orange stripes on lateral face of dactyl. Ambulatory legs cream; dactyls with two orange stripes and one white median stripe; propodi, carpi and meri each with three orange stripes; orange stripes edged by dark red (Rahayu and Forest, 1993).

Habitat

Subtidal, shallow on hard substrate; 1–2 m.

Records for southern Thailand.– Phuket, Yao Yai Island, Phangnga, Andaman Sea.

Distribution

Mascarene Islands; Andaman Sea; Vietnam and Indonesia.

Remarks

Personal reexamination of the specimens in the collection of the Phuket Marine Biological Center that were included by Nateewathana, *et al*. (1981) in their list of hermit-crab species as *Clibanarius padavensis* included only specimens of *Clibanarius demani*, *Diogenes avarus* Heller, 1865, and *Diogenes klaasi* Rahayu and Forest, 1995.

Clibanarius padavensis De Man, 1888

Clibanarius padavensis De Man, 1888a: 242, pl. 16, figs 1–5.– Alcock, 1905b: 44, pl. 4, fig. 2.– Dechancé, 1964: 32, fig. 5.– Pitagsalee, 1980: 36, figs 18, 19.– Naiyanetr, 1980: 23 (list); 1998: 48 (list).

? *Clibanarius padavensis*.– Frith *et al.*, 1976: 10.– Frith, 1977: 13.

Not *Clibanarius padavensis*.– Nateewathana *et al*., 1981: 51 (list) (= *Clibanarius demani* Buitendijk, 1937, *Diogenes avarus* Heller, 1865, and *Diogenes klaasi* Rahayu and Forest, 1995).

? Not *Clibanarius padavensis*.– Ball and Haig, 1972: 95, fig. 4.– Tirmizi and Siddiqui, 1982: 69, fig. 56 (see Remarks).

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Material examined

PMBC 14850, 1 male, sl = 4.0 mm, Nam Bor Bay, upper mud bank, intertidal, coll. P. Davie, 13.12.1998; PMBC 15437, 1 male, sl = 2.7 mm, 1 female, sl = 3.0 mm, Sire Island area, intertidal, coll. P. Ng, 09.12.1998; USNM 266381, 1 male, sl = 6.7 mm, PMBC 3976, 1 ovig. female, sl = 5.7 mm; Mak Island, Phang-nga, Andaman Sea, coll. Gallardo, 17.02.1966; CUMZ 229, 1 male, sl = 10.0 mm, Satun, Gulf of Thailand, coll. C. Pitagsalee.

Diagnosis

Ocular peduncles long and slender; corneas dilated little if at all; ocular acicles with 2–4 small spines. Antennular peduncles usually slightly longer, occasionally equal to or slightly shorter than ocular peduncles. Antennal peduncles usually reaching to bases of corneas. Antennal acicles reaching to or slightly beyond proximal margins of fifth peduncular segments

Chelipeds similar and equal. Chelae with dorsolateral surfaces of palms unarmed or with few low ridges and tufts of setae, few spines distally and fixed finger and dactyl. Carpi each with spine at dorsodistal angle and occasionally 1 smaller additional spinule mesially. Ambulatory legs longer than chelipeds, right longer than left. Dactyls somewhat longer than propodi, ventral margins each with row of 15–30 very small corneous spines. Propodi of both pairs subcylindrical. Carpi each with dorsodistal spine.

Telson with shallow median cleft; posterior lobes subequal; terminal margins each with 5 or 6 spines, strongest laterally.

Colour in life.– Shield reddish-olive brown with blue tinges. Ocular peduncles light bluish-olive with red-brown longitudinal stripe dorsally, medially and laterally; ocular acicles red-brown with white spines. Antennular and antennal peduncles bluish-grey with patches of red-brown. Chelipeds with base colour of bluish-grey, mottled with red-brown; dactyls each with moderately broad red-brown longitudinal stripe adjacent to cutting edge, slightly thinner stripe dorsomesially and on mesial face; palms each with longitudinal dorsolateral red-brown stripe extending to tip of fixed finger and second similar stripe on dorsal surface laterally joining stripe on fixed finger. Ambulatory legs with base colour of bluish-grey on dactyls and propodi, bluish-olive on carpi and meri; dactyls each with four longitudinal red-brown stripes, two visible in lateral view (*i.e.*, on lateral face), upper stripe often interrupted by bluish punctae, two slightly thinner stripes on mesial face; propodi each with two lateral longitudinal red-brown stripes, and one stripe additionally dorsomesially, on mesial face and ventral surface; carpi each with two longitudinal red-brown stripes on lateral face, one stripe ventrally and one on mesial face; meri of second pereopods with two broad longitudinal stripes laterally, third pereopods each with three red-brown stripes on lateral face.

Habitat

Coarse rubble and fine mud in mangroves; intertidal.

Records for southern Thailand.– Ranong, Phangnga, Phuket, Krabi, Trang, Satun, Andaman Sea.

Distribution

East coast of Africa to northeast Australia, Andaman Sea; New Caledonia.

Remarks

Ball and Haig (1972) reported that their specimens agreed morphologically with *C. padavensis* except for having shorter and stouter ocular peduncles, a peculiarity these authors attributed to the small size of their specimens. However, the colour notes they provided for the specimens after three months in alcohol indicated that the shield, at least in some specimens had two distinct stripes. Ball and Haig also indicated that the ambulatory legs had distal and proximal bands of white on the propodi and dactyls that in some specimens were crossed by the longitudinal stripes on these segments and in other specimens not crossed. De Man (1888a) provided very detailed colour notes on his specimens, and specifically indicated that the shield was never marked with 'longitudinal lines'. Additionally he did not indicate that the dactyls and propodi of the ambulatory legs had distal and proximal white bands. This latter colouration was questionably attributed to *C.*

laevimanus Buitendijk, 1937 by Dechancé (1964), who similarly reported moderately short and stout ocular peduncles in her specimens from Madagascar. A similar colour pattern for *C. laevimanus* was given by Rahayu and Forest (1993).

Although Tirmizi and Siddiqui (1982: 70, fig. 36) illustrated the left cheliped of a species presumed to be *C. padavensis* as having an unarmed carpus, in their description they indicated that there were 'a few strong spines dorsomesially on this segment'. The carpus of *C. padavensis* has a single dorsodistal spine and according to De Man (1888a: 243–44) sometimes a small spinule on the internal side.

Clibanarius danai Rahayu and Forest, 1993

Clibanarius lineatus.– Dana, 1852c: 462; 1855: pl. 29, fig. 2.– Fize and Serène, 1955: 10, fig. 14.– Pitagsalee, 1980: 46, figs 24, 25.– Naiyanetr, 1980: 23 (list); 1998: 47 (list). Not *Clibanarius lineatus* (H. Milne Edwards, 1848).

Clibanarius danai Rahayu and Forest, 1993: 767, figs 4e, 5e, 6e.– Rahayu and Komai, 2000: 23, figs 2, 3.

Material examined

PMBC 16607, 1 ovig. female, sl = 3.5 mm, muddy area in mangrove swamps, Nam Bor Bay, intertidal, coll. T. Komai, 15.11.1995; USNM 266374, IIOE Patong, 3 males, sl = 2.0–2.8 mm, 1 female, sl = 1.5 mm, 2 ovig. females, sl = 1.5, 2.9 mm, Andaman Sea, coll. Taylor *et al.*, 22.03.1963; CUMZ 677, 1 female, sl = 6.9 mm, Chachoengsao, Gulf of Thailand, coll. C. Pitagsalee, 1977.

Diagnosis

Ocular peduncles moderately short to moderately long, 0.75–0.80 length of shield; ocular acicles moderately long, slender, with 1 or 2 distal spines and occasionally 1 or 2 minute lateral spinules. Antennular peduncles nearly same length as ocular peduncles. Antennal peduncles overreaching bases of corneas. Antennal acicles short, not reaching proximal margins of fifth segments.

Chelipeds subequal, right slightly larger. Chelae each with blunt tubercles on palm, stronger and sometimes with corneous tips near dorsomesial margin. Carpi each with 1 strong dorsodistal spine. Ambulatory legs with dactyls longer than propodi, ventral margins with 12–20 tiny corneous spinules on ventral margins. Carpi each with dorsodistal spine.

Telson with median cleft only faintly indicated, posterior lobes subequal; terminal margins each with row of quite small spines extending onto lateral margins.

Colour in preservative.– Shield, ocular, antennal and antennular peduncles yellowish-white. Chelipeds yellowish-white; dorsal face of dactyls each with two longitudinal orange stripes, fixed fingers each with one longitudinal orange stripe; carpi each with two longitudinal orange stripes. Ambulatory legs yellowish-white with longitudinal orange stripes over entire lengths; lateral faces of dactyls each with two stripes; propodi each with four more narrow stripes; carpi and meri each with three stripes (Rahayu and Forest, 1993).

Habitat

Sandy bottom, near river mouth.

Records for southern Thailand.– Nam Bor Bay, Phuket, Krabi, Phang-nga, Andaman Sea; Chanthaburi, Gulf of Thailand.

Distribution

South Africa; Andaman Sea and Gulf of Thailand; Sri Lanka; Balikpapan, Indonesia, Vietnam, Samoa.

Remarks

Pitagsalee (1980) identified this species as *Clibanarius lineatus*, and while he credited authorship to H. Milne Edwards (1848), his synonymy included only the reports of Dana (1852c, 1855) and Fize and Serène (1955), other than the literature citations of Alcock (1905b) and Gordan (1956). Pitagsalee's (1980: fig. 24) photograph of this species was of a specimen collected at Chachoengsao, whereas his illustrated shield, cephalic appendages cheliped and ambulatory leg (ibid, fig. 25) were taken from Fize and Serène (1955: fig. 14). Rahayu and Forest

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(1993) demonstrated that the Indo-Pacific species identified by Dana (1852c, 1855) and Fize and Serène (1955) as *C. lineatus* was not conspecific with the taxon described by H. Milne Edwards (1848). For *C. lineatus* [*sensu*] Dana (1852c) and Fize and Serène (1955), Rahayu and Forest (1993) proposed the name *Clibanarius danai*. A comparison of Pitagsalee's (1980) *C. lineatus* from the Gulf of Thailand with *C. danai* identified by Rahayu and Komai (2000) from Nam Bor Bay, has shown that the two are conspecific. I have had the opportunity to examine only a male from Chachoengsao, in the northern Gulf of Thailand; however Pitagsalee (1980) reported his taxon from three other Gulf localities, including Chanthaburi. He also indicated that his taxon had been collected in Krabi and Phangnga in the Andaman Sea. Additional specimens collected in the Patong area during the first IIOE cruise, as well as the specimen from Nam Bor Bay, confirm the presence of *C. danai* in the Andaman Sea.

Calcinus Dana, 1851

Key to the regional species

1. Dactyl and distal part of propodus of left third pereopod with tufts of long setae forming dense brush 2
— Dactyl and distal part of propodus of left third pereopod without tufts of long setae forming dense brush..... 3
2. Ocular acicles approximate or nearly so [chelipeds with white-tipped spines and tubercles; ambulatory legs with alternating bands of colour on propodi, carpi and meri, dactyls with spots]..... *C. elegans**
— Ocular acicles widely separated. Chelipeds solidly colored, chelae white-tipped; ambulatory legs solidly colored, but with dactyls usually white distally..... *C. gaimardii*
3. Outer face of left chela smooth..... 4
— Outer face of left chela tuberculate at least near upper and lower margins [outer and inner faces of chelae each with patch of color; ambulatory legs light colored with numerous short colored longitudinal stripes, and median or subdistal dark band]..... *C. pulcher*
4. Dactyls of ambulatory legs distinctly shorter than propodi [ambulatory legs each with lateral and short ventral dark longitudinal stripe on carpus, dactyl with subdistal dark band and subproximal dark spot] ..... *C. laevimanus**
— Dactyls of ambulatory legs slightly shorter to slightly longer than propodi [dactyls of ambulatory legs cream or white with dark proximal band comprised of several short longitudinal stripes..... *C. latens**

Remarks

The genus *Calcinus* includes a large number of species that are widely distributed throughout the Indo-Pacific; however most are associated with coral reef areas. It is probable that when more intensive sampling is conducted in the reef areas of Thailand, numerous additional species will be encountered, thus rendering the present regional key inadequate. More comprehensive coverage of *Calcinus* species is given by Morgan (1991) and Poupin (1997).

Calcinus elegans (H. Milne Edwards, 1836)*

Pagurus elegans H. Milne Edwards, 1836: 278, pl. 13, fig. 2.
Pagurus pictus Owen, 1839: 83, pl. 25, figs 2, 2a.
Pagurus decorus Randall, 1840: 134.
Calcinus elegans.– Dana, 1851: 267; 1852c: 458; 1855: pl. 28 figs 10a–c.– Alcock, 1905b: 55, pl. 5, fig. 2.– Yap-Chiongco, 1938: 206, pl. 2, fig. 10.– Miyake, 1956: 18, figs 12, 13.– Lee, 1969: 54, fig. 10.– Pitagsalee, 1980: 99, figs

58, 59.– Naiyanetr, 1980: 24 (list); 1998: 46 (list).– Morgan, 1991: 874, figs 7–9.– Yu and Foo, 1991: 34, unnumbered colour fig.– Jones and Morgan, 1994: 113, 115, unnumbered figs.– Poupin, 1994: 15, fig. 1; 1997: 687, figs 2A, 3A, 4A.

Diagnosis

Ocular peduncles overreaching antennal peduncles and equaling length of antennular peduncles; ocular acicles simple.

Outer face of palm of left cheliped with closely-spaced tubercles, upper margin with 4 or 5 more prominent tubercles. Right cheliped with 5 sharp spines on upper surface of palm. Dorsal margin of carpus spinose. Dactyl of left third pereopod markedly shorter than propodus; 4 to 8 tufts of long setae on ventral margin of dactyl and propodus distally, forming dense brush. Not more than 3 tufts of thin setae on ventral margin of dactyl of left second pereopod.

Telson with asymmetrical posterior lobes, left lobe longer; terminal margins each with 3 to 5 spines.

Colour in life.– Ocular peduncles bright blue with narrow dark brown area at base. Antennules and antennae uniform orange. Chelipeds dark brown with white tubercles on fingers and distal part of palms. Meri and carpi of ambulatory legs bright blue in proximal and dark brown in distal halves or blue with brown patches; propodi blue proximally and distally with broad dark brown band medially; dactyls bright blue with dark brown spots, with narrow white band next to claw; dactyls and propodi with bright red setae ventrally (after Poupin, 1997). In Hawaiian Islands specimens, the brightly coloured bands of the ambulatory legs are orange rather than blue.

Habitat

Frequently found intertidally on wet erosion beaches and exposed rocky shores, and subtidally on outer edges of reef-flats, on algal ridges, coral and coral rubble; intertidal to 10 m.

Records for southern Thailand.– Phuket, Andaman Sea.

Distribution

East coast of Africa to Hawaiian Islands and Tuamotu Archipelago, including Maluku region of Indonesia.

Calcinus gaimardii (H. Milne Edwards, 1848) *sensu stricto*

Pagurus gaimardii H. Milne Edwards, 1848: 63.

Calcinus gaimardii.– Dana, 1852c: 457, 1855: pl. 28, fig. 9.– Miyake, 1978: 54.– Pitagsalee, 1980: 102 (in part), fig. 60, not fig. 61.– Naiyanetr, 1980: 24 (list); 1998: 47 (list).– Morgan, 1991: 876 (in part), fig. 13, not figs 10–12.– Tudge, 1995: 10 (in part), figs 4C, D, not figs 4A, B, pl. 1, fig. E.

Calcinus gaimardi.– Fize and Serène, 1955: 49 (in part), pl. 2, figs 5–8, not figs 7, 8.

Not *Calcinus gaimardii*.– Alcock, 1905b: 56, pl. 5, fig. 3.– Fize and Serène, 1955: figs 7, 8.– Miyake, 1956: 326, figs 16, 17; 1982: 114, pl. 38, fig. 4.– Pitagsalee, 1980: 102 (in part), fig. 61.– Haig and Ball, 1988: 159.– Morgan, 1991: 878 (in part), figs 10–12.– Poupin, 1997: 688, figs 2B, 5D (= *Calcinus morgani* Rahayu and Forest, 1999).

Material examined

PMBC 15431, 4 males, sl = 3.2–5.8 mm, 3 ovig. females, sl = 2.2–3.2 mm, Phuket, Andaman Sea. intertidal, coll. P. Davie and P. Ng, 06.12.1998.

Diagnosis

Ocular peduncles long, considerably overreaching antennular and antennal peduncles; ocular acicles simple.

Outer surface of chela of left cheliped with distinct, closely-spaced tubercles, strongest distally and on fixed finger and dactyl. Upper margin of propodus and carpus of right cheliped spinose. Dactyl of left third pereopod shorter than propodus; with brush of long, plumose setae on ventral margins of dactyl and distal part of propodus.

Telson with several spines on terminal margins of left and right posterior lobes.

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Colour in life.– Shield, at least in males, completely dark brown with white strip on anterior margin. Ocular peduncles dark brown, orange-brown or brown-green proximally, with longitudinal triangular dark stripe dorsally and narrow bright blue distal band below cornea; acicles dark brown. Antennular peduncles dark red-brown, ultimate segment orange distally. Chelipeds with orange-brown with paler finger tips; palms darker red-brown or deep chocolate; carpi and meri brown. Ambulatory legs generally dark brown or dark orange-brown; dactyls with reddish or cream tips.

Habitat

On coral, sand and rocks, utilizing shells of *Conus*, *Turbo*, *Strombus*, *Trochus*, *Drupa* and *Cypraea*; intertidal to 20 m.

Records for southern Thailand.– Phuket, Andaman Sea.

Distribution

Andaman Sea, Indonesia, southern Japan, New Guinea, east to Hawaiian Islands; western, northern and eastern Australia.

Remarks

Until recently *C. gaimardii,* was considered to be variable in colour patterns, but with two distinguishable colour morphs (Morgan, 1991; Poupin, 1997). However, Rahayu and Forest (1999) have restricted *C. gaimardii* to the taxon exhibiting a generally overall dark brown or dark red-brown colouration on the shield and appendages. The lighter colour morph has been described as *Calcinus morgani* by Rahayu and Forest. Although the Thai female specimens personally examined exhibited some white posteriorly on the shields, the shields of the males were almost entirely dark. These Thai specimens have been identified as *C. gaimardii sensu stricto*. Similarly, Pitagsalee's specimens represent *C. gaimardii*, even though his figure 61, taken from Fize and Serène (1955), represents *C. morgani*.

Calcinus pulcher Forest, 1958

Calcinus pulcher Forest, 1958: 287, figs 4, 12, 13, 16.– Morgan, 1991: 896, figs 43–45.

Material examined

PMBC 14905, sl = 5.7 mm, Racha Yai Island, Andaman Sea, 30 m, 05.12.1998.

Diagnosis

Ocular peduncles very long and slender, as long or longer than shield; acicles multispinose.

Lateral face of palm of left cheliped with scattered tubercles or small spines, strongest near upper and lower margins; upper margins of palm and carpus each with row of spines. Upper margin of propodus and carpus of right cheliped spinose. Dactyl of third left pereopod subequal to propodus; no brush of long setae on ventral margins of dactyl and propodus.

Telson with several spines on terminal margins of both posterior lobes, strongest on left and extending onto lateral margin.

Colour in life.– Shield cream, pale or medium brown, often darker anteriorly and laterally. Ocular peduncles rose-brown on proximal half, distally cream; ocular acicles brown or orange. Antennular peduncles with penultimate segment orange or brown, ultimate segment orange or brown proximally, blue distally; flagella orange. Antennal peduncles mostly cream with ultimate segment orange; flagella orange. Chelipeds with fingers cream or white; palm cream distally grading to grey-brown proximally; dark grey or brown spot on lateral and mesial faces of palms of both chelae; carpus and merus grey-brown. Second and third pereopods cream with numerous short longitudinal grey-green or grey-brown flecks; broad band of very dark grey-blue or brown at approximate mid-length of dactyls and subdistally on propodi; carpi of third pereopods and meri of both second and third pereopods with similar dark band usually incomplete and mostly dorsal; carpi of second pereopods mostly intense rose pink (Morgan, 1991).

Habitat

Usually associated with coral and dead coral rubble; subtidal to about 30 m.

Records for Thailand.– Racha Yai Island, Phuket, Andaman Sea.

Distribution

Cocos (Keeling) Islands; western Thailand; Indonesia; Vietnam; southern Japan; Ashmore Reef, north-western Australia.

Calcinus laevimanus (Randall, 1840)*

Pagurus tibicen H. Milne Edwards, 1836: 278. Not *Cancer tibicen* Herbst, 1791.
Pagurus laevimanus Randall, 1840: 135.
Pagurus lividus H. Milne Edwards, 1848: 63.
Calcinus tibicen.– Dana, 1852c: 457. Not *Calcinus tibicen* (Herbst, 1791).
Pagurus levimanus.– Stimpson, 1858: 234.
Pagurus (*Calcinus*) *tibicen*.– Hilgendorf, 1869: 97; 1879: 823. Not *Calcinus tibicen* (Herbst, 1791).
Calcinus Herbstii De Man, 1888b: 437.
Calcinus herbsti.– Ortmann, 1892: 292.– Fize and Serène, 1955: 41, fig. 6, pl. 2, figs 1–4.
Calcinus herbstii.– Alcock, 1905b: 53, pl. 5, fig. 4.– Yap-Chiongco, 1938: 205, pl. 2, fig. 5.– Forest, 1951: 89, figs 2, 5, 6, 9.
Calcinus herbstii var. *lividus*.– Borradaile, 1898: 462.
Calcinus herbsti var. *lividus*.– Alcock, 1905b: 55.
Calcinus laevimanus.– Rathbun, 1907: 208 (footnote).– Barnard, 1950: 437, figs 80e, f.– Miyake, 1956: 323, figs 14, 15.– Pitagsalee, 1980: 96, figs 56, 57.– Naiyanetr, 1980: 24 (list); 1998: 47 (list).– Morgan, 1991: 888, figs 30–33.– Poupin, 1994: 16, fig. 12; 1997: 702, figs 2F, 3G, 4E.

Diagnosis

Ocular peduncles approximately as long as shield; ocular acicles triangular, simple.

Outer face of palm of left cheliped rounded and almost smooth, upper margin similar. Upper margin of palm of right chela and dorsal margin of carpus also smooth or only slightly granular. Dactyl of left third pereopod distinctly shorter than the propodus; no brush of setae on ventral margins of dactyl and propodus.

Telson with posterior lobes asymmetrical, left larger; terminal margins of both lobes unarmed or with single spine.

Colour in life.– Shield cream, pale orange, orange-green or grey-green. Ocular peduncles with thin orange proximal band, sky-blue on proximal half or third, orange on distal half to 0.65; ocular acicles pale orange or cream. Antennular peduncles pale blue, usually with orange near articulations of segments; flagella orange. Antennae orange. Chelipeds predominantly dark chocolate-brown. Left cheliped with tip of dactyl, most of fixed finger and cutting edges white or cream, white extending some distance along ventral margin of palm and sometimes dorsally, covering most of palm. Right cheliped with distal half of fingers and cutting edges white. Ambulatory legs primarily orange or red-brown; dactyls white or cream, each with subdistal dark brown or green band and subproximal lateral and mesial dark spot; propodi rather uniformly brown or darker distally; carpi with lateral and short ventral longitudinal brown, green or grey stripes; meri with diffuse distolateral and distoventral longitudinal stripes. Setae sparse, pale yellow (after Morgan, 1991).

Habitat

Hard substrate of littoral zone, particularly in areas of shallow pools and ridges towards the upper part of the shore with sparse algal growth, also on coral rubble, rocky platforms, sand and mud flats; intertidal and very shallow subtidal.

Records for southern Thailand.– Phuket, Andaman Sea.

Distribution

East Africa to Indonesia; Philippines, Japan; Australia; New Caledonia, French Polynesia; Marianas; Cocos (Keeling) and Christmas Islands; Hawaiian Islands.

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Calcinus latens (Randall, 1840)*

Pagurus latens Randall, 1840: 135.
Pagurus cristimanus H. Milne Edwards, 1848: 64.
Calcinus latens.– Dana, 1852c: 459; 1855: pl. 28, fig. 2.– Alcock, 1905b: 58, pl. 5, fig. 5.– Nobili, 1906b: 83, pl. 5, fig. 20.– Forest, 1951: 85, figs 14–18.– Fize and Serène, 1955: 58, figs 9a, b, c, pl. 2, figs 9–11.– Miyake, 1956: 331, figs 20, 21.– Lee, 1969: 53, fig. 12.– Pitagsalee, 1980: 106, figs 62, 63.– Naiyanetr, 1980: 24 (list); 1998: 47 (list).– Tirmizi and Siddiqui, 11981: fig. 8; 1982: 61, figs 32, 33.– Morgan, 1991: 890, figs 34–36.– Poupin, 1994: 17, fig. 13, pl. 2 fig. b; 1997: 703, figs 3H, 6C.
Calcinus cristimanus.– Stimpson, 1858: 234.
Pagurus (*Calcinus*) *latens*.– Hilgendorf, 1879: 823.
Calcinus intermedius De Man, 1881: 102.
Calcinus terrae-reginae Haswell, 1882: 760.– Alcock, 1905b: 57, pl. 5, fig. 7.– Miyake, 1956: 328, figs 18, 19.
Calcinus latens var. *terrae reginae*.– Buitendijk, 1937: 269.
Calcinus abrolhensis Morgan, 1988: 218, fig. 1.
Not *Calcinus terrae-reginae*.– De Man, 1888a: 226; 1888b: 439 [= *Calcinus gaimardii* (H. Milne Edwards, 1836)].

Diagnosis

Ocular peduncles longer than shield, slender; ocular acicles small, simple (rarely with additional spinules).

Left cheliped with outer face of palm smooth and naked; upper margin variously armed with spines, spinules, tubercles, granules, or unarmed. Right cheliped with 5 strong spines on upper margin of palm. Dorsal margin of carpus carinate and spinose. Dactyl of left third pereopod longer than propodus; slightly greater development of long setae on dactyls and distal part of propodi than on second pereopods, but not forming brush. Carpi each with sharp spine on dorsodistal margin.

Telson with 1 to 6 spines on terminal margin of left posterior lobe, terminal margin or right posterior lobe with 0–3 spines, all directed ventrally.

Colour in life.– Shield green-grey or deep green with pale areas. Ocular peduncles pale salmon-grey or orange, paler at bases of corneas; acicles cream, pale orange or green. Antennular peduncles bright blue with darker green band proximally on ultimate and sometimes penultimate segments; flagella orange. Antennal peduncles green and cream, ultimate segment and flagella pale orange. Chelipeds with dactyls white or cream; chelas with fingers and distal part of palms white or cream, remainder green, green-brown or green-grey; carpi and meri green or green-brown with cream tubercles. Ambulatory legs with dactyls cream, each with proximal dark red-purple or brown-purple band comprised of several short longitudinal stripes on slightly paler background; propodi pale salmon-brown or grey-brown proximally grading to pale green or cream in distal third; carpi and meri green-grey with cream tubercles, meri each with orange patch distally (Morgan, 1991).

Habitat

Wide variety of habitats including inner and outer coral reef flats not exposed to high surf, rocky platforms, rock pools on lower shore, coral heads in lagoons, rubble and sand, occupying variety of gastropod shells; intertidal and shallow subtidal to 5 m.

Records for southern Thailand.– Phuket, Andaman Sea.

Distribution

Eastern Africa to Indonesia; Indo-Pacific to French Polynesia

Diogenes Dana, 1851

Key to the regional species

1. Rostriform process unarmed marginally, well developed or reduced.....2
— Rostriform process armed marginally with spines or spinules.....10
2. Rostriform process well developed.....3
— Rostriform process reduced or vestigial.....*D. stenops**

3. Antennal acicle broad, nearly subquadrate. Palm of left cheliped covered with flat-topped mushroom-shaped tubercles.....*D. guttatus*
— Antennal acicle moderately slender, triangular. Palm of left cheliped not covered with flat-topped mushroom-shaped tubercles.....4
4. Carpi of second pereopods (first ambulatory legs) with row(s) of spines on dorsal surface, or at least cluster of small spines distally.....5
— Carpi of second pereopods (first ambulatory legs) without row(s) of spines on dorsal surface, only 1 spine dorsodistally.....8
5. Spinose upper margin of palm of left chela with 1 very prominent tuberculate spine distally.....*D. goniochirus*
— Spinose upper margin of palm of left chela without 1 very prominent tuberculate spine distally.....6
6. Antennular peduncles overreaching distal margins of corneas by at least 0.75 length of ultimate segment .....*D. rectimanus*
— Antennular peduncles overreaching distal margins of corneas by 0.5 or less length of ultimate segment 7
7. Palm of left cheliped with arc of prominent spines beginning at lower proximal margin and curving upward to central portion of palm.....*D. costatus*
— Palm of left cheliped without arc of prominent spines beginning at lower proximal margin and curving upward to central portion of palm.....*D. avarus*
8. Antennular peduncles distinctly longer than ocular peduncles; antennal flagella with long setae.....*D. klaasi*
— Antennular peduncles slightly longer to or shorter than ocular peduncles; antennal flagella with few short setae.....9
9. Palm of left cheliped with row of prominent spines on upper margin. Carpi of ambulatory legs each with dorsodistal and dorsoproximal spine.....*D. serenei*
— Palm of left cheliped without row of prominent spines on upper margin. Carpi of ambulatory legs with only dorsodistal spine.....*D. tumidus*
10. Intercalary rostriform process short, reaching little if at all beyond spines of ocular acicles; antennal acicles weakly, if at all bifurcate.....*D. planimanus*
— Intercalary rostriform process long, overreaching spines of ocular acicles by at least 0.35 own length; antennal acicles usually clearly bifurcate.....11
11. Antennular peduncles overreaching antennal peduncles; inner fork of antennal acicle reaching mid-length of fourth peduncular segment or beyond.....*D. mixtus*
— Antennular peduncles approximately equal to length of antennal peduncles; inner fork of antennal acicles not reaching mid-length of fourth peduncular segment.....*D. dubius*

Diogenes stenops Morgan and Forest, 1991*

Diogenes senex.– Lanchester, 1902: 366. Not *Diogenes senex* Heller, 1865.

Diogenes jousseaumei.– Morgan, 1987b: 179. Not *Diogenes jousseaumei* (Bouvier, 1897).

Diogenes stenops Morgan and Forest, 1991: 671, figs 9, 10.– McLaughlin and Clark, 1997: 43, figs 7a, 9g, 13 b.– Rahayu and Komai, 2000: 29.

Diagnosis

Dorsal surface of shield with tubercles and spines, often in short transverse ridges. Ocular peduncles long and slender, slightly overreached by antennular peduncles. Ocular acicles with 3–5 spines on terminal margins. Intercalary rostriform process very small, or vestigial. Antennal peduncles slightly overreaching distal margins of corneas. Antennal acicles with terminal spine and 3 or 4 spines on mesial margin. Antennal flagella

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with long ventral setae.

Left cheliped with dense plumose setae obscuring armature, particularly on dactyl and palm. Dactyl and palm with row of strong spines on upper margin; outer faces of fixed finger and palm with scattered tubercles or small spines, lower margins with spines or spinulose tubercles. Carpus with row of 6 or 7 very prominent spines on upper margin, distal margin with several spines, 1 or 2 very prominent spines on outer surface near distal midline. Ambulatory legs with scattered long setae on all segments; dactyls and propodi of second and right third unarmed; carpi each with dorsodistal spine. Left third slightly shorter than right or second pereopods, ventral margin of propodus with row of spinules; dactyl and propodus with appreciably more dense tufts of setae, carpus with row of spinules or tubercles ventrolaterally and scattered tubercles on lateral surface, obscured by tufts of setae.

Telson with distinct, but not deep median cleft; posterior lobes markedly asymmetrical, terminal margins with several large and numerous smaller spines, extending onto lateral margins, at least on left.

Colour in life.– Ocular peduncles cream with some brown dorsally and ventrally; antennules and antennae cream. Chelipeds cream and dark brown. Ambulatory legs cream with grey-brown mottling, each often with irregular brown band proximally on dactyl and at mid-length of propodus, carpus, and merus (Morgan and Forest, 1991).

Habitat

Often mud substrate.

Records for Thailand.– Andaman Sea off Phuket.

Distribution

Andaman Sea; Northern Australia from the Northern Territory east to the vicinity of Townsville, Queensland; Penang; Singapore.

Diogenes guttatus Henderson, 1888
(Fig. 1A, B)

Diogenes guttatus Henderson, 1888: 54, pl. 6, fig. 4.

Not *Diogenes guttatus*.– Tirmizi and Siddiqui, 1982: 57, figs 30, 31.

Material examined

Holotype: NHM 1888.33, 1 male, sl = 3.2 mm, 'Challenger' Station 187, Torres Strait, off Cape York, North Australia, 10°36´S, 14°55´E, 11 m, 09.09.1874; PMBC 14851, 1 male, sl = 1.5 mm, 1 female, sl = 1.5 mm, BIOSHELF St. A2, Andaman Sea, 09º29´N, 097º52´E, OS, 61 m, coll. S. Bussarawit and Aungtonya, 18.02.1998.

Diagnosis (based on Andaman Sea specimens)

Shield slightly convex, centrally smooth; lateral margins each with protuberant spinulose ridge in posterior half. Rostrum obsolete; lateral projections produced. Branchiostegal margins each with 4 or 5 acute spines. Intercalary rostriform process simple, tapering to acute tip, not reaching to apices of acicular spines. Ocular peduncles (including corneas) reaching approximately to midpoint of ultimate segments of antennal peduncles and proximal margins of ultimate antennular peduncular segments; ocular acicles with 4 or 5 spinules on distal margin, innermost largest. Second segment of antennal peduncle with row of small spinules on lateral margin ventrally, 1 prominent spine at dorsolateral distal angle and smaller spine at dorsomesial distal angle. Antennal acicle short, broad, generally subquadrate, outer spine not reaching beyond middle of penultimate peduncular segment, inner margin with 2 prominent spines. Antennal flagellum shorter than twice carapace length, articles each with pair of long ventral setae.

Left cheliped missing. Right cheliped with 2 rows of small tuberculate spines on upper surface of dactyl. Palm with double row of small spines or spinulose tubercles on upper surface, outer face with scattered spinules or small tubercles, 1 longitudinal row of small spines or tubercles in midline, and similar row on lower margin. Carpus with prominent spine at upper distal margin and row of smaller spines on upper surface. Ambulatory legs with dactyls slightly curved, longer than propodi; carpi of second pereopods each with 1 dorsodistal, 2 or 3 smaller dorsoproximal spines and few minute spinules on dorsal margin; third with only dorsodistal spine or

sometimes also with very small spinule proximally.

Telson with faint median cleft; left posterior lobe with few moderately large spines on terminal margin, 1 very elongate spine at outer angle, spines extending nearly entire length of lateral margin; right posterior lobe with small to moderately large spines on terminal and lateral margins.

Colour.– Not known.

Habitat

Not known.

Records for southern Thailand.– Andaman Sea, west of Phuket.

Distribution

Torres Strait; Andaman Sea.

Remarks

Henderson (1888) described *Diogenes guttatus* from a single male specimen collected from the Torres Strait during the 'Challenger' expedition. It lacked a right cheliped. In his description, Henderson reported that the ambulatory legs were smooth and slightly 'ciliated', and with a few spinules on the meri; however, reexamination of the holotype has shown that the spinules referred to by Henderson actually are on the carpi of the ambulatory legs, not the meri, and by present-day standards, those of the second pereopods would be called small spines. The armature of the outer face left chela was accurately described by Henderson as consisting of perfectly circular, drop-shaped and flattened ['mushroom-shaped'] tubercles. The

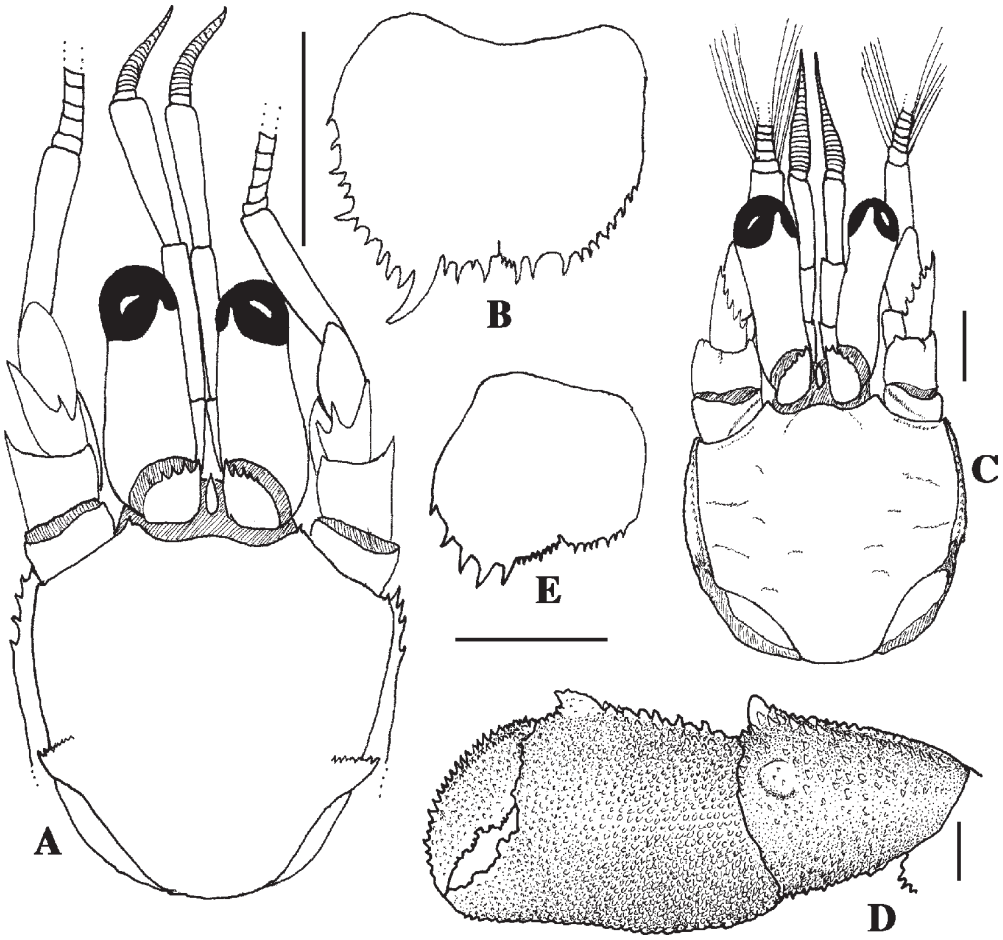

Figure 1 A, B, *Diogenes guttatus* Henderson, 1888, male, sl = 1.5 mm, BIOSHELF St. A2; C–E, *Diogenes goniochirus* Forest, 1956, male, sl = 3.2 mm, Phetchaburi. A, C, shield and cephalic appendages (aesthetascs omitted); D, chela and carpus of left cheliped; B, E, telson. Scales equal 0.5 mm, B; 1.0 mm A, C–E.

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Thai specimens both lack the left cheliped. The ambulatory legs differ from the type in having one dorsodistal and one to three dorsoproximal spines on the carpi and a few minute spinules on one of the detached second pereopods, fewer on the other carpi. The ocular peduncles are also shorter in the Thai specimens. However, the holotype is vastly larger than either of the Thai specimens. Given the size disparity, the present specimens agree well with the holotype in the cephalic appendages, particularly the strongly produced lateral projections and very distinctive antennal acicles. There is also agreement between the Thai specimens and the holotype in the relative lengths of the dactyls and propodi of the ambulatory legs and the armature of the telson.

The report of *D. guttatus* from Karachi, Pakistan (Tirmizi and Siddiqui, 1982) is the only account of this species, other than the literature citations of Alcock (1905b) and Gordan (1956); however, Tirmizi and Siddiqui's species is not conspecific with Hendenson's (1888) taxon. Tirmizi and Siddiqui (1982) referred to the armature of the outer face of the palm of the left cheliped as 'granular', personal reexamination of their specimens (MRCRC Anom. 261) has shown the surface of the palm to be covered with spiniform tubercles. The telson of their species is markedly different from that of *D. guttatus*. The dactyls of the ambulatory legs are not much longer than the propodi. The Pakistani specimens also differ from *D. guttatus* and the Thai specimens in having shorter antennular and antennal peduncles, larger spines on the ocular acicles, and more numerous and smaller spines on the branchiostegal margins. However, like the Thai specimens, the Karachi specimens have the similar, very distinctive, antennal acicles. The identity of the Pakistani specimens is, at present, uncertain.

Diogenes goniochirus Forest, 1956
(Fig. 1C–E)

Diogenes goniochirus Forest, 1956: 527, figs 5–7.– McLaughlin and Clark, 1997: 38, figs 3a, 8a, 9a, 11a.

Material examined

CUMZ 1279, 1 male, sl = 3.2 mm, Phetchaburi, Gulf of Thailand, coll. C. Pitagsalee.

Diagnosis

Shield with only few spinules on anterior margin between broadly rounded rostrum and slightly produced lateral projections; dorsal surface with few transverse, setose and/or spinulose ridges laterally. Dorsal margins of branchiostegites each with row of closely-spaced small spines over entire length. Ocular peduncles 0.75 to 0.80 length of shield; corneas dilated little if at all; ocular acicles broadly subtriangular, terminal margins with 3 or 4 spines, extending approximately half length of margins. Intercalary rostriform subovate, acute, not reaching to tips of acicular spines, no ventral spine. Antennular and antennal peduncles approximately equal in length, both overreaching ocular peduncles. Antennal acicles not bifurcate, with simple terminal spine, lateral margin with 1 spine distally, mesial margin with row of 4–6 spines. Antennal flagella with long ventral setae.

Left cheliped with outer face of carpus spinulose, longitudinal row of small spines centrally, culminating in prominent blunt, subacute or spinose protuberance distally, upper margin with row of spines; lower surface and margin of palm and fixed finger straight or convex, armed with 3 to several rows of blunt or spinulose tubercles, outer surface of palm spinulose but without median crest, row of small spines on upper margin of palm, usually more prominent distally, double row of spines on dactyl. Ambulatory legs with dorsal margins of carpi each with row of closely-spaced, small spines; dorsal margins of propodi each with row of very small spinules and long setae (second) or double row of long stiff setae (third); mesial faces of dactyls each with 4 rows of setae, dorsal and ventral rows long and simple, median rows shorter and pinnate, more distinct on third.

Telson with distinct median cleft, lobes slightly asymmetrical; terminal margins with 2 to 4 moderate to strong and 3 to 6 smaller spines, sometimes extending onto lateral margins.

Colour.– Not recorded.

Habitat

Intertidal pools on sand substrate, commonly in shells of *Cerithidea*.

Records for southern Thailand.– Phetchaburi, Pattani, Gulf of Thailand

Distribution

Gulf of Thailand; Singapore; Vietnam; Indonesia; Sulawesi.

Diogenes rectimanus Miers, 1884
(Fig. 2A–C)

Diogenes rectimanus Miers, 1884: 262, pl. 27, fig. c.– Alcock, 1905b: 71, pl. 6, figs 8, 8a, pl. 7, figs 2, 2a.– Pitagsalee, 1980: 86, figs 50, 51.– Naiyanetr, 1980: 24 (list); 1998: 49 (list).– Ajmal Khan and Natarajan, 1984: 20, fig. 17.– McLaughlin and Clark, 1997: 37, fig. 10b.

Not *Diogenes rectimanus*.– Lanchester, 1902: 366 (=*Diogenes goniochirus* Forest, 1956, and *Diogenes avarus* Heller, 1865).

Material examined

PMBC 14852, 2 females, sl = 3.9, 5.3 mm, 1 ovig. female, sl = 5.2 mm, fishing trawler, off Phuket, Andaman Sea, 10–11.12.1998; CUMZ 1151, 1 male, sl = 6.4 mm, Prachuap Khirikhan, Gulf of Thailand, coll. C. Pitagsalee.

Diagnosis

Shield with few transverse, spinulose ridges on dorsal surface laterally. Branchiostegal margins each with 5 or 6 moderately well-developed spines. Ocular peduncles approximately 0.80 length of shield, rather stout; corneas not dilated; ocular acicles with straight inner margins, broadly rounded anterolaterally, with 3 small, but prominent spines and several additional smaller spinules, not extending entire length of terminal margin. Intercalary rostriform process reaching approximately to distal 0.35 of ocular acicles, broad basally, tapering to moderately slender, subacute tip. Antennular peduncles overreaching corneas by almost entire length of ultimate segment. Antennal peduncles overreaching distal margins of corneas by 0.20 to 0.45 length of ultimate segment. Antennal acicles not bifurcate, not reaching to apex of fourth segment, with strong bifid terminal spine and 4 accessory strong spines on mesial margin.

Dactyl of left cheliped with double row of spines on upper margin, outermost strongest, row of equally prominent spines adjacent to upper margin, outer surface with scattered small, spinose tubercles. Upper surface of palm with irregular triple row of spines, outer surface with slightly concave area just below upper margin with few scattered spinules and tubercles and tufts of short setae, upper outer face with adjacent longitudinal row of moderately strong spines in proximal half, not reaching articulation of dactyl, remaining outer surface with rather widely-spaced, small spines; proximal margin with row of stronger spines continuing to lower margin, lower outer surface of palm spinose; lower margin with row of strong, outwardly directed spines, decreasing in size on fixed finger, and adjacent second row of much smaller spines; outer surface of fixed finger with spinulose tubercles. Carpus with row of moderately blunt spines on upper margin, distal 2 or 3 stronger; outer surface convex, with series of small tuberculate spines, lower margin with strong spine at lower distal angle. Ambulatory legs with dactyls 0.25 to 0.35 longer than propodi; dorsal margins of dactyls each with almost double row of long stiff, dense setae; lateral faces each with faint transverse sulcus in proximal half and row of long setae; ventral margins each with row of long setae proceeding onto lateroventral margin distally; mesial faces also with row of long stiff dense setae ventrally and second row of stiff setae beginning in upper half and progressing ventrally toward claw. Propodi of left with rows of tufts of setae each often accompanied by row of spinules on dorsal surfaces, strongest on third. Carpi each with row of acute spines, somewhat shorter on third.

Telson with small median cleft; terminal margins of both lobes with long spines interspersed with slightly smaller spines; spines extending down lateral margins, at least on left.

Colour in life.– Ocular, antennular and antennal peduncles pale orange-yellow. Dactyls and propodi of chelipeds cream or pale orange with darker green-grey tubercles; carpi and meri cream with

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green-grey or brown tinges. Ambulatory legs cream with tinges of yellow; propodi, carpi, meri, each with darker green or brown patches middorsally and midventrally (after Morgan, 1987b).

Habitat

Frequently found on mud substrate.

Records for southern Thailand.– West of Phuket, Trang, Andaman Sea; Prachuap Khirikhan, Pattani, Gulf of Thailand.

Distribution

Australia; Gulf of Aden; India; Sri Lanka; Thailand; Malaysia; Arafura Sea and Torres Strait.

Remarks

The Thai specimens differed from the holotype of *D. rectimanus* in lacking tiny spinules on the dorsal surfaces of the propodi of the left ambulatory legs, and in some specimens having the spines of the telson continued onto the lateral margins of both lobes. McLaughlin and Clark (1997) described the telson of the holotype as having spines on the left lateral margin only. However, these types of variations are not unexpected in species of *Diogenes*.

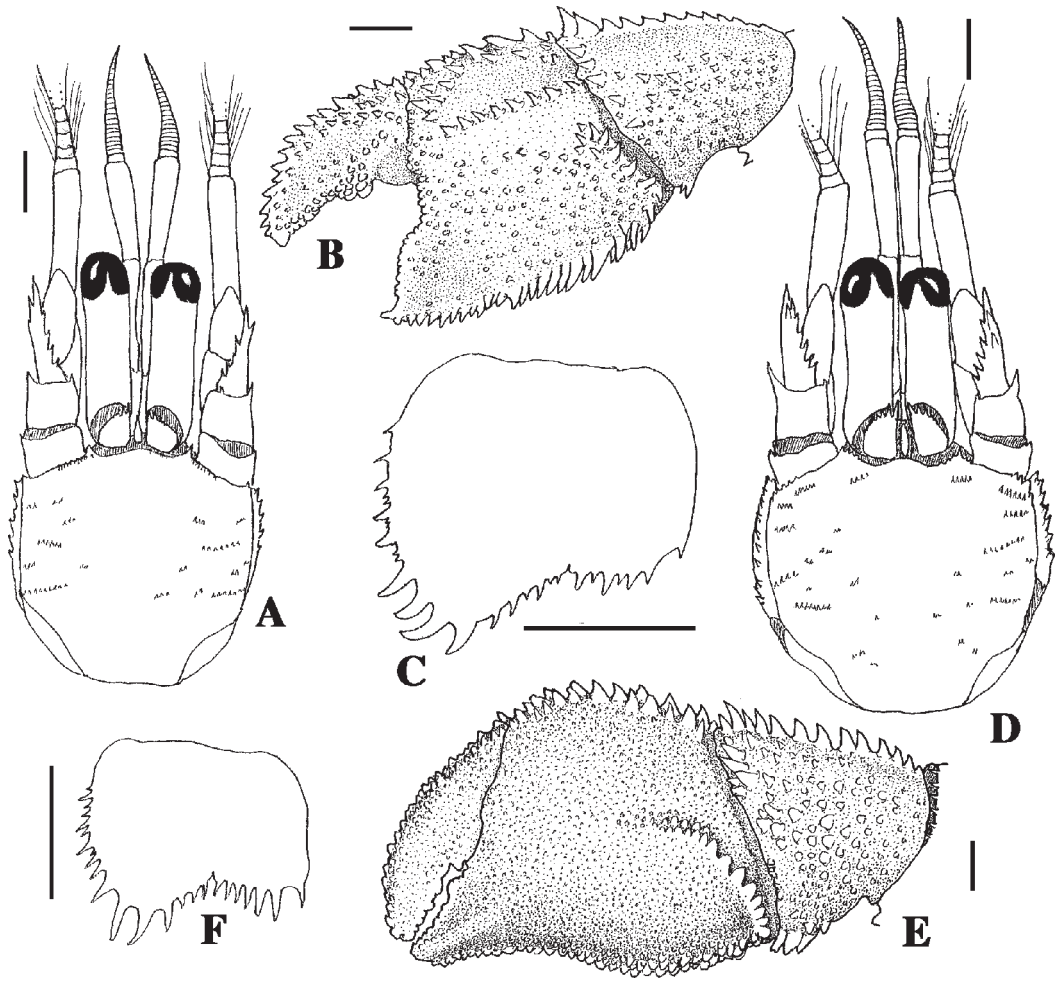

Figure 2 A–C, *Diogenes rectimanus* Miers, 1884, female, sl = 3.9 mm, off Phuket; D–F, *Diogenes costatus* Henderson, 1893, male, sl = 4.0 mm, west of Phuket. A, D, shield and cephalic appendages (aesthetascs omitted); B, E, chela and carpus of left cheliped; C, F, telson. Scales equal 1.0 mm.

Diogenes costatus Henderson, 1893
(Fig. 2D–F)

Diogenes costatus Henderson, 1893: 418, pl. 39, figs 7, 8.– Alcock, 1905b: 70, pl. 6, fig. 7.– Barnard, 1950: 443, figs 81e–g.– Lewinsohn, 1969: 42, fig. 6.– Ahmad and Khan, 1971: 14, figs 7, 7a.– Tirmizi and Siddiqui, 1982: 46, figs 23–26.– Thomas, 1989: 74, figs 2s–u.

Not *Diogenes costatus*.– Stebbing, 1917: 21 (= *Diogenes brevirostris* Stimpson, 1858).

Material examined

Syntype: NHM 1894.7.21.3, 1 male, sl = 3.6 mm, Madras, Bay of Bengal. PMBC 15448, 1 male, sl = 4.0 mm, fishing trawler, west of Phuket, Andaman Sea, 40–100 m, 10–11.12.1998.

Diagnosis

Branchiostegites each with several spines on dorsal margin. Shield with anterolateral margins unarmed or with few small spines. Intercalary rostriform process simple, shorter than ocular acicles. Ocular peduncles shorter than antennular peduncles and shorter than or equal to length of antennal peduncles; ocular acicles with 2 or 3 prominent spines and few small spinules. Antennal acicles not bifurcate, with prominent terminal and 4–8 mesial and dorsal spines. Antennal flagella with long ventral setae.

Left chela with 2 or 3 rows of spines on upper margin, outer surface smooth or weakly granular, and with transverse tuberculate or spinose ridge beginning at lower carpal articulation and curving obliquely, extending nearly to middle of palm, sometimes almost to level of articulation of dactyl, lower margin acutely or bluntly spinulose in proximal half, small tubercles sometimes distally. Carpus with row of prominent spines on upper margin; outer surface with numerous blunt or subacute tubercles, outer distal margin with at least partial row of spines and few spines at lower distal angle. Ambulatory legs with dactyls unarmed. Propodi and carpi of second with spinose dorsal margins, carpi of third each with dorsodistal spine, 1 or 2 spines proximally or partial to complete row of spinules.

Telson with small median cleft, lobes subequal or unequal, terminal and lateral margins, at least of left, with spines.

Colour in life.– Chelipeds and legs with brown bands across segments. Background colour of body and proximal three segments of ambulatory legs whitish; propodi and dactyls brown (Thomas, 1989).

Habitat

Variety of large-mouthed shells.

Records for southern Thailand.– Andaman Sea west of Phuket.

Distribution

Mozambique; KwaZulu-Natal, South Africa; Red Sea; Seychelles; northern Arabian Sea; Gulf of Mannar, India; Andaman Sea.

Remarks

Barnard (1950) was of the opinion that Henderson (1888) erred when he reported *Diogenes brevirostris* Stimpson, 1858 from Simon's Bay, South Africa, considering instead that Henderson's (1888) specimen actually represented *D. costatus*. Barnard was followed by Tirmizi and Siddiqui (1982) in citing *D. brevirostris* of Henderson (1888) as a synonym of *D. costatus*. Personal reexamination of Henderson's specimen (female, sl = 3.9 mm, NHM 1888.33) has shown that it was Barnard, not Henderson, who made the mistake. Henderson's specimen was accurately identified as *D. brevirostris*.

Diogenes avarus Heller, 1865
(Fig. 3A–C)

Diogenes avarus Heller, 1865: 83, pl. 7, fig. 2.– Alcock, 1905b: 68, pl. 6, figs 6, 6a.– Forest, 1956: 524, figs 1–4.– Lewinsohn, 1969: 37, fig. 4.– Pitagsalee, 1980: 89, figs 52, 53.– Naiyanetr, 1980: 24 (list); 1998: 48 (list).– Nateewathana, *et al.*, 1981: 51 (list).– Tirmizi and Siddiqui, 1982: 54, fig. 29.– Ajmal Khan and Natarajan, 1984: 18, fig. 15.– Thomas, 1989: 74, figs 2m–o.– Rahayu and Forest,

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1995: 398, figs 2b, g, h.– McLaughlin and Clark, 1997: 39, figs 3b, 8b, 9b–d, 11b.– Rahayu and Komai, 2000: 28.

Diogenes rectimanus.– Lanchester, 1902: 366 (in part). Not *Diogenes rectimanus* Miers, 1884.

Diogenes pugilator.– Bouvier, 1892: 55.– Nobili, 1903b: 16; 1906a: 119; 1906b: 76.– Balss, 1915: 9. Not *Diogenes pugilator* Roux, 1829.

Diogenes pugilator var. *avarus*.– Nobili, 1906a: 119.

Clibanarius padavensis.– Nateewathana, *et al.*, 1981: 51 (in part) (list). Not *Clibanarius padavensis* De Man, 1888.

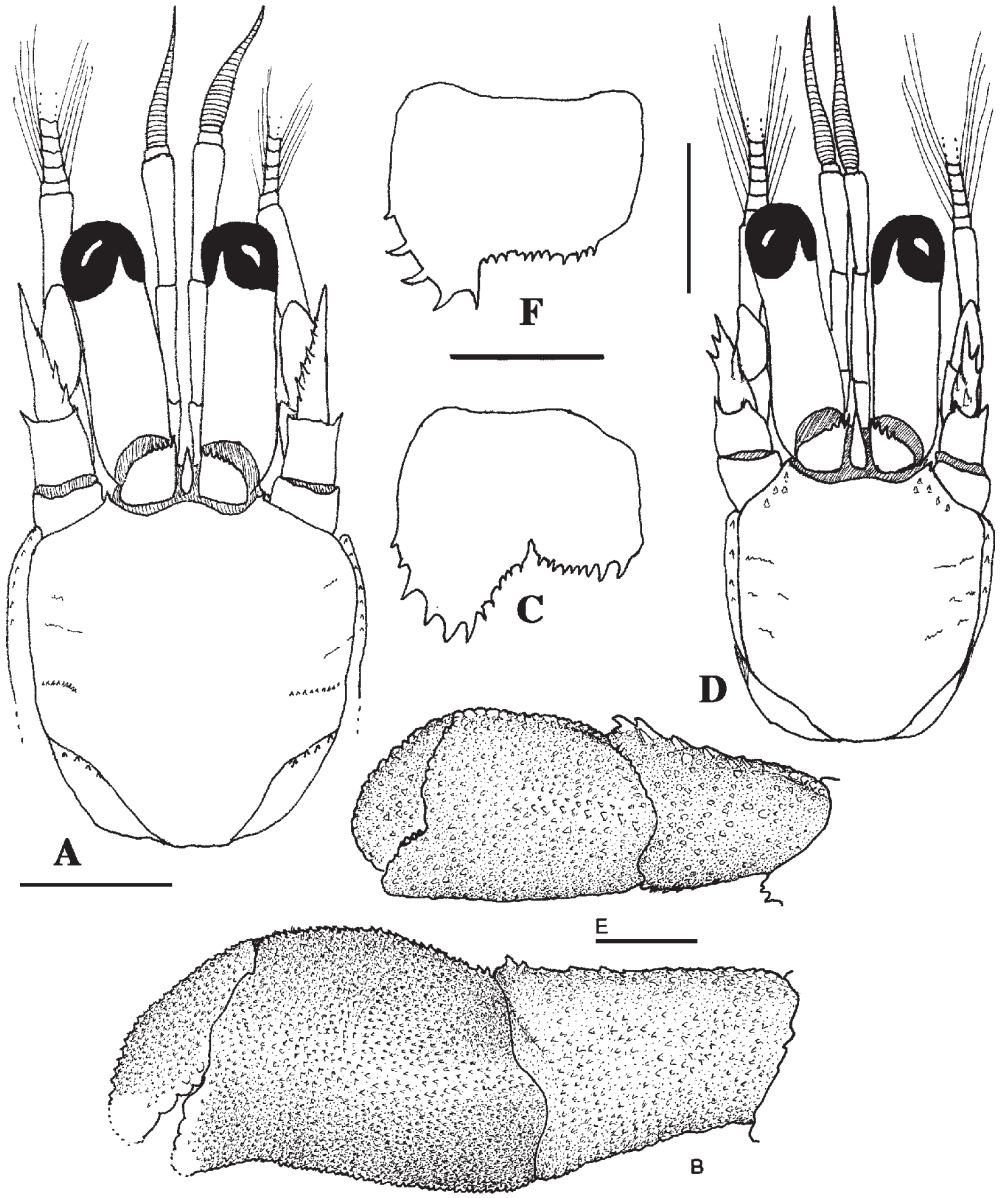

Figure 3 A–C, *Diogenes avarus* Heller, 1865, male, sl = 2.0 mm, Nam Bor Bay; D–F, *Diogenes klaasi* Rahayu and Forest, 1995, 1 male, sl = 1.8 mm, Tang Khen Bay. A, D, shield and cephalic appendages (aesthetascs omitted); B, E, chela and carpus of left cheliped; C, F, telson. Scales equal 0.5 mm, C, F and 1.0 mm A, B, D, E.

Material examined

Lectotype: NHMW 19393, 1 ovig. female, sl = 2.5 mm, Nicobar Islands.PMBC 3766, 17 males, sl = 0.9–2.7 mm, 5 ovig. females, sl = 1.2–1.8 mm, 5 not sexed or measured, Yao Yai Island, Phangnga, 1979; PMBC 3767, 1 male, sl = 1.7 mm, Yao Yai Island, Phangnga, 1978–79; PMBC 14882, 1 female, sl = 1.7 mm, BIOSHELF St. K1, 07º00´N, 099º16´E, OS, 41 m, coll. S. Bussarawit and C. Aungtonya, 24.02.1998; PMBC 14883, 2 males, sl = 1.0, 1.4 mm, BIOSHELF St. K2, 07º00´N, 099º04´E, OS, 53 m, coll. S. Bussarawit and C. Aungtonya, 24.02.1998; PMBC 4692, 13 males, sl = 1.2–2.4 mm, 1 female, sl = 1.4 mm, Phuket, Fifth Thai–Danish Expedition, intertidal, coll. Gallardo, 06.02.1966; PMBC 4695, 1 male, sl = 1.8 mm, 1 ovig. female, sl = 1.7 mm, Mak Island, Fifth Thai–Danish Expedition, coll. Gallardo, 17.02.1966; PMBC 16609, 3 males, sl = 1.8–2.0 mm, Phuket mud flat area, Nam Bor Bay, intertidal, coll. T. Komai, 07.10.1990; PMBC 14884, 15 males, sl = 0.9–2.0 mm, 4 females, sl = 1.2–1.4 mm, mangrove area near PMBC, Andaman Sea, intertidal, coll. G. Dinesen, 03.12.1998.

Diagnosis

Shield longer than broad, with few short transverse spinulose ridges and long setae on dorsal surface; rostrum obsolete or broadly rounded. Dorsal margins of branchiostegites each with 5–8 small spines. Ocular peduncles short and moderately stout; overreached by both antennular and antennal peduncles; ocular acicles broad, with 1–3 strong spines and several minute spinules on terminal margin, not extending entire length. Intercalary rostriform process slender, reaching beyond proximal half of acicle but not beyond tip of inner-most acicular spines. Antennal peduncles slightly shorter to nearly equal length of antennular peduncles. Antennal acicle usually not reaching to distal apex of fourth peduncular segment, occasionally reaching slightly beyond, with simple or bifid terminal spine, lateral margins usually with 1 or 2 spines distally, mesial margins with 3–7 small spines. Antennal flagellum with paired long setae ventrally.

Palm of left cheliped with convex outer surface armed with moderately to closely-spaced tubercles, subacute or acute spines or spinules, weak to prominent crest of stronger tubercles or spines proximally near midpoint of proximal margin but not continued to articulation with dactyl, upper margin with irregular, usually double row of small spines, strongest on slightly produced upper distal angle, lower margin of fixed finger and palm straight, with irregular rows of small tubercles or subacute spines; 2 or 3 rows of spines on upper surface of dactyl. Carpus with 3 rows of small, acute or subacute spines on broad upper surface, stronger on slightly produced distal angle, outer face weakly convex, surface armed with blunt or spinulose tubercles and small spines. Ambulatory legs with dorsal margins of carpi each usually with 1or 2 rows of small spines on second, occasionally only cluster of small spines distally, often single row of smaller spinules on third, occasionally only dorsodistal spine. Propodi with irregular row or rows of small spines or spinules, frequently on second, often also on third. Mesial faces of dactyls each with 2 rows of rather widely-spaced, moderately short setae.

Telson usually with obvious median cleft; terminal margin of left lobe with 3–6 large spines extending onto lateral margin and few to several very small spinules medianly, right terminal margin with several small spines.

Colour in life.– Ocular peduncles cream, sometimes with blue-green flecks basally. Antennular peduncles cream, sometimes with green-blue spot on dorsal surface of penultimate segment near articulation with ultimate segment, and spots proximally and distally on ultimate segment; flagella cream. Antennal peduncles cream; flagella cream with narrow blue-green bands on approximately every fourth article. Chelipeds cream with variable areas of brown especially ventrally on propodi. Ambulatory legs cream with some brown on propodi near mid-length, and scattered brown areas on carpi and meri (Morgan, 1987b).

Habitat

Occupying a broad range of small littoral and shallow sublittoral gastropod shells.

Records for southern Thailand.– Ranong, Phuket, Satun, Andaman Sea; Chumphon, Surat Thani, Songkhla, Gulf of Thailand.

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Distribution

East Africa and Red Sea; across Indian Ocean to Malaysia; northern Arabian Sea; Thailand; Philippines; Indonesia; northern and northwestern Australia.

Remarks

Diogenes avarus is most commonly found intertidally and in very shallow subtidal depths, thus its presence at Biosshelf Program stations 51 and 52, at depths between 44 and 52.5 meters is quite unusual.

Diogenes klaasi Rahayu and Forest, 1995
(Fig. 3D–F)

Clibanarius padavensis.– Nateewathana *et al.*, 1981: 51 (in part). Not *Clibanarius padavensis* De Man, 1888a.

Diogenes klaasi Rahayu and Forest, 1995: 395, fig. 3.– Rahayu and Komai, 2000: 28.

Material examined

PMBC 14879, 4 males, sl = 1.2–1.7 mm, 1 female, sl = 1.4 mm, 2 ovig. females, sl = 1.4, 1.5 mm, Yao Yai Island, Phangnga, 1979; PMBC 16610, 1 male, sl = 1.8 mm, Tang Khen Bay, Phuket, coll. Komai, 10.11.95; PMBC 14891, 1 ovig. female, sl = 1.4 mm, BIOSHELF St. PB3, 07º51´N, 098º32´E, OS, 20 m, coll. S. Bussarawit, 23.04.1997.

Diagnosis

Rostrum broad, rounded, not reaching level of lateral projections; dorsal surface with weak and irregular granulations. Ocular peduncles stout, somewhat shorter than shield; corneas slightly dilated; ocular acicles large, anterolateral margins each with 4 sharp spines decreasing in size laterally. Intercalary rostriform process triangular, as long or nearly as long as ocular acicles. Antennular peduncles long and slender, when fully extended, ultimate segment overreaching corneas by approximately 0.5 own length; antennal peduncles slightly shorter to slightly longer than ocular peduncles. Antennal acicles short, somewhat broadened basally and slender distally, reaching or overreaching mid-length of fourth segment, with 2–4 marginal spines, 1 or 2 on dorsal surface, and prominent terminal spine. Antennal flagellum with long setae.

Chelipeds and ambulatory legs all with sparse, but long simple or weakly plumose setae. Left cheliped with dorsal margin of dactyl spinulose; outer face with spinous tubercles or small spines. Palm convex, upper and lower margins with spines or spinulose tubercles, outer face with spinules and median longitudinal row of slightly larger spines. Carpus with row of spines on upper margin; lower margin also with several spines, upper outer surface covered with small spines or tubercles. Ambulatory legs slender; dactyls longer than propodi. Carpi of both pair with distal spine and sometimes second pereopods with additional spine proximally.

Telson broader than long; median cleft small or indistinct. Left lobe larger than right, subtriangular, terminal margin oblique, with row of spinules, becoming strong spines laterally and extending onto lateral margin; right terminal margin with small spinules, sometimes with 1 or 2 larger spines laterally.

Colour in preservative.– Ocular peduncles with two red stripes beginning on both sides of base and converging toward indentation posterior to corneas (Rahayu and Forest, 1995; Rahayu and Komai, 2000).

Habitat

Bottom of sand and rocks.

Records for southern Thailand.– Phangnga, Phuket, Andaman Sea.

Distribution

Western Thailand; Balikpapan, Indonesia,

Remarks

An ovigerous female (sl = 2.5 mm) from the Thai–Danish Expedition, station 27, Mak Island (PMBC 4706) also appears to represent *D. klaasi*; however, as the left cheliped is damaged, this identification is tentative.

Diogenes serenei Forest, 1956
(Fig. 4A–C)

Diogenes senex.– Nobili, 1906b: 78. Not *Diogenes senex* Heller, 1865.
Diogenes serenei Forest, 1956: 530, figs 12–15.– Rahayu and Komai, 2000: 29.
? *Diogenes serenei*.– Gherardi and McLaughlin, 1994: 643.

Material examined
CAS 046540, 1 ovig. female, sl = 3.0 mm, I Mao Island, off Sattahip, Chon Buri, Gulf of Thailand, 03.02.1972.

Diagnosis
Shield slightly longer than broad, lateral margins armed with strong, hooked spines. Ocular peduncles slender, approximately as long as shield; ocular acicles large, armed with 4 sharp spines. Intercalary rostriform process slender, with strong ventral spine hidden from dorsal view. Antennular peduncles not reaching quite to level of corneas. Antennal peduncles reaching distal 0.35 of ocular peduncles. Antennal acicle sharp, overreaching base of fifth peduncular segment, armed with prominent spines, 2 on inner margin, 1 on outer margin. Antennal flagella with few short, widely-spaced setae.

Carpus and palm of left cheliped with very strong spines on upper margins and medially on outer faces; dactyl with spinulose upper margin and outer face, fixed finger with spines or spinules on outer face, lower margin of fixed finger and palm slightly sinuous. Carpi of ambulatory legs each with 1 strong spine proximally on dorsal margin and 1 at distal angle.

Telson with median cleft weakly indicated; posterior lobes asymmetrical; terminal margins each with few spines, becoming much stronger on left and extending onto lateral margin.

Colour in life.– Ocular peduncles cream or white with brown mottling and brown band in distal third. Antennular and antennal peduncles cream with some brown mottling, both with dark brown band at distal margin of ultimate segments; antennular flagella cream, pale green or yellow; antennal flagella cream with faint brown band on each article. Chelipeds mottled cream and brown, spines and tubercles cream or white; meri and carpi darker than propodi, dactyls mostly cream. Ambulatory legs mottled cream and brown; darker brown band often mid-dorsally and dorsomesially on meri, carpi and propodi, and proximally on dactyls (Morgan, 1987b).

Habitat
Intertidal to shallow subtidal in areas of coral or sandy muck and rocks; 0–3 m.

Records for southern Thailand.– Phuket, Andaman Sea; I Mao Island, Sattahip, Chon Buri Gulf of Thailand.

Distribution
Northern Australia; Gulf of Iran; Thailand; Vietnam; eastern New Guinea; Indonesia.

Remarks
The specimen from I Mao Island confirms the presence of *D. serenei*, in the Gulf of Thailand, as well as in the Andaman Sea as reported by Rahayu and Komai (2000).

Diogenes tumidus Rahayu and Forest, 1995
(Fig. 4D–F)

Diogenes gardineri.– Pitagsalee, 1980:84, figs 48, 49.– Naiyanetr, 1998: 48 (list). Not *Diogenes gardineri* Alcock, 1905a.
Diogenes tumidus Rahayu and Forest, 1995: 402, fig. 5.– Rahayu and Komai, 2000: 30.

Material examined
PBMC 14853, 3 males, sl = 1.1–1.5 mm, 1 ovig. female, sl = 1.2 mm, Yao Yai Island, Phangnga, 1979; PMBC 16611, 1 male, sl = 1.5 mm, 1 ovig. female, sl = 1.3 mm, Tang Khen Bay, Phuket, Andaman Sea, coll. T. Komai, 10.11.95; CUMZ 1147, 1 male, sl = 2.3 mm, Chon Buri, Gulf of Thailand, coll. C. Pitagsalee.

Diagnosis
Shield with few small spines on dorsal surface anterolaterally. Rostrum obsolete, rostral margin weakly convex. Ocular peduncles moderately

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slender, slightly shorter than shield; ocular acicles broad, armed anteriorly by 4 or 5 strong spines. Intercalary process about same length as ocular acicles. Antennular peduncles slender, slightly longer than ocular peduncles. Antennal peduncles short, reaching approximately distal 0.25 of ocular peduncles. Antennal acicles reaching nearly to or overreaching distal margin of fourth peduncular segments, with strong terminal spine, mesial margins at least, with 2 strong spines. Antennal flagella short, with moderately short setae.

Left cheliped with small spines on upper margin and outer face of dactyl. Outer face of palm convex, with few irregular rows of spinules or spines and weak longitudinal row of slightly larger spines in midline; upper margin with spines or spinulose tubercles. Carpus with row of prominent spines on upper margin; outer face with

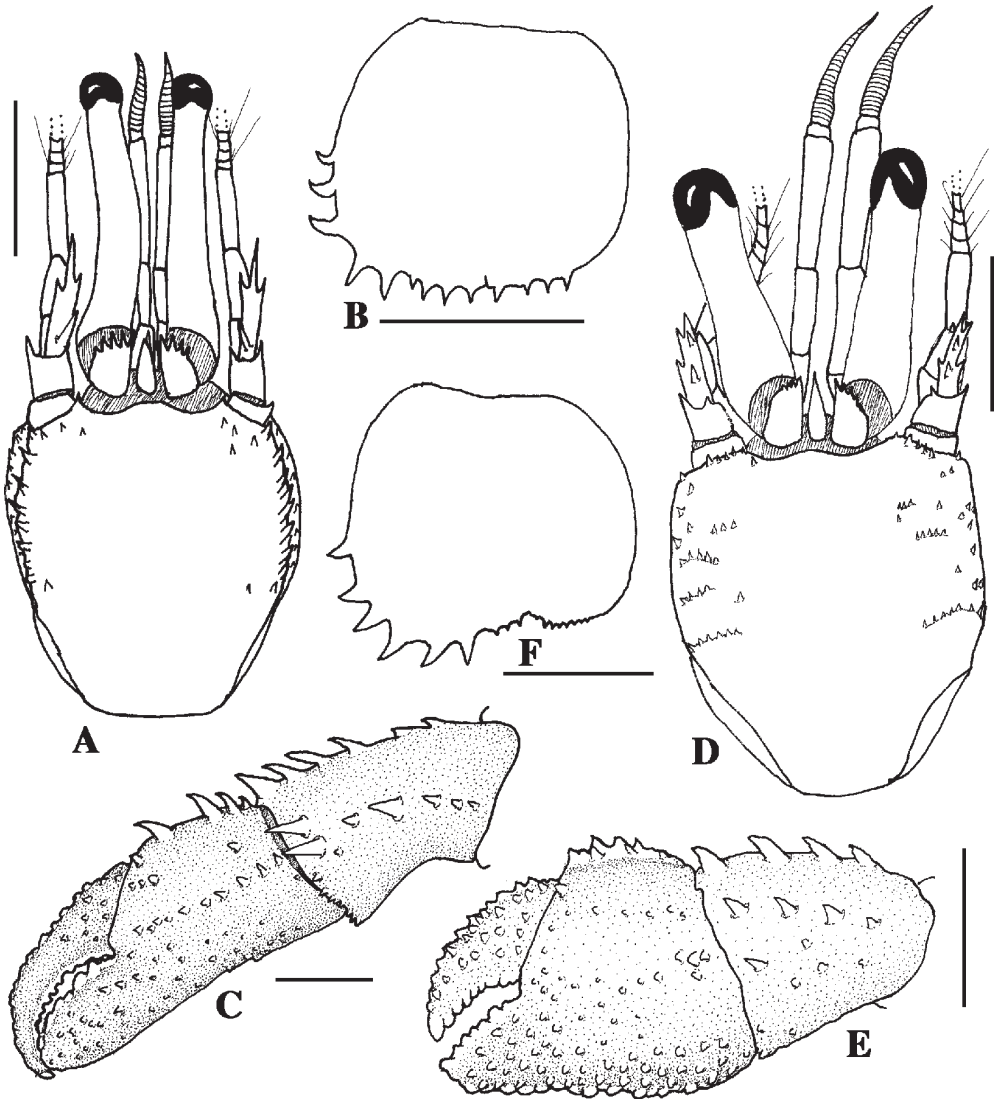

Figure 4 A–C, *Diogenes serenei* Forest, 1956, ovig. female, sl = 3.0, I Mao Island off Sattahip, Chon Buri; D–F, *Diogenes tumidus* Rahayu and Forest, 1995, male, sl = 2.3 mm, Chon Buri. A, D, shield and cephalic appendages (aesthetascs omitted); C, E, chela and carpus of left cheliped; B, F, telson. Scales equal 0.5 mm, F and 1.0 mm, A–E.

scattered spinules. Ambulatory legs with dactyls equal to or slightly longer than propodi. Carpi each with dorsodistal spine, occasionally also with small dorsoproximal spine on second pereopods; other segments unarmed. Chelipeds and ambulatory legs sparsely covered with fine, long, simple and weakly plumose, setae.

Telson longer than broad, without distinct median cleft; terminal margins each with row of spinules, increasing on left to prominent spines laterally and extending onto lateral margin.

Colour.– Not reported

Habitat

Seagrass beds.

Records for southern Thailand.– Surat Thani, Gulf of Thailand; Phangnga, Phuket, Andaman Sea.

Distribution

Thailand; Singapore; Indonesia.

Remarks

As noted by Rahayu and Forest (1995), *D. tumidus* closely resembles *D. gardineri*, and it is therefore not surprising that Pitagsalee (1980) attributed his specimens to Alcock's (1905a) taxon. Perhaps even more striking than the characters given by Rahayu and Forest (1995) to separate the two species, is the armature of the right chela. In *D. tumidus* the upper margin is virtually unarmed, whereas in *D. gardineri*, the upper margin carries a row of large spines.

Although the specimen from Pitagsalee's collection that I examined was from the northern Gulf of Thailand, he also reported this species (as *D. gardineri*) from Surat Thani in the Gulf, and Phuket in the Andaman Sea

Diogenes planimanus Henderson, 1893
(Fig. 5A–C)

Diogenes planimanus Henderson, 1893: 416, pl. 39, figs 5, 6.– Lanchester, 1902: 365 (in part).– Tirmizi and Siddiqui, 1981: fig. 11.– 1982: 43, figs 21, 22.– Rahayu, 1996: 345, fig. 3.– McLaughlin and Clark, 1997: 40, figs 4a, 9c, e, 12a.

Diogenes custos var. *planimanus*.– Alcock, 1905b: 66, pl. 6, fig. 3.

Not *Diogenes planimanus*.– Dechancé, 1964: 35 (= *Diogenes custos* Fabricius, 1798)

Material examined

Lectotype: NHM 1894:7:21.4, 1female, sl = 5.7 mm, Madras; PMcL, 4 males, sl = 2.4–3.3 mm, female, sl = 2.4 mm, Patong Beach, Phuket, Andaman Sea, coll. S. Ahyong and R. Ahyong, 26.11.1999; CUMZ 1081, 1 male, sl = 4.3 mm, Pattani, Gulf of Thailand, coll. C. Pitagsalee.

Diagnosis

Shield nearly as broad or broader than long; anterior margin denticulate over entire length. Ocular peduncles approximately 0.80 shield length, moderately slender; ocular acicles spinose along entire anterior margin. Intercalary rostriform process slightly overreaching tips of acicular spines; usually with 2 to 5 spines on lateral margins and terminal spine. Antennular and antennal peduncles approximately equal in length, both overreaching ocular peduncles. Antennal acicles weakly produced mesially, not distinctly bifurcate, anterior margin concave and spinulose or spinose.

Left cheliped with upper margin of dactyl armed with row of closely-spaced, spinulose tubercles, flanked on either side by row of smaller tubercles. Palm with 2 irregular rows of moderately small tuberculate spines on upper margin, proximal margin with row of large, blunt or spinulose tubercles; outer surfaces of dactyl, palm and fixed finger all with blunt or acute tubercles, strongest in upper half of palm, lower half of palm flattened, lower margin of palm and fixed finger straight. Carpus with double row of spines on upper margin, outer face with irregular row of spines, strongest distally; inner faces of palm and carpus tuberculate. Merus with prominent spine adjacent to dorsodistal margin. Ambulatory legs each with double row of small spines on dorsal margins of dactyls, mesial faces each with longitudinal row of small spines partially obscured by row of long setae. Propodi, carpi and meri each with double or triple rows of spines or spinules on dorsal margins, lateral faces spinulose or tuberculate. Distal margins of carpi also spinulose.

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Males with paired gonopores, females with single right gonopore. Telson without distinct median cleft, but with markedly asymmetrical lobes; terminal and lateral margins each with several strong spines interspersed by small spinules.

Colour in life.– Light cream with dark brown patches (Tirmizi and Siddiqui, 1982).

Habitat

Intertidal sandy substrate in protected areas of low wave action.

Records for southern Thailand.– Patong, Phuket, Andaman Sea; Nakhon Si Thammarat, Songkhla, Pattani, Gulf of Thailand.

Distribution

Northern Arabian Gulf; Indian Ocean; Andaman Sea; Gulf of Thailand; Malaysia; Northern Australia.

Remarks

Diogenes planimanus is morphologically very similar to the true *D. custos* (cf. McLaughlin and Holthuis, 2001). *Diogenes planimanus* is most

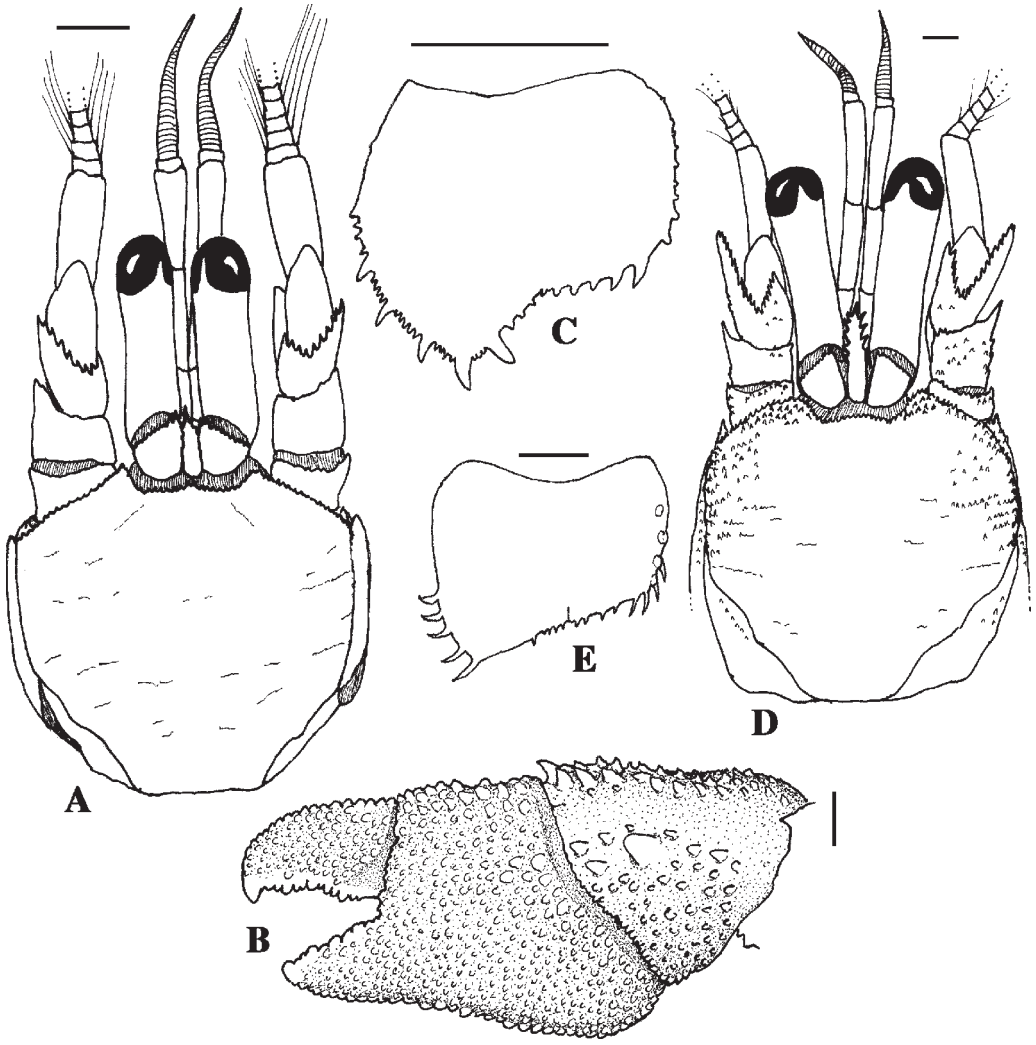

Figure 5 A–C, *Diogenes planimanus* Henderson, 1893, male, sl = 4.3 mm, Pattani; D, E, *Diogenes mixtus* Lanchester, 1902, male, sl = 8.0 mm, Pattani. A, D, shield and cephalic appendages (aesthetascs omitted); B, chela and carpus of left cheliped; C, E, telson. Scales equal 1.0 mm.

readily distinguished by the much more prominent row of median tubercles or subacute spines on the carpus of the left cheliped, and the more clearly defined tubercles on the lower proximal margin and central midline of the palm.

The specimen examined from the Gulf of Thailand differs from the lectotype of *D. planimanus* in having a more elongate and slender left chela, and in this regard more closely resembled one of the female chelipeds illustrated by Rahayu (1996) for a specimen from peninsular Malaysia. The Phuket specimens, although appreciably smaller than the holotype, agreed well; however, the spines of the ambulatory legs were more acute.

Diogenes mixtus Lanchester, 1902
(Figs 5D, E; 6A)

Diogenes mixtus Lanchester, 1902: 367, pl. 34, figs 2, 2a, 2b.– Nobili, 1903b:16.– Alcock, 1905b: 165 (list).– McLaughlin and Clark, 1997: 45, figs 7f, 8f, 9I, 13a.– McLaughlin and Holthuis, 2001: 254.

Diogenes hainanica Wang and Dong, 1977: 109, fig. 2.

Diogenes diogenes.– Naiyanetr, 1980: 24 (list), 1998: 48 (list).– Pitagsalee, 1980: 78, figs 44, 45 (not *Cancer diogenes* Linnaeus, 1758).

Diogenes platvoeti McLaughlin and Clark, 1997: 42, figs 5, 6, 8d, e, 9f, h, 12b.

Material examined

ZRC 1999.1442, 8 males, sl = 8.4–10.5 mm, 1 ovig. female, sl = 7.6 mm, from fishing vessel off Phuket, Andaman Sea, coll. P. Ng, 04.1999; CUMZ 1142, 1 male, sl = 8.0 mm, Pattani, coll. C. Pitagsalee; RMNH D 365314, male, sl = 9.0 mm, Pattani, Gulf of Thailand, coll. Swenen, 14.11.1985.

Diagnosis

Shield with serrate or spinulose anterior, anterolateral and posterolateral margins; dorsal surface with serrate and setose ridges. Intercalary rostriform process much longer than ocular acicles, laterally spinose at least in distal half. Ocular peduncles shorter than both antennular and antennal peduncles; ocular acicles with spinulose anterior margins. Antennal peduncles shorter than antennular peduncles. Antennal acicle bifurcate, outer fork longest, inner margins of both forks spinulose. Antennal flagella with basal articles sparsely setose.

Left cheliped with double row of spines on upper margin of dactyl; outer face with row of smaller spines, usually not extending to tip. Palm with double row of spines on upper margin, outer face with irregular rows of moderate to small spines, sometimes nearly obsolete in lower half, lower margin straight or slightly convex, tuberculate or weakly spinose. Ambulatory legs with dorsal margins of meri, carpi and propodi each armed with 1 or 2 rows of spines, lateral faces granular or spinulose. Dactyls with dorsal margins spinose at least in proximal half.

Females with paired gonopores. Telson (Thai specimens) somewhat asymmetrical, median cleft weakly delineated; right lobe with 2 corneous nodules on lateral surface adjacent to margin anteriorly, few short and moderately long spines on terminal margin, extending onto lateral margin posteriorly; left lobe with few subacute spinules medianly, several longer spines on lateral margin.

Colour in preservative.– Ocular peduncles still sometimes showing longitudinal dark stripe dorsomesially and dorsolaterally.

Habitat

Not known.

Records for southern Thailand.– Off Phuket, Andaman Sea; Songkhla, Pattani, Gulf of Thailand.

Distribution

Andaman Sea and Gulf of Thailand; Malaysia; Singapore.

Remarks

McLaughlin and Holthuis (2001) have discussed the incorrect application by Fabricius (1787, as *Pagurus diogenes*) and Herbst (1791, as *Cancer diogenes*) of the name *Cancer diogenes* Linnaeus, 1758 to a species of *Diogenes*, and have described as new, the species long reported as *Diogenes diogenes* Herbst, 1791. However, the species reported by Pitagsalee (1980) and Naiyanetr (1980, 1998) as *D. diogenes* is not Fabricius' (1787) and Herbst's (1791) taxon. One

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of Pitagsalee's (1980) specimens has been reexamined and found to represent *D. mixtus*. Fabricius' and Herbst's taxon is distinguished from *D. mixtus*, not only by the unarmed or very weakly armed oblique area on the upper outer surface of the palm and carpus of the left cheliped of the former species, but more significantly by a row of very strong spines on the lateral face of the propodus of the third left pereopod.

Diogenes dubius (Herbst, 1804)
(Fig. 6B–D)

Cancer dubius Herbst, 1804, pl. 60, fig. 5.
Pagurus dubius.– Olivier, 1812: 647.
Diogenes dubius.– Alcock, 1905b: 165 (list).– Gordan, 1956: 317 (lit).– Sakai, 1999: 12 (in part), pl. 3, fig. D.– McLaughlin and Holthuis 2001: 261.
Diogenes custos.– Henderson, 1893: 414.– Nobili, 1903a: 15.– Alcock, 1905b: 64, pl. 6, fig. 1.– Ahmad and Khan, 1971: 13, figs 6, 6a.– Pitagsalee, 1980: 81, figs 46, 47.– Tirmizi and Siddiqui, 1981: fig. 10; 1982: 32, figs 14–17.– Thomas, 1989: 73, pl. 2E.– Naiyanetr, 1998: 48 (list).– Sakai, 1999: 12 (in part), pl. 3, fig. D. Not *Diogenes custos* (Fabricius, 1798).

Material examined
CUMZ 1143, 1 male, sl = 8.0 mm, Satun, coll. C. Pitagsalee.

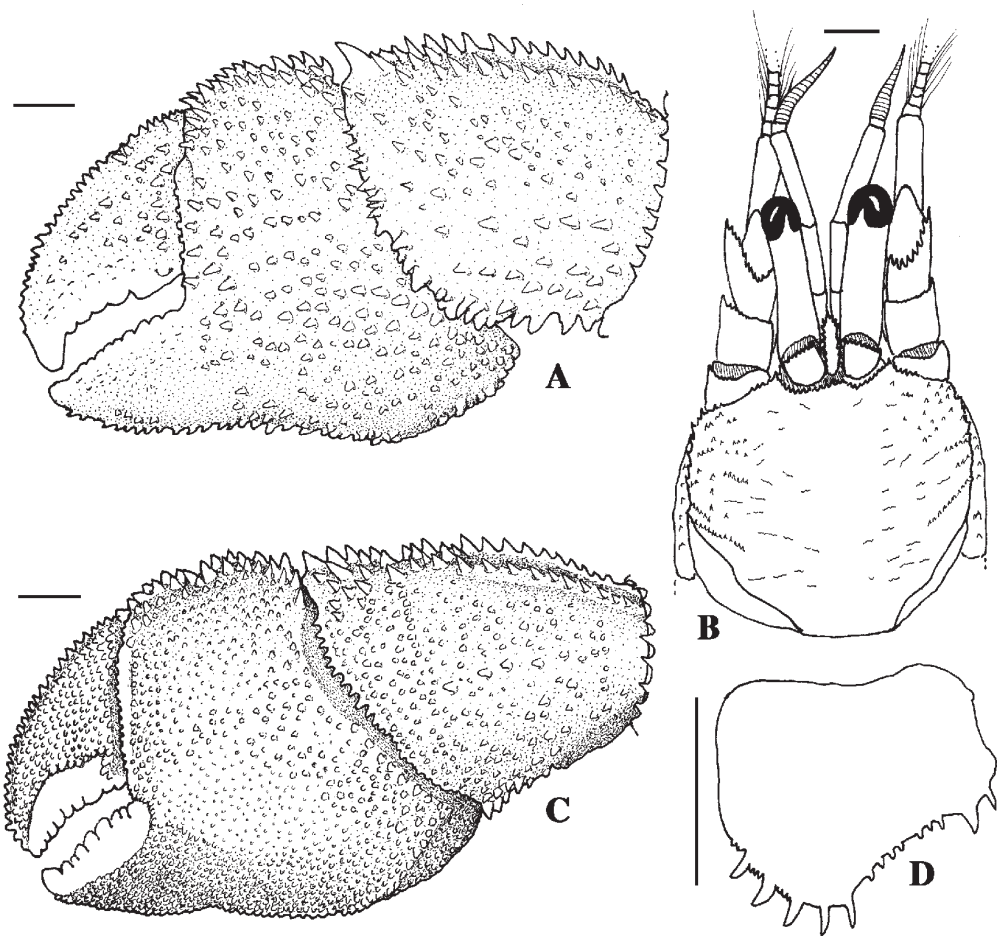

Figure 6 A, *Diogenes mixtus* Lanchester, 1902, male, sl = 8.0 mm, Pattani; B–D, *Diogenes dubius* (Herbst, 1804), male, sl = 8.0 mm, Satun. A, C, chela and carpus of left cheliped; B, shield and cephalic appendages (aesthetascs omitted); D, telson. Scales equal 2.0 mm.

Diagnosis

Shield as broad as long or broader, with serrate or spinulose anterior and anterolateral margins; dorsal surface with tubercles and tufts of setae. Intercalary rostriform process longer than ocular acicles, margins spinose, at least distally. Ocular peduncles shorter than both antennular and antennal peduncles; ocular acicles with spinose terminal margins. Antennular and antennal peduncles of approximately equal length. Antennal acicles bifurcate, although not always prominently, inner margins spinulose, outer process not quite reaching to or reaching slightly beyond distal apex of fourth peduncular segment. Antennal flagella with long setae at least in proximal half.

Left chela broad; palm with spinose upper margin, outer face granular, most pronounced near flattened lower margin. Carpus with double row of moderately small spines on upper margin, outer face spinulose, with row of slightly more prominent spines centrally. Ambulatory legs with dactyls appreciably longer than propodi. Dorsal margins of meri and carpi each with short spines. Propodi and dactyls with 2 or 3 rows of spinose tubercles or small spines; lateral faces of propodi granular.

Females with single right gonopore. Telson asymmetrical but without distinct median cleft, left lobe larger; terminal margins with several small spines medianly, 2 or 3 larger spines laterally on right, 5 or 6 large spines on left laterally and extending partially down lateral margin.

Colour in life.– Basically light cream with grey. Ocular peduncles, antennular and antennal peduncles marked with longitudinal stripes of alternating cream and grey. Rostriform process and ocular acicles grey with red tinge. Chelipeds and ambulatory legs grey with brownish-grey patches (after Tirmizi and Siddiqui, 1982).

Habitat

Frequently inhabits shells of *Natica* and *Murex*.

Records for southern Thailand.– Krabi, Satun, Andaman Sea.

Distribution

Indian Ocean; northern Arabian Sea, Gulf of Bengal; western Thailand; Indonesia; southeast coast of Australia.

Remarks

The specimens identified by Pitagsalee (1980) as *Diogenes custos* and reported by Naiyanetr (1998) is his list of crustaceans in Thailand are not the true *D. custos*, as defined by neotype selection by McLaughlin and Holthuis (2001). These latter authors reviewed the published records of *D. custos* and concluded that at least two taxa had been confounded under that name. As the neotype of *Diogenes custos* Fabricius, 1798, McLaughlin and Holthuis selected the lectotype of *Diogenes affinis* Henderson, 1893, a junior synonym of Fabricius' (1798) species. They found that the majority of reports of *D. custos*, actually were referable to *D. dubius* Herbst, 1804. The Thai specimen (CUMZ 1143) was compared with the lectotype of *D. custos* (NHM 1894.7.21.4) and holotype of *D. dubius* (ZMB 1988).

Dardanus Paul' son, 1875

Key to the regional species

1. Outer face of left chela covered with scutes; lateral faces of dactyls, propodi, carpi and meri of ambulatory legs also ornamented with scutes.....*D. callichela*
— Outer face of left chela not covered by scutes; lateral faces of segments of ambulatory legs not ornamented with scutes.....2
2. Outer, and/or upper-outer face of palm of left cheliped with granules, tubercles or very blunt spines ..... *D. pedunculatus*
— Outer, and/or upper-outer face of palm of left cheliped with sharp, often corneous-tipped spines 3
3. Chelipeds subequal.....4
— Chelipeds unequal, left very much larger.....5

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4. Ocular peduncles (including corneas) equal to or shorter than antennular peduncles.....*D. hessii*
— Ocular peduncles (including corneas) longer than antennular peduncles.....*D. lagopodes*
5. Spines on outer surface of palm of left cheliped each with circle of very short, stiff bristles; left third pereopod with lateral faces of dactyl and propodus deeply concave, sculptured.....*D. setifer*
— Spines on outer surface of palm of left cheliped accompanied by, but not encircled by, long setae; left third pereopod with lateral faces neither deeply concave nor sculptured.....6
6. Dactyl and propodus of left third pereopod with lateral face flattened, dactyl with shallow longitudinal sulcus.....*D. aspersus*
— Dactyl and propodus of left third pereopod with lateral face convex, dactyl without shallow longitudinal sulcus.....*D. megistos*

Dardanus callichela Cook, 1989

Pagurus imbricatus.– Alcock, 1905b: 92, pl. 9, fig. 8.– Fize and Serène, 1955: 220, fig. 35A–C, pl. 6, figs 11–14. Not *Dardanus imbricatus* (H. Milne Edwards, 1848).

Dardanus imbricatus.– Pitagsalee, 1980: 63, figs 36, 37. Not *Dardanus imbricatus* (H. Milne Edwards, 1848).

Dradanus imbricatus.– Naiyanetr, 1980: 23 (list); 1998: 48 (list) (misspelling of *Dardanus*). Not *Dardanus imbricatus* (H. Milne Edwards, 1848).

? *Dardanus imbricatus*.– Ajmal Khan and Natarajan, 1984, p. 11, fig. 8. ? Not *Dardanus imbricatus* (H. Milne Edwards, 1848).

Dardanus callichela Cook, 1989: 115, figs 3, 6B, 8A.

Material examined

CUMZ 1012, 1 female, sl = 14.0 mm, Pattani, Gulf of Thailand, coll. C. Pitagsalee.

Diagnosis

Ocular peduncles shorter than antennular peduncles; cornea occupying more than 0.35 of peduncle; ocular acicles broad, well separated basally, distal margins each with 3 spines.

Palm of left cheliped with a row of 4–7 spines on the upper inner margin, outer surface strongly convex and scutellated, with fringe of plumose setae on the distal edge of each scute, lower margin with brush of long plumose setae partially concealing robust spines. Carpus with row of spines on upper margin, smaller spines on upper half of outer surface, spinose scutes on lower half. Ambulatory legs with dactyls longer than propodi. Dactyl of left third pereopod bordered by dense brush of long bristles and plumose setae, dorsal margin with row of long sharp spines partially obscured by setae, proximal half of ventral margin with row of spines, lateral surface flattened, with smooth, longitudinal, median area, sometimes ill-defined and flanked by transverse scutes. Propodus with row of large simple and multifid spines on the ventromesial margin, lateral surface convex, with 2 rows of scutes. Carpus with spinose scutes fringed with plumose setae on lateral face, dorsal surface with spines, tufts of setae, and bristles, mesial face smooth, slightly convex, with 3 large spines on ventrodistal margin, 2 large and 1 small spine on dorsodistal margin. Carpus of left fourth pereopod (right missing in Thai specimen) with row of prominent, corneous-tipped spines on dorsal surface.

Telson with roundly triangular, slightly asymmetrical posterior lobes; oblique terminal and rounded lateral margins each with several spines.

Colour in preservative.– Proximal halves of ocular peduncles royal purple. Scutes on fingers and palm of left cheliped pink bordered by scarlet, some with lilac hue, colour most brilliant on lower part of hand and fixed finger. Distal halves of fingers of right cheliped similarly coloured. Dactyls of ambulatory legs orange to brick red, with cream blotches at bases of tufts of bristles; scutes on

outer surfaces of dactyl and propodus of third left pereopod similar to those on lower part of hand (after Cook, 1989).

Habitat

Depth range from 37–88 m and one questionable report of 350 m.

Records for southern Thailand.– Chumphon, Surat Thani, Pattani, Gulf of Thailand,

Distribution

Sri Lanka; Gulf of Thailand; South China Sea; Northwestern Australia and Chesterfield Reefs.

Remarks

Dardanus callichela is most readily distinguished from *D. imbricatus* by the absence of spiniform tubercles on the scutes of the left chela, and the presence of scutes on the lateral face of the carpus and merus of the left third pereopod of *D. callichela*.

Dardanus pedunculatus (Herbst, 1804)

Cancer pedunculatus Herbst, 1804: 25, pl. 61, fig. 3.
Pagurus pedunculatus.– Olivier, 1812: 647.
Pagurus asper De Haan, 1849: 208, pl. 49, fig. 4.– Alcock, 1905b: 90, pl. 9, fig. 5.– Yap-Chiongco, 1938: 197, pl. 1, fig. 14.
Pagurus pedunculatus var. *varipes*.– Hilgendorf, 1879: 815. Not *Pagurus varipes* Heller, 1861.
Pagurus varipes.– De Man, 1888b: 436.– Alcock, 1905b: 90, pl. 9, fig. 7. Not *Pagurus varipes* Heller, 1861.
Pagurus sigmoidalis Zehntner, 1894: 192, pl. 8, figs 19a, b.
Dardanus haani Rathbun, 1903: 34.– Miyake, 1965: 644, fig. 1083.
Neopagurus horai Kamalaveni, 1950: 83, figs 2a–c, 3.
Pagurus haani.– Fize and Serène, 1955: 207, text figs 32. 33, pl. 4.
Dardanus pedunculatus.– Lewinsohn, 1969: 29, pl. 1, fig. 3.– Miyake, 1978: 60, text fig. 216.– McLaughlin and Hogarth, 1998: 11, pl. 1, figs C, D.– Sakai, 1999: 11, pl. 2F.
Not *Pagurus pedunculatus*.– Ortmann, 1894: 31.– Barnard, 1950: 429, text fig. 79a [= *Dardanus tinctor* (Forskål, 1775)].

Material examined

PMBC 14855, 3 males, sl = 16.5–19.7 mm, 1 ovig. female, sl = 15.8 mm, Andaman Sea, from fishing trawler west of Phuket, coll. P. Ng and P. McLaughlin, 11.12.1998; PMBC 14854, 1 female, sl = 19.5 mm, coll. P. Ng and P. McLaughlin, 11–13.12.1998; ZRC 1999.1439, 1 male, sl = 18.1 mm, coll. P. Ng, 04.1999; ZRC 1999.2003, 1 male, sl = 18.1 mm, coll. P. Ng, 24.08.1999; PMcL, 1 male, sl = 14.3 mm, 1 female, sl = 21.0 mm, coll. P. Ng and S. Ahyong, 26.11.99.

Diagnosis

Ocular peduncles short, stout; corneas not dilated, diameter approximately 0.35 of peduncle; ocular acicles subtriangular to subquadrate, with several terminal spines. Antennular and antennal peduncles both overreaching distal margins of corneas.

Chelipeds grossly unequal. Palm of left cheliped with ventral margin sinuous and tuberculate, outer surface with lower half nearly smooth, upper half with longitudinal rows of tubercles separated by shallow furrows, upper margin with strong spinulose tubercles or blunt spines. Upper margin and outer face of dactyl with rows of tubercles separated by shallow furrows. Carpus with few spines or spinulose tubercles on upper margin and outer face. Ambulatory legs with dactyls longer than propodi. Left third pereopod with dorsal and ventral margins of dactyls armed with very small spinules, lateral face with strong longitudinal carina in proximal half. Propodus with dorsolateral margin rounded or acute, lateral face convex medianly, ventral margin with row of small, closely-spaced tubercles.

Posterior lobes of telson separated by narrow median cleft, left lobe elongate; distal margins each with long setae and few inconspicuous, small, corneous spines.

Colour in life.– Ocular peduncles dark brown, with white bands beneath cornea and at base of peduncle; ocular acicles purplish-brown and cream. Antennular and antennal peduncles with distal

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segments light purple or brownish-purple, more proximal segments mottled light brown and cream. Chelipeds with outer faces varying shades of purple, inner faces tan to cream or light purple; carpus tan-brown to deep purple; meri with lateral faces cream to purplish-brown. Ambulatory legs with dactyls olive-tan or purplish-tan; propodi with tan or purplish-tan lateral faces each with darker median band, mesial faces light purplish tan or cream; carpi with tan or orange-brown lateral faces; meri with purple or purplish-brown lateral faces, each with tan-cream median band.

Habitat

Collected on sandy substrates; commonly inhabiting turban shells usually encrusted with anemones; 10–60 m.

Records for southern Thailand.– Andaman Sea west of Phuket.

Distribution

Andaman Sea; Southern Japan, Kii Peninsula, Tosa Bay, Kyushu, and Okinawa; Taiwan; Philippines; Seychelles; Amboina; Timor; Hawaii; Australia.

Dardanus hessii (Miers, 1884)

Pagurus hessii Miers, 1884: 264, pl. 28, fig. 4.– Alcock, 1905b: 93, pl. 8, fig. 4.

Pagurus similimanus Henderson, 1888: 59, pl. 6, fig. 6.

Pagurus hessi.– Fize and Serène, 1955: 158, 214, text fig. 34, pl. 4.

Dardanus hessii.– Gordan, 1956: 314 (lit) .– Pitagsalee, 1980: 61, figs 34, 35.– Forest and Morgan, 1991: 207.– Rahayu and Komai, 2000:27.

Pagurus semilimanus.– Estampador, 1937: 503 (misspelling of *Pagurus similimanus* Henderson, 1888).

Dardanus semilimanus.– Gordan, 1956: 315. [misspelling of *Pagurus similimanus* (Henderson, 1888)].

Dradanus hessii.– Naiyanetr, 1980: 23 (list); 1998: 49 (list) (misspelling of *Dardanus*).

Material examined

PMBC 14856, 1 male, sl = 2.8 mm, PMBC 14857, 16 males, sl = 11.8–17.6 mm, 10 females, sl = 7.6-16.5 mm, 4 ovig. females, sl = 11.0–13.7, PMBC 14858, 3 males, sl = 10.9–14.6, 1 female, sl = 11.5 mm, from fishing trawler west of Phuket, Andaman Sea, 40-80 m, coll. P. Ng and P. McLaughlin, 11–13.12. 1998.

Diagnosis

Ocular peduncles broadened distally, much shorter than antennular and about as long as antennal peduncles; corneas reniform, occupying 0.40 length peduncle. Antennal acicles projecting well beyond the bases of the fifth peduncular segments.

Chelipeds equal or subequal, similar, fingers opening obliquely. Outer surface of carpus of left cheliped with 3 longitudinal rows of spines. Outer surface of palm and fingers spinose, 3 to 4 very conspicuous, longitudinal rows of spines on palm, long bristles on chelipeds and ambulatory legs not obscuring sculpture. Ambulatory legs all similar. Carpi, propodi and dactyls all strongly spinose dorsally; dactyls considerably longer than propodi. Propodus of the third left leg approximately 0.35 as broad as long.

Telson with asymmetrical posterior lobes separated by shallow median cleft, left lobe largest; terminal margins each with row of small, corneous spines, extending onto lateral margins.

Colour in life.– Ocular peduncles with broad longitudinal stripe of green-grey dorsally outlined in white, additional stripe of violet-carmine laterally and mesially. Antennular and antennal peduncles pale greyish-green; setae on acicle and first antennal segments bright carmine. Chelipeds with meri pale grey-violet mixed with patches of yellow-ocher, one more or less transverse band of bright yellow-ocher distally, spines carmine distally, setae carmine and yellow, tips black. Ambulatory legs with meri marked proximally by transverse band of yellow, much less developed medianly and distally and separated by two transverse bands of violet-grey; carpi violet-grey mixed with yellow; propodi with yellow tint proximally and dorsally, violet distomesially; dactyls grey; spines of carpi and propodi grey-white, tips black; setae of all

segments carmine except bright yellow band of dense setae on dorsodistal 0.75 of dactyl of left third pereopod.

Habitat

Collected at depths between 15 and 55 m.

Records for southern Thailand.– Phuket, Trang, Satun, west of Phuket, Andaman Sea; Surat Thani, Songkhla, Pattani, Gulf of Thailand.

Distribution

Gulf of Oman; Maldives; Bay of Bengal; Gulf of Martaban; Andaman Sea and Gulf of Thailand; Indonesia; Vietnam; Arafura Sea.

Dardanus lagopodes (Forskål, 1775)*

Cancer lagopodes Forskål, 1775: 93.
Pagurus sanguinolentus Quoy and Gaimard, 1824: 532, pl. 79, fig 2.– Forest, 1953b: 559, figs 12–14.– Fize and Seréne, 1955: 166, text fig. 25A, B, C, pl. 4a, figs 4, 5.
Pagurus affinis H. Milne Edwards, 1836: 274.
Pagurus euopsis Dana, 1852c: 452, 1855: 10, pl. 28, fig. 6.– Alcock, 1905b: 86, pl. 9, fig. 2.– Yap-Chiongco, 1938: 200, pl. 1, fig. 7.
Pagurus depressus Heller, 1861: 248.
Dardanus Hellerii Paul'son, 1875: 90, 91, pl. 12, figs 4, 4a–c.
Dardanus sanguinolentus.– Minei, 1973: 49, text fig. 8.
Dardanus affinis.– Gordan, 1956: 312 (lit.).
Dardanus lagopodes.– Lewinsohn, 1969: 32, pl. 2, figs 1, 2.– Miyake, 1978: 55, text fig. 19.– Pitagsalee, 1980: 66, figs 38, 39.
Dradanus lagopodes.– Naiyanetr, 1980: 24 (list); 1998: 48 (list) (misspelling of *Dardanus*).

Diagnosis

Ocular peduncles subcylindrical, longer than antennular peduncles; cornea occupying no more than 0.20 of peduncle.

Left cheliped broad, but not massive, and not much longer than right. Upper margin and outer surface of palm with rows of acute spines, not obscured by long setae. Dactyl of left third pereopod nearly equaling length of propodus, not laterally compressed, lateral face with shallow median longitudinal groove flanked dorsally and ventrally by row(s) of prominently corneous-tipped spines or tubercles. Propodus armed dorsally and ventrally with prominently corneous-tipped spines or tubercles, lateral face weakly concave and with median longitudinal row of long, stiff, simple setae.

Telson strongly asymmetrical; posterior lobes each with terminal row of corneous-tipped, ventrally directed spines, weaker on right, but extending further on lateral margin.

Colour in life.– Ocular peduncles pinkish-grey with yellow band distally near cornea. Antennular and antennal peduncles yellow with thin dorsal and ventral olive-green lines; antennular flagella yellow or orange; antennal flagella yellow or pale green. Chelipeds mottled red, brown, orange and white; chelae red-orange on fingers and most of palms; carpi red-brown with large purplish-red patch dorsally; meri red-brown and white. Ambulatory legs red-brown mottled with flecks of pale violet; carpi mostly red-brown dorsally with similar purplish-red patch on proximal end of segment. Setae red with cream tips (after Morgan, 1987b).

Habitat

Hard substrates of the shallow sublittoral, including coral heads in lagoons.

Records for southern Thailand.– Phuket, Andaman Sea; Surat Thani, Gulf of Thailand.

Distribution

East Africa; Seychelles; Mauritius; Madagascar; Red Sea; southern India; Thailand; Philippines; Malaysia; New Guinea; Australia; Taiwan; Japan; Samoa; French Polynesia.

Dardanus setifer (H. Milne Edwards, 1836)

Pagurus setifer H. Milne Edwards, 1836: 274.– Alcock, 1905b: 83, pl. 8, fig. 3.– Fize and Serène, 1955: 182, figs 27A, B, 28, pl. 5, figs 4–8.
Pagurus sculptipes Stimpson, 1858: 246.
Pagurus pavimentatus Hilgendorf, 1879: 816, pl. 3, figs 1–5.

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Dardanus setifer.– Tirmizi and Siddiqui, 1982: 80, figs 41, 42.– Ajmal Khan and Natarajan, 1984: 10, fig. 7.– McLaughlin and Hogarth, 1998: 14, pl. 2, figs G, H.– Sakai, 1999: 11, pl. 3A.

Not *Pagurus setifer*.– Hess, 1865: 35.– Hilgendorf, 1879: 815, pl. 3, fig. 8.– Ortmann, 1892: 287.– Borradaile, 1898: 460; 1900: 396, 397, 425 [= *Dardanus guttatus* (Olivier, 1812)].

Not *Pagurus setifer*.– De Haan, 1849: 209.– Terao, 1913: 379.– Terao, *et al.*, 1932: pl. 57, fig. 3.– Barnard, 1950: 426, text fig. 79d [=*Dardanus crassimanus* (H. Milne Edwards, 1836)].

Material examined

PMBC 15423, 2 males, sl = 3.9, 4.3 mm, 2 ovig. females, sl = 4.1, 4.2 mm, BIOSHELF St. E1, 08º30´N, 098º06´E, OS, 41 m, coll. S. Bussarawit and C. Aungtonya, 22.04.1996; PMBC 15443, 1 male, sl = 13.9 mm, from fishing trawler west of Phuket, Andaman Sea, 40–80 m, 09.12.1998.

Diagnosis

Ocular peduncles long and moderately slender, slightly overreaching antennular peduncles; corneas slightly dilated, occupying slightly less than 0.20 of peduncle; ocular acicles subtriangular to subquadrate, with 3 or 4 terminal spines. Antennal peduncles not reaching bases of corneas.

Chelipeds grossly unequal. Palm of left cheliped covered with corneous-tipped, thorn-like spines, each accompanied by wreath of very short bristles, lower margin with spines grouped in palisade. Left third pereopod distinct in form and sculpture; maximum width of propodus approximately 0.60 length, lateral faces of propodus and dactyl each with broad, longitudinal, spinose median carina, surfaces above and below carina, but particularly dorsally, tessellated by series of deep-cut and extremely regular, transverse grooves, dorsal and ventral margins each with row of very long setae.

Telson with subequal, roundly triangular posterior lobes; terminal and lateral margins each with several corneous-tipped spines.

Colour in life.– Ocular peduncles pale brown. Antennules and antennae bright yellow. Dactyl of left cheliped maroon with darker corneous spines dorsally, paler tubercles ventrally. Palm maroon or red-brown, with fixed finger darker maroon. Carpus brown and red-brown with large violet or blue-violet patch dorsomesially. Right cheliped with dactyl and palm red-brown with lighter patches. Ambulatory legs red-brown with paler brown patches; carpi each with violet patch on dorsomesial surface (after Morgan, 1987b).

Habitat

Collected in depths from 40–80 m.

Records for southern Thailand.– BIOSHELF station E51; Andaman Sea west of Phuket.

Distribution

Mauritius; Pakistan; India; Sri Lanka; western Thailand; Vietnam; Hong Kong; Australia; Torres Strait.

Dardanus aspersus (Berthold, 1846)

Pagurus aspersus Berthold, 1846: 21, pl. 2, fig. 1.

Pagurus diogenes.– De Haan, 1849: 208.– Ortmann, 1892: 285.– Balss, 1913: 45 (list).– Terao, 1913: 377.– Terao *et al*., 1932: pl. 57, fig. 2. Not *Cancer diogenes* Linnaeus, 1758.

Dardanus diogenes.– Gee, 1925: 159.– Lee, 1969: 48, text fig. 6.

Dardanus aspersus.– Holthuis and Sakai, 1970: 96.– Miyake, 1978: 64, pl. 1, fig. 2, text fig. 23.– Baba, 1986: 187, 296, fig. 134.

Material examined

PMBC 14859, 1 female, sl = 19.4 mm, Rawai Beach, Andaman Sea, 19.01.1972.

Diagnosis

Ocular peduncles moderately long and stout; corneas slightly dilated, occupying approximately 0.20 of peduncular length. Antennular peduncles overreaching distal margins of corneas. Antennal peduncles reaching at least to bases of corneas. Antennal acicles with few spinules obscured by setae.

Left cheliped massive; chela with convex outer face thickly covered with short, sharp spines and tufts of long setae, lower surface nearly glabrous.

Ambulatory legs with dactyls longer than propodi; both dorsal and ventral margins of dactyls and propodi with spines and setae. Dactyl and propodus of left third distinctly broader, lateral face of dactyl with weak longitudinal sulcus, lateral face of propodus flattened or weakly concave, both with covering of spines and setae.

Posterior lobes of telson separated by median cleft; terminal margins with minute spinules; left lobe with about 10, right with 3.

Colour in preservative.– Body and legs light brown, with numerous dark red and white dots. Ocular peduncles brownish in distal and proximal regions, centrally purplish. Dactyls, middle parts of propodi and carpi of ambulatory legs all dark red.

Habitat

In Japanese waters, collected in shells of *Charonia*, *Hemifusus* and *Fulgoraria* on sandy mud bottoms; 20–50 m.

Distribution

Andaman Sea; Boso Peninsula and Tottori southward on both coasts of Japan; Taiwan and South China Sea.

Remarks

This is the first record of *Dardanus aspersus* in Thai waters.

Dardanus megistos (Herbst, 1804)

Cancer megistos Herbst, 1804: 23, pl. 61, fig. 1.
Pagurus megistos.– Olivier, 1812: 639.– Barnard, 1950: 425, fig. 79c.– Fize and Serène, 1955: 158, text fig. 24, pl. 4A.
Pagurus punctulatus Olivier, 1812: 641.– Quoy and Gaimard, 1824: 528, pl. 78, fig. 2.– Dana, 1852c: 451; 1855: pl. 28, figs 4a, b.– Alcock, 1905b: 81, pl. 8, fig. 1.
Pagurus spinimanus H. Milne Edwards, 1848: 61.– Dana, 1852c: 452; 1855: pl. 28, fig. 5a–c.
Dardanus megistos.– Rathbun, 1907: 205.– Pitagsalee, 1980: 69, figs 40, 41.– Thomas, 1989: 68, pl. 2, fig. E.– Poupin, 1994: 23, fig. 19, pl. 2 fig. g.– Sakai, 1999: 11, pl. 2E.
Cancer magistes.– Estampador, 1937: 503 (misspelling of *Cancer megistos* Herbst, 1804).
Dardanus megsitos.– Ward, 1942: 64 (misspelling of *Dardanus megistos* (Herbst, 1804)].
Dardanus spinimanus.– Holthuis, 1953: 49.
Dradanus megistos.– Naiyanetr, 1980: 24 (list); 1998: 48 (list) (misspelling of *Dardanus*).

Material examined

PMBC 4736, 1 male, sl = 11.2 mm, Kradan Island, Andaman Sea, Fifth Thai–Danish Expedition, intertidal, coll. Gallardo, 11.02.1966.

Diagnosis

Ocular peduncles subcylindrical; corneas only very slightly dilated, occupying less than 0.20 of peduncle; ocular acicles subtriangular, setose and slightly spinose. Antennular peduncles reaching beyond distal margin of corneas. Antennal peduncles reaching approximately to bases of corneas. Antennal acicles setose and slightly spinulose, just overreaching proximal margins of fifth peduncular segments.

Chelipeds and ambulatory legs, especially 3 distal segments thickly covered with tufts of long bristles, and with corneous-tipped, thorn-like spines. Left cheliped much larger than right. Carpus and palm with prominent spines on upper margins. Ambulatory legs with dactyls considerably longer than propodi. Left third pereopod with maximum width of subcylindrical propodus between 0.40 and 0.35 maximum length, surfaces covered, but not densely, with very acute, corneous-tipped spines. Dactyl subcylindrical, strongly arched, surfaces also with numerous small, corneous-tipped spines.

Telson with moderately shallow median cleft; posterior lobes distinctly asymmetrical, left largest; terminal margins each with row of corneous spines, not extending onto lateral margins.

Colour in preservative.– Overall colour of chelipeds and ambulatory legs reddish with circular white spots ringed with black. Ocular peduncles uniformly dark red-brown.

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Habitat

Often inhabiting waters on outer sides of reefs and often found in shells of *Charonia*, *Turbo* and *Lambis*.

Records for southern Thailand.– Phuket, Krabi, Trang, Satun, Andaman Sea.

Distribution

Red Sea and east coast of Africa eastwards through the Indo-Pacific to the Liu-Kiu Islands; Australia; Sandwich Islands; French Polynesia.

Superfamily Paguroidea

Family Paguridae

Key to the regional genera

1. Crista dentata of third maxilliped with accessory tooth. Pleurobranch above fourth pereopod 2
— Crista dentata of third maxilliped without accessory tooth. No pleurobranch above fourth pereopod .....*Catapaguroides*
2. Abdomen well developed; males with 2 to 4 unpaired left pleopods 3
— Abdomen reduced; males without unpaired left pleopods.....*Alainopaguroides*
3. Males with sexual tube developed on one or both coxae of fifth pereopods 4
— Males without sexual tube developed on one or both coxae of fifth pereopods 6
4. Females with paired and modified first pleopods; males with elongate right sexual tube .....*Nematopagurus*
— Females without paired and modified first pleopods; males with elongate right or left sexual tube 5
5. Males with right sexual tube curving over dorsal surface of body. Ocular acicles elongate, slender .....*Catapagurus*
— Males with left sexual tube not curving over dorsal surface of body. Ocular acicles not elongate, subovate .....*Spiropagurus*
6. Pleurobranch present above fourth pereopod only. Females without paired and modified first pleopods 7
— Pleurobranchs present above second, third and fourth pereopods. Females with paired and modified first pleopods .....*Pylopaguropsis*
7. Males with gonopore of right fifth pereopod obscured by tuft of moderate to long setae directed toward left .....*Pagurixus*
— Males with gonopore of right fifth pereopod not obscured by tuft of moderate to long setae .....*Pagurus*

Catapaguroides A. Milne Edwards and Bouvier, 1892

Catapaguroides sp.

Material examined

PMBC 14860, 1 ovig. female, sl = 0.7 mm, BIOSHELF St. NBB, 07º40´N, 098º20´E, OS, 60 m, coll. N. Bruce and G. Dinesen, 27.11.1997; PMBC 14861, 2 males, sl = 0.7, 0.8 mm, BIOSHELF St. A1, 09º30´N, 097º57´E, OS, 46 m, coll. S. Bussarawit and C. Aungtonya, 18.02.1998.

Diagnosis

Ten pairs of biserial gills. Ischium of third maxilliped with crista dentata more or less reduced, without accessory tooth. Chelipeds unequal, right appreciably stronger. Carpi of ambulatory legs with dorsodistal spine. Fourth pereopods semichelate; propodal rasp with single row of corneous scales.

Males with sexual tube developed on coxa of right 5th pereopod, directed from right to left under thorax and recurved anteriorly. Short tube developed on coxa of left 5th pereopod and

concealed between 2 thick tufts of setae on sternite; 3 unpaired biramous pleopods (3–5). Female with single gonopore on coxa of left third pereopod. No paired pleopods and 4 unpaired, biramous pleopods (2–5).

Telson with transverse suture only weakly delineated; posterior lobes not markedly asymmetrical.

Distribution

Records for Thailand.– This is the first report of this genus in Thai waters.

Remarks

Only a generic diagnosis is provided, as all of the specimens thoracic lack appendages, thus a specific identification is not possible.

Alainopaguroides McLaughlin, 1997

Alainopaguroides andamanensis sp. nov.
(Fig. 7A–E)

Material examined

PMBC 14862, 1 female, sl = 1.8 mm, 1 ovig. female, sl = 2.0 mm, BIOSHELF St. RN2, 07º26´N, 098º18´E, OS, 75 m, coll. S. Bussarawit and C. Aungtonya, 08.05.1996; PMBC 14863, 4 males, sl = 1.6–2.1 mm, 1 female, sl = 1.3 mm, 2 ovig. females, sl = 1.8, 2.2 mm, BIOSHELF St. I3–I2, 07º33´N, 098º19´E, OS, 55 m, coll. S. Bussarawit and C. Aungtonya, 22.12.1998; PMBC 14864, 1 male, sl = 1.0 mm, 1 juvenile, poor condition, BIOSHELF St. F2, 08º15´N, 098º03´E, OS, 66 m, coll. S. Bussarawit and C. Aungtonya, 16.02.1998; PMBC 14865, 4 females, sl = 1.4–1.8 mm, 1 ovig. female, sl = 1.6 mm, BIOSHELF St. F2, 08º15´N, 098º03´E, OS, 66 m, coll. S. Bussarawit and C. Aungtonya, 16.02.1998; PMBC 14866, 1 male, sl = 1.0 mm, 1 female, sl = 1.3 mm, 2 ovig. females, sl = 1.7, 1.8 mm, BIOSHELF St. G1, 08º00´N, 098º12´E, OS, 49 m, coll. S. Bussarawit and C. Aungtonya, 20.02.1998; PMBC 14867, BIOSHELF Station I3–I2, 07º33´N, 098º19´E, OS, 55 m, coll. S. Bussarawit and C. Aungtonya, 22.02.1998; PMBC 14868, 12 males, sl = 0.8–1.8 mm, 2 females, sl = 1.5, 1.7 mm, 2 ovig. female, sl = 1.6, 1.6 mm, BIOSHELF St. I3–I2, 07º33´N, 098º19´E, OS, 55 m, coll. S. Bussarawit and C. Aungtonya, 22.02.1998.

Holotype: PMBC 14887, 1 female, sl = 1.4 mm, BIOSHELF St. F2, 08º15´N, 098º03´E, OS, 66 m, coll. S. Bussarawit and C. Aungtonya, 16.02.1998; **Paratypes:** PMBC 14889, 1 male, sl = 2.1 mm, BIOSHELF St. A3, 09º33´N, 097º38´E, T, 83 m, coll. S. Bussarawit and C. Aungtonya, 19.04.1996; PMBC 14888, 1 male, sl = 1.8 mm, BIOSHELF St. I3–I2, 07º33´N, 098º19´E, Andaman Sea, OS, 55 m, coll. S. Bussarawit and C. Aungtonya, 22.02.1998.

Description

Shield as broad or broader than long. Anterior margin between rostral lobe and lateral projections concave; anterolateral margin terraced; posterior margin truncate. Rostrum broadly rounded, unarmed, somewhat upturned, usually not reaching beyond level of lateral projections. Lateral projections well developed, with very prominent, long spine. Dorsal surface of shield convex, somewhat vaulted, with scattered moderate to long setae, most numerous laterally.

Ocular peduncles (including corneas) short but more than half shield length, stout, enlarged distally; with corneas strongly dilated; ocular acicles 0.30 to 0.50 length of peduncle (excluding cornea), narrowly triangular; terminating acutely; mesial margins each with row of moderately long setae.

Antennular peduncles overreach ocular peduncles by 0.50–0.35 half length of penultimate segment. Segments each with few scattered, short setae; ultimate segment also usually with sparse tuft of long setae at dorsolateral distal angle.

Antennal peduncles overreaching ocular peduncles (including corneas) by 0.25 to 0.50 length of short ultimate segment. Fifth and fourth segments with few scattered, moderately long setae. Third segment with small spine or spinule at ventrodistal angle. Second segment with dorsolateral distal angle developed as slender spine reaching nearly to mid-length of short fourth peduncular segment; dorsomesial distal angle with prominent spine. First segment with acute spine at laterodistal margin; ventrodistal angle also with

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small, acute spine. Antennal acicle reaching beyond proximal margin of ultimate peduncular segment; terminating in small spine; mesial margin with few sparse tufts of setae and 1 prominent spine proximally. Antennal flagellum very long and whip-like; each article naked or proximal articles with 1 or 2 minute bristles.

Right cheliped missing. Left cheliped with dactyl approximately equaling length of palm; surfaces unarmed but with few scattered, moderately long setae; cutting edge with row of tiny corneous teeth, terminating in small corneous claw and slightly overlapped by fixed finger. Palm approximately 0.50 length of carpus; margins and surfaces unarmed, but with few moderately long setae; cutting edge of fixed finger with very tiny teeth. Carpus slightly longer than merus, dorsolateral margin with 4 spines in distal half, other surfaces unarmed. Merus with prominent spine on dorsodistal margin, dorsal surface with few

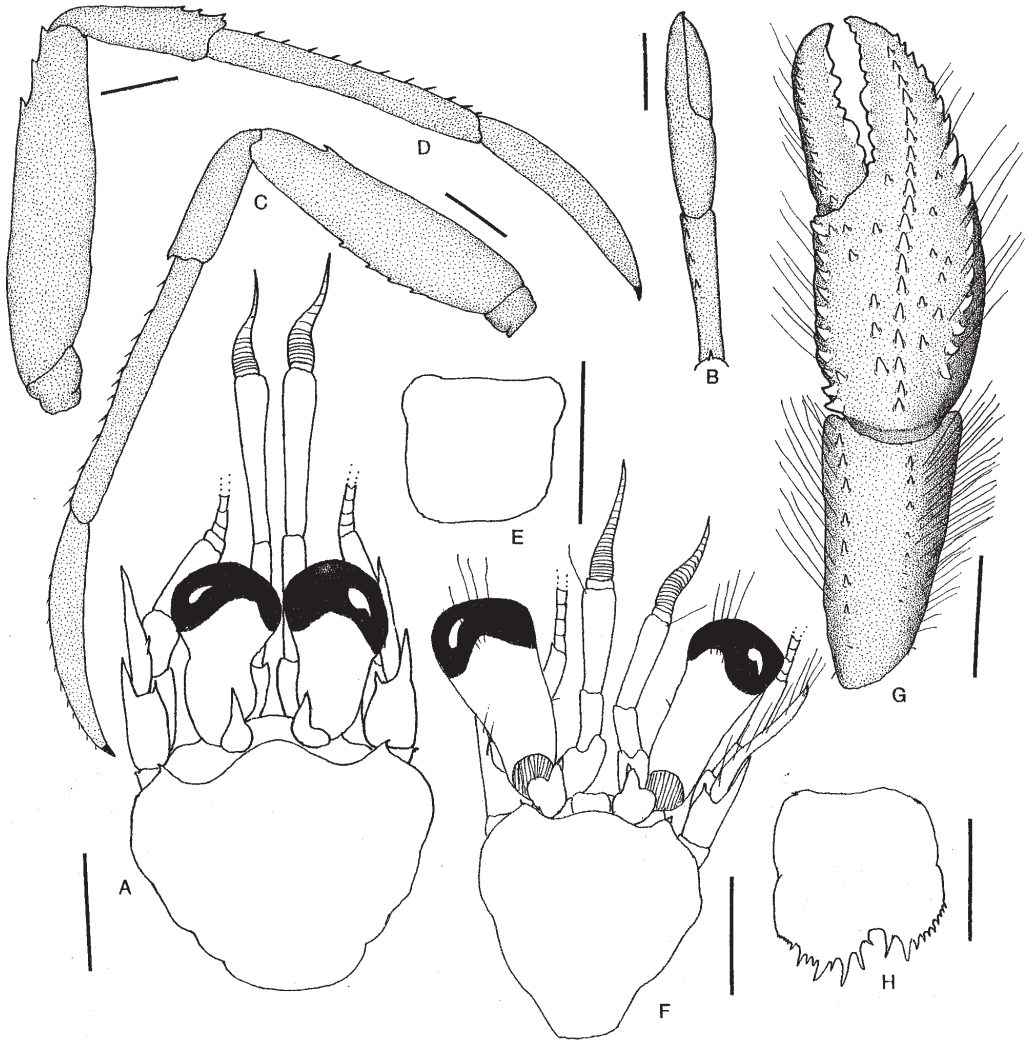

Figure 7 A–E, *Alainopaguroides andamanensis* sp. nov.; F–H, *Nematopagurus* cf. *australis* Henderson, 1893; A, B, holotype, female, sl = 1.4 mm, BIOSHELF St. F2; C, paratype, male, 1.8 mm, BIOSHELF St. I3–I2; D, E, paratype, male, sl = 2.1 mm, BIOSHELF St. A3; F–H, ovig. female, sl = 1.8 mm, 'Challenger' St. 88; A, F, shield and cephalic appendages (setae and aesthetascs omitted); B, chela and carpus of left cheliped (dorsal view, setae omitted); C, second left pereopod (lateral view); D, third right pereopod (lateral view); E, H, telson; G, chela and carpus of right cheliped. Scales equal 0.5 mm, H, 1.0 A–G.

widely-spaced, low protuberances accompanied by 1 or 2 setae, remaining surfaces and margins unarmed. Ambulatory legs appreciably longer than left cheliped; slight differences in armature. Dactyls distinctly blade-shaped; shorter than propodi, terminating in small, corneous claws; mesial faces somewhat concave, right third with ventral row of tiny, spiniform bristles; dorsal surfaces each with row of regularly-spaced, very short, stiff spiniform setae; ventral margins unarmed. Propodi approximately twice length of carpi, somewhat laterally compressed; dorsal surfaces each with row of tiny, spiniform bristles; mesial and lateral faces unarmed. Carpi approximately half length of meri; dorsal surface of right third with 4 very small spines in distal half, left second with dorsodistal spine; lateral and mesial faces glabrous; ventral surfaces unarmed. Merus of right third with 3 prominent spines in distal 0.35 of dorsal surface, ventral margin unarmed; left second with small spine on dorsal margin in distal 0.20, ventral margin with row of very small spines in proximal 0.65. Fourth pereopods each with 5 or 6 spiniform corneous scales on ventrodistal margin of propodus; dactyl with prominent preungual process at base of claw. Fifth pereopods chelate.

Male right sexual tube often elongate and curved over dorsal surface of abdomen, anteriorly; no left sexual tube apparent; no paired or unpaired pleopods. Females with paired gonopores; no paired pleopods; three unpaired left pleopods (2–4).

Uropods symmetrical, with elongate moderately narrow rasps of corneous scales on both exopods and endopods; protopods each with prominent posteriorly-directed spine. Telson subquadrate, with only faint indication of division into anterior and posterior lobes; terminal margin without median cleft, unarmed.

Colour.– Unknown.

Habitat

Known from 47–75 m.

Etymology

The species is named for the Andaman Sea

Distribution

Andaman Sea off Phuket, Thailand.

Remarks

Although *Alainopaguroides andamanensis* sp. nov. is not uncommon in the BIOSHELF material, few of the specimens have any appendages. The specimen selected as the holotype is a moderately small female in poorly calcified condition. However, it is the only specimen with a cheliped, the left, and both third pereopods attached to the body. The chela and carpus of the holotype have been illustrated; however, the shield, cephalic appendages and second and third pereopods have been illustrated from larger and better preserved male paratypes.

Until the discovery of *A. andamanensis*, the genus *Alainopaguroides* was known from a single deep-water species reported only from the Kai and Tanimbar Islands of Indonesia. *Alainopaguroides andamanensis* shares with *A. lemaitrei* McLaughlin, 1997, the basic characters of the genus; however, it is not only a much smaller species, it occurs in much shallower depths. Females of *A. andamanensis* are ovigerous at shield lengths measuring only 1.6–2.0 mm, whereas no females of *A. lemaitrei* were ovigerous with shield lengths less than 4.5 mm. The bathymetric range for *A. lemaitrei* was reported to be between 210 and 502 m. All specimens of *A. andamanensis* were collected in depths less than 100 meters.

Nematopagurus A. Milne-Edwards and Bouvier, 1892

Nematopagurus* cf. *australis (Henderson, 1888) (Fig. 7F–H)

Catapagurus australis Henderson, 1888: 76, pl. 8, fig. 1.

Nematopagurus australis.– McLaughlin, 1997: 505.

Material examined

Syntypes: NHM 88.33, 2 male, sl = 2.2, 2.6 mm, Levuku, Fiji Islands, 'Challenger' St. 188, 09°59′S, 139°42′E, 51 m, 10.09.1874; PMBC 14869, 1 ovig. female, sl = 1.8 mm, BIOSHELF St. B3, 09º15′N, 097º42′E, TD, 80 m, coll. S. Bussarawit and C. Aungtonya, 18.02.1998.

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Diagnosis

Shield slightly longer than broad; rostrum broadly rounded; lateral projections produced, roundly triangular, with laterally directed marginal spine. Ocular peduncles slightly shorter than shield; corneas somewhat dilated; ocular acicles slender, ovately triangular, with strong submarginal spine, separated basally by more than basal width of 1 acicle; interocular lobes distinct. Antennular peduncles slightly overreaching distal margin of corneas. Antennal peduncles reaching beyond bases of corneas, second segment with dorsolateral distal angle produced, terminating in simple spine. Antennal acicles reaching beyond bases of corneas.

Right cheliped with dactyl slightly longer than palm; dorsomesial margin with row of spines and tufts of setae. Palm with row of slender, acute spines on dorsomesial margin, dorsal midline with slightly irregular double row of spines, extending onto fixed finger as single row, dorsal surface laterally with few smaller spines, dorsolateral margin of palm and fixed finger with row of spines; mesial, ventral and lateral faces with long setae. Carpus with row of spines on dorsolateral margin, dorsal surface medio-laterally with row of smaller spines and long iridescent setae extending onto lateral face. Merus with acute spine at ventrolateral distal angle. Left cheliped similarly armed, but median row of spines on palm not double. Merus with 2 spines distally on ventrolateral margin. Ambulatory legs with dactyls approximately 1.5 length of propodi; ventral margins each with 8 or 9 rather widely-spaced, corneous spines on ventral margins; mesial faces each with row of widely-spaced, small spines dorsally; dorsal margins with long stiff setae. Carpi each with single dorsodistal spine.

Telson with moderately broad, shallow median cleft; terminal margins each with 3 or 4 large spines, 1 or 2 large spines and several spinules laterally.

Colour.– Unknown.

Habitat

Unknown for Thai specimen.

Records for southern Thailand.– Continental shelf off Phuket.

Distribution

Arafura Sea and Fiji; ?Andaman Sea.

Remarks

McLaughlin (1997) discussed Henderson's (1888) incorrect assignment of this species to the genus *Catapagurus*, and formally transferred it to *Nematopagurus*. The Thai specimen, while agreeing in most particulars with the male syntypes, lacks the mat of fine setae present on the dorsal surfaces of palms and fingers of the males. If the assignment of the Thai specimen is correct, this represents not only a new distributional record, but also the first report of this species since Henderson's original description.

Catapagurus A. Milne-Edwards, 1880

Key to the regional species species

1. Dactyls of ambulatory legs broadly spatulate .....*Catapagurus* sp. of Haig and Ball (1988)
— Dactyls of ambulatory legs not broadly spatulate .....*Catapagurus danida* sp. nov.

Catapagurus sp. of Haig and Ball, 1988

Catapagurus sp.– Haig and Ball, 1988: 181, fig. 10.

Material examined

PMBC 14885, 1 female, sl = 1.2 mm, BIOSHELF St. NBB, 07º40´N, 098º20´E, OS, 60 m, coll. N. Bruce and G. Dinesen, 27.11.1997; PMBC 14870, 1 male, sl = 1.4 mm, 1 female, sl = 1.2 mm, 2 ovig. females, sl = 1.7, 1.8 mm, BIOSHELF St. A1, 09º30´N, 097º57´E, Andaman Sea, OS, 46 m, coll. S. Bussarawit and C. Aungtonya, 18.02.1998.

Diagnosis

Shield broader than long; surface with numerous fine setae. Rostrum broadly rounded,

not produced to level of lateral projections. Obtusely triangular lateral projections each with terminal spinule. Ocular peduncles moderately short and terminally stout; corneas dilated. Ocular acicles narrowly triangular, slender, reaching to basal 0.25–0.35 of ocular peduncles, terminally acute and very widely separated. Antennular peduncles overreaching distal margins of corneas by entire length of ultimate peduncular segment. Antennal peduncles overreaching distal margins of corneas by approximately half length of ultimate segment. Antennal acicles reaching to bases of fifth peduncular segments.

Chelipeds missing. Ambulatory legs with 'blade-shaped' dactyls; dorsal surfaces of dactyls each with row of stiff setae, decreasing in length posteriorly; ventromesial margins each with row of very short bristles. Dorsal surfaces of propodi microscopically serrate and with few short setae. Dorsal surfaces of carpi minutely spinulose. Dorsal surfaces of meri each with 3 small spines in distal 0.35.

Telson with posterior lobes subtriangular, separated by moderately broad subrectangular median cleft.

Colour in life.– Corneas grey, distal portions of second and third pereopods transparent; rest of body mottled with red and white chromatophores (Haig and Ball, 1988)

Habitat

Sandy substrate.

Records for Thailand.– Continental shelf of Andaman Sea off Phuket, 07°40′–09°30′N.

Distribution

Andaman Sea; Arafura Sea.

Remarks

All of the specimens lack chelipeds; however, the blade-shaped ambulatory legs agree with those illustrated by Haig and Ball (1988) for their *Catapagurus* sp. from the Arafura Sea, and Dr. A. Asakura's (personal communication) description of the diagnostic row of bristles on the ventromesial margins of the dactyls. Despite the lack of appendages, except for the two ambulatory legs of the large ovigerous female from station 1 and those similar appendages of the female from site B, the shape of the telson in all of the specimens indicates their conspecificity, and identity with Haig and Ball's taxon currently being described by Dr. Asakura.

Catapagurus danida sp. nov.
(Fig. 8A–F)

Material examined

Holotype: PMBC 14871, 1 female, sl = 2.1 mm, BIOSHELF St. B3, 09º15′N, 097º42′E, TD, 80 m, coll. S. Bussarawit and C. Aungtonya, 18.02.1998.
Paratypes: PMBC 14872, 1 male, sl = 3.5 mm, 1 parasitised female, sl = 2.7 mm, same data as holotype.

Description

Shield slightly longer than broad; anterior margin between rostrum and lateral projections concave; anterolateral margins sloping; posterior margin roundly truncate; dorsal surface with scattered fine setae. Rostrum broadly rounded, not produced to level of prominent lateral projections. Lateral projections triangular, with terminal spinule. Third maxillipeds with crista dentata each consisting of 7 or 8 small teeth; accessory tooth considerably larger.

Ocular peduncles moderately short, slightly less than 0.75 length of shield, dorsal surfaces each with tuft of setae at corneal indentation; corneas slightly dilated. Ocular acicles narrowly triangular, slender, reaching nearly to or slightly beyond basal 0.25 of peduncles; terminating acutely; very widely separated.

Antennular peduncles overreach distal margins of corneas by more than entire length of ultimate segment. Ultimate and penultimate segments glabrous. Basal segment with produced, subacute ventrodistal margin.

Antennal peduncles overreach distal margin of corneas by full length of ultimate segment, or nearly so. Fifth segment with few short setae on ventrodistal margin and few scattered setae on dorsal surface. Fourth segment with few scattered setae. Third segment with unarmed ventrodistal angle. Second segment with produced dorsolateral

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distal angle reaching base of fourth peduncular segment, terminating in spine or spinule, and occasionally with small spine laterally; dorsomesial distal angle with long spine. First segment with small spine on laterodistal margin, ventral margin also with 1 small spine distolaterally. Antennal acicles moderately long, reaching slightly beyond bases of fifth peduncular segments and overreaching distal margins of corneas; with small terminal spinule, few long setae distally and on mesial margin. Antennal flagella very long, considerably overreaching outstretched ambulatory legs; each article usually with 2 minute setae.

Right cheliped long, slender. Dactyl approximately 0.80 length of palm; dorsal surface with few sparse tufts of setae; dorsomesial margin not delimited; cutting edge with row of small, calcareous teeth, slightly overlapped by fixed finger. Palm approximately 0.60 length of carpus; rounded dorsomesial margin with irregular rows of minute spinules, dorsolateral margin not distinctly delimited but with row of very small spinules, not extending onto fixed finger, dorsal surface of palm with few scattered tiny granules; ventromesial margin with row of low protuberances; dorsal surface of fixed finger

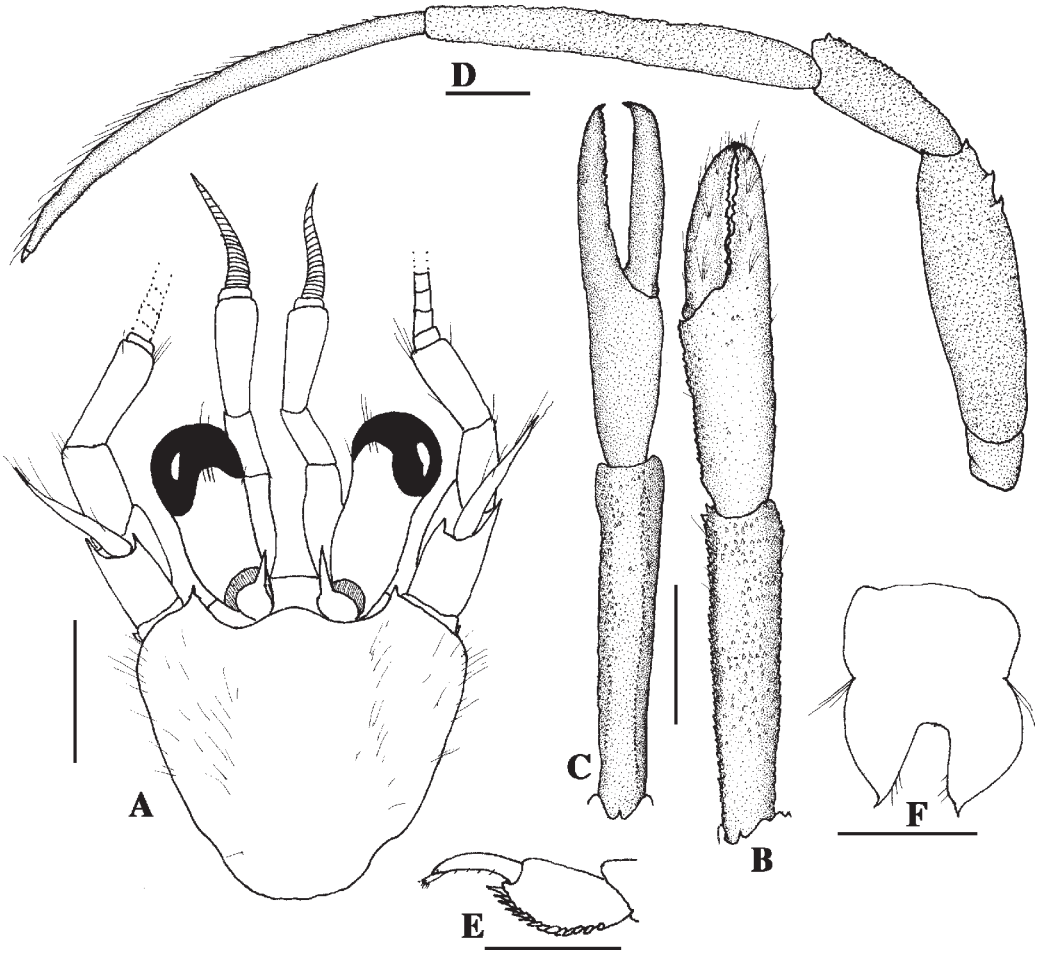

Figure 8 *Catapagurus danida* sp. nov. A–D, F, holotype, female, sl = 2.1 mm, BIOSHELF St. B3; E, paratype, female, sl = 27 mm, BIOSHELF St. B3; A, shield and cephalic appendages (aesthetascs omitted); B, chela and carpus of right cheliped (dorsal view); C, chela and carpus of left cheliped (dorsal view, setae omitted); D, left third pereopod (lateral view); E, dactyl and propodus of left fourth pereopod (lateral view); F, telson. Scales equal 0.5 mm, F, 1.0 mm, A–E.

smooth but with few sparse tufts of setae, cutting edge with row of small, calcareous teeth, terminating in small corneous claw. Carpus slightly longer than merus; dorsomesial margin with 2 or3 rows of tiny spinules, dorsodistal margin unarmed, dorsal surface with numerous very small spinules, dorsolateral margin with row of very small spinules; lateral, mesial and ventral surfaces unarmed. Merus subtriangular; dorsodistal margin with spine and few fine setae, dorsal surface 2 short,, transverse ridges, each with few moderately short setae, few setae posteriorly; mesial, lateral and ventral surfaces unarmed; ventrolateral and ventromesial margins each with few minute spinules in distal half, ventromesial distal angle with small acute spine. Ischium damaged.

Left cheliped slender, as long as right. Dactyl slightly longer than palm; terminating in corneous claw; dorsomesial margin not delimited, several moderately long setae on dorsal surface. Palm approximately half length of carpus; rounded dorsomesial and dorsolateral margins unarmed; dorsal surfaces of palm and fixed finger also unarmed, latter with few sparse tufts of fine setae; mesial and lateral faces and ventral surface unarmed, but ventromesial margin with row of faint protuberances. Carpus longer than merus; dorsomesial and dorsolateral margins each with row of very small spinules, dorsal surface with few scattered tiny spinules. Merus with spine at dorsodistal margin, 2 short transverse ridges and few fine setae in distal 0.35; ventral surface and margins with numerous microscopic tubercles and spinules, ventromesial and ventrolateral distal angles each with spinule. Ischium unarmed.

Ambulatory legs elongate. Dactyls not blade-shaped; in dorsal view, straight; in lateral view, curved ventrally in distal half; slightly shorter (second) to slightly longer (third) than propodi, dorsal margins each with row of spiniform setae, longer and more bristle-like distally; mesial faces weakly concave, lateral faces weakly convex; ventromesial margins each with row of more than 30 minute corneous spinules. Propodi twice to three times length of carpi; surfaces spinulose or granular. Carpi 0.60–0.75 length of meri; dorsal surfaces spinulose with slightly stronger spinules distally, lateral, mesial and ventral surfaces granular. Meri with 3–6 small to moderately strong spines distally on dorsal surfaces; lateral, mesial and ventral surfaces tuberculate or spinulose, ventromesial and ventrolateral margins granular or minutely spinulose, but delimited only distally, ventrolateral distal angles each with very small spinule. Ischia unarmed. Sternite of third pereopods with narrowly subrectangular anterior lobe. Fourth pereopods weakly subchelate, with well developed preungual process. Fifth pereopods chelate.

Male with elongate right sexual tube curved dorsally over abdomen, terminally forked; 2 (third and fourth) markedly reduced, uniramous left pleopods. Females well developed left pleopods 2–4, fifth elongate, uniramous.

Telson with lateral indentations suggesting separation of anterior and posterior portions; roundly triangular posterior lobes separated by moderately deep U-shaped median cleft, each terminating in corneous spine, straight inner margins with 2 or 3 minute bristles.

Colour.– Unknown

Habitat

Unknown

Etymology

The specific name is the acronym for the Danish foreign aid organization, DANIDA

Records for southern Thailand.– Andaman Sea off Phuket.

Distribution

Known only from the type locality.

Pagurixus Melin, 1939

? *Pagurixus anceps* (Forest, 1954)

Eupagurus (*Pagurixus*) *anceps* Forest, 1954: 72, figs 15–19.

Pagurus (*Pagurixus*) *anceps*.– Dechancé, 1964: 38.

Pagurus boninensis.– Lewinsohn, 1969: 64, fig. 11; 1982: 58. Not *Pagurus boninensis* (Melin, 1939).

Pagurus anceps.– Baba, 1982: 66, fig. 1.

Pagurixus anceps.– McLaughlin and Haig, 1984: 135, fig. 5.

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Material examined

PMBC 14873, 1 female, sl = 0.8 mm, Racha Yai Island, Phuket, Andaman Sea, 10–15 m, 05.12. 1996.

Diagnosis

Shield longer than broad. Rostrum triangular, usually well developed. Ocular peduncles short and stout in small individuals, increasing in length with increased size; ocular acicles usually subtriangular, acute or subacute. Antennular peduncles when fully extended overreaching distal margins of corneas; ultimate segment without row(s) of short setae on ventral margin. Antennal peduncles reaching to or slightly beyond distal margins of corneas; acicle short, but reaching beyond proximal margin of ultimate peduncular segment.

Right cheliped sexually dimorphic (missing in Thai specimen). Males with dorsal and mesial faces of dactyl usually tuberculate. Palm with dorsal and ventral surfaces strongly convex, dorsolateral and dorsomesial margins each with row of spinulose granules or small tubercles, tending to become obsolete in large individuals; dorsal surface smooth, granular or weakly tuberculate, dorsomesial proximal angle sometimes produced and with stronger tubercle. Carpus with irregular row or double row of small spines or spinules on dorsomesial margin, dorsal surface granular or with low protuberances. Right cheliped of female with dorsomesial margin of dactyl armed with row of granules or spinules, surfaces spinulose or granular. Dorsal surface of palm with several irregular rows of small spines or spinules, dorsomesial margin with 1 or 2 rows of small spines, dorsolateral margin with row of spinules, dorsal surface of fixed finger often only granular or weakly tuberculate. Dorsomesial margin of carpus with single or double row of spines, dorsolateral margin with spinulose protuberances, occasionally not well delimited.

Dactyl of left cheliped with short row of spinulose protuberances on dorsomesial margin or dorsal surface proximally. Dorsomesial margin of palm with row of weak to strong spines, dorsal midline with 2 irregular single or double rows of small spines, sometimes extending onto fixed finger proximally, dorsolateral face sloping and armed with irregular rows of spinules or tubercles; occasionally spines of chela reduced, or rarely absent. Dorsomesial margin of carpus with row of acute or subacute spines, dorsolateral margin with row of spines at least distally, dorsal surface frequently slightly protuberant, often also with 1 or 2 spines at distal margin.

Ambulatory legs with dactyls shorter to nearly equal to length of propodi, moderately stout; ventral margins with 5 to 8 strong corneous spines. Ventral margins of propodi each with row of corneous spinules. Carpi each with small spine at dorsodistal angle. Sternite of third pereopods with anterior lobe subquadrate or subrectangular.

Females with paired gonopores or with single gonopore on left coxa. Telson with terminal margins straight or slightly concave, each with 3 to 5 spines or spinules.

Colour in preservative.– Antennal peduncles with basal red band. Ambulatory legs with base colour white, with broad red rings; chelipeds white.

Habitat

Shallow water species; intertidal to 15 m.

Records for southern Thailand.– Racha Yai Island, Phuket, Andaman Sea.

Distribution

Red Sea, Indian Ocean, Andaman Sea, Central Pacific, Philippine, Ryukyu, Palau, and Caroline Islands.

Remarks

The single female specimen from Racha Yai Island can only be tentatively assigned to *Pagurixus*, as females of this genus exhibit few diagnostic characters. Similarly, although it generally agrees with the characters that distinguish *P. anceps* from other members of the genus, the small size of the specimen makes positive identification impossible. However, despite its small size, the individual is a mature female with a single left gonopore.

Pylopaguropsis Alcock, 1905b

Pylopaguropsis lewinsohni McLaughlin and Haig, 1989

Pylopaguropsis cf. *magnimanus*.– Lewinsohn, 1969: 58, fig, 9. Not *Pylopaguropsis magnimanus* (Henderson, 1896).

Pylopaguropsis undescribed sp. 1.– Haig and Ball, 1988: 190.

Pylopaguropsis lewinsohni McLaughlin and Haig, 1989: 155, figs 3f, 5f, 7g, 11f, 13f.

Material examined

PMBC 15424, 1 female, sl = 2.8 mm, BIOSHELF St. B3, 09º15´N, 097º42´E, TD, 80 m, coll. S. Bussarawit and C. Aungtonya, 18.02.1998.

Diagnosis

Shield slightly broader than long to slightly longer than broad. Rostrum acute, often overreaching lateral projections; usually terminating in moderately well developed spine. Ocular peduncles (including corneas) overreached by antennular peduncles; ocular acicles acute, slender, triangular, sometimes with submarginal terminal spinule. Antennal peduncles not overreaching ocular peduncles.

Right chela and dactyl somewhat dorsoventrally flattened. Dactyl set on strongly oblique angle; dorsomesial margin with row of acute, corneous-tipped spines, dorsal surface with scattered small, spinulose tubercles. Palm narrowed proximally, dorsomesial margin with row of small, spinulose tubercles and 2 additional irregular rows of spinulose tubercles extending onto weakly tuberculate mesial face, dorsal surface faintly convex, with few widely-spaced spinules on mesial half, 2 rows of stronger spines on lateral half, not extending onto fixed finger, dorsolateral margin slightly elevated and with row of small tooth-like spines. Carpus with row of acute spines on dorsodistal margin, dorsal surface with short row of spines in midline, spines distally, spinules or granules laterad of midline and extending onto lateral face. Left cheliped with propodal-carpal articulation rotated counter clockwise approximately 30°; dactyl unarmed. Palm with weakly convex, unarmed dorsal surface. Dorsomesial margin of carpus with row of spines and tufts of long setae, dorsolateral margin with spine at distal margin. Second pereopods and third left generally similar, dactyl and propodus of third right markedly different. Dactyls of second and left third each with row of 8–12 strong, corneous spines on ventral margins. Propodi each with corneous spine and ventrodistal margin. Third right pereopod considerably larger. Dactyl almost twice as broad; dorsally flattened, crenulate; lateral face concave dorsally and ventrally with intervening prominent ridge; mesial face with row of corneous spinules in ventral half and second row dorsally; ventral margin also with row of corneous spines. Propodus broad, laterally compressed; lateral face deeply concave in upper third, deep concavity in midline and small concavity near ventral margin; ventral margin with row of corneous spinules. Carpi each with spine at dorsodistal margin. Propodal rasps of 4th pereopods with single row of corneous scales or with single row proximally, double row distally.

Telson with subrectangular or subtriangular posterior lobes; terminal margins subhorizontal or oblique; left lobe with 2 or 3 acute spines near cleft and 2 or 3 near distolateral angle; right lobe with 3 to 5 spines, sometimes unequally spaced; lateral margins plate-like; lobes separated by moderately wide median cleft.

Colour in preservative.– Right cheliped white on dorsal surfaces of chela and carpus; mesial face of carpus red and white striped; merus red dorsally and red and white striped mesially and laterally. Left cheliped and ambulatory legs with red and white stripes (McLaughlin and Haig, 1989).

Habitat

Probably on coral.

Records for Thailand.– Continental shelf of Andaman Sea off Phuket.

Distribution

Red Sea; Andaman Sea; Indonesia.

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Pagurus Fabricius, 1775

Key to the regional species

1. Carpus of right cheliped with foramen on ventral surface. Dactyls of ambulatory legs distinctly longer than propodi. Males with 4 unpaired left pleopods ..... *P. cavicarpus*
— Carpus of right cheliped without foramen on ventral surface. Dactyls of ambulatory legs shorter than propodi. Males with 3 unpaired left pleopods 2
2. Dorsal surfaces of palms of both chelipeds with prominent median protuberances separated by.smooth area; setae abundant and usually plumose ..... *P. pitagsaleei*
— Dorsal surfaces of palms of both chelipeds without prominent median protuberances; setae sparse, simple ..... *P. kulkarnii*

Pagurus cavicarpus (Paul'son, 1875)

Eupagurus cavicarpus Paul'son, 1875: 91, pl. 12, figs 3–3a; 1961: 97, pl. 12, figs 3–3a.

Eupagurus carpoforaminatus var. *nephromma* Alcock, 1905b: 131, not pl. 11, figs 4–4a.

Eupagurus carpoforaminatus.– Thompson, 1943: 425 (in part).

Pagurus cavicarpus.– Gordan, 1956: 327 (lit).– Lewinsohn, 1969: 61 (in part), fig. 10.– McLaughlin and Forest, 1999: 301, figs 1A–C, E–I, K.

Not *Eupagurus carpoforaminatus* var. *nephromma*.– Terao, 1913: 370 [= *Pagurus megalops* (Stimpson, 1858)].

Material examined

PMBC 15429, 1 ovig. female, sl = 2.2 mm, BIOSHELF St. A3, 09º30´N, 097º38´E, trawl, 83 m, coll. S. Bussarawit and C. Aungtonya, 09.04.1996; PMBC 15420, 1 male, sl = 3.1 mm, 1 female, sl = 2.7 mm, 07º46´N, 097º58´E, trawl, 80 m, coll. S. Bussarawit, 08.04.1997; PMBC 15425, 1 male, sl = 2.4 mm, 1 female, sl = 2.6 mm, BIOSHELF St. B3, 09º15´N, 097º42´E, TD, 80 m, coll. S. Bussarawit and C. Aungtonya, 18.02.1998; PMBC 15428, 1 male, sl = 3.1 mm, BIOSHELF St. C2, 09º01´N, 097º53´E, Trawl, 64 m, coll. S. Bussarawit and C. Aungtonya, 17.02.1998; PMBC 15422, 1 male, sl = 5.9 mm, BIOSHELF St. G1, 08º00´N, 098º13´E, TD, 46 m, coll. S. Bussarawit and C. Aungtonya, 20.02.1998; PMBC 15421, 1 male, sl = 3.8 mm, BIOSHELF St. G2, 07º59´N, 098º09´E, Andaman Sea, TD, 68 m, coll. S. Bussarawit and C. Aungtonya, 20.02.1998.

Miscellaneous collections: PMBC 15434, 1 female, sl = 3.0 mm, 07º 34.3´N, 098º 13.1´E, 77 m, 01.12.1998; PMBC 15435, 1 female, sl = 4.0 mm, 07º 34.5´N, 098º 13.7´E, Andaman Sea, 73.3 m, 02.12.1998.

Diagnosis

Shield slightly broader than long. Rostrum usually broadly rounded, not produced beyond level of lateral projections. Ocular peduncles broadest at bases of corneas; approximately equal to length of antennal peduncles, but reaching only to approximately mid-length of antennular peduncles; corneas somewhat dilated; ocular acicles triangular. Antennal peduncles with dorsolateral distal angles of second segments extending to distal half of fourth peduncular segment, but not reaching distal margins. Antennal acicle reaching to or beyond mid-length of ultimate peduncular segment, but not reaching distal margins of corneas.

Chelipeds with numerous distinctly plumose setae, not masking armature and not appreciably more dense on ventral surfaces and margins of meri. Right cheliped moderately slender; dactyl with row of spines on dorsomesial margin. Palm with row of teardrop-shaped spines on dorsomesial margin, medianly elevated dorsal surface similarly armed and set off by longitudinal grooves mesially and laterally. Carpus with row of spines on dorsomesial margin, dorsal surface with several rows of spines, ventral surface with distinct foramen centrally near distal margin. Left cheliped appreciably shorter than right. Palm with single or double row of spines on dorsolateral margin and additional double or triple row on elevated dorsal

mid-line. Carpus with row of strong spines dorsally, ventral surface with distinct foramen or circular depression. Ambulatory legs with dactyls appreciably longer than propodi. Dorsal margins of propodi and carpi each with row of spines. Meri of second pair with spinose dorsal and ventral margins.

Males with 4 unpaired uniramous or unequally biramous left pleopods. Telson with faint, partial transverse suture indicating division into anterior and posterior portions; terminal margins of posterior lobes each with row of strong, corneous-tipped spines extending on to lateral margins.

Colour in preservative.– Shield, ocular peduncles, and ocular acicles mottled tan and cream. Chelipeds with palms and fixed fingers cream shading to reddish-brown, darkest distally on palms and adjacent to cutting edge of fixed fingers; carpi dorsally, light yellowish-tan, darkest near proximal margins; meri cream or light tan, light brown distally on dorsal, mesial and lateral faces. Ambulatory legs with dactyls uniformly light reddish-brown; propodi with faint longitudinal light brown or tan stripes, two on lateral faces, one each dorsally and ventrally; carpi cream, grading to light reddish-brown proximally on dorsal and lateral surfaces, white mesially and ventrally; meri reddish-tan distally fading to cream proximally on dorsal and lateral surfaces, cream on mesial and ventral surfaces.

Habitat

Unknown.

Records for southern Thailand.– Continental shelf of Andaman Sea off Phuket.

Distribution

Gulf of Aqaba, Red Sea; KwaZulu-Natal, South Africa; southern Arabian coast and Indian Ocean between Maldives and Cape Comorin; Andaman Sea.

Pagurus pitagsaleei sp. nov.

Pagurus cf. *boriaustraliensis*.– Rahayu and Komai, 2000: 30, figs 4–8. Not *Pagurus boriaustraliensis* Morgan, 1990.

Material examined

Holotype: PMBC 14880, male, sl = 3.2 mm, Cape Panwa, Phuket, low tide, coll. P. Davie and P. Ng, 03.12.1998.

Allotype: PMBC 14886, 1 ovig. female, sl = 3.6 mm, same data as holotype.

Additional material examined: PMBC 16613, 1 male, sl = 3.3 mm, 1 female, sl = 3.1 mm, beach associated with PMBC, Andaman Sea, coll. T. Komai, 27.10.95, rather poor condition.

Description

Shield longer than broad, with scattered clumps of long plumose setae. Rostrum broadly rounded, produced slightly beyond level of lateral projections. Anterior margin between rostrum and lateral projections somewhat concave; anterolateral margins sloping or terraced; posterior margin truncate.

Ocular peduncles moderately long and slender, approximately 0.65 shield length; corneas not noticeably dilated. Ocular acicles large, roundly triangular; with moderately prominent submarginal spine; interocular lobe distinct.

Antennular peduncles reaching to or slightly beyond distal margins of corneas. Dorsodistal margin of ultimate segment with tuft of long simple setae laterally, few scattered setae on dorsal surface. Basal segment with slender spine on lateral face proximally.

Antennal peduncles extending slightly beyond distal margins of corneas. Fifth and fourth segments each with few scattered setae. Third segment with spinule at ventrodistal angle. Second segment with dorsolateral distal angle produced well beyond proximal margin of fourth peduncular segment, terminating in small spine, mesial margin with 1 or 2 small spines, and tufts of plumose setae. Antennal acicles reaching to or nearly to bases of corneas, mesial margins setose.

Right cheliped larger, but not necessarily longer than left. Dactyl approximately as long as palm; dorsal surface with longitudinal, tubercular median ridge, partially obscured by plumose setae proximally, and additional row of more widely-spaced tubercles adjacent to cutting edge, remaining dorsal surface smooth; dorsomesial margin with row of small, closely-spaced spines

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and tufts of long, plumose setae; ventral surface nearly glabrous; cutting edge with row of calcareous teeth in proximal 0.65, separated from distal tooth by several smaller calcareous teeth. Palm slightly shorter than carpus; dorsomesial margin with irregular single or double row of tuberculate spines, dorsal midline with proximal protuberance obscured by tuft of long plumose setae and separated by glabrous space from tuberculate and setose ridge, broader and glabrous on fixed finger and extending nearly to tip, remaining dorsal surface of palm with few, scattered tubercles; dorsolateral margin of palm and fixed finger with row of small spines fringed with long plumose setae; cutting edge of fixed finger with row of small, calcareous teeth, terminating in broad, somewhat hoof-shaped corneous claw; mesial face with few tubercles and transverse row of short ridges partially concealed by plumose setae. Carpus slightly shorter than merus; dorsomesial margin with row of prominent spines and tufts of long plumose setae, dorsal surface with scattered low tubercles and protuberances, dorsolateral margin with row of small spines partially obscured by fringe of plumose setae, dorsodistal margin with few widely-spaced, small spines or spinules; lateral face with few scattered tufts of plumose setae, ventrolateral margin weakly denticulate; mesial face with few sparse tufts of plumose setae, ventromesial margin produced into wing-like projection in both sexes, ventromesial margin unarmed or with several acute or subacute spines; ventral surface unarmed. Merus subtriangular; dorsodistal margin with slender, acute spine and few tufts of plumose setae; ventromesial margin with very pronounced wing-like projection, more distinctly developed in male, but more prominently armed with spines in female; ventrolateral margin with row of spines or spinules and tufts of plumose setae. Ischium with row of small spines on ventromesial margin.

Left cheliped slightly shorter or slightly longer than right, with numerous tufts of long plumose setae. Dactyl approximately twice length of palm; dorsomesial margin with row of tiny spinules and sparse setae not extending to tip, dorsal midline with short row of spines in proximal half; cutting edge with row of small calcareous teeth, and distally short row of slender corneous spines. Palm nearly 0.65 length of carpus; dorsomesial margin with 3 or 4 moderately well developed spines partially concealed by tufts of plumose setae, dorsal midline with 2 tuberculate protuberances and tufts of plumose setae followed distally by longitudinal row of small subacute tubercles extending nearly to tip of fixed finger, second short row of low tubercles adjacent to cutting edge; dorsolateral margin of finger and palm with row of spines; mesial face with row of low tubercles adjacent to dorsal margin; lateral face and ventral surface with few low tubercles and tufts of plumose setae. Carpus subtrapezoidal, with flattened dorsal surface, dorsomesial margin with row of 3 large spines, dorsodistal margin with small spines or tubercles, dorsolateral margin with row of 3 or 4 somewhat smaller spines, both at least partially concealed by tufts of plumose setae; mesial and lateral faces and ventral surface all with scattered tufts of plumose setae. Merus with spine at dorsodistal margin and sparse tufts of plumose setae on dorsal surface; ventromesial and ventrolateral margins each with row of spines, strongest laterally. Ischium with row of small tubercles on ventromesial margin.

Ambulatory legs similar; all segments with spare tufts of plumose setae. Dactyls about 0.90 length of propodi, ventral margins each with 5 or 6 corneous spines. Propodi each with row of corneous spines on ventral surface (second) or single spine at ventrodistal margin (third). Carpi each with dorsodistal spine. Meri each with row of spines on ventrolateral margin in distal half (second) or unarmed (third). Fourth pereopods with single row of scales in propodal rasp; dactyls of left somewhat broader than right, and more densely setose. Sternite of third pereopods with anterior lobe subrectangular.

Male with 3 unpaired, markedly unequal biramous left pleopods. Telson with left posterior lobe slightly larger and more oblique than right; separated by deep median cleft; terminal and lateral margins with several long, slender spines interspersed with smaller spines.

Colour in life.– Ocular peduncles greyish-white with short longitudinal stripes of reddish-black proximally and one continuous longitudinal stripe laterally; ocular acicles each with subcircular

reddish-black patch. Antennular peduncles with penultimate and basal segments greyish-white with blackish-red stripes and patches; ultimate segment orange distally and with blackish-red stripes; flagellum bright orange. Antennal peduncles greyish-white with black stripes; flagellum greyish-white with dark red-brown or black bands, bands increasing in length distally. Chelipeds with palms mottled greyish-white and black. Ambulatory legs greyish-white with interrupted short reddish-black stripes, each with faint blackish coloured band proximally and subdistally on dactyls; propodi, carpi, and meri each with faint median blackish band.

Habitat

Shallow sublittoral areas of sand and coral and under stones on muddy sand beach.

Etymology

This species is named for Mr. Chinanwat Pitagsalee whose unpublished Master's Thesis (Pitagsalee, 1980) provided the foundation for subsequent information on Thai hermit crabs.

Records for southernThailand.– Cape Panwa, Phuket (type locality), Andaman Sea.

Distribution

Known only from the type locality.

Affinities.– *Pagurus pitagsaleei*, new species is most closely allied to *P. boriaustraliensis* Morgan, 1990, sharing with this northern Australian species, the elongate ocular peduncles; subequal chelipeds, with wing-like projections developed from the ventromesial margins of the right merus and carpus; and the generally similar pilosity and armature. However, the dorsal surface of the palm of each cheliped in *P. pitagsaleei* has only two tuberculate, large setose protuberances in the dorsal midline, while the midline of *P. boriaustraliensis* is armed with a spinose ridge. More importantly, the males, at least, of the Australian species are provided with a large tubercle proximally on the ventromesial margin of the merus of each cheliped. In *P. pitagsaleei*, the male holotype and additional male examined each had a median ventral spine; the female allotype and additional female examined had one or two proximal spines of the ventromesial margin enlarged. The left cheliped in all specimens had a more prominent proximal spine or tubercle on the ventroproximal margin of the merus.

Colour patterns in the two species also serve to facilitate identification. The ultimate segment of the antennular peduncles of *P. pitagsaleei* is greyish-white proximally and orange distally; whereas that of *P. boriaustraliensis* is cream-coloured. The palms of the chelae in *P. boriaustraliensis* are cream colour, with black or reddish-black lines, while those of *P. pitagsaleei* are greyish-white mottled with black. Both species have stripes on the ambulatory leg with median and/or subdistal brown or reddish-black bands superimposed.

Pagurus pitagsaleei is also related to *P. kulkarnii* Sankolli, 1962, recognized for the first time in the Gulf of Thailand, and *P. hedleyi* (Grant and McCulloch, 1906), from Australia. The three species share the distinctive wing-like development of the ventromesial margins of the carpus and merus of the right cheliped, but are immediately distinguished by the armament of the right chelae.

Remarks

Pagurus pitagsaleei sp. nov. was profusely illustrated by Rahayu and Komai (2000) under the name *Pagurus* cf. *boriaustraliensis*. Consequently additional illustrations appearing in a sequential volume in the same journal seem superfluous.

Pagurus kulkarnii Sankolli, 1962

Pagurus kulkarnii Sankolli, 1962: 136, text-figs 1, 2.– Tirmizi and Siddiqui, 1982: 89, figs 44, 45.

Pagurus sp..– Pitagsalee, 1980: 111, figs 64, 65. Not *Pagurus kulkarnii*: Morgan, 1987b: 182; 1990: 27 (= *Pagurus hedleyi* Grant and McCulloch, 1906).

Material examined

CUMZ 1357, 1 male, sl = 5.8 mm, Ang Sila, Chon Buri Province, Gulf of Thailand, coll. C. Pitagsalee.

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Diagnosis

Shield longer than broad. Rostrum rounded, not reaching level of lateral projections. Ocular peduncle moderately long, but overreached by both antennular and antennal peduncles; corneas not noticeably dilated; ocular acicles roundly triangular, with terminal spinule. Antennal acicles reaching beyond proximal margins of ultimate peduncular segments, mesial margins with few setae. Crista dentata of third maxilliped with 1 accessory tooth.

Chelipeds unequal, right longer and stouter. Dactyl of right cheliped with small conical tubercles on upper surface. Palm with tuberculate or granular upper surface; dorsomesial and dorsolateral margins each with row of small spines or tubercles. Carpus with weakly tuberculate or spinulose dorsal surface, dorsomesial margin with row of spines, dorsolateral margin spinulose; ventromesial margin developed obliquely into wing- or keel-like projection, often provided distally with few spinules or tubercles. Merus with ventromesial and mesiodistal margins developed into wing- or keel-like subsemicircular, marginally smooth or serrate protuberance. Left cheliped with dorsomesial margin of dactyl spinulose, dorsal surface with tuberculate granules. Palm with conical granular tubercles covering dorsal surface, dorsolateral margin with small spines or tubercles, dorsomesial margin spinulose. Carpus with distally spinulose dorsomesial margin, dorsodistal margin with prominent spine. Ambulatory legs with dactyls shorter than propodi, ventral margins each with 5 or 6 corneous spines. Propodi with transverse rows of minute ridges, ventrodistal margins each with few corneous spinules. Carpi each with dorsodistal spine. Fourth pereopods with single row of corneous scales in propodal rasp. Anterior lobe of sternite of third pereopods subrectangular.

Males with 3 unpaired left pleopods. Telson with anterior and posterior portions very distinctly indicated; posterior lobes separated by moderately deep median cleft; terminal margins each with row of irregularly-sized, usually blunt spines, extending onto lateral margins.

Colour in life.– General colour light brown with longitudinal stripes of chocolate-brown on major portions of chelipeds and ambulatory legs (Sankolli, 1962). Tirmizi and Siddiqui (1982) added 'distal ends of segments green. Ocular acicles brown, proximal portions of ocular peduncles orange, brown distally. Antennal flagella banded brown and ivory.'

Remarks

Sankolli (1962), Haig and Ball (1988) and Morgan (1987b, 1990) all have commented upon the great similarity betweeen *P. kulkarni* and *P. hedleyi* Grant and McCulloch, 1906. I have now had the opportunity to examine the holotype *of P. hedleyi* (NHM 1882.7), Pitagsalee's specimen of *P. kulkarnii* from the Gulf of Thailand, referred to in his thesis as *Pagurus* sp., a specimen of *P. kulkarnii* from Pakistan, kindly provided by Dr. Siddiqui, and specimens of both species, which occur sympatrically in the Hong Kong area. Colour patterns will immediately separate the two taxa; however, in the absence of colour, the armature of the dactyl, and the strength of the spines on the dorsomesial margin of the carpus of the right cheliped will distinguish the two. In *P. kulkarnii*, the dorsomesial margin and dorsal surface of the dactyl have a covering of low tubercles, whereas this margin and surface in *P. hedleyi* each are armed with 1 or 2 irregular rows of moderately large spines or spiniform tubercles. The carpal spines are much more prominent in *P. hedleyi* than in *P. kulkarnii*. The colour patterns remaining on the chelipeds and ambulatory legs in preserved specimens of *P. hedleyi* correspond well with the colour patterns described by Morgan (1987b, 1990) for material he reported as *P. kulkarnii*.

Sankolli (1962) remarked that he had difficulty in sexing his specimens, but it appeared that male and female pleopods were morphologically similar. However, females from Karachi, Pakistan, were reported by Tirmizi and Siddiqui (1982) to have pleopods with subequal rami. It is quite possible that no females were actually represented in Sankolli's collection.

Habitat

Intertidal.

Records for southern Thailand.– Chonburi Province, Gulf of Thailand.

Distribution

Bombay, India; Karachi, Pakistan; Chonburi Province, Gulf of Thailand; Hong Kong.

Spiropagurus Stimpson, 1858

Remarks

Alcock (1905b) described three subspecies of *Spiropagurus spiriger* (De Haan, 1849), all occurring in the Andaman Sea. His varieties, heretofore considered subspecies, are morphologically very similar, but, as Lewinsohn (1982b) surmised, probably represent valid species. That is certainly the case for *S. profundorum* Alcock 1905b, which has been found to be sympatric with *S. spiriger* in the Gulf of Thailand, and is elevated herein to specific rank. *Spiropagurus lophomeris* Alcock, 1905b and *S. spiniosicarpis* Alcock, 1905b are similarly elevated to specific rank.

Key to the regional species

1. Dorsal surfaces of ocular peduncles with several short transverse rows of setae .....*S. spiriger*
— Dorsal surface of ocular peduncles without short transverse rows of setae .....*S. profundorum*

Spiropagurus spiriger (De Haan, 1849)
(Fig. 9A, B)

Pagurus spiriger De Haan 1849: 206, pl. 49, fig. 2.
Spiropagurus spiriger.– Stimpson 1858: 248.– Alcock 1905b: 118, pl. 13, fig. 1.– Miyake, 1978: 137, fig. 54; 1982: 122, pl. 41, fig. 5.– Pitagsalee, 1980: 114, figs 66, 67.– Naiyanetr, 1980: 24 (list); 1998: 49 (list).– Lewinsohn, 1982: 216, fig. 2.– Baba, 1986: 211, fig. 155.

Material examined

PMBC 4737, 1 male, sl = 5.9 mm, Fifth Thai–Danish Expedition St. 5, 07º01´48´´–05´19´´N, 099° 20´24´´–18´44´´E, Andaman Sea, 35 m, 10.02. 1996; CUMZ 1365, 1 ovig. female, sl = 5.2 mm, Samut Sakhon, Gulf of Thailand, coll. C. Pitagsalee.

Diagnosis

Rostrum broadly subtriangular, not reaching beyond level of lateral projections. Ocular peduncles very short, stout and broadened distally; dorsal surfaces with transverse rows of short setae; corneas dilated. Antennal peduncles nearly as long as antennular peduncles and much longer than ocular peduncles (including corneas). Antennal acicles slender, nearly as long to distinctly longer than ocular peduncles.

Chelipeds slender, similar and usually of equal length; occasionally right slightly larger. Chelae with marginal fringes of long setae. Dorsal surfaces of palms each with numerous, short, transverse, setose squamae, dorsal surfaces of dactyls and fixed fingers each with 2 or 3 longitudinal rows of setae. Carpi each with transverse, setose squamae on dorsal surface, dorsomesial margin with longitudinal row of spines and second partial row laterally. Ambulatory legs considerably longer than chelipeds. Meri, carpi, and propodi laterally compressed, all surfaces with squamiform setose ridges. Meri each with dorsodistal spine. Carpi each with row of spines on dorsal surfaces, partially obscured by fringe of long setae; spines of third pereopods smaller. Propodi each with row of setae long setae dorsally and ventrally almost entirely obscuring row of widely-spaced, small spines dorsally and few small distal spines ventrally. Dactyls each with row of long setae on dorsal margins; mesial and lateral faces each with longitudinal row of shorter setae.

Male left sexual tube stout, long, coiled. Triangularly spiniform posterior lobes of telson separated by deep median notch; mesial and lateral margins each with few prominent spines.

Colour in preservative.– General base colour light yellowish-brown. Anterior carapace, chelae and distal two segments of ambulatory legs reddish.

Habitat

Muddy or sandy bottoms in depths of 10 to 90 m.

Records for southern Thailand.– Southern Andaman Sea; Surat Thani, Pattani, Gulf of Thailand.

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Distribution

Bay of Bengal; Andaman Sea; Gulf of Thailand; East Indian Archipelago; East China Sea; Japan; Hong Kong; northern Australia.

Remarks

Although the specimen available for examination was collected in the northern Gulf of Thailand, Pitagsalee (1980) also reported the occurrence of this species within the study area. This species apparently occurs sympatrically with *S. profundorum* in Pattani, and for this reason alone the two taxa cannot be considered subspecies. Although they are morphologically quite similar, the several short rows of setae on the dorsal surfaces of the ocular peduncles and fringe of setae at the corneal margin immediately set *P. spiriger* apart not only from *S. profundorum*, but from all other species of the genus.

Spiropagurus profundorum Alcock, 1905
(Fig. 9C, D)

Spiropagurus spiriger var. *profundorum* Alcock, 1905b: 120, pl. 13, fig. 5.

Spiropagurus spiriger profundorum.– Pitagsalee, 1980: 117, figs 68, 69.– Naiyanetr: 1980: 24 (list); 1998: 49 (list).

Material examined

PMBC 14874, 1 male, sl = 8.0 mm, from fishing trawler, west of Phuket, coll. P. Ng and P. McLaughlin, 11–13.12.1998; PMBC 14892, 1 female,

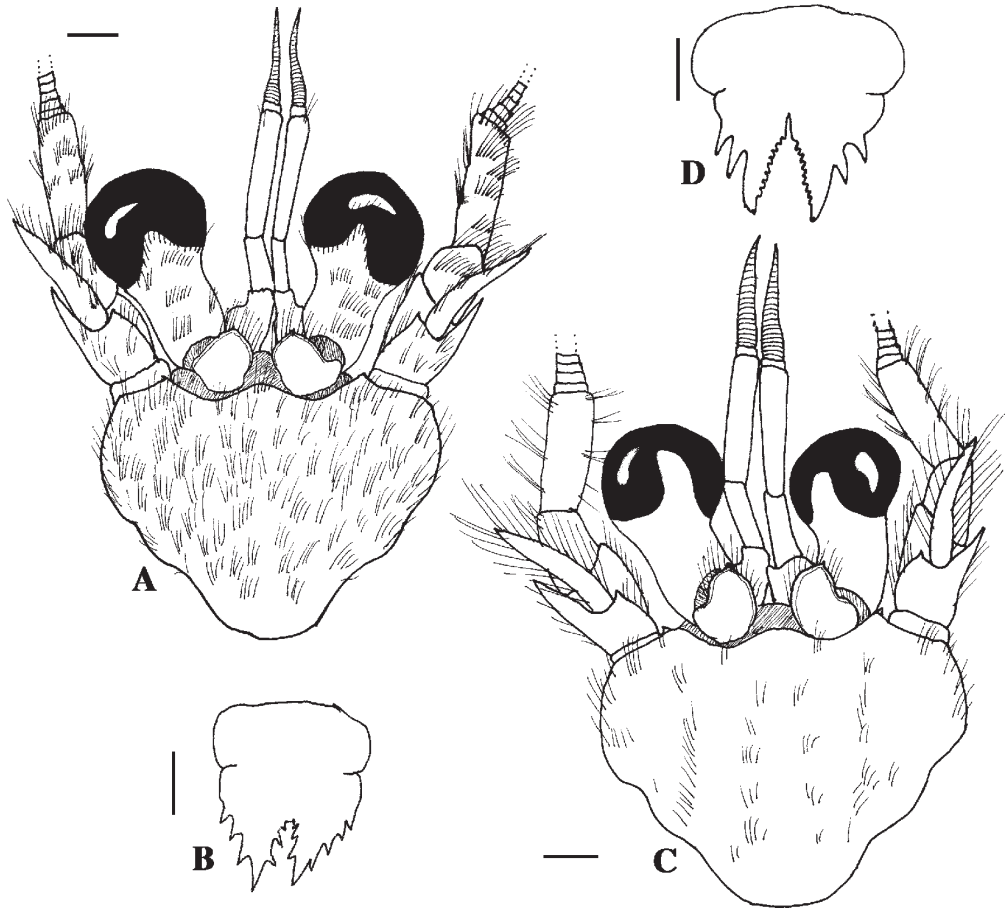

Figure 9 A, B, *Spiropagurus spiriger* Stimpson, 1858; C, D, *Spiropagurus profundorum* Alcock, 1905b. A, ovig. female, sl = 5.2 mm, Samut Sakhon; B, after Lewinsohn (1982, fig. 2f); C, D, female, sl = 6.0 mm, Pattani. A, C, shield and cephalic appendages (aesthetascs omitted); B, D, telson. Scales equal 1 mm.

sl = 4.4 mm, between Hae and Racha Yai Islands, OS, 50 m, coll. Bruce, 23.11.1997; PMBC 14875, 1 juvenile, sl = 1.8 mm, BIOSHELF St. A3, 09º33´N, 097º38´E, T, 83 m, coll. S. Bussarawit and C. Aungtonya, 19.04.1998; PMBC 15432, 1 juvenile male, sl = 2.2 mm, 1 female, sl = 4.6 mm, BIOSHELF St. A2, 09º32´N, 097º50´E, OS, 61 m, coll. S. Bussarawit and C. Aungtonya, 18.02.1998; PMBC14876, 2 males, sl = 4.7, 6.0 mm, 1 female, sl = 4.2 mm, BIOSHELF St. B3, 09º15´N, 097º42´E, TD, 80 m, coll. S. Bussarawit and C. Aungtonya, 18.02.1998; PMBC 14877, 1 male, sl = 5.4 mm, BIOSHELF St. PB7, 07º44´N, 098º41´E, Andaman Sea, OS, 32 m, coll. S. Bussarawit and C. Aungtonya, 21.02.1998; CUMZ 1367, 1 female, sl = 6.0 mm, Pattani, Gulf of Thailand.

Diagnosis

Rostrum broadly subtriangular, not reaching to level of well developed lateral projections. Ocular peduncles short, stout, distally broadened; dorsal surface glabrous; corneas prominently dilated. Antennal peduncles nearly or as long as antennular peduncles, both distinctly overreaching distal margins of corneas. Antennal acicles reaching to middle of corneas or somewhat beyond.

Chelipeds slender, similar; right often slightly longer. Chelae both with marginal fringe of long setae. Dorsal surfaces of palms each with 2 rows of broad, marginally setose squamae, extending onto fixed finger; dactyls with 2 or 3 longitudinal rows of setae. Carpi each with short transverse setose, sometimes spinulose squamae on dorsal surfaces, dorsomesial and dorsolateral margins each with row of spines usually extending to proximal 0.35, sometimes almost full length of segment. Ambulatory legs considerably longer than chelipeds. Meri, carpi, and propodi all with squamiform lateral surfaces, sometimes denticulate, particularly on lateral faces of carpi. Propodi, carpi, and distal halves of meri each with row of prominent spines on dorsal surface partially obscured by low setae; carpi sometimes with partial or complete irregular second row of spines on dorsal surfaces; ventral margins of propodi also usually with 2–4 strong spines distally, partially concealed by long setae. Dactyls each with row of long setae on dorsal margins; lateral faces each with longitudinal row of much shorter setae; mesial faces each with longitudinal row of long setae dorsally and row of somewhat shorter setae adjacent to ventral margin.

Male left sexual tube stout, long, coiled. Posterior lobes of telson separated by deep median notch; each lobe with prominent, central, often corneous-tipped, spine-like projection with spinous or corneous-toothed mesial margin, lateral margins each usually with 2 or 3 well-developed, often corneous-tipped spines, but much more weakly developed in small individuals.

Colour in life.– Generally pink. Ocular peduncles transparent with scattered white chromatophores. Antennular and antennal peduncles transparent, with scattered white chromatophores. Carpi of chelipeds with orange spines; chela with pale orange-brown longitudinal stripes on silvery-white background (Haig and Ball, 1988).

Habitat

Collected at depths between 5 and 64 m in Indonesia and the Andaman Sea, but 75–82 in the Red Sea and 1500 m in the Indian Ocean.

Records for southern Thailand.– Continental shelf off Phuket, Andaman Sea; Pattani, Gulf of Thailand.

Distribution

Red Sea; Indian Ocean between Maldives and Cape Comorin; Andaman Sea; Gulf of Thailand, Arafura Sea; Torres Strait; Seram.

Remarks

Lewinsohn (1982b) described as a new species, a female specimen collected in the Gulf Aqaba. However, he noted that *S. fimbriatus* Lewinsohn bore considerable similarities to Alcock's varieties of *S. spiriger*, none of which had been reported on since their original descriptions. Pitagsalee (1980) correctly identified and illustrated one of Alcock's (1905b) varieties, citing it as *S. spiriger profundorum*. Additional specimens collected during the BIOSHELF Program have provided an opportunity to evaluate character variation, which in this taxon is

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considerable. After personally examining Lewinsohn's (1982) holotype (RMNH D33782), there is no doubt that it is distinct from Alcock's (1905b) first described variety. However, as previously indicated, *S. profundorum* must be considered valid species, equal in rank to *S. spiriger*.

Despite the morphological variation seen in *S. profundorum*, the characters specified by Alcock (1905b) to differentiate *S. lophomeris* and *S. spiniosicarpis* do not fall within that range. In none of the specimens examined, has the diagnostic meral carina of *S. lophomeris* been observed. Occasionally two rows of spines are present on the carpi of the second pereopods in *S. profundorum*, but not the three rows that Alcock described on the carpi of both the chelipeds and ambulatory legs of *S. spiniosicarpis*.

Family Parapaguridae

Oncopagurus Lemaitre, 1996

Oncopagurus monstrosus (Alcock, 1894)

'?*Parapagurus monstrosus*' Alcock, 1894: 243
Sympagurus monstrosus.– Alcock and Anderson, 1897, pl. 32, fig. 4.
Sympagurus arcuatus var. *monstrosus*.– Alcock, 1905b: 104, pl. 10, fig. 5.
?*Eupagurus brevimanus*.– Yokoya, 1933: 90, fig. 34.
Parapagurus monstrosus.– de Saint Laurent, 1972: 108.– Baba, 1986: 302, fig. 146.
Sympagurus bicristatus.– Thompson, 1943: 418 (in part).
Oncopagurus monstrosus.– Lemaitre, 1996: 198, figs 19, 20.
Not *Parapagurus arcuatus* var. *monstrosus*.– Balss, 1912: 99, pl. 10, fig. 3 [= *Parapagurus brevipes* de Saint Laurent, 1972].

Material examined

PMBC 14878, 1 juvenile male, sl = 1.5 mm, BIODEEP St. U1, 06º48´N, 097º 45´E, G, 400 m, coll. S. Bussarawit, 19.04.1997.

Diagnosis (after Lemaitre, 1996)

Shield as long as broad. Rostrum broadly rounded, with low dorsal ridge. Ocular peduncles more than half length of shield; ocular acicles subtriangular, terminating in strong spine; corneas dilated. Epistomial spine slender, strongly curved upward. Antennular peduncles exceeding distal margins of corneas by at least full length of ultimate segments. Antennal peduncles and acicles reaching nearly to or slightly beyond distal margins of corneas, mesial margins of acicles with 8–15 spines.

Chelipeds markedly dissimilar, with some iridescence and moderately dense setae. Right cheliped with chela less than twice as long as broad (males), or about as long as broad (females). Palm with irregular rows of small spines medially on dorsal face, lateral and dorsomesial margins each well delimited by row of spines; mesial face of palm rounded, with small spines or tubercles. Left cheliped with unarmed chela. Carpus usually with dorsodistal spine. Ambulatory legs each with ventromesial row of usually 5 or 6 (occasionally up to 15) small, corneous spines on ventromesial margin of dactyls, dorsal and dorsomesial rows of long setae. Carpi each with small dorsodistal spine. Merus of right third pereopod with unarmed dorsal surface.

Male first gonopods with weakly concave distal lobe; second gonopods with distal segment nearly flat. Female with right second pleopod vestigial. Telson with posterior lobes separated by shallow, broad, median concavity, left terminal margin, particularly, often armed with strongly curved corneous spines

Colour in preservative.– Left cheliped, and ambulatory legs light pink with two orange-red spots on mesial and lateral faces of meri, carpi, and propodi (spots on meri often partially fused). Right cheliped with chela, distal 0.65 of carpus, and distal third of merus, cream-white; merus and carpus with orange-red portions proximally (after Lemaitre, 1996).

Habitat

Found in gastropod shells usually with actinian attached.

Records for southern Thailand.– Andaman Sea off Phuket

Distribution

Gulf of Aden; Bay of Bengal; Andaman Sea; Indonesia; Australia; Japan; and Philippines.

Remarks

Although only a juvenile specimen has been observed among the Thai collections to date, as more deep-water collections are made, it will probably be more regularly observed.

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