

## Crustacea Decapoda: A revision of the Indo-Pacific species of the genus *Calappa* Weber, 1795 (Calappidae)

Bella S. GALIL

Israel Oceanographic and Limnological Research  
National Institute of Oceanography  
P.O.B. 8030, Haifa 31080, Israel

### ABSTRACT

The Indo-Pacific species of *Calappa* Weber, 1795 are revised. Specimens have been collected from the intertidal to depths over 380 m, with nine species from water depths greater than 100 m.

One new genus of calappid crab is established: *Calappula*, for *Calappa saussurei* Rathbun, 1898 and *C. tortugae* Rathbun, 1933 from each side of the Central American Isthmus. Five new species are described: *C. conifera*, *C. matsuzawa*, *C. monilicanthus*, *C. sebastieni*, and *C. torulosa*. All taxa are described and illustrated, detailed synonymies are listed, and a key is provided.

### RÉSUMÉ

**Crustacea Decapoda : Une révision des espèces indo-ouest pacifiques du genre *Calappa* Weber, 1795 (Calappidae).**

Les espèces indo-ouest pacifiques du genre *Calappa* Weber, 1795 sont revues. Les récoltes ont été faites de la zone intertidale jusqu'à plus de 380 m de profondeur. Neuf espèces ont été récoltées à plus de 100 m de profondeur.

Un genre nouveau *Calappula* est établi pour *Calappa saussurei* Rathbun, 1898 et *C. tortugae* Rathbun, 1933, qui se trouvent de part et d'autre de l'isthme de l'Amérique centrale. Cinq espèces nouvelles sont décrites : *C. conifera*, *C. matsuzawa*, *C. monilicanthus*, *C. sebastieni*, and *C. torulosa*. Toutes les espèces sont décrites et figurées, des synonymies détaillées sont fournies et une clé d'identification est proposée.

### INTRODUCTION

"Box crabs", or "shame-faced crabs", characteristically barricaded behind flexed massive chelae and with legs tucked under the eaves of their carapace, are among the most distinctive crabs in tropical and subtropical seas.



Because they are commonly found in shallow waters or hauled in from as deep as 380 m, owing to their size and brightly-colored carapace they were described early and often. However, this same seemingly distinctive and familiar shape was the cause of some taxonomic confusion. HERBST (1799: 22) already wrote in apparent pique: "Genauer lassen sich die Verschiedenheiten jetzt erwahnter Arten unmoglich durch eine blosser Beschreibung verstandlich machen". HERBST's vexation finds an echo in MONOD (1928: 109): "Le genre *Calappa* est extremement homogene et comprend une vingtaine d'espes souvent tres voisines les unes des autres et que l'on pourrait ranger en une serie lineaire.... Cette homogenite si remarquable du genre *Calappa* rend parfois la distinction des espes rien moins que facile, ce qui explique les incertitudes taxonomiques des carcinologistes  leur sujet".

A study of the extensive collections of the Museum national d'Histoire naturelle, Paris (MNHN), Nationaal Natuurhistorische Museum, Leiden (formerly Rijksmuseum van Natuurlijke History (RMNH)), National Museum of Natural History, Smithsonian Institution, Washington (USNM), together with material made available by the American Museum of Natural History, New York (AMNH), The Natural History Museum and Institute, Chiba (CMB ZC), Institute of Oceanology, Chinese Academy of Sciences, Qingdao (IOCAS), Natural History Museum of Los Angeles (LAM), Museo Zoologico, Universita degli studi di Firenze (MF), The Natural History Museum, London (NHM), Naturhistorisches Museum, Wien (NMW), Zoological Reference Collection, National University of Singapore (NUS); Queensland Museum, Brisbane (QM), South African Museum, Cape Town (SAM), Senckenberg Museum, Frankfurt (SMF), Tel Aviv University (TAU), and the Zoologisk Museum, Copenhagen (ZM) has enabled re-examination of most type specimens and much of the published material.

The present study divides the Indo-Pacific species between *Calappa* Weber, 1795 and a new genus, *Calappula*, and describes five new species. Descriptive and distributional information is presented as well as detailed references to literature. All taxa examined have been photographed and illustrated, and a key is presented for their identification. Measurements refer to carapace length and are given in mm.

In the lists of Material examined, the names of the cruises are in capital letters. The names of vessels are in italic letters and quoted. Station numbers of the MUSORSTOM cruises are often preceded by two capital letters, denoting the gear used: DW means Warren dredge, CP beam trawl.

## SPECIES LIST

### Genus *CALAPPA*

*Calappa bicornis* Miers, 1884  
*C. calappa* (Linnaeus, 1758)  
*C. capellonis* (Laurie, 1906)  
*C. clypeata* (Borradaile, 1903)  
*C. conifera* sp. nov.  
*C. convexa* Saussure, 1853  
*C. depressa* Miers, 1886  
*C. dumortieri* Guinot, 1962  
*C. gallus* (Herbst, 1803)  
*C. hepatica* (Linnaeus, 1758)  
*C. japonica* Ortmann, 1892

*C. lophos* (Herbst, 1782)  
*C. matsuzawa* sp. nov.  
*C. monilicanthus* sp. nov.  
*C. philargius* (Linnaeus, 1758)  
*C. pustulosa* Alcock, 1896  
*C. sebastieni* sp. nov.  
*C. torulosa* sp. nov.  
*C. undulata* Dai, 1991  
*C. yamasitae* Sakai, 1980

### Genus *CALAPPULA*

*Calappula saussurei* comb. nov.



## SYSTEMATIC ACCOUNT

*CALAPPA* Weber, 1795

*Calappa* Weber, 1795: 92.

Type species: *Cancer granulatus* Linnaeus, 1758, by subsequent designation LATREILLE, 1810: 422. Gender feminine. Name placed on the Official List of Generic Names in Zoology by the International Commission on Zoological Nomenclature in their Opinion 712 (1964, *Bull. zool. Nomencl.*, **21**: 336-351).

*Lophos* De Haan, 1837: 69, pls E, 19 fig. 1, 20 fig. 1.

Type species: *Cancer lophos* Herbst, 1782, by absolute tautonymy. Gender masculine.

*Camara* De Haan, 1837: 69, pl. E.

Type species: *Cancer fornicatus* Fabricius, 1781: 502 (= *Cancer calappa* Linnaeus, 1758: 630), by monotypy. Gender feminine. Incorrectly cited as *Camera* by DE HAAN, 1850, *Fauna Japonica* (Crust.) (Index: 237).

*Gallus* De Haan, 1837: 70, pl. E.

Type species: *Cancer gallus* Herbst, 1803, by monotypy and absolute tautonymy. Gender masculine. This name is invalid as it is a junior homonym of *Gallus* Brisson, 1760, for a genus of Aves.

*Pistor* Gistel, 1848: viii. A new replacement name for *Gallus* De Haan, 1837. Type species thereby *Cancer gallus* Herbst, 1803. Gender masculine.

DIAGNOSIS. — Carapace typically convex, regions undefined, furrows bordering cardiac region most pronounced. Front, triangulate, as wide as orbit. Anterolateral margin arcuate, crenate, dentate or granulate. Posterolateral margin typically expanded, clypeiform, concealing flexed ambulatory legs underneath. Eye filling orbit, eyestalk short, cornea large. Supraorbital margin swollen medially, bifissured. Antennules folding nearly vertically. Basal article of antennae dilate, forming inner orbital margin. Buccal cavity elongate, anteriorly divided by median septum. Outer maxillipeds gaping, exposing mandibles, lamellar processes of first maxillipeds. Subhepatic regions and outer maxillipeds densely setose. Chelipeds massive, subequal, fitting closely. Merus with transverse dentate crest externally, distalmost tooth largest, keel-like. Carpus trigonal. External surface of chela swollen, upper margin crested, with foliate lobes; laminar tooth proximally near lower margin, lower margin with two subparallel files of tubercles, converging distally; internal surface densely setose along lower margin. Larger dactylus proximally with crochet tooth fitting into molariform depression, dactylus' upper margin setose, granulate. Pereiopods smooth, laterally compressed, dactyli styliform. Male abdomen five-segmented, second segment trilobate, bearing transverse granulate carina. First male pleopod stout, tapering, distally spinulose. Second male pleopod filamentose.

ETYMOLOGY. — From *Kelapa*, coconut in Malay. "Maleits *Cattam Calappa*, naar de gedaante van een *Calappusdop*" (RUMPHIUS, 1741).

REMARKS. — All but one of the Indo-Pacific species treated here belong to *Calappa* Weber, 1795. These species are characterized by bifissured supraorbital border, buccal cavity with median septum anteriorly, and clypeiform expansion on posterolateral margin. Among the 20 species described here, some seem more clearly allied. The "*philargius*" group comprises four species - *C. philargius*, *C. lophos*, *C. dumortieri* and a new species - distinguished by nearly smooth carapace, external surface of chela with prominent ridge running subparallel to lower margin, first male pleopod markedly curved distad, and second pleopod with stubby digitate tip. The "*gallus*" group encompasses eight species - *C. gallus*, *C. capellonis*, *C. undulata*, *C. yamasitae* and four new species - characterized by depressed hepatic region, and having second male pleopod with subdistal denticulate flange and digitate tip. The "*hepatica*" group includes two species - *C. hepatica* and *C. depressa* - possessing anteriorly spatulate basal antennal article and second male pleopod with spatulate tip.

Most of the Indo-Pacific species of *Calappa*, excluding the recently described species, are widely distributed. One species, *C. convexa*, is confined to tropical west America, another, *C. dumortieri*, to the Red Sea. Two species cover nearly the entire range: *C. gallus* is found from the Red Sea to Hawaii and *C. hepatica* ranges from



the Red Sea to Clipperton Is. All but four species - *depressa*, *gallus*, *japonica*, *pustulosa* - are found in waters no deeper than 150 m (table 1).

Depth (m)	50	100	150	200	250	300
<i>C. bicornis</i>	-----					
<i>C. calappa</i>	-----					
<i>C. capellonis</i>	-----					
<i>C. clypeata</i>	-----					
<i>C. conifera</i> *	-----					
<i>C. convexa</i>	-----					
<i>C. depressa</i>	----- → 350					
<i>C. dumortieri</i>	-----					
<i>C. gallus</i>	-----					
<i>C. hepatica</i>	-----					
<i>C. japonica</i>	----- → 380					
<i>C. lophos</i>	-----					
<i>C. matsuzawa</i> *	?					
<i>C. monilicanthus</i> *	-----					
<i>C. philargius</i>	-----					
<i>C. pustulosa</i>	-----					
<i>C. sebastieni</i> *	---					
<i>C. torulosa</i> *	-----					
<i>C. undulata</i> *	-----					
<i>C. yamasitae</i> *	?					
<i>Calappula saussurei</i>	-----					

TABLE 1. — Vertical distribution of the Indo-Pacific species of *Calappa* and *Calappula*.  
\* New species or species known from less than 5 specimens.

### Key to the Indo-Pacific species of *Calappa* and *Calappula*

1. Supraorbital border unfissured; buccal cavity lacking median septum anteriorly; milled ridge vertically transversing interior surface of chela ..... *Calappula saussurei* comb. nov.
- Supraorbital border bifissured; buccal cavity with median septum anteriorly, no milled ridge on interior surface of chela ..... *Calappa* ...2



2. Carapace subcircular, with only moderate clypeiform expansions ..... *C. pustulosa*  
 — Carapace not subcircular because of well-developed clypeiform expansions ..... 3
3. Clypeiform expansions of carapace entire and smooth ..... *C. calappa*  
 — Clypeiform expansions of carapace dentate or lacinate ..... 4
4. External surface of chela nearly smooth, with ridge running subparallel to lower margin, first male pleopod markedly curved distad ..... 5  
 — External surface of chela granulate, tuberculate, first male pleopod only slightly curved ..... 8
5. Posterior margin of carapace bearing median tooth ..... 6  
 — Posterior margin of carapace lacking median tooth ..... 7
6. Median tooth on posterior margin of carapace rounded, shorter than adjacent teeth, carpus and chela each with large maroon spot, maroon crescents encircle eyes . *C. philargius*  
 — Median tooth on posterior margin of carapace conical, as long as adjacent teeth, carapace densely covered with minute maroon spots, posterolateral teeth pale yellow ..... *C. dumortieri*
7. Posterolateral margins lacinate ..... *C. lophos*  
 — Posterolateral margins lamellar, granulate ..... *C. monilicanthus* sp. nov.
8. Second male pleopod with subdistal denticulate flange and digitate tip (figs 5d, 23d).... 9  
 — Second male pleopod otherwise ..... 16
9. Carapace 1.6 wide as long ..... 10  
 — Carapace 1.4 wide as long, or less ..... 11
10. Carapace coarsely granulate, branchial regions with mammilate tubercles ..... *C. yamasitae*  
 — Carapace minutely granulate, branchial regions with flattened lumps ..... *C. sebastieni* sp. nov.
11. Hepatic region somewhat depressed ..... 12  
 — Hepatic region markedly depressed ..... 15
12. Tubercles on branchial regions contiguous, mammilate ..... 13  
 — Tubercles on branchial regions otherwise ..... 14
13. Front projecting, bidentate; large tubercles anteriorly on clypeiform process ..... *C. capellonis*  
 — Front truncate, obtuse; no tubercles anteriorly on clypeiform process ..... *C. torulosa* sp. nov.
14. Carapace posteriorly rugose, front quadridentate, keel-like tooth proximally on external surface of chela ..... *C. matsuzawa* sp. nov.  
 — Carapace posteriorly nearly glabrous, front bidentate, no keel-like tooth proximally on external surface of chela ..... *C. undulata*
15. Front bidentate, anterolateral margin arcuate, prominently dentate, conical tubercles anteriorly on external surface of chela ..... *C. conifera* sp. nov.  
 — Front truncate, anterolateral margin sinuous, unevenly granulate, rounded tubercles anteriorly on external surface of chela ..... *C. gallus*
16. Second male pleopod tip spatulate (figs 9d, 14d)..... 17  
 — Second male pleopod tip otherwise ..... 19



17. Carapace granulate, tuberculate, clypeiform process with transverse granulate rows, basal antennal article anteriorly spatulate ..... **18**  
 — Carapace finely punctate, clypeiform process smooth, basal antennal article with anterior proximal angle produced ..... *C. clypeata*
18. Carapace convex, 1.6-1.7 wide as long ..... *C. hepatica*  
 — Carapace flattened, 1.4 wide as long ..... *C. depressa*
19. Front projecting, with two triangular teeth separated by deep sulcus; anterolateral margin prominently dentate, anteriormost tooth largest; second male pleopod with subdistal denticulate flange and pod-like tip ..... *C. bicornis*  
 — Front not projecting, with two rounded teeth separated by wide sulcus; anterolateral margin unevenly granulate; second male pleopod otherwise ..... **20**
20. Carapace lavender finely spotted with white; second male pleopod distally sickle-shaped .  
 ..... *C. convexa*  
 — Carapace with yellow-tipped red tubercles; second male pleopod distally crook-like .....  
 ..... *C. japonica*

*Calappa bicornis* Miers 1884

Fig. 1 a, 2, 4 a, 29

*Calappa gallus* var. *bicornis* Miers, 1884: 550.

*Calappa bicornis* - RATHBUN, 1911: 197, pl. 17 fig. 8. — IHLE, 1918: 308 (list). — SAKAI, 1937: 95, pl. 17 fig. 4. — GUINOT, 1967: 245 (list). — SERÈNE, 1968: 41 (list). — TAKEDA & KOYAMA, 1974: 104, pl. 10 fig. a. — SAKAI, 1976: 132, pl. 40 fig. 1. — TAKEDA, 1982: 106, fig. 312. — MIYAKE, 1983: 23, pl. 8 fig. 1. — TAKEDA & SHIKATANI, 1990: 477.

*Calappa gallus* - RATHBUN, 1937: 214 (part).

Not *Calappa bicornis* Manning & Chace, 1990: 45 (= *C. galloides* Stimpson, 1859).

**MATERIAL EXAMINED.** — **Seychelles.** Providence I., 35 m, coll. H.M.S. "Alert": 1 ♀ holotype, 33.3 mm (NHM 1882.24). — 62 m, 20.10.1905, coll. "Sealark": 1 ♂ 40.3 mm (USNM 41056). — N. of Bird I., 3°42'S, 55°13'E, sandy bottom with calcareous algae, 50-52 m, 22.12.1992, coll. "Tyro": 1 ♀ 16.1 mm (RMNH).

**REYES 2:** stn 1, 5°24.8'S, 57°03.5'E, 55 m, 2.09.1980: 1 ♂ 19.4 mm (MNHN). — Stn 38, 5°03.5'S, 56°50.5'E, 44 m, 13.09.1980: 1 ♀ 15.5 mm (MNHN).

**Madagascar.** North-west coast, 13°05'S, 48°21'E, 50 m, 19.06.1967, coll. A. CROSNIER: 1 ♂ 39.4 mm, 1 ♀ 36.4 mm (MNHN).

**Réunion I.** 150 m, 1966, coll. M. GUÉZÉ: 2 ♂ 53.3, 60.6 mm (MNHN).

**Indonesia.** 5°48'S, 106°12'E, 38 m, sand, 27.07.1922, coll. Th. MORTENSEN: 1 ♀ 50.0 mm (ZM CRU1828).

**South China Sea.** Macclesfield Bank, 37-79 m: 1 ♂ 46.6 mm (NHM).

**Philippines.** "Albatross": stn 5151, Sirun I., 5°24.40'N, 120°28.15'E, 43 m, 18.02.1908: 1 ♂ 31.5 mm (USNM). — Stn 5165, Tawitawi grp., Observation I., 16 m, 24.02.1908: 1 ♂ 21.5 mm (USNM 122722).

**Japan.** 1 ♂ 62.3 mm, 1 ♀ 63.4 mm, coll. T. SAKAI (SMF 22940). — Shikoku I., Tosa Bay, coll. K. SAKAI: 1 ♀ 57.9 mm (USNM 286118). — Cape Muroto, 14.10.1986, coll. K. MATSUZAWA, det. K. SAKAI: 1 ♂ 55.9 mm (SMF). — Honshu I., Kii Peninsula, coll. T. SAKAI: 1 ♂ 49.0 mm (NHM 1961.6.5.26). — Minabe, 30 m, coll. T. SAKAI: 1 ♂ 37.7 mm (USNM 123312), 2 ♂ 49.4, 54.5 mm (USNM 268805).

**DESCRIPTION.** — Carapace moderately convex, 1.2-1.3 wide as long, deep longitudinal groove separating gastrocardial from branchial regions, hepatic region depressed. Surface prominently tuberculate, branchial tubercles largest, conical, intestinal region with granulate tubercles. Front projecting, with two triangular teeth separated by deep sulcus. Anterior margin of basal antennal article bidentate, peduncle emerging from distal angle, tubercle at base of peduncle. Afferent branchial canal ending below orbit in tridentate process. Endostomial septum visible with first maxillipeds closed, with straight anterior margin. First maxillipeds with triangular notch on anterointernal margin. Anterolateral margin setose, carinate, with granulate, triangular teeth, anteriormost tooth



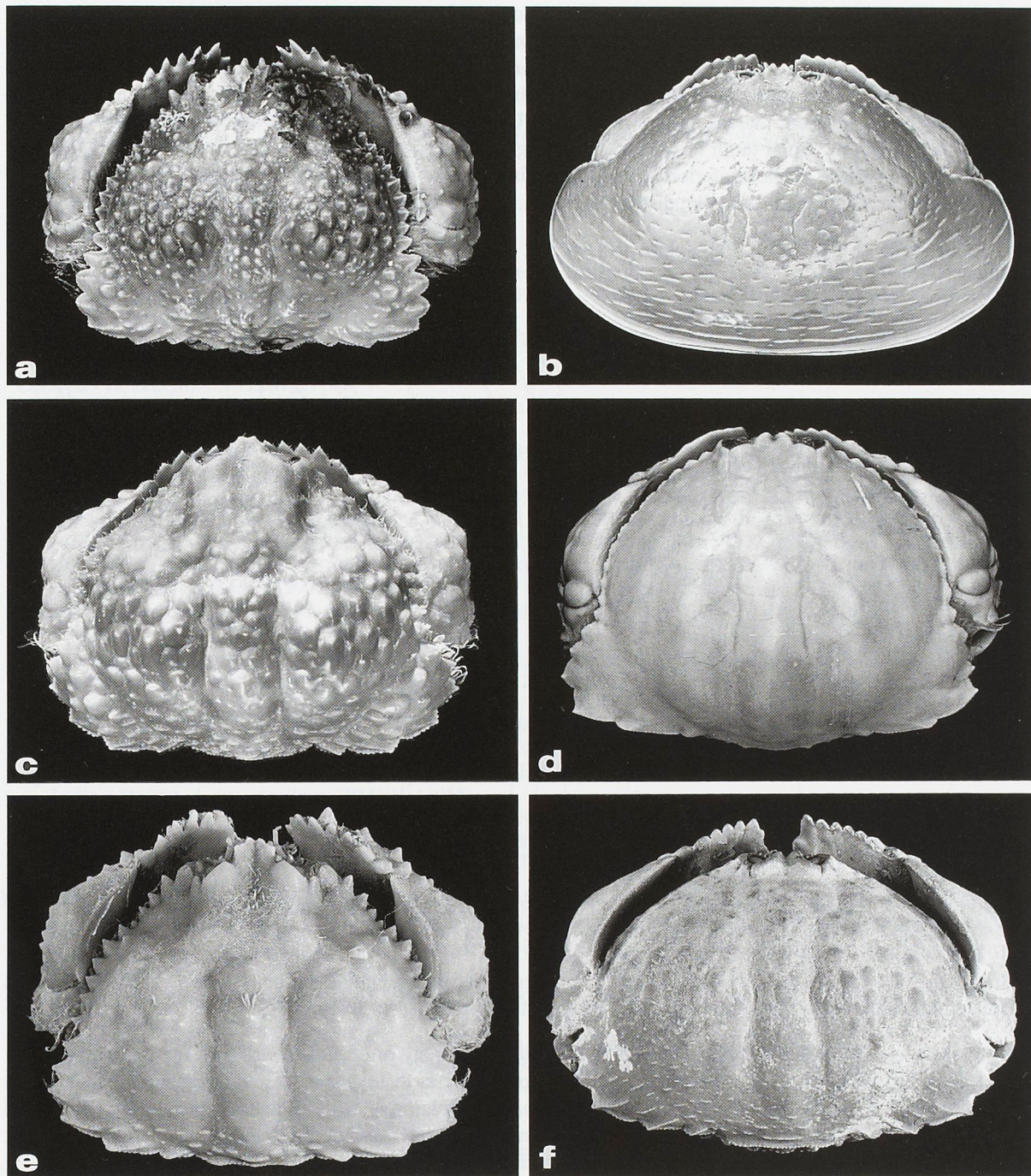


FIG. 1. — Whole crab, dorsal view: **a**, *Calappa bicornis* Miers, 1884, ♂ 39.4 mm, Madagascar, 13°05'S, 48°21'E, 50 m (MNHN). — **b**, *Calappa calappa* (Linnaeus, 1758), ♂ 55.4 mm, Madagascar, Nosy Be, 4 m (MNHN). — **c**, *Calappa capellonis* (Laurie, 1906), ♂ 36.6 mm, Seychelles, "REVES 2", stn 25, 4°54.6'S, 55°20.5'E, 60 m (MNHN). — **d**, *Calappa clypeata* (Borradaile, 1903), ♂ 36.0 mm, Madagascar, Majunja, "Vauban" stn 129, 15°25'S, 46°03.5'E, 57 m (MNHN). — **e**, *Calappa conifera* sp. nov., ♂ 18.6 mm, South Africa, holotype (SAM A43141). — **f**, *Calappa convexa* Saussure, 1853, ♂ 68.1 mm, Panama (USNM 144344).



large. Posterolateral margin setose, marginally beaded, four anterior teeth rounded, distalmost largest, two posterior teeth shallow, beaded median ridges setose. Posterior margin sinuous, beaded. Merus of cheliped distally with setose quadrilobate lamina. Carpus distally with four prominent tubercles. External surface of chela sparsely granulate, obliquely traversed by three rows of conical tubercles, median row most prominent. Crest of larger chela cut into seven conical teeth increasing in size distally. Unevenly granulate ridge running subparallel to beaded lower margin, from proximal tooth to base of fixed finger. Lower margin narrow, two beaded rows contiguous distally. Internal surface of chela inferiorly granulate, with beaded row parallel to lower margin. First male pleopod stout, slightly curved, tapering apically, distally spinulate; second pleopod slender, subdistal denticulate flange and podlike tip.

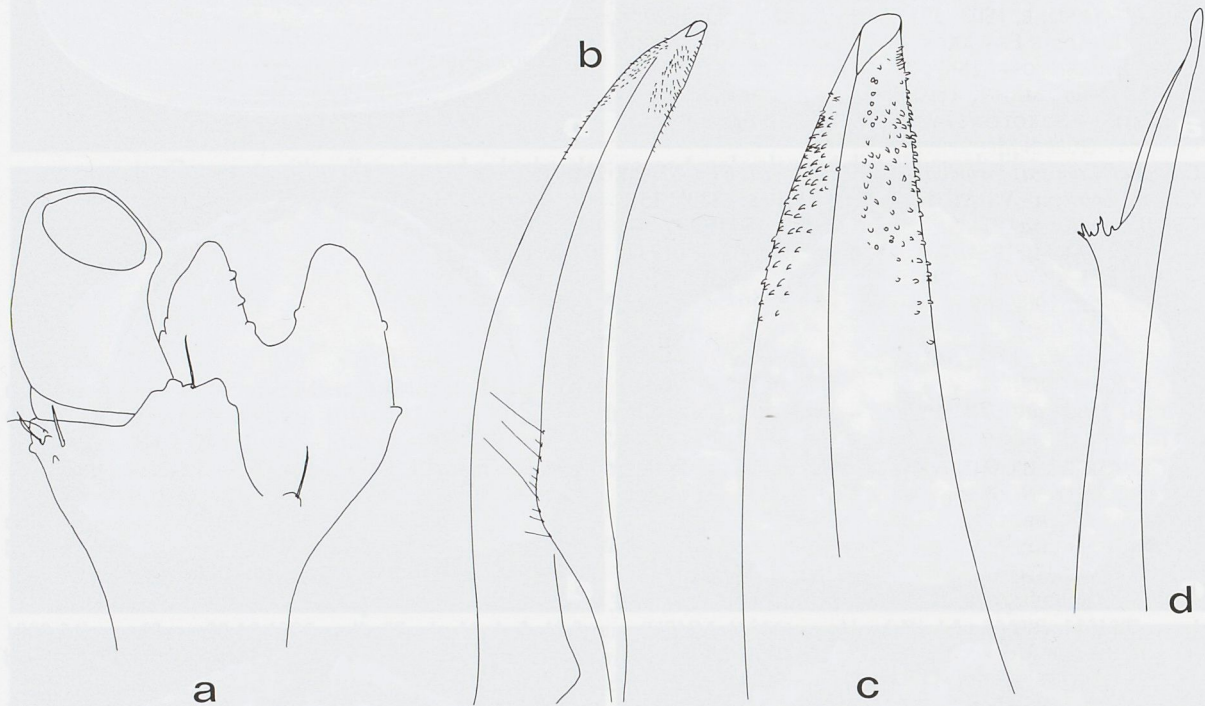


FIG. 2. — *Calappa bicornis* Miers, 1884, ♂ 39.4 mm, Madagascar, 13°05'S, 48°21'E, 50 m (MNHN): a, first article of antenna; b-c, first pleopod male with enlargement of distal part; d, second pleopod male, enlargement of distal part.

*Color.* — Carapace orange-yellow with red markings across branchial region. Chela internally with red reticulate pattern. Ambulatories striped in red. Color photograph in MIYAKE (1983).

*REMARKS.* — MIERS (1884), while describing *bicornis* as a variety of *C. gallus*, wrote "It may not improbably prove to be a distinct species". RATHBUN (1911) first recognized it as distinct species and then submerged it within *C. gallus* (1937) together with *C. galloides* and *C. capellonis*, claiming wide variation "in relative length and breadth due to greater or less convexity; in size and prominence of dorsal tubercles; and in distinctness of rostral teeth, some having four teeth, others having no median sinus".

*C. bicornis* differs from both *C. gallus* and *C. capellonis* in having anterior margin of basal antennal article bidentate rather than concave; front prominently bidentate rather than truncate; conical rather than foliate teeth on cheliped crest and in form of second male pleopod. The damaged female specimen (USNM 112522) from St. Helena I., identified by CHACE (1966) as *C. gallus* and by MANNING & CHACE (1990) as *C. bicornis*, is assigned to *C. galloides*.

*DISTRIBUTION* (fig. 29). — Seychelles, Madagascar, Philippines, Japan. Sand and pebble bottoms, 15-150 m.



*Calappa calappa* (Linnaeus, 1758)

Fig. 1 b, 3, 4 b, 29

*Cancer calappoides* Rumphius, 1741: 21, pl. 11 figs 2-3.*Cancer calappa* Linnaeus, 1758: 630; 1764: 449; 1767: 1048. — HERBST, 1785: 196, pl. 12 figs 73-74. — FABRICIUS, 1793: 454.*Cancer flosculosus* Seba, 1759, pl. 19 fig. 24.*Cancer heracleoticus* Seba, 1759: 51, pl. 20 figs 7-8.*Cancer fornicatus* Fabricius, 1781: 502; 1793: 453.*Calappa fornicata* - WEBER, 1795: 92. — FABRICIUS, 1798: 345. — BOSC, 1802: 183; 1830: 213 (nec pl. 3 fig. 3). — LATREILLE, 1803: 393; 1806: 28; 1817: 50; 1829: 66. — DESMAREST, 1825: 109. — GUÉRIN MÉNEVILLE, 1827: 4. — H. MILNE EDWARDS, 1837: 106. — DANA, 1853: 394, pl. 25 fig. 1. — A. MILNE EDWARDS, 1868: 72; 1874: 56. — HILGENDORF, 1869: 92. — BRITO CAPELLO, 1871: 133, pl. 2 fig. 5. — HOFFMANN, 1874: 41. — NAUCK, 1880: 46. — ORTMANN, 1892: 569. — ALCOCK, 1896: 142. — BOUVIER, 1915: 216. — SERÈNE, 1937: 78; 1968: 41 (list). — SOKOLOWSKY, 1945: 74, pl. 2 figs 7-9.*Calappa* - GUÉRIN MÉNEVILLE, 1827: 4.*Calappa (Camara) fornicata* - DE HAAN, 1837: 69. — HERKLOTS, 1861: 25.*Camara calappa* - WHITE, 1847: 44. — MIERS, 1880: 315.*Calappa calappa* - RATHBUN, 1906: 887; 1911: 197. — PARISI, 1914: 286. — IHLE, 1918: 184. — BALSS, 1922: 123. — T. SAKAI, 1934: 284; 1936: 43, text-fig. 6; 1937: 90, pl. 17 fig. 1; 1956: 8; 1965: 55 (list); 1976: 129, pl. 39 figs 1, 3. — WARD, 1942: 69. — DAWYDOFF, 1952: 139. — UTINOMI, 1956: 70, pl. 35 fig. 7. — TYNDALE-BISCOE & GEORGE, 1962: 69. — MICHEL, 1964: 36. — TINKER, 1965: 70, pl. 23. — GUINOT, 1967: 245 (list). — SERÈNE, 1968: 41 (list). — TAKEDA, 1973: 83; 1982: 105, fig. 308. — MATSUZAWA, 1977, pl. 91 fig. 1. — MIYAKE, 1983: 19, pl. 7 fig. 1. — NOMURA *et al.*, 1988: 64. — TAKEDA & SHIKATANI, 1990: 477. — CHEN, 1993: 678, fig. 1. — YAMAGUCHI & BABA, 1993: 306, fig. 92. — ALLEN & STEENE, 1994: 154.*Calappa fornicata* - ZIMSEN, 1964: 650 [erroneous spelling].MATERIAL EXAMINED. — **Kenya**. Andromache Reef, off Mombasa, 16.11.1964: 7 juv. 10.8-25.6 mm (USNM).**Seychelles**. N. of Bird Id., 3°42'S, 55°13'E, 45-55 m, 21.12.1992, coll. "Tyro": 1 ♀ 35.8 mm (RMNH). — Aldabra I., coll. W.L. ABBOTT: 2 ♂ 55.5, 62.7 mm (USNM 17746).**Madagascar**. N.W. coast, Nosy Be, 4 m, April 1959, coll. & det. A. CROSNIER: 3 ♂ 25.1-55.4 mm; 2 ♀ 22.3, 23.5 mm (MNHN). — Nosy Be, intertidal, September 1959, coll. & det. A. CROSNIER: 1 ♀ 68.4 mm (MNHN). — W coast, Morombe, coll. B. KOEHLIN: 1 ♂ 61.9 mm (MNHN-B 12333).**Indian Ocean**. 1 dry specimen (RMNH 43055).**Indonesia**. *Moluccas*. 1821-1822, coll. C.G.C. REINWARDT, det. HERKLOTS as *C. (Camara) fornicata*, redet. L.B. HOLTHUIS: 1 dry specimen (RMNH 43057). — 1895, coll. W.A. MORAUX: 1 ♀ 76.5 mm (RMNH 7294). — Amboina Bay, shore at lowtide, February 1922, coll. Th. MORTENSEN: 1 ♀ 70.9 mm (ZM CRU1793). — Ternate, coll. H.A. BERNSTEIN: 1 ♂ 71.0 mm (RMNH 761).**Irian Jaya**. Sekru, coll. K. SCHADLER: 1 dry specimen (RMNH 43056). — Manokwari, 1954, coll. J.C. BAUWENS: 1 ♀ 73.6 mm (RMNH 12842). — Mansiman nr Manokwari, July 1952, coll. J.C. BAUWENS: 1 ♂ 69.6 mm (RMNH 9861).**Sulawesi**. Selat Lembeh, Pulau Lembeh, 01°29'N, 12°5.15'E, sandy bay, 5-10 m, 21.10.1994, coll. Sulawesi Exped: 1 ♀ 34.0 mm (RMNH).**Papua New Guinea**. Bismarck Arch., New Britain, Kilenge, 28 July 1973, coll. A.A. GERBRANDS: 1 ♂ 75.1 mm (RMNH 29377).**Philippines**. Borocay I., January 1979, coll. J.P. NACIART: 1 ♀ 31.3 mm (MNHN).**Japan**. 1 ♂ 54.0 mm (RMNH 762). — Shikoku I., Kochi-Ken, Nakamura, Saga, 33°04'N, 133°06.6'E, 10-20 m, 29.10.1979, coll. M. TÜRKAY: 1 ♂ 54.5 mm (SMF 18674). — Cape Muroto, 14.10.1986, coll. K. MATSUZAWA, det. K. SAKAI: 1 ♂ 56.4 mm (SMF). — Kushimoto, Wakayama, 20 m, March 1995, coll. K. NOMURA: 1 ♀ 60.4 mm (SMF).**Bonin Is.** Coll. C.B. CLAUSEN, 16.06.1913: 2 ♂ 42.3, 45.1 mm (ZM CRU1799).**New Caledonia**. Coll. CLOUE: 2 specimens (MNHN B.10799).**French Polynesia**. Society Is., Raiatea I., 1908, coll. A. CANQUE: 2 specimens (MNHN-B 4076). — Marquesas Is., Nuku Hiva I., coll. M. MERCIER: 1 ♀ 39.9 mm (MNHN-B 45).**Hawaii Is.** Ohau I., Makapuu Pt., 4 m, colls ROPER, SWEENEY & YOUNG: 1 ♂ 42.6 mm; 1 ♀ 45.9 mm (USNM 268811).

DESCRIPTION. — Carapace markedly convex, 1.6-1.7 wide as long, regions undefined. Surface minutely squamose, anteriorly with barely distinguished flattened tubercles, posteriorly with minutely beaded transverse lines, increasing in length laterally, longest line running parallel to posterior margin. Front projecting, with two



triangular teeth separated by deep sulcus. Anterior margin of basal antennal article bicuspidate, peduncle emerging from distal angle. Afferent branchial canal ending below orbit in rounded granulate process. Endostomial septum visible with first maxillipeds closed, anterior margin straight. Anterior margin of first maxillipeds straight. Anterolateral margin carinate, scalloped. Clypeiform process greatly developed, Posterolateral margin entire, smooth. Posterior margin smooth. Merus of cheliped distally with well developed laminar carina, margin setose. External surface of chela with minutely beaded transverse lines, increasing in length inferiorly, interspaced with granules. Crest of larger chela with six teeth, proximalmost lowest. External beaded row on lower margin running entire length of chela, internal row only distal half. Internal surface of chela inferiorly granulate, with beaded row parallel to lower margin. First male pleopod stout, nearly straight, distally spinulate; second pleopod slender, straight, subdistal denticulate flange and digitate tip.

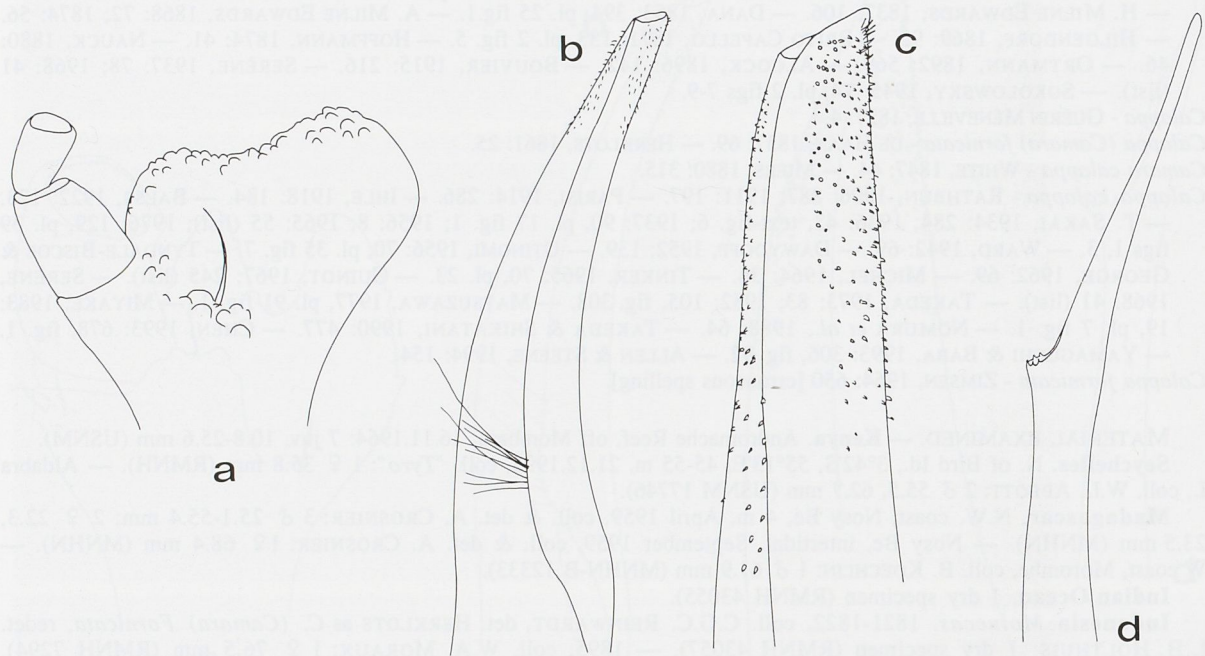


FIG. 3. — *Calappa calappa* (Linnaeus, 1758), ♂ 55.4 mm, Madagascar, Nosy Be, 4 m (MNHN) : a, first article of antenna; b-c, first pleopod male with enlargement of distal part; d, second pleopod male, enlargement of distal part.

*Color.* — TINKER (1965) wrote "A form of this species, in which the back of the carapace is covered by dark spots of varying sizes, occurs in Hawaii, Japan, and probably elsewhere" and presented BW photos of both forms (pl. 23). SAKAI (1976) collected in one location both "Uniformly light yellowish brown" specimens (pl. 39 fig. 1) and those with "dark purplish mottles of various sizes" (pl. 39 fig. 3). MIYAKE (1983, pl. 7 fig. 1) and ALLEN and STEENE (1994: 154) provided color photographs of both forms. MATSUZAWA (1977, pl. 91 fig. 1) furnished us with an excellent color photo of a remarkable leopard-patterned specimen, its carapace densely covered with chocolate colored irregular spots.

*REMARKS.* — RUMPHIUS (1741: 21, pl. 11 figs 2-3) description and drawings being very clear, there has never been any confusion over the identity of this aptly named "broken coconut-shell crab". Though LINNAEUS (1758, 1764, 1767) described correctly its "Habitat in Asia", HERBST (1785) wrote "Ihr Ausenthalt ist in dem ost-und westindischen Meere", FABRICIUS (1793, 1798) "Habitat in Oceano Americano" and LATREILLE (1803) "Il se trouve dans l'océan Américain". This was set right again by LATREILLE (1806).

*C. calappa* is easily distinguished from all its congeners in having margins of clypeiform expansions entire. Examination of both spotted and uniformly-colored specimens revealed no morphological differences.



DISTRIBUTION (fig. 29). — East Africa to Japan, Australia and Hawaii. On sandy bottoms, intertidal to 50 m.

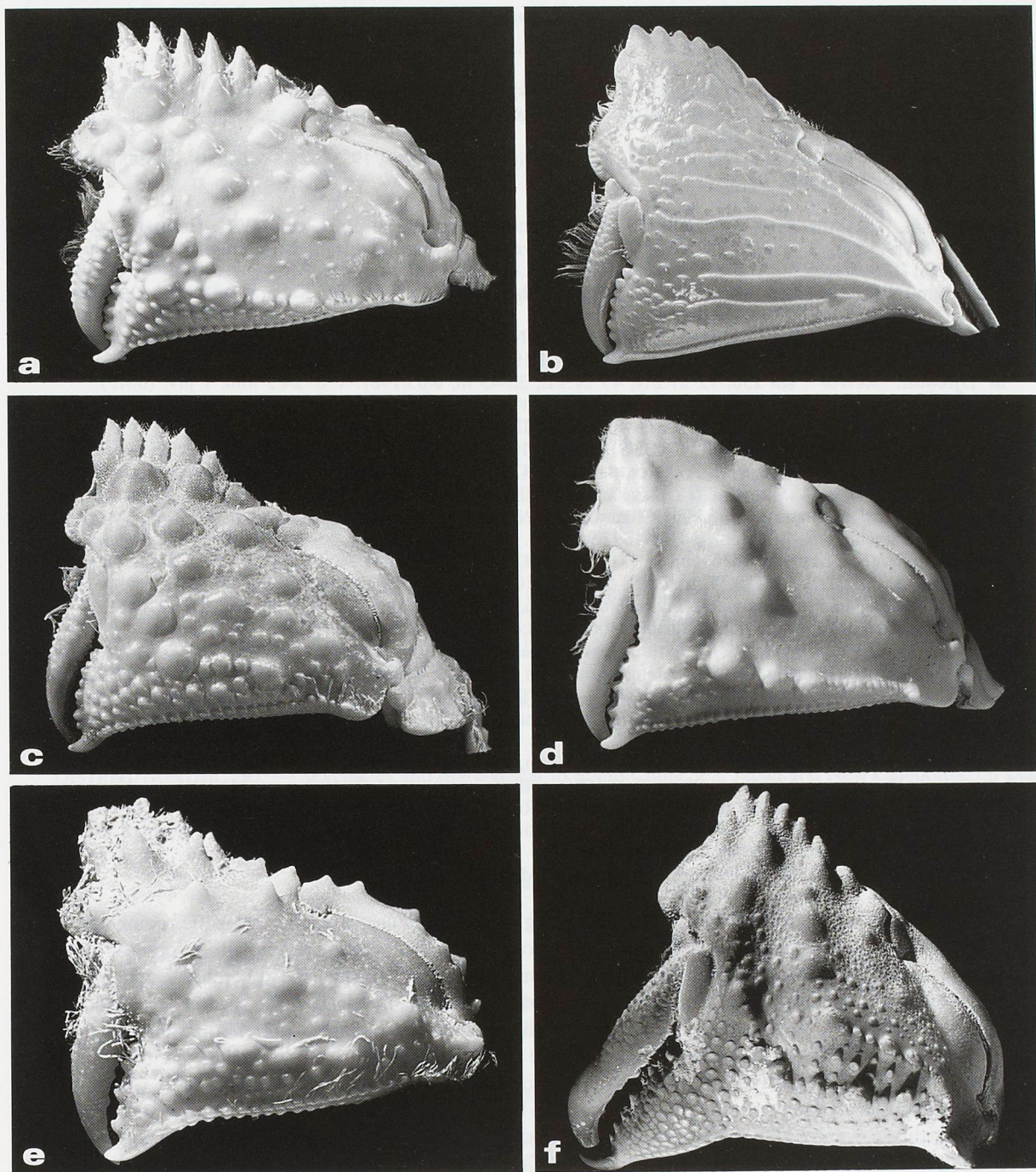


FIG. 4. — Cheliped, external view: **a**, *Calappa bicornis* Miers, 1884, ♂ 39.4 mm, Madagascar, 13°05'S, 48°21'E, 50 m (MNHN). — **b**, *Calappa calappa* (Linnaeus, 1758), ♂ 55.4 mm, Madagascar, Nosy Be, 4 m (MNHN). — **c**, *Calappa capellonis* (Laurie, 1906), ♂ 36.6 mm, Seychelles, "REVES 2", stn 25, 4°54.6'S, 55°20.5'E, 60 m (MNHN). — **d**, *Calappa clypeata* (Borradaile, 1903), ♂ 36.0 mm, Madagascar, Majunja, "Vauban" stn 129, 15°25'S, 46°03.5'E, 57 m (MNHN). — **e**, *Calappa conifera* sp. nov., ♂ 18.6 mm, South Africa, holotype (SAM A463). — **f**, *Calappa convexa* Saussure, 1853, ♂ 68.1 mm, Panama (USNM 144344).



*Calappa capellonis* (Laurie, 1906)

Fig. 1 c, 4 c, 5, 29, 35 a

*Calappa gallus capellonis* Laurie, 1906: 355. — URITA, 1926: 37. — SAKAI, 1934: 284; 1937: 95, pl. 17 fig. 3; 1976: 131, text-fig. 73. — SERÈNE, 1968: 41 (list). — TAKEDA & SUGA, 1979: 43. — MIYAKE, 1983: 199 (list).

*Calappa gallus* - RATHBUN, 1937: 214 (part).

*Calappa capellonis* - TAKEDA & KOYAMA, 1974: 104, pl. 10 fig. b. — TAKEDA, 1983: 125. — TAKEDA & SHIKATANI, 1990: 477. — CHEN, 1993: 685, fig. 6.

**MATERIAL EXAMINED.** — **Sri Lanka.** Gulf of Manaar, Pearl banks, 1902, coll. W.H. HERDMAN: 2 ♂ 32.8, 21.7 mm; 1 ♀ 19.5 mm; 1 juv. (NHM 1907.5.22.13-15), Syntypes. — Coral reefs, 1 ♂ 16.0 mm; 1 ♀ 25.3 mm (NHM 1907.5.22.16-17), Syntypes. — 1 ♀ 37.2 mm (NHM 75.14). — Gulf of Manaar, coll. Miss HERDMAN: 1 (broken); 5 juvs 12.1-17.7 mm (NHM 1934.1.15-18). — 1 ♂ 21.2 mm (NHM 1934.1.16.12). — Off Kaltura, coll. Miss HERDMAN: 1 ♂ 17.6 mm (NHM 1934.1.19-22). — Aripu coral reefs, coll. Miss HERDMAN: 1 ♀ 13.6 mm (NHM 1934.1.19-22). — N. of Cheval, 10 m. coll. Miss HERDMAN: 1 juv. 7.6 mm (NHM 1934.1.19-22). — W. of Periya Paar, 57-80 m, 1902, coll. Miss HERDMAN: 2 juvs 12.2, 10.9 mm (NHM 1934.1.19-22).

**nr Djibouti.** "Meteor": stn 236, 12°21.2'N, 43°27.1'E, 35-45 m, 6.03.1987: 1 ♂ 24.3 mm, 1 juv. (SMF).

**Seychelles.** Off Mahe, 40 m, 1974, coll. C. RATCLIFFE: 1 ♂ 38.1 mm (NHM). — REVES 2: stn 25, 4°54.6'S, 55°20.5'E, 60 m, 8.09.1980: 1 ♂ 36.6 mm; 1 ♀ 40.0 mm (MNHN).

**Madagascar.** West coast: "FAO 60", 16°33'S, 44°19'E, 10 m: 1 ♂ 46.9 mm; 1 ♀, 25.0 mm (MNHN). — NW coast, baie d'Ambaro, 9 m, 27.07.1958, coll. A. CROSNIER: 2 ♂ 42.9, 27.9 mm (MNHN). — Nosy Be, 15 m, January 1962, coll. A. CROSNIER: 1 ♂ 45.9 mm; 1 ♀ 32.3 mm (MNHN). — NW coast, 13°05'S, 48°21'E, 50 m, 19.06.1967, coll. R. PLANTE: 1 ♂ 47.4 mm; 3 ♀ 31.7-42.2 mm (MNHN).

**Pakistan.** Karachi: 1 ♀ 21.1 mm (NHM 1897.9.12.25).

**Indonesia.** Celebes. Menado, 1836, coll. A.J. VAN DELDEN: 1 ♀ 24.1 mm (RMNH 760). — Irian Jaya. Tiger I., S. of Pulau Tarupa Kecil, 6°32.7'S, 121°8.7'E, sand, 53-57 m, 18.10.1984: 1 ♂ 17.6 mm (RMNH).

**New Guinea.** Padaido Is., Geelvinck Bay, February 1956, coll. T. ABBOTT: 1 ♂ 20.1 mm (RMNH 27085).

**Japan.** Honshu I., Wakayama-Ken, Minabe, 6.06.1974, coll. T. SAKAI: 1 ♀ 49.1 mm (SMF 22937).

**Taiwan.** Takao, 3.12.1914, id. M.J. RATHBUN as *C. gallus*: 1 ♀ 37.6 mm (USNM 47933).

**Australia.** NW shelf, coll. "Solea": 1 ♀ 17.3 mm; 3 juvs (QM W19796). — 19°29.6'S, 118°52.2'E, 38-39 m, 30.08.1983, coll. "Solea": 3 juvs (QM W19793). — 19°05.4'S, 118°53.9'E, 80 m, 30.10.1983, coll. "Solea": 1 ♀ 16.5 mm; 1 juv. (QM W19792). — Southport: 1 ♀ 41.3 mm (QM W105). — 12°6.4'S, 143°17.6'E, 16 m, September 1979: 1 ♂ 22.7 mm (QM W9878).

**New Caledonia.** Îlot Maître, 28.05.1984: 1 ♂ 48.9 mm; 1 ♀ 45.5 mm (MNHN). — Îlot Maître, 28.05.1984: 1 ♂ 49.0 mm; 1 ♀ 36.7 mm (MNHN). — 30 m, 3.07.1986, coll. P. LABOUTE: 1 ♀ 40.4 mm (MNHN). — North lagoon, stn DW 1215, 19°48'S, 163°4'E, 26 m, 3.11.1989, coll. B. RICHER DE FORGES: 1 ♀ 39.0 mm (MNHN). — Nr Nouméa, stn 58, 22°09'S, 166°13'E, 22 m, coll. B. RICHER DE FORGES: 1 ♀ 37.2 mm (MNHN). — St. Vincent Bay, stn 163, 22°12'S, 166°07'E, 15 m, coll. B. RICHER DE FORGES: 1 ♀ 34.0 mm (MNHN). — St. Vincent Bay, stn 179, 22°01'S, 166°04'E, 12 m, coll. B. RICHER DE FORGES: 1 ♂ 37.8 mm (MNHN).

**DESCRIPTION.** — Carapace convex, 1.3 wide as long, surface minutely granulate. Hepatic region depressed, gastro-cardial region delimited by deep longitudinal grooves. Branchial region and clypeiform process anteriorly with large mammilate tubercles. Cardiac and metabranchial regions with beaded tubercles. Front projecting, anteriorly bidentate. Basal antennal article granulate, anterior margin slightly concave, peduncle emerging from distal angle. Endostomial septum visible with first maxillipeds closed, with convex anterior margin. Distal margin of first maxillipeds deeply scooped, anterointernal angle acute. Anterolateral margin arcuate, carinate, anteriorly unevenly granulate, posteriorly with mammilate tubercles. Posterolateral margin setose, with six marginally beaded triangular teeth, three posterior teeth with median beaded ridges. Posterior margin sinuous, closely beaded. Merus of cheliped distally with quadrilobate lamina. External surface of chela minutely granulate, horizontally traversed by rounded tubercles, largest near upper crest. Crest of larger chela cut into seven foliate teeth increasing in size distally, proximalmost flattened. Lower margin with two beaded files. First male pleopod stout, slightly curved, tapering apically, distally spinulate; second pleopod slender, straight, with subdistal denticulate flange and digitate tip.

**Color.** — Carapace orange-red, red markings on branchial regions, interior surface of chela with red reticulation. Color photographs in TAKEDA & KOYAMA (1974), TAKEDA (1982).



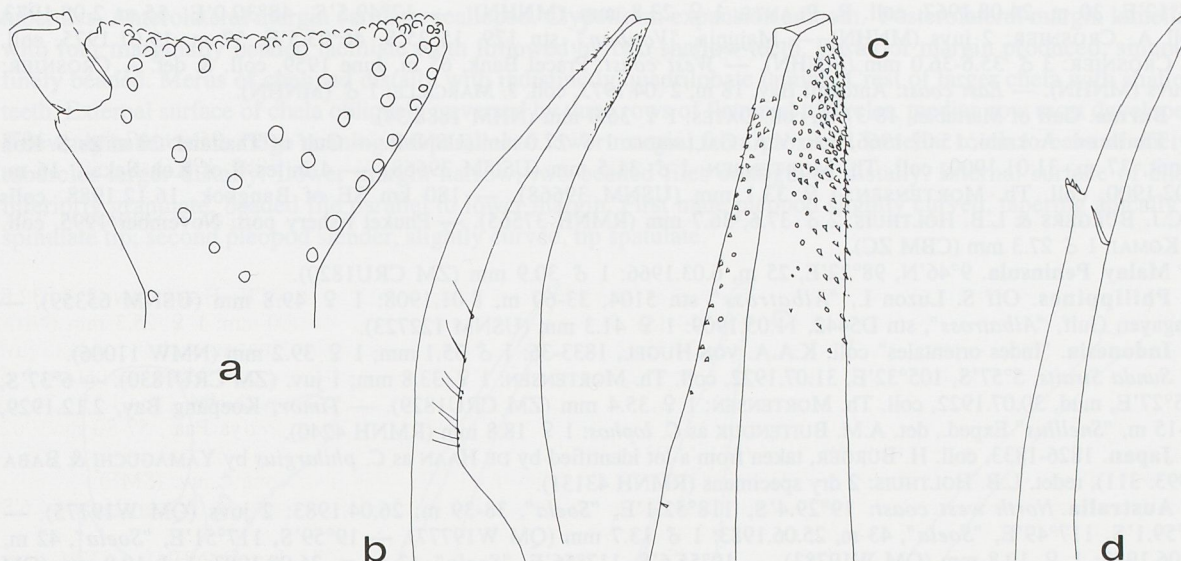


FIG. 5. — *Calappa capellonis* (Laurie, 1906), ♂ 36.6 mm, Seychelles, "REVES 2", stn 25, 4°54.6'S, 55°20.5'E, 60 m (MNHN): a, first article of antenna; b-c, first pleopod male with enlargement of distal part; d, second pleopod male, enlargement of distal part.

REMARKS. — LAURIE (1906) describing *C. gallus* divided his material into "two morphological series" and named his series (B) var. *capellonis*. RATHBUN (1937) submerged *capellonis* within *C. gallus* claiming the differences are but intraspecific variations (see above), but TAKEDA & KOYAMA (1974) recognized it as a distinct species. *C. capellonis* differs from *C. gallus* in having front emarginate rather than thickly truncate, tubercles on branchial region, clypeiform processes and outer surface of chelae more prominent and closely-set, and hepatic regions less markedly depressed.

DISTRIBUTION (fig. 29). — Seychelles and Madagascar to South China Sea, Japan and New Caledonia; on sand, pebbles, rocky bottoms; 9-80 m.

*Calappa clypeata* (Borradaile, 1903)

Fig. 1 d, 4 d, 6, 34, 35 d

*Calappa pustulosa* var. *clypeata* Borradaile, 1903: 436.

*Calappa terraereginae* Ward, 1936: 11, pl. 3 figs 9-11. — SAKAI, 1937: 92, pl. 18 fig. 1, text-figs 6b, 7; 1956: 8; 1976: 130, text-figs 72a-b. — TYNDALE-BISCOE & GEORGE, 1962: 70, pl. 1 fig. 2, pl. 2 fig. 2. — SERÈNE, 1968: 41 (list). — KIM, 1970: 11. — MIYAKE, 1983: 199. — DAI *et al.*, 1986: 92, fig. 50, pl. 11 fig. 5. — TAKEDA & SHIKATANI, 1990: 483. — DAI & YANG, 1991: 103, fig. 50, pl. 11 fig. 5. — CHEN, 1993: 682, fig. 4a. — YAMAGUCHI & BABA, 1993: 311, fig. 95.

*Calappa lophos* - BUITENDIJK, 1939: 231 (part). [Non Herbst, 1782].

MATERIAL EXAMINED. — **Maldive Is.** Haddumati Atoll, 1900, coll. J.S. GARDINER: 1 juv. (UMZC), syntype of *C. pustulosa* var. *clypeata* Borradaile, 1903. — Mulaku Atoll, 1900, coll. J.S. GARDINER: 1 juv. (UMZC), syntype of *C. pustulosa* var. *clypeata* Borradaile, 1903.

**Seychelles.** REVES 2 (coll. E. MARCHAL): stn 3, 5°13.7'S, 56°41.4'E, 50 m, 2.09.1980: 1 juv. (MNHN). — Stn 36, 4°40.7'S, 55°03.0'E, 55-62 m, 10.09.1980: 1 ♀ 23.2 mm (MNHN). — Stn 68, 60-65 m, 21.09.1980: 1 ♀ 24.2 mm (MNHN).

**Zanzibar.** 7-9 m, coll. I. GORDON: 1 ♂ 18.0 mm (NHM 1964.7.1.120).

**Madagascar.** *North west coast:* Nosy Be, 6-8 m, May 1957, coll. & det. P. FOURMANOIR: 3 ♂ 33.9, 37.1, 37.7 mm; 6 ♀ 32.7-40.5 mm (MMHN). — Nr Nosy-Iranja, 18.11.1969, coll. R. PLANTE: 1 ♀ 30.8 mm (MNHN). — 13°27'S,



48°12'E, 30 m, 24.08.1967, coll. R. PLANTE: 1 ♀ 23.8 mm (MNHN). — 12°49.5'S, 48°30.0'E, 55 m, 2.08.1973, coll. A. CROSNIER: 2 juvs (MNHN). — Majunja, "Vauban", stn 129, 15°25'S, 46°03.5'E, 57 m, 19.01.1975, coll. A. CROSNIER: 3 ♂ 35.6-36.0 mm (MNHN). — West coast: Pracel Bank, 65 m, June 1959, coll. & det. A. CROSNIER: 3 juvs (MNHN). — East coast: Antongil Bay, 18 m, 2.04.1973, coll. J. MARCILLE: 1 ♂ (MNHN).

**Burma.** Gulf of Martaban, 18-37 m, coll. OATES: 1 ♀ 36.0 mm (NHM 1888.34).

**Thailand.** Aokrabi, 15.02.1966, coll. V.A. GALLARDO: 1 ♂ 27.0 mm (USNM). — Gulf of Thailand. 20 miles S. Koh Samit, 37 m, 31.01.1900, coll. Th. MORTENSEN: 1 ♂ 31.5 mm (USNM 39668). — 4 miles S of Koh Sakait, 16 m, 3.02.1900, coll. Th. MORTENSEN: 1 ♀ 33.1 mm (USNM 39668). — 180 km SE of Bangkok, 16.12.1988, colls A.C.J. BÜRGERS & L.B. HOLTHUIS: 2 ♂ 37.6, 36.7 mm (RMNH 37565). — Phuket fishery port, November 1995, coll. T. KOMAI: 1 ♂ 27.3 mm (CBM ZC).

**Malay Peninsula.** 9°46'N, 98°22'E, 25 m, 6.03.1966: 1 ♂ 30.9 mm (ZM CRU1820).

**Philippines.** Off S. Luzon I., "Albatross" stn 5104, 33-60 m, 8.01.1908: 1 ♀ 49.8 mm (USNM 65359). — Lingayen Gulf, "Albatross", stn D5442, 11.05.1909: 1 ♀ 41.3 mm (USNM 122723).

**Indonesia.** "Indes orientales" coll. K.A.A. VON HUGEL, 1833-36: 1 ♂ 35.1 mm; 1 ♀ 39.2 mm (NMW 11006).

**Sunda Straits,** 5°57'S, 105°32'E, 31.07.1922, coll. Th. MORTENSEN: 1 ♀ 33.8 mm; 1 juv. (ZM CRU1830). — 6°37'S, 105°27'E, mud, 30.07.1922, coll. Th. MORTENSEN: 1 ♀ 35.4 mm (ZM CRU1829). — Timor, Koepang Bay, 2.12.1929, 10-15 m, "Snellius" Exped., det. A.M. BUITENDIJK as *C. lophos*: 1 ♀ 18.8 mm (RMNH 4240).

**Japan.** 1826-1833, coll. H. BÜRGER, taken from a lot identified by DE HAAN as *C. philargius* by YAMAGUCHI & BABA (1993: 311), redet. L.B. HOLTHUIS: 2 dry specimens (RMNH 43131).

**Australia.** North west coast: 19°29.4'S, 118°52.1'E, "Soela", 38-39 m, 26.04.1983: 2 juvs (QM W19775). — 19°59.1'S, 117°49'E, "Soela", 43 m, 25.06.1983: 1 ♂ 13.7 mm (QM W19777). — 19°59'S, 117°51'E, "Soela", 42 m, 25.06.1983: 1 ♀ 19.8 mm (QM W19783). — 19°55.6'S, 117°56'E, "Soela", 43-44 m, 26.08.1983: 1 ♂ 10.9 mm (QM W19778). — North coast: Gulf of Carpentaria, 1965; 1 ♀ 29.8 mm (QM W2403). — Gulf of Carpentaria, 14°27.5'S, 138°42'E, "Southern Surveyor", 52 m, 12.12.1991: 1 ♂ 29.6 mm; 2 ♀ 19.6, 17.8 mm (QM W17345). — Torres Straits, 10°12'S, 143°12'E, "Kulasi", 27 m, 27.09.1988: 1 ♀ 27.7 mm (QM W16095). — East coast: Cairns, 17°00'S, 146°07'E, 35 m, 25.04.1982: 1 ♂ 40.7 mm; 1 ♀ 38.8 mm (QM W9966). — 12°34.5'S, 143°48.6'E, 16 m, September 1979: 1 ♀ 25.2 mm (QM W9889). — Darnley I., coll. Dr. TOSH: 1 ♂ 22.5 mm (QM W12267). — Bowen, coll. E.H. RAINFORD: 1 ♂ 20.2 mm (QM W216). — Nr Layoak I., 9°48'S, 143°18'E, "Kulasi", 33 m, 26.09.1988: 1 ♂ 27.5 mm (QM W16096).

**New Caledonia.** LAGON (coll. B. RICHER DE FORGES): stn 7, 22°24'S, 166°19.7'E, 14 m, 21.05.1984: 5 ♂ 26.3-30.8 mm; 5 ♀ 24.4-35.8 mm (MNHN). — Stn 12, 22°17'S, 166°23'E, 23 m, 21.05.1984: 1 ♀ 38.1 mm (MNHN). — Stn 512, 19°24'S, 163°35'E, 59 m, 5.03.1985: 1 ♂ 34.4 mm; 1 ♀ 37.8 mm (MNHN). — Stn 513, 19°20'S, 163°35'E, 55 m, 5.03.1985: 3 ♀ 28.4, 39.5, 41.5 mm (MNHN). — Stn 527, 19°22'S, 163°34'E, 59 m, 5.03.1985: 1 ♂ 18.5 mm; 1 ♀ 20.6 mm (MNHN). — Stn 988, 20°17.1'S, 163°58.7'E, 19-20 m, 30.04.1988: 1 ♂ 25.9 mm (MNHN). — Stn 1066, 19°5'S, 163°52.2'E, 20 m, 23.10.1989: 1 ♀ (MNHN). — Stn 1067, 19°55.8'S, 163°52.8'E, 28 m, 23.10.1989: 1 ♂ 20.8 mm; 6 ♀ 18.3-27.0 mm; 7 juv. (MNHN). — Stn 1068, 19°57.3'S, 163°52.8'E, 26 m, 23.10.1989: 1 ♂ 19.9 mm; 1 ♀ 19.1 mm; 5 juvs (MNHN). — Stn 1069, 19°59.1'S, 163°52.5'E, 30 m, 23.10.1989: 1 ♀ 24.9 mm (MNHN). — Stn 1076, 19°52.3'S, 163°54.9'E, 31 m, 23.10.1989: 1 ♀ 12.8 mm (MNHN). — Stn 1109, 19°43.8'S, 163°44.2'E, 38 m, 25.11.1989: 1 ♂ 35.4 mm (MNHN). — Stn 1194, 19°29.5'S, 163°22.9'E, 57 m, 1.11.1989: 1 juv. (MNHN). — Stn 1199, 19°37.8'S, 163°27.9'E, 43 m, 2.11.1989: 1 ♀ (MNHN). — Stn 1214, 19°49.9'S, 163°36.6'E, 29 m, 3.11.1989: 2 juvs (MNHN).

**North Lagoon** (M. KULBICKI coll.): stn 2, 19°54.3'S, 163°50'E, 30-33 m, 13.06.1985: 2 ♀ 31.4, 33.7 mm (MNHN). — Stn 6, 19°46.5'S, 163°47.2'E, 37 m, 14.06.1985: 1 ♂ 24.5 mm; 1 ♀ 24.4 mm (MNHN). — Stn 8, 19°54.8'S, 163°45.10'E, 33-36 m, 14.06.1985: 3 ♂ 19.6-30.0 mm; 5 ♀ 17.3-37.6 mm (MNHN). — Stn 9, 19°54.1'S, 163°42.9'E, 33 m, 14.06.1985: 3 ♀ 34.0-37.4 mm (MNHN). — Stn 13, 19°40.2'S, 163°47.2'E, 42 m, 15.06.1985: 2 ♂ 29.2, 29.5 mm (MNHN). — Stn 20, 19°19.5'S, 163°36.0'E, 55-58 m, 18.06.1985: 1 ♂ 31.5 mm; 1 ♀ 40.5 mm (MNHN). — Stn 21, 19°41.8'S, 163°31.2'E, 40 m, 19.06.1985: 3 ♀ 33.6-38.8 mm (MNHN). — Stn 30, 19°36.5'S, 163°39.5'E, 40 m, 20.06.1985: 1 ♂ 29.9 mm; 1 ♀ 36.6 mm (MNHN). — Stn 34, 19°18.2'S, 163°40.3'E, 50-54 m, 18.06.1985: 1 ♂ 32.7 mm (MNHN). — Stn 36, 19°14.1'S, 163°21.2'E, 60-62 m, 21.06.1985: 1 ♀ 25.3 mm (MNHN). — Stn 39, 19°29.0'S, 163°25.4'E, 52-56 m, 22.06.1985: 3 ♂ 31.9-33.7 mm; 2 ♀ 26.7, 29.1 mm (MNHN). — Stn 43, 19°32.8'S, 163°40.6'E, 45-50 m, 23.06.1985: 2 ♂ 31.9, 33.7 mm; 2 ♀ 26.7, 29.1 mm (MNHN). — Stn 44, 19°46.5'S, 163°47.4'E, 38 m, 23.06.1985: 6 ♂ 26.4-33.9 mm; 2 ♀ 21.4, 24.2 mm (MNHN).

**St Vincent Bay** (M. KULBICKI coll.): 22°04.19'S, 166°00.5'E, 13-20 m, 29.04.1985: 1 ♂ (MNHN). — 22°05.5'S, 166°05.5'E, 15 m, 20.08.1985: 1 ♂ 29.0 mm (MNHN).

**DESCRIPTION.** — Carapace convex, 1.4 wide as long, surface finely punctate. Front only slightly projecting, with two rounded teeth separated by triangular sulcus. Basal antennal article with anterior proximal angle produced, peduncle emerging medially. Afferent branchial canal ending below orbit in rounded process. Endostomial septum visible with first maxillipeds closed, with slightly rounded anterior margin. First maxillipeds with small triangular notch on anterior margin. Branchial ridges prominent in young, barely distinguished, anteriorly with flattened



tubercles. Anterolateral margin carinate, scalloped. Clypeiform expansion smooth. Posterolateral margin lamellar, with four marginally beaded lacinate teeth followed by two shallow teeth. Posterior margin produced, sinuous, finely beaded. Merus of cheliped distally with indistinctly quadrilobate lamina. Crest of larger chela with shallow teeth. External surface of chela obliquely traversed by three rows of flattened tubercles, median row most developed. Unevenly tuberculate ridge running subparallel to lower margin, from proximal lamellar tooth to base of dactyl, tubercles larger distally. Lower margin narrow, two beaded files contiguous distally. Internal surface of chela inferiorly granulate, beaded file parallel to lower margin. First male pleopod slightly curved, tapering apically to spinulate tip; second pleopod slender, slightly curved, tip spatulate.

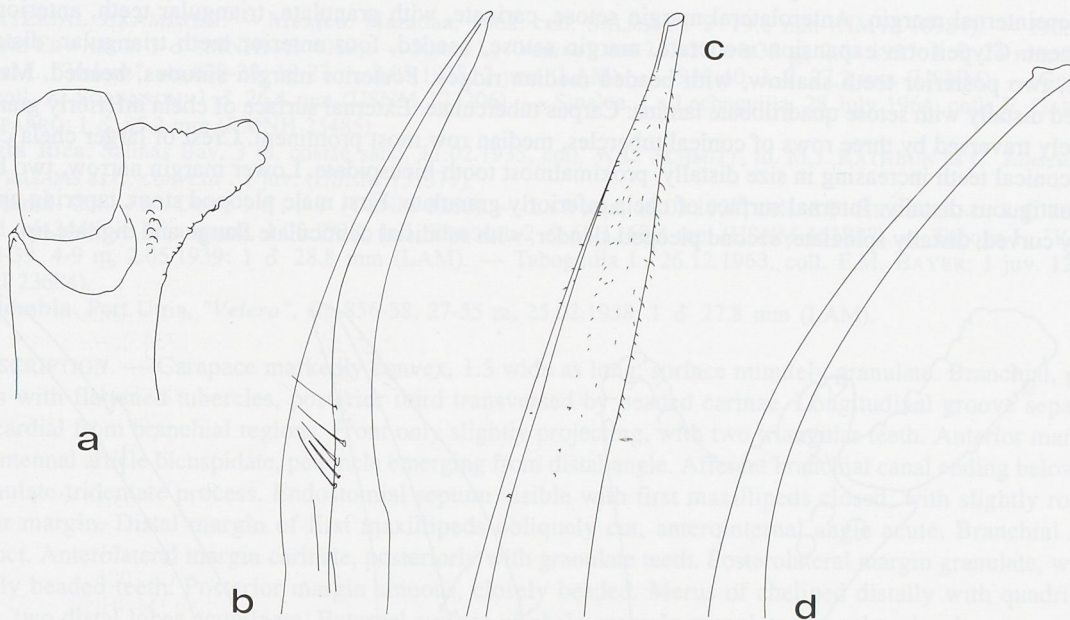


FIG. 6. — *Calappa clypeata* (Borradaile, 1903), ♂ 36.0 mm, Madagascar, Majunja, "Vauban" stn 129, 15°25'S, 46°03.5'E, 57 m (MNHN): a, first article of antenna; b-c, first pleopod male with enlargement of distal part; d, second pleopod male, enlargement of distal part.

*Color* (in alcohol). — "Pale grey-pink on carapace, inside of the palm marked with orange" (TYNDALE-BISCOE & GEORGE, 1962).

**REMARKS.** — BORRADAILE (1903) distinguished var. *clypeata* from the typical *C. pustulosa* as having the clypeiform expansions similar to those of *C. depressa* and denticulate anterolateral margins. Indeed, its carapace is as smooth and glabrous as that of *C. pustulosa*, but it differs from that species in having clypeiform expansions; it is easily distinguished from *C. depressa* by its smooth, convex carapace.

As *clypeata* Borradaile, 1903 is older than *terraereginae* Ward, 1936, it has priority. The fact that *clypeata* was proposed conditionally does not make it unavailable, as this was done before 1961 (International Code of Zoological Nomenclature, Articles 11(d)(i) and 15).

**DISTRIBUTION** (fig. 34). — From east African coast to Japan, the Philippines and New Caledonia, at 6-160 m.

*Calappa conifera* sp. nov.

Fig. 1 e, 4 e, 7

**MATERIAL EXAMINED.** — **South Africa.** "Pieter Faure": Off Port Shepstone, 43 m: 1 ♂ 18.6 mm (SAM A43141); 1 ♀ 18.8 mm (SAM A43142). — Tongaat River, 65 m: 2 ♂ 10.5 and 10.9 mm, 1 broken specimen (SAM A463).



TYPE MATERIAL. — The male collected off Port Shepstone is the holotype. The other specimens are paratypes.

DESCRIPTION. — Carapace markedly convex, 1.2-1.3 wide as long, deep longitudinal groove separating gastrocardial from inflated branchial regions, hepatic region markedly depressed. Surface prominently tuberculate anteriorly, branchial tubercles largest, conical, intestinal region with granulate tubercles. Front projecting, with two triangular teeth separated by sulcus. Basal antennal article distally granulate, anterior margin bidentate, peduncle emerging from distal angle. Afferent branchial canal ending below orbit in tridentate process. Endostomial septum visible with first maxillipeds closed, with straight anterior margin. First maxillipeds with triangular notch on anterointernal margin. Anterolateral margin setose, carinate, with granulate, triangular teeth, anterior tooth prominent. Clypeiform expansion moderate, margin setose, beaded, four anterior teeth triangular, distalmost largest, two posterior teeth shallow, with beaded median ridges. Posterior margin sinuous, beaded. Merus of cheliped distally with setose quadrilobate lamina. Carpus tuberculate. External surface of chela inferiorly granulose, obliquely traversed by three rows of conical tubercles, median row most prominent. Crest of larger chela cut into seven conical teeth increasing in size distally, proximalmost tooth bicuspidate. Lower margin narrow, two beaded files contiguous distally. Internal surface of chela inferiorly granulate. First male pleopod stout, tapering apically, slightly curved, distally spinulate; second pleopod slender, with subdistal denticulate flange and digitate tip.

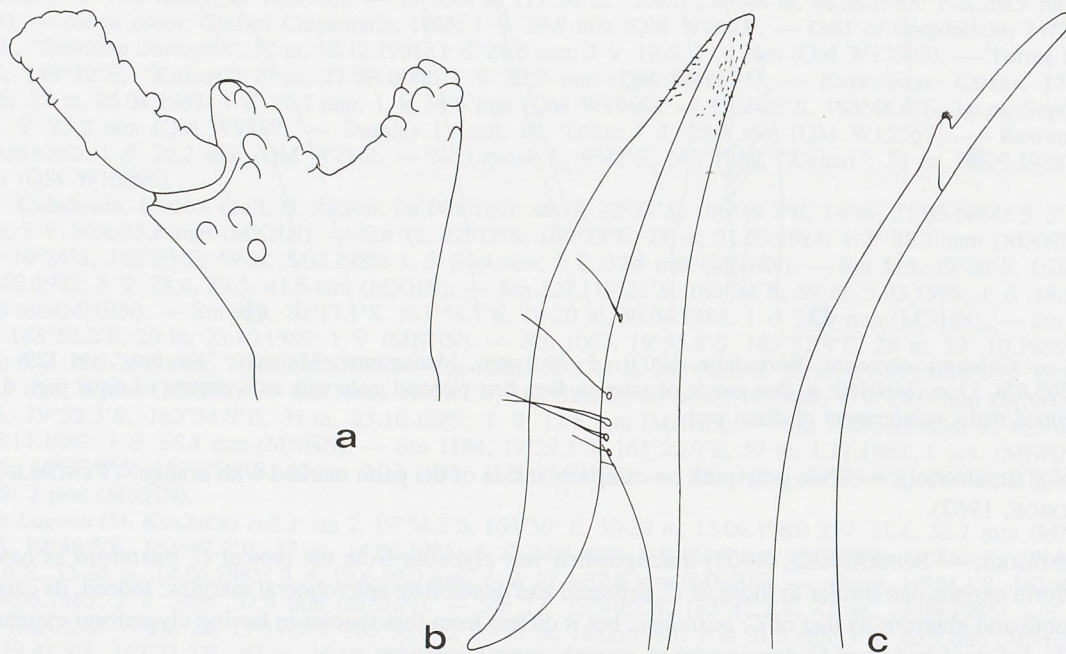


FIG. 7. — *Calappa conifera* sp. nov., ♂ cl 18.6 mm, South Africa, holotype (SAM A463) : a, first article of antenna; b, first pleopod male; c, second pleopod male, enlargement of distal part.

ETYMOLOGY. — From the Latin, *conus*, cone, after the conical tubercles on carapace and chelae, and the verb *fero*, bear.

REMARKS. — The deep longitudinal grooves separating the gastrocardial from inflated branchial regions and the markedly depressed hepatic region of *C. conifera* are similar to those of *C. gallus*. However, *C. conifera* is easily distinguished from the latter by its bidentate front, bidentate basal antennal article, prominently dentate anterolateral margin, moderate clypeiform expansion and conical tubercles on chelae.

DISTRIBUTION. — Known only from the type locality, South Africa, at 43-65 m.



*Calappa convexa* Saussure, 1853

Fig. 1 f, 4 f, 8

*Calappa convexa* Saussure, 1853: 362, pl. 13 fig. 3. — STIMPSON, 1889: 470. — NOBILI, 1901: 29. — RATHBUN, 1907: 74; 1910b: 593; 1924a: 159; 1937: 206, pl. 62 figs 1-3. — BOONE, 1927: 280, fig. 99. — GARTH, 1946a: 360, pl. 62 fig. 6; 1946b: 620 (list); 1948: 19; 1960: 121 (list); 1966: 12. — PRAHL & SANCHEZ, 1986: 23. — LEMAITRE & ALVAREZ-LEON, 1992: 50 (list). — HENDRICKX, 1992: 9 (list); 1993a: 8 (list); 1993b: 311 (list); 1994: 576.

*Calappa xanthusiana* Stimpson, 1860: 237.

**MATERIAL EXAMINED.** — **Mexico.** Mazatlan, 1862, coll. SALMIN: 1 ♀ 19.6 mm (NMW 10984). — 1903, coll. A. MILNE EDWARDS: 1 ♂ (MNHN-B 4089). — Isabel I., "Velero", stn 747-37, 18-33 m, 2.04.1937: 1 ♀ 24 mm (LAM). — Isabel I., "Velero", stn 870-38, 18-27 m, 8.03.1938: 3 juvs (LAM). — 1939-40: 1 ♀ 27.2 mm (USNM). — Guaymas, 1946, coll. A. SORENSON: 1 ♂ 26.4 mm (USNM 173206). — Sinaloa, La Lechoguilla, 28 July 1964, colls F. GARCIA & E. CHAPARRO: 1 ♂ 85.2 mm (RMNH 25485).

**Costa Rica.** Salinas Bay, 3 m, coarse sand, 11.02.1935, coll. W.L. SCHMITT, id. M.J. RATHBUN as *C. saussurei*, id. A.B. WILLIAMS as *C. convexa*: 1 juv. (USNM 131571).

**Panama.** Coll. J.M. Dow: 1 ♂, 1 ♀ (USNM 3263). — La Venta, 11.03.1937, coll. S.F. HILDEBRAND: 1 ♂ 78.6 mm (USNM 144344). — Changame, 1.05.1938, coll. ROBSON: 2 ♂ 68.1, 68.4 mm (USNM 161887). — Taboga I., "Velero", stn 960-39, 4-9 m, 2.05.1939: 1 ♂ 28.8 mm (LAM). — Taboguilla I., 26.12.1963, coll. F.M. BAYER: 1 juv. 12.7 mm (RMNH 23684).

**Colombia.** Port Utria, "Velero", stn 856-38, 27-55 m, 25.02.1938: 1 ♂ 27.8 mm (LAM).

**DESCRIPTION.** — Carapace markedly convex, 1.5 wide as long, surface minutely granulate. Branchial, gastric regions with flattened tubercles, posterior third transversed by beaded carinae. Longitudinal groove separating gastrocardial from branchial regions. Front only slightly projecting, with two triangular teeth. Anterior margin of basal antennal article bicuspidate, peduncle emerging from distal angle. Afferent branchial canal ending below orbit in granulate tridentate process. Endostomial septum visible with first maxillipeds closed, with slightly rounded anterior margin. Distal margin of first maxillipeds obliquely cut, anterointernal angle acute. Branchial ridges indistinct. Anterolateral margin carinate, posteriorly with granulate teeth. Posterolateral margin granulate, with six medially beaded teeth. Posterior margin sinuous, closely beaded. Merus of cheliped distally with quadrilobate lamina, two distal lobes acuminate. External surface of chela coarsely granulate, granules closely set near lower margin; obliquely traversed by three flattened tubercles, similar tubercles distally above dactyl. Uneven tubercles running subparallel to lower margin, from proximal keel-like tooth to base of fixed finger, tubercles larger distally. Crest of larger chela cut into six teeth increasing in size distally, proximalmost lowest. Lower margin narrow, two beaded files contiguous distally. First male pleopod sinuous, distally spinulate; second pleopod slender, sickle-shaped distally.

**Color.** — *C. convexa* was named "Grey Box Crab" by RATHBUN (1924), who then (1937) proceeded to describe a splendid specimen with "carapace dull red with fine dots of pale yellow; granulated ridges also yellow. On the carpus and distal end of merus of chelipeds the yellow spots are larger; on the upper half of the manus the ground is red with irregular splotches of yellow, on the lower half the ground is yellow with little red. Carpus and propodus of legs red with white spots; on the merus the white predominates". BOONE (1927) called it "Purple Box Crab" with carapace "an exquisite shade of lilac-lavender. The ambulatory legs are banded alternately with light rose and lavender on the three distal joints". According to GARTH (1946a) "Carapace hazel... Eugenia red patch on anterolateral area... but almost covered with small patterns of ochraceous orange and russet. Marginal teeth ochraceous orange. Eyestalks tawny; eye pale blue. Chelipeds same as carapace with a large Eugenia red spot across distal end of hand and base of movable finger. Fingers tawny olive shading to very light tips". CRANE in GARTH (1966) saw it as "Lavender spotted finely with white. Inside of cheliped orange. Ambulatories and chelipeds spotted with yellow and mottled with white and lavender".

**REMARKS.** — NOBILI (1901) remarked: "Questa specie [*C. convexa*] che rappresenta sulla costa occidentale dell'America la *C. flammea*, e a questa molto affine, ma e facile distinguerla". RATHBUN (1937) too found it "Allied to *C. flammea* in its little protruded front and in the character of the surface. It is, however, more convex



than that species, and the triangular teeth of the posterolateral margins are more strongly carinated along the middle above; also there are numerous short transverse crenulated carinae on the posterior third of the carapace". GARTH (1946a) considered *C. convexa* "nearly related [to] *C. saussurei* Rathbun". However, the latter belongs altogether to a separate genus (see later).

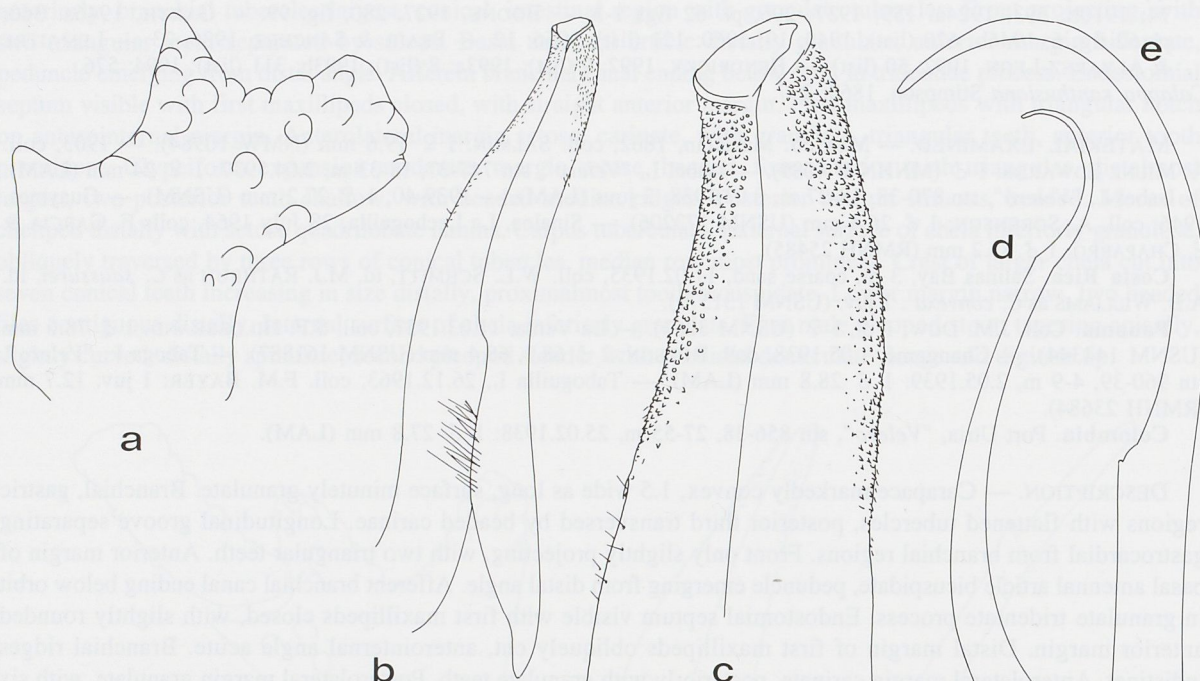


FIG. 8. — *Calappa convexa* Saussure, 1853, ♂ 68.1 mm, Panama (USNM 144344): a, first article of antenna; b-c, first pleopod male with enlargement of distal part; d-e, second pleopod male with enlargement of distal part.

DISTRIBUTION. — Lower California, Mexico, to Ecuador and Galapagos; intertidal to 60 m; on gravelly sand, crushed shell, dead coral, rocks, sand and algae.

### *Calappa depressa* Miers, 1886

Fig. 9, 10 a, 11, 13 a, 30, 35 e-f

*Calappa depressa* Miers, 1886: 287, pl. 23 fig. 2. — BORRADAILE, 1903: 436. — HALE, 1927: 190, fig. 191. — TYNDALE-BISCOE & GEORGE, 1962: 70. — SERÈNE, 1968: 41 (list).

*Calappa woodmasoni* Alcock, 1896: 148, pl. 6 fig. 2. — ALCOCK & ANDERSON, 1897, pl. 28 figs 2, 2a. — IHLE, 1918: 181. — SERÈNE, 1968: 41 (list).

*Calappa alata* Rathbun, 1911: 198, pl. 15 fig. 2. — SERÈNE, 1968: 41 (list).

*Calappa depressus* Chopra, 1933: 31.

*Calappa elata* - GUINOT, 1967: 25 (list) [erroneous spelling].

MATERIAL EXAMINED. — **Australia.** *South coast*: 4-18 m, April 1874: 1 ♀ holotype, 18.0 mm (NHM 1884.31). — *North-west shelf*: 19°56.8'S, 117°53.4'E, 42 m, 22.04.1983, coll. "Soela": 2 ♀ 20.5, 14.0 mm (QM W19779). — 19°29.4'S, 118°51.5'E, 40 m, 25.10.1983, coll. "Soela": 1 ♂ 13.6 mm (QM W19776). — 19°30.9'S, 118°49.2'E, 38-39 m, 25.10.1983, coll. "Soela": 1 ♂ 14.4 mm (QM W19779). — 19°29.4'S, 118°52.4'E, 38 m, 25.10.1983, coll. "Soela": 3 juvs (QM W19780).

**Somalia.** 1 ♂ 24.1 mm (NHM 1950.8.8.37).

**Seychelles.** Amirante I., "Sealark", stn E9, 62 m, 9.10.1905: 1 ♂ 17.9 mm (USNM 41057), holotype of *C. alata*.



REVES 2 (coll. E. MARCHAL): stn 22, 5°16.3'S, 55°58.42'E, 60 m, 6.09.1980: 2 ♀ 14.7, 16.7 mm (MNHN). — Stn 25, 4°54.6'S, 55°20.5'E, 60 m, 8.09.1980: 2 ♂ 22.0, 19.8 mm; 1 ♀ 17.7 mm (MNHN). — Stn 29, 4°44.0'S, 54°38.3'E, 56 m, 9.09.1980: 1 ♂ 13.4 mm (MNHN). — Stn 30, 4°42.4'S, 54°24.9'E, 50-55 m, 9.09.1980: 1 ♀ ovig. 18.0 mm (MNHN). — Stn 31, 4°37.4'S, 54°20.7'E, 50 m, 9.09.1980: 1 ♂ 13.0 mm (MNHN). — Stn 54, 3°53.2'S, 55°09.1'E, 50 m, 17.09.1980: 1 ♀ 18.6 mm (MNHN). — Stn 55, 3°48.0'S, 55°6.2'E, 50-55 m, 17.09.1980: 1 ♂ 19.2 mm (MNHN). — Stn 60, 4°11.2'S, 55°12.6'E, 40-50 m, 19.09.1980: 1 ♀ ovig. 18.2 mm (MNHN).

W. of Poivre Atoll, 5°46'S, 53°11'E, 57 m, 1.01.1993, coll. "Tyro" Exped.: 1 ♀ 16.1 mm (RMNH). — SW of La Digue I., 4°23'S, 55°51'E, 25 m, 23.12.1992, coll. "Tyro" Exped.: 1 juv. 8.8 mm (RMNH).

**Comoro Is.** Mayotte lagoon, August 1959, coll. A. CROSNIER (as *C. alata*): 1 ♂ 19.9 mm (MNHN). — 50 m, September 1959, coll. A. CROSNIER (as *C. alata*): 1 ♂ 12.5 mm; 1 ♀ 11.2 mm (MNHN).

**Madagascar.** North-west coast: S. of Nosy Iranja, 20 m, 19.09.1960, colls HUMES & FOSTER: 1 ♂ 18.4 mm, 1 ♀ 20.3 mm (MNHN). — West coast: Tuléar, 8 m: 1 ♀ ovig. 13.0 mm (MNHN).

**New Caledonia.** LAGON (coll. B. RICHER DE FORGES): stn 4, 22°22.5'S, 166°20.7'E, 9 m, 21.05.1984: 1 ♀ 23.3 mm (MNHN). — Stn 10, 22°19.9'S, 166°20.4'E, 15 m, 21.05.1984: 1 ♀ (MNHN). — Stn 45, 22°11.9'S, 166°19.2'E, 14 m, 25.05.1984: 1 ♂ 20.5 mm (MNHN). — Stn 376, 22°33.6'S, 167°06.2'E, 75-76 m, 21.01.1985: 1 ♂ 17.2 mm (MNHN). — Stn 403, 22°34.5'S, 167°17.5'E, 45 m, 23.01.1985: 1 ♀ 17.3 mm (MNHN). — Stn 405, 22°37.5'S, 167°19.5'E, 27 m, 23.01.1985: 1 ♂ 19.9 mm (MNHN). — Stn 444, 18°15.3'S, 162°58.8'E, 300-350 m, 28.02.1985: 1 ♂ 18.9 mm (MNHN). — Stn 519, 19°02.5'S, 163°34.0'E, 5.03.1985: 3 ♂ 13.4-17.2 mm (MNHN). — Stn 581, 22°41.5'S, 167°26.1'E, 24 m, 18.07.1985: 1 ♀ 18.4 mm (MNHN). — Stn 911, 20°56.8'S, 164°34.8'E, 13-19 m, 26.04.1988: 1 juv. (MNHN). — Stn 934, 20°43.0'S, 164°16.8'E, 10 m, 27.04.1988: 1 ♀ ovig. 20.1 mm (MNHN). — Stn 940, 20°38.1'S, 164°15.5'E, 10 m, 27.04.1988: 1 ♂ 16.7 mm (MNHN). — Stn 949, 20°33.1'S, 164°10.6'E, 12 m, 28.04.1988: 1 ♂ 19.0 mm (MNHN). — Stn 1015, 20°10.1'S, 163°51.6'E, 12 m, 3.04.1988: 1 ♂ 12.4 mm (MNHN). — Stn 730, 21°17.2'S, 165°54.5'E, 40-43 m, 12.08.1986: 1 ♀ ovig. 10.1 mm (MNHN). — Stn 771, 21°09.0'S, 165°42.45'E, 34 m, 8.01.1987: 1 ♀ 16.3 mm (MNHN). — Stn 865, 20°38.7'S, 165°04.4'E, 24 m, 13.01.1987: 2 ♂ 15.5, 15.5 mm; 2 ♀ 12.0, 13.9 mm (MNHN). — Stn 888, 20°22.0'S, 164°37.9'E, 20 m, 14.01.1987: 1 ♂ 12.1 mm (MNHN). — Stn 1071, 19°54.7'S, 163°59.0'E, 26 m, 23.10.1989: 1 ♂ 11.8 mm (MNHN). — Stn 1072, 19°56.0'S, 164°02.4'E, 20 m, 23.10.1989: 2 ♀ 11.9, 12.9 mm (MNHN). — Stn 1075, 19°52.0'S, 163°58.4'E, 28 m, 23.10.1989: 2 ♂ 16.7, 17.0 mm (MNHN). — Stn 1078, 19°48.3'S, 163°59.5'E, 24 m, 24.10.1989: 1 juv. (MNHN). — Stn 1094, 19°54.4'S, 163°41.2'E, 26 m, 24.10.1989: 1 ♀ 18.4 mm (MNHN). — Stn 1105, 19°40.0'S, 163°57.8'E, 25 m, 25.10.1989: 2 ♀ 11.9, 15.2 mm (MNHN). — Stn 1129, 19°29.2'S, 163°48.8'E, 40 m, 26.10.1989: 2 ♀ 12.2, 17.2 mm (MNHN). — Stn 1158, 19°10.0'S, 163°06.5'E, 48 m, 30.10.1989: 2 juvs (MNHN). — Stn 1174, 19°21.2'S, 163°13.7'E, 53 m, 31.10.1989: 2 ♀ ovig. 12.6, 15.8 mm (MNHN). — Stn 1196, 19°32.5'S, 163°21'E, 30 m, 1.11.1989: 2 juvs (MNHN). — Stn 1205, 19°41.6'S, 163°25.6'E, 38 m, 2.11.1989: 1 ♂ 17.6 mm (MNHN). — Stn 1214, 19°49.9'S, 163°36.6'E, 29 m, 3.11.1989: 1 ♂ 15.1 mm (MNHN).

St. Vincent Bay, 7-8 m, 7.12.1961, coll. Mission Singer-Polignac: 2 ♂ 19.0, 20.8 mm; 1 ♀ 16.7 mm (MNHN).

**Lagoon** (coll. P. LABOUTE): 22°18.35'S, 166°25.06'E, 14 m, 11.02.1985: 1 ♀ 18.5 mm (MNHN). — 20°01.8'S, 161°33.1'E, 2.12.1986: 1 ♂ 24.8 mm (MNHN).

**DESCRIPTION.** — Carapace flattened, 1.4 wide as long. Surface anteriorly granulate, with granulate tubercles on gastrocardial, hepatic and branchial regions; posteriorly granules set in transverse, setiferous rows, rows increasing in length laterally. Front only slightly projecting, with two obliquely triangular teeth separated by triangular sulcus. Basal antennal article anteriorly spatulate, peduncle emerging medially. Afferent branchial canal ending below orbit in rounded process. Endostomial septum visible with first maxillipeds closed, with slightly rounded anterior margin. First maxillipeds with triangular notch on anterointernal margin. Anterolateral margin carinate, scalloped, setose. Posterolateral margin lamellar, setose, beaded, with five triangular teeth followed by two shallow indentations. Posterior margin slightly convex, beaded, setose. Merus of cheliped distally with indistinctly quadrilobate lamina, distalmost lobe acuminate, ram-like. External surface of carpus tuberculate. Crest of larger chela with seven teeth, proximalmost bicuspidate. External surface of chela unevenly granulate, obliquely traversed by two parallel granulate rows. Lower margin narrow, with two contiguous beaded rows. Internal surface of chela unevenly granulate. First male pleopod slightly curved, tapering apically to narrow spinulate tip; second pleopod slender, nearly straight, tip spatulate.

**Color** (in alcohol). — "Light yellow-brown; the lateral expansions of the carapace, outer surface of the chelipeds, and the ambulatory legs of a pinker hue; the inner surface of the palms are brownish-pink upon a yellowish ground; the coloration being disposed, in places, in wavy lines" (MIERS, 1886). "Pale brown mottled with pink; some sharp pink markings on palm of chelipeds" (TYNDALE-BISCOE & GEORGE, 1962).



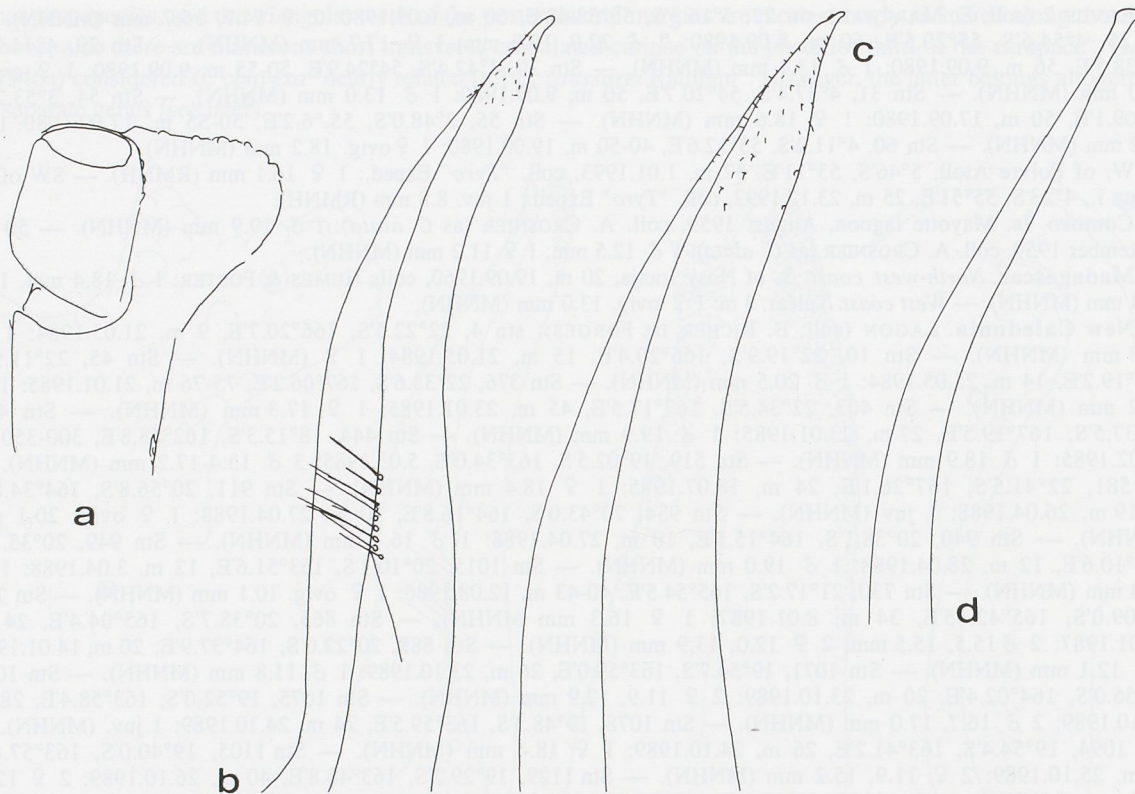


FIG. 9. — *Calappa depressa* Miers, 1886, ♂ 24.8 mm, New Caledonia, 20°01.8'S, 161°33.1'E (MNHN): a, first article of antenna; b-c, first pleopod male with enlargement of distal part; d, second pleopod male, enlargement of distal part.

REMARKS. — ALCOCK (1896) described *C. woodmasoni* as "Very closely allied to *C. depressa*". His drawings and description depict most likely a juvenile specimen of *C. depressa*. RATHBUN (1911) distinguished *C. depressa* Miers from *C. alata* "in its relatively narrower and more triangular carapace, the wings following the antero-lateral outline; obscure antero-lateral teeth; nearly transverse frontal lobes; in having two regular lines of granules on lower half of outer surface of palm." This comparison must have been based solely on MIERS' drawing. Examination of both MIERS' and RATHBUN's type specimens revealed they are one and the same species.

DISTRIBUTION (fig. 30). — Somalia, Comoro Is., Seychelles, Madagascar, Maldives Is (Suvadiva Atoll), Australia, New Caledonia, 2-350 m.

*Calappa dumortieri* Guinot, 1962

Fig. 10 b, 11, 13 b, 30, 35 b

*Calappa cristata* - H. Milne Edwards, 1837: 105; 1840: 17, pl. 20 fig. 1 [Non Fabricius, 1798].

*Calappa philargius* - NOBILI, 1906: 148. — HOLTHUIS, 1958a: 45 [Non Linnaeus, 1758].

*Calappa dumortieri* Guinot, 1962: 21, figs 7-10, 16, 19a-b, 20, pl. 1 fig. 2, pl. 2 fig. 2; 1967: 245 (list). — SERÈNE, 1968: 41 (list).

MATERIAL EXAMINED. — "Mers d'Asie", det. H. MILNE EDWARDS as *C. cristata*: 1 ♂ 48.6 mm (MNHN B.3985), Paratype.



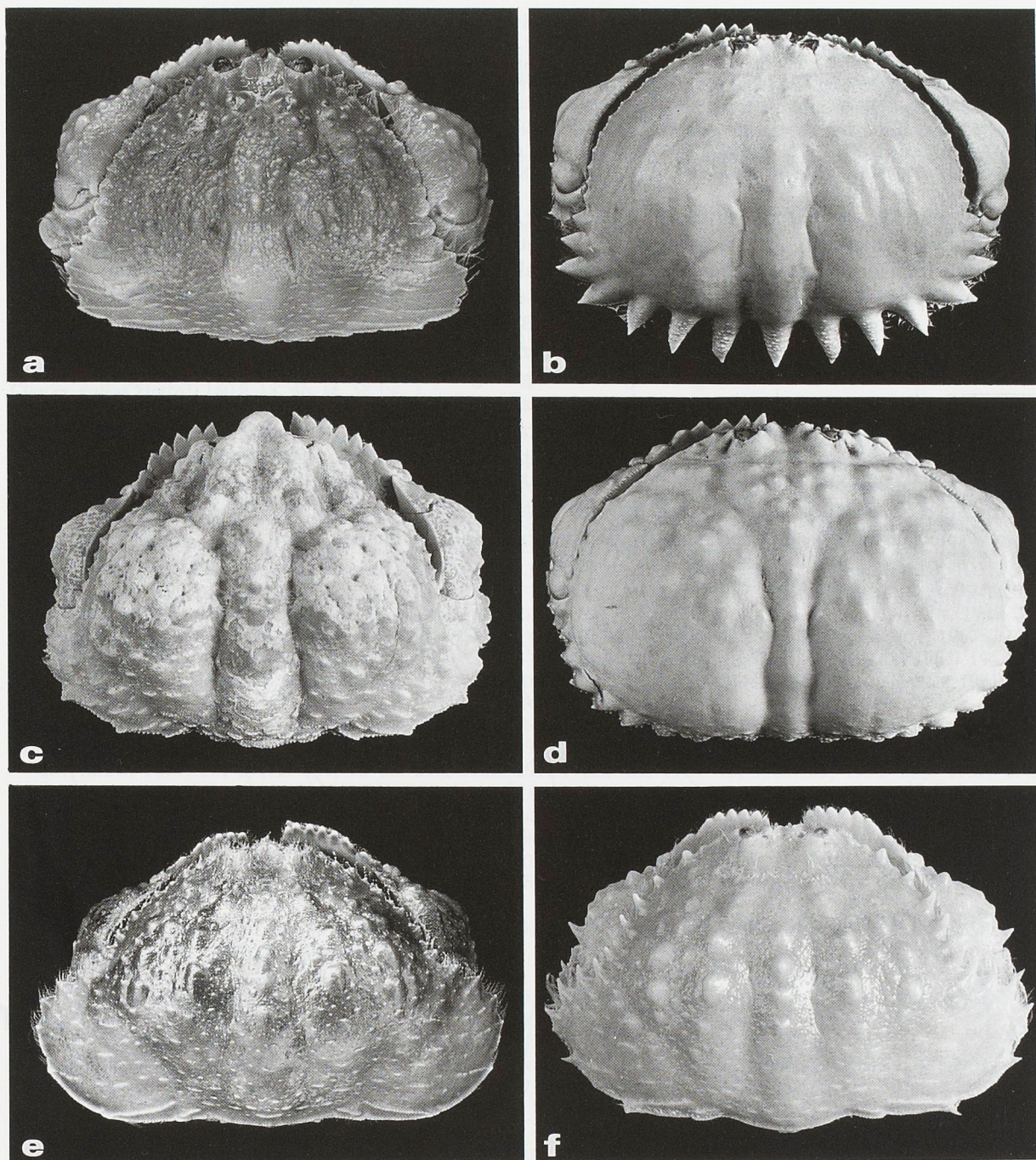


FIG. 10. — Whole crab, dorsal view: **a**, *Calappa depressa* Miers, 1886, ♂ 24.8 mm, New Caledonia, 20°01.8'S, 161°33.1'E (MNHN). — **b**, *Calappa dumortieri* Guinot, 1962, ♀ 67.1 mm, Assab (MF 1512). — **c**, *Calappa gallus* (Herbst, 1803), ♀ 53.3 mm, South Africa (SAM 462). — **d**, *Calappa japonica* Ortmann, 1892, ♂ 58.4 mm, Bay of Bengal, syntype of *C. exhamentosa* (NHM 1896.9.8.8). — **e**, *Calappa hepatica* (Linnaeus, 1758), ♂ 46.2 mm, New Caledonia, Platier de Touaourou (MNHN); **f**, *idem*, ♀ 32.8 mm, Aldabra, Île Picard (USNM 268809).



**Red Sea.** 1897, coll. F.P. JOUSSEAUME, det. G. NOBILI: 1 ♂ damaged (MNH-B 13465). — 1957-58, coll. A. BEN TUVIA: 1 ♂ 42.9 mm (RMNH 25609). — Eilat: 1 ♀ 55 mm (TAU E58/86); 2 juv (TAU E58/86). — 5 m, October 1994, coll. N. POPPER: 1 ♀ 61.0 mm (TAU). — Eritrea, North Massawa Channel, 9.12.1957, coll. A. BEN TUVIA: 1 ♂ 48.5 mm, paratype (RMNH 16900). — S. Red Sea, 1957-58, coll. A. BEN TUVIA: 1 ♂ 62.0 mm, paratype (RMNH 16901). — Assab, 1880-1882, coll. RAGAZZINI: 1 ♀ 67.1 mm (MF 1512). — 1884, coll. SCAROMUCCI: 1 ♀ 64.4 mm (MF 783). — 16.01.1966, coll. B. DE WILDE: 1 ♂ 64.2 mm (RMNH 25570).

**Gulf of Aden.** 12°03.9'N, 44°47.7'E, 76 m, "Meteor", stn 283, 16.03.1987: 1 ♂ damaged (SMF). — nr Djibouti, 12°21.2'N, 43°27.1'E, 35-45 m, "Meteor", stn 236, 6.03.1987: 1 ♀ 80.6 mm (SMF).

**DESCRIPTION.** — Carapace convex, 1.4 wide as long, frontal and epigastric regions minutely granulate. Front with two triangular teeth. Anterior margin of basal antennal article concave, proximal lobe dilated, peduncle emerging from distal angle. Afferent branchial canal ending below orbit in granulate tridentate process. Endostomial septum visible with first maxillipeds closed, with convex anterior margin. Distal margin of first maxillipeds obliquely cut, anterointernal angle acute. Branchial ridges indistinct, anteriorly with few flattened tubercles. Anterolateral margin carinate, unevenly granulate. Posterolateral margins setose, with four marginally beaded lacinate teeth, distalmost largest, and three elongate, granulate, conical teeth. Posterior margin with long, conical, granulate median tooth. Merus of cheliped distally with quadrilobate lamina, two distalmost acuminate. External surface of chela minutely granulate, vertically traversed by three nearly flattened tubercles. Crest of larger chela cut into seven teeth increasing in size distally, proximalmost bicuspidate. Granulate, tuberculate ridge running subparallel to beaded lower margin, from proximal keel-like tooth to base of pollex. Lower margin narrow, two beaded files contiguous distally. First male pleopod markedly curved distad, tapering apically to narrow spinulate tip, second pleopod slender, slightly curved, tip short, digitate.

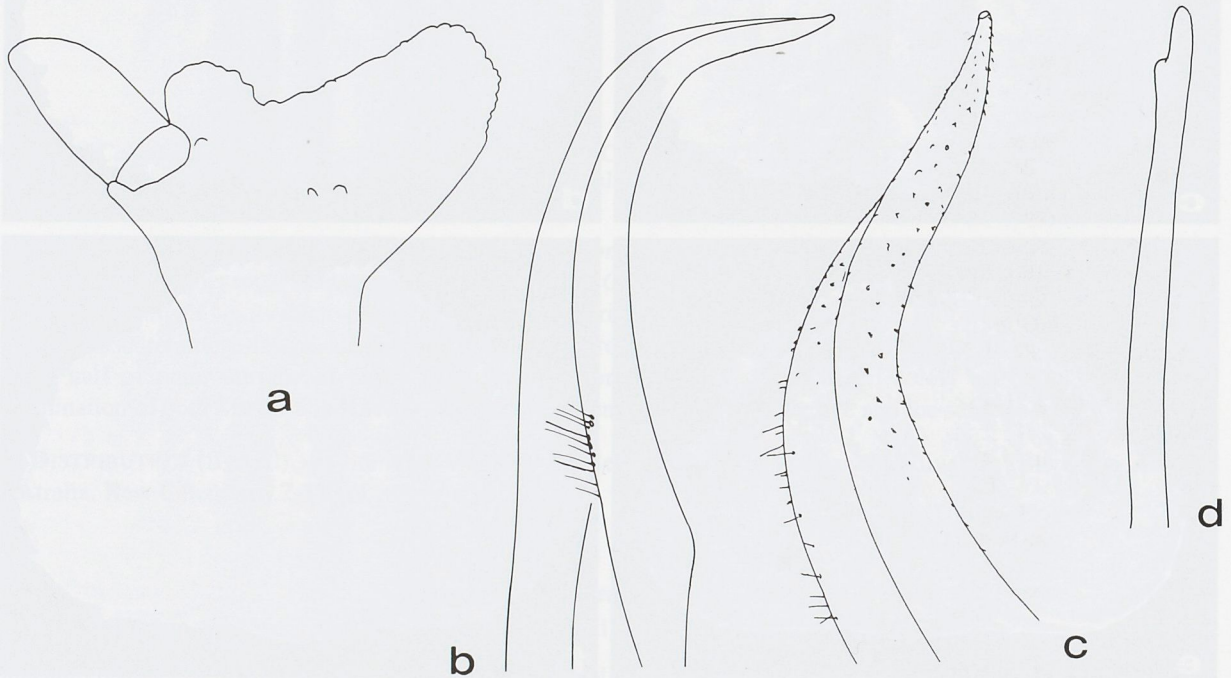


FIG. 11. — *Calappa dumortieri* Guinot, 1962, ♂ 64.2 mm, Red Sea (RMNH 25570): **a**, first article of antenna; **b-c**, first pleopod male with enlargement of distal part; **d**, second pleopod male, enlargement of distal part.

**Color.** — Carapace and chelae densely covered with numerous rich brown spots on pale background, leaving clear thin wavy lines, spots larger near posterolateral margins; posterolateral teeth pale yellow, wide brown lines on grooves separating teeth; brown reticulation on inner surface of chela.



REMARKS. — H. MILNE EDWARDS' drawing of *C. cristata* (1840, pl. 20 fig. 1) is quite accurate, but for the color scheme. According to GUINOT (1962), *C. dumortieri* is distinguished from the closely related *C. philargius* in having longer spiniform teeth on posterior margin, spinose interior angle anteriorly on first maxilliped endopod rather than obliquely truncate anterior margin, lesser pubescence on third maxilliped, and granulate tubercles on ridge running parallel to larger chela lower margin. *C. dumortieri* lacks the conspicuous maroon crescents near eyes and large maroon spots on chelipeds characteristic of *C. philargius*, rather its carapace and chelae are covered with numerous brown dots, posterolateral teeth yellow.

DISTRIBUTION (fig. 30). — Red Sea and Somalia, 5-76 m.

*Calappa gallus* (Herbst, 1803)

Fig. 10 c, 12, 13 c, 31

*Cancer gallus* Herbst, 1803: 18, 46, pl. 58 fig. 1.

*Cancer (Calappa) gallus* - LATREILLE, 1817: 24.

*Gallus gallus* - DE HAAN, 1837: 70.

*Calappa gallus* - H. MILNE EDWARDS, 1837: 105. — WHITE, 1847: 45. — DANA, 1853: 393. — A. MILNE EDWARDS, 1862: 10; 1874: 55. — BRITO CAPELLO, 1871: 133, pl. 2 figs 4, 14. — HOFFMANN, 1874: 26. — RICHTERS, 1880: 157. — MULLER, 1887: 473. — DE MAN, 1888a: 388; 1888b: 197. — ORTMANN, 1892: 567. — HENDERSON, 1893: 395. — ALCOCK, 1896: 146. — NOBILI, 1899: 249; 1906: 148. — THURSTON, 1890: 82. — DOFLEIN, 1900: 137. — BORRADAILE, 1903: 436. — LENZ, 1905: 346. — KLUNZINGER, 1906: 61, pl. 2 fig. 14. — LAURIE, 1906: 354; 1915: 409 (list). — RATHBUN, 1906: 887; 1911: 197. — IHLE, 1918: 181. — SAKAI, 1936: 47, text-fig. 10; 1937: 94, pl. 17 fig. 2; 1965: 55, pl. 2 fig 3; 1976: 131, pl. 39 fig. 2. — ESTAMPADOR, 1937: 515. — STEPHENSEN, 1945: 65. — SOKOLOWSKY, 1945: 65, pl. 1 figs 4-6. — BARNARD, 1947: 372; 1950: 350, figs 66e-i (part). — LIN, 1949: 13 (list). — DAWYDOFF, 1952: 139. — UTINOMI, 1956: 70, pl. 35 fig. 6. — MICHEL, 1964: 36. — GUINOT, 1967a: 245. — SERÈNE, 1968: 41 (list). — ZARENKOV, 1971: 170. — TAKEDA, 1982: 106, fig. 311. — MIYAKE, 1983: 19, 199, pl. 7 fig. 2. — DAI *et al.*, 1986: 94, text-fig. 51. — TAKEDA & SHIKATANI, 1990: 478. — TIRMIZI & KAZMI, 1991: 54, fig. 16. — DAI & YANG, 1991: 105, text-fig. 51. — CHEN, 1993: 683, fig. 5.

*Calappa lophos* - BUITENDIJK, 1939: 231 pl. 8 fig. 5 (part). [Non Herbst, 1782].

Not *Calappa gallus* - MIERS, 1886: 286. — OSORIO, 1887a: 227; 1887b: 188; 1889: 135; 1890: 47; 1898: 193. — RATHBUN, 1897: 36; 1898a: 609; 1898b: 290; 1900: 297; 1902a: 85; 1920: 15; 1921: 66; 1936: 388; 1937: 214, pl. 65 figs 2-3. — BOUVIER, 1907: 496; 1922: 57. — BALSS, 1921: 50. — MONOD, 1927: 606; 1928: 116, figs 2b, 3, 9d; 1956: 100, figs 115-116; 1967: 178. — ROSSIGNOL, 1957: 76, 127 (key), fig. 1; 1962: 114. — LONGHURST, 1958: 87. — GAULD, 1960: 68. — GUINOT & RIBEIRO, 1962: 26. — RIBEIRO, 1964: 4; 1973: 5. — CHACE, 1966: 636. — FOREST & GUINOT, 1966: 51. — FILHO, 1967: 41 (list). — COELHO, 1971: 234 (list). — COELHO & RAMOS, 1972: 180. — MANNING & HOLTHUIS, 1981: 51 (= *C. galloides* Stimpson, 1859 *vide* MANNING & CHACE, 1990: 45).

MATERIAL EXAMINED. — Red Sea. Sharm el Naga, 33 kms S Hurgada, 28-31.08.1988, colls J. GOUD & W. VAN DONGEN, det. L.B. HOLTHUIS: 1 ♀ (RMNH 38534).

Gulf of Aden. nr Djibouti, 12°21.2'N, 43°27.1'E, 35-45 m, "Meteor", stn 236, 6.03.1987: 1 ♀ 80.6 mm (SMF).

Seychelles. S.W. La Digue I., 4°23'S, 55°49'E, 30 m, 23.12.1992, coll. "Tyro" Exped.: 1 ♂ 22.9 mm (RMNH).

Mozambique Channel. Europa I., coll. P. FOURMANOIR: 2 ♀ 21.9, 37.5 mm (MNHN).

South Africa. Port Shepstone: 1 ♀ 53.3 mm (SAM 462).

Madagascar. North-west coast: Nosy Be, intertidal, coll. M. CHAVANE: 1 ♂ (broken) (MNHN). — Nosy Be, intertidal, December 1958, coll. A. CROSNIER: 3 ♀ 13.1-27.7 mm (MNHN). — 13°17.5'S, 48°07'E, 30 m, 24.08.1967, coll. R. PLANTE: 1 ♂ 44.9 mm; 1 ♀ 22.8 mm (MNHN). — West coast: Tuléar, 1976, coll. P. GALENON: 1 ♀ 35.8 mm (MNHN).

Glorieuses Is. Intertidal, 30.01.1971, coll. A. CROSNIER: 1 ♀ 24.6 mm (MNHN).

Mauritius. Det. HERKLOTS as *C. (Gallus) gallus*: 1 dry specimen (RMNH 43071).

Indonesia. *Moluccas*, Ambon, 9 m, 4.07.1956: 1 ♂ 43.7 mm (MNHN-B 13461). — Timor, nr Koepang, 4.12.1929, coll. & det. A.M. BUITENDIJK as *C. lophos*: 1 juv. (RMNH 4238). — Irian Jaya, Manokwari, 1962, coll. D. SMITS: 1 ♀ 28.8 mm (RMNH 17739).

Japan. Shikoku I., E. of Cape Muroto, 21.10.1973, coll. K. MATSUZAWA, det. K. SAKAI: 1 ♀ 43.0 mm (SMF).

New Caledonia. Coll. A. MILNE EDWARDS, det. E.L. BOUVIER: 2 ♂ 22.4, 32.3 mm (MNHN 48); 1 juv. (MNHN 47).

Tonga Is. Nukualofa, 6 m, January 1956: 1 ♀ damaged (ZM CRU1816).



**Hawaii.** "Albatross" stn 4061: 1 ♂ 40.1 mm (USNM 29892). — Honolulu, 1915, coll. Th. MORTENSEN: 1 ♂ 39.6 mm; 1 ♀ 44.5 mm (ZM CRU1812).

**DESCRIPTION.** — Carapace convex, 1.3 wide as long, surface rugose. Hepatic region markedly depressed. Gastric, cardiac regions delimited by deep longitudinal grooves. Branchial, gastric regions with flattened tubercles, posteriorly transversely beaded carinae. Front projecting, truncate. Basal antennal article closely granulate, anterior margin concave, peduncle emerging from distal angle. Endostomial septum visible with first maxillipeds closed, with convex anterior margin. Distal margin of first maxillipeds obliquely cut, anterointernal angle acute. Anterolateral margin sinuous, carinate, unevenly granulate. Posterolateral margin setose, with three small, marginally granulate teeth anteriorly, and three shallow, medially beaded teeth posteriorly. Posterior margin marginally beaded, sinuous. Merus of cheliped distally with quadrilobate lamina. External surface of chela minutely granulate, obliquely traversed by rounded tubercles, largest near upper crest. Crest of larger chela cut into seven teeth increasing in size distally, proximalmost flattened. Lower margin with two beaded files. First male pleopod stout, slightly curved, tapering apically, distally spinulate; second pleopod slender, curved, with subdistal denticulate flange and digitate tip.

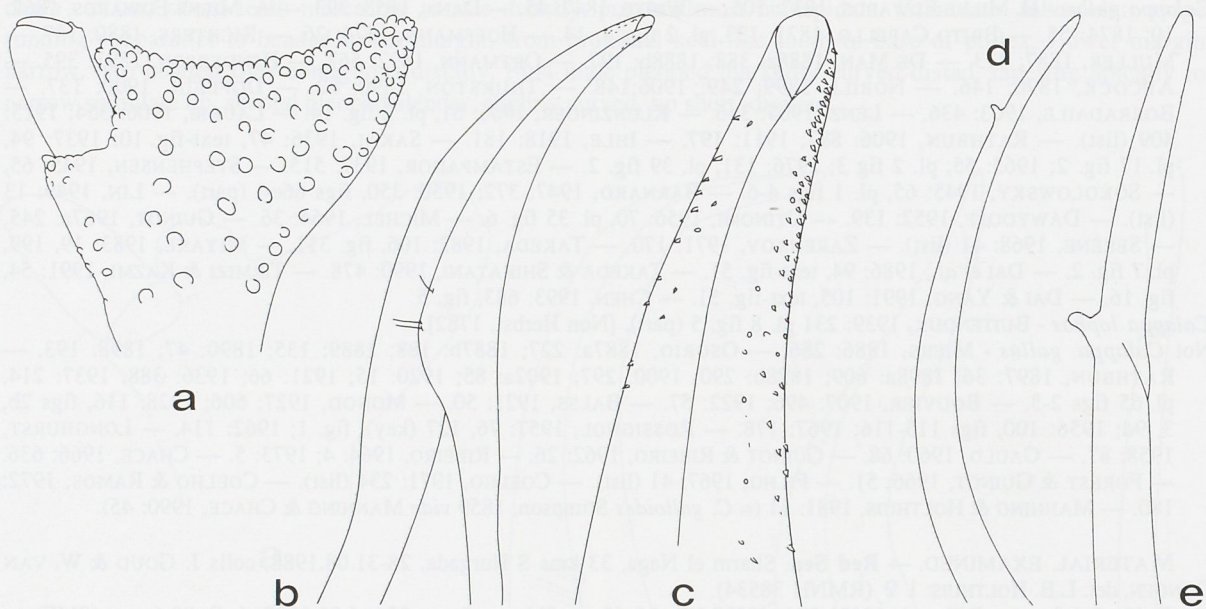


FIG. 12. — *Calappa gallus* (Herbst, 1803), ♂ 44.9 mm, Madagascar, 30 m (MNHN): **a**, first article of antenna; **b-c**, first pleopod male with enlargement of distal part; **d-e**, second pleopod male with enlargement of distal part.

**Color.** — Legs yellow, chelipeds and carapace mottled yellowish-reddish and greyish-brown; undersurface mottled yellow and white. Color photographs in TAKEDA (1982, fig. 311), MIYAKE (1983, pl. 7 fig. 2).

**REMARKS.** — HERBST (1803) described *C. gallus* as differing from its congeners in its markedly beveled anterior carapace, thick, truncate front, and black fingers. However, the presence of an Atlantic species - *C. galloides* Stimpson, 1859 - which shares these characters, gave rise to confusion. Since both HERBST's and STIMPSON's types were lost, many authors presumed, like RATHBUN (1937), that *C. gallus* is a widely distributed species in which the "carapace varies in relative length and breadth due to the greater or less convexity; in size and prominence of dorsal tubercles; and in distinctness of rostral teeth, some having four teeth, others having no median sinus, or the lateral teeth slightly developed", and that "The variations do not correspond with geographical regions".



DANA (1853) erroneously cited RUPPELL's *Krabben des rothen Meeres* (1830: 18, pl. 4 fig. 5) in his list of synonymies and RICHTERS obviously copied it without checking.

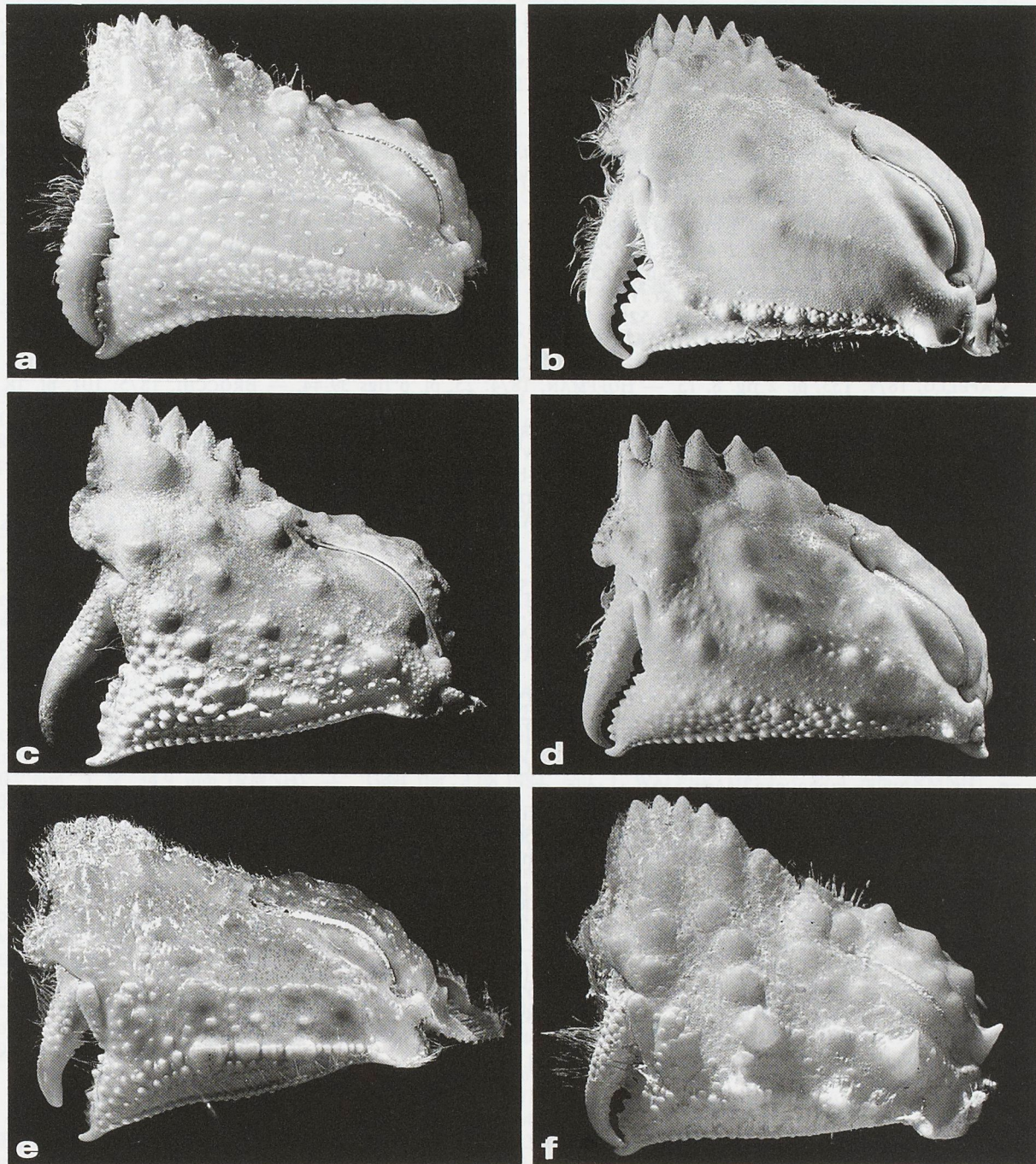


FIG. 13. — Cheliped, external view: **a**, *Calappa depressa* Miers, 1886, ♂ 24.8 mm, New Caledonia, 20°01.8'S, 161°33.1'E (MNHN). — **b**, *Calappa dumortieri* Guinot, 1962, ♀ 67.1 mm, Assab (MF 1512). — **c**, *Calappa gallus* (Herbst, 1803), ♀ 53.3 mm, South Africa (SAM 462). — **d**, *Calappa japonica* Ortmann, 1892, ♂ 58.4 mm, Bay of Bengal, syntype of *C. exhamentosa* (NHM 1896.9.8.8). — **e**, *Calappa hepatica* (Linnaeus, 1758), ♂ 46.2 mm, New Caledonia, Platier de Touaourou (MNHN); **f**, *idem*, ♀ 32.8 mm, Aldabra, Ile Picard (USNM 268809).



Of BUITENDIJK's (1939) material from Timor identified as *C. lophos*, the specimen that appears in pl. 8 fig. 5 was redetermined as *C. gallus*.

DISTRIBUTION (fig. 31). — Red Sea, Seychelles and Madagascar, to New Caledonia and Hawaii. On sandy, muddy, shelly bottoms, coral reefs, intertidal - 160 m.

*Calappa hepatica* (Linnaeus, 1758)

Fig. 10 e-f, 13 e-f, 14, 31

*Cancer hepaticus* Linnaeus, 1758: 630; 1764: 448; 1767: 1048.

*Cancer tuberculatus* Herbst, 1785: 204, pl. 13 fig. 78. — FABRICIUS, 1793: 454. — BOSCH, 1802: 183.

*Calappa tuberculata* - WEBER, 1795: 92. — FABRICIUS, 1798: 345. — BOSCH, 1802: 183; 1830: 213. — LATREILLE, 1803: 392; 1806: 28; 1829: 139. — DESMAREST, 1825: 109, pl. 10 fig. 1. — H. MILNE EDWARDS, 1837: 106. — EYDOUX & SOULEYET, 1842: 245. — KRAUSS, 1843: 52. — WHITE, 1847: 45. — GIBBES, 1850: 183. — HERKLOTS, 1851: 24. — DANA, 1853: 393. — STIMPSON, 1859a: 162; 1907: 165. — HELLER, 1861b: 372; 1865: 69. — HESS, 1865: 157. — MARTENS, 1866: 381. — A. MILNE EDWARDS, 1868: 72; 1874: 55. — HILGENDORF, 1869: 92; 1878: 809. — BRITO CAPELLO, 1871: 133, pl. 2 fig. 8, 13. — HOFFMAN, 1874: 25, pl. 6 figs 39-44. — BROCCHI, 1875: 101, pl. 18 figs 160-161. — PAULSON, 1875: 74, 75, pl. 9 fig. 5. — KOSSMANN, 1877: 63. — STREETS, 1877: 116. — DE MAN, 1880: 184; 1888a: 388. — NAUCK, 1880: 46. — RICHTERS, 1880: 157. — LENZ & RICHTERS, 1881: 425. — MÜLLER, 1887: 473. — SERÈNE, 1937: 78; 1968: 41 (list). — DAWYDOFF, 1952: 139. — ZIMSEN, 1964: 647.

*Calappa tuberculosa* Guérin Méneville, 1829, pl. 12 figs 2a-b.

*Calappa (Calappa) hepatica* - DE HAAN, 1837: 70. — HERKLOTS, 1861: 25.

*Calappa spinosissima* H. Milne Edwards, 1837: 106. — A. MILNE EDWARDS, 1847: 55. — RICHTERS, 1880: 157. — ALCOCK, 1896: 144.

*Calappe sandwichien* Eydoux & Souleyet, 1842, pl. 3 figs 9-10.

*Calappa hepatica* - WHITE, 1847: 44. — MIERS, 1876: 55; 1877: 238; 1879: 491; 1884: 257, 550; 1886: 285. — HILGENDORF, 1879: 809. — HASWELL, 1882: 136. — FILHOL, 1886: 406. — CANO, 1889a: 94; 1889b: 249. — WHITELEGGE, 1889: 231. — THURSTON, 1890: 82. — THALLWITZ, 1891: 52. — ORTMANN, 1892: 568. — HENDERSON, 1893: 395. — ALCOCK & ANDERSON, 1895: 203. — ALCOCK, 1896: 142. — DE MAN, 1896: 360; 1902: 687. — NOBILI, 1899: 249; 1900: 496; 1906: 148. — CALMAN, 1900: 25. — SCHENKEL, 1902: 574. — BORRADAILE, 1903: 436, pl. 22 fig. 6. — LENZ, 1905: 346. — GRANT & McCULLOCH, 1906: 24. — RATHBUN, 1906: 887; 1911: 197. — KLUNZINGER, 1906: 60. — STEBBING, 1910: 333. — PESTA, 1911: 37. — PARISI, 1914: 285. — BOUVIER, 1915: 215. — LAURIE, 1915: 409, 427. — BALSS, 1915: 15; 1922: 123; 1938: 8. — IHLE, 1918: 183, fig. 80. — GRAVIER, 1920: 379. — McNEILL, 1926: 306. — URITA, 1926: 36. — GRAVELY, 1927: 142, pl. 22 fig. 27. — MONOD, 1928: 124, fig. 13a. — WARD, 1928: 243, pl. 27; 1941: 1; 1942: 69. — McNEILL & WARD, 1930: 373. — ANDRÉ, 1931: 639. — STEPHENSON *et al.*, 1931: 44, 52. — BOONE, 1934: 32, figs 8-10; 1938: 212. — GORDON, 1934: 73. — SAKAI, 1934: 284; 1936: 44, text-fig. 7; 1937: 89, pl. 12 fig. 2; 1956: 8; 1960: 33, pl. 16 fig. 4; 1965: 55; 1976: 128, pl. 38 figs 1, 3. — MIYAKE, 1936: 507; 1939: 198; 1983: 20, pl. 7 fig. 6. — MONOD, 1935: 96. — CHOPRA & DAS, 1937: 382. — SERÈNE, 1937: 78. — ESTAMPADOR, 1937: 515. — BUITENDIJK, 1939: 230. — SOKOLOWSKY, 1945: 62. — STEPHENSEN, 1945: 65. — LIN, 1949: 13 (list). — BARNARD, 1950: 348, figs 66a-d. — TWEEDIE, 1950: 106. — DAWYDOFF, 1952: 139. — HOLTHUIS, 1953: 3; 1958a: 45. — STELLA, 1953: 58. — FOREST & GUINOT, 1961: 11, figs 1a-b, 2. — TYNDALE-BISCOE & GEORGE, 1962: 69. — SANKARANKUTTY, 1961: 135; 1962: 152. — MICHEL, 1964: 37. — GARTH, 1965: 7, figs 9-10. — GUINOT, 1967: 245 (list). — ROMMOHTARTO, 1967: 4. — McNEILL, 1968: 43. — KIM, 1970: 11. — ZARENKOV, 1971: 170. — TAKEDA, 1973: 83; 1982: 105, fig. 307. — TAKEDA & NUNOMURA, 1976: 65. — SHIRAI, 1980: 415. — DAI *et al.*, 1986: 91, fig. 49, pl. 11 fig. 3. — NOMURA *et al.*, 1988: 18. — TAKEDA & SHIKATANI, 1990: 478. — DAI & YANG, 1991: 102, fig. 49, pl. 11 fig. 3. — CHEN, 1993: 677.

*Calappa uberulata* - HELLER, 1861a: 20 [erroneous spelling].

*Calappa spinosissimus* - STEBBING, 1917: 19.

*Cancer alata* - CURTISS, 1938: 170. [Non Rathbun, 1911].

*Calappa hepatica* var. *spinosissima* - BUITENDIJK, 1939: 231.

*Calappa hepatica hepatica* - SERÈNE, 1968: 41 (list).

*Calappa hepatica spinosissima* - SERÈNE, 1968: 41 (list).

MATERIAL EXAMINED. — Red Sea. det. HERKLOTS as *C. (Calappa) Hepatica*: 1 dry specimen (RMNH 43098). — 1846-1854, coll. L.W. RUYSSENAERS, det. L.B. HOLTHUIS: 3 dry specimens (RMNH 43094). — 1880, coll. R. KOSSMANN: 1 ♂ (RMNH 3113). — Gulf of Eilat, November 1956: 1 ♂ 31.8 mm (TAU NS21299). — Eilat, 8.07.1969, coll.



D. POPPER: 3 ♂ 19.1-19.4 mm; 4 ♀ 23.6-34.6 mm; 2 parasitised (TAU NS7288). — 20.06.1986: 2 ♂ 29.6, 32.0 mm (TAU). — Coll. L. FISHELSON: 1 ♂ 27.0 mm (TAU NS21294). — Ras Burqa, 28.04.1973, coll. L.B. HOLTHUIS: 1 ♂ 27.3 mm (RMNH 29231). — Nabeq, 9.06.1975: 1 ♂ 32.4 mm (TAU NS21298). — 3 km S Nabeq, sand, 0-0.5 m, 8.11.1981, colls L.B. HOLTHUIS & Ch. LEWINSOHN: 7 ♂ 17.3-35.9 mm; 3 ♀ 22.1-32.9 mm; 2 juvs (TAU NS21292). — Mersa Mukabeila, July 1977, coll. N. GUNDERMAN: 1 ♂ 30.1 mm (TAU NS21297). — Shurat el Manqata, intertidal flat, 25.04.1976, colls L.B. HOLTHUIS & Ch. LEWINSOHN: 1 ♂ 39.7 mm (TAU NS21290). — Abu Zabad, 1.01.1957, coll. H. STEINITZ: 1 ♂ 34.6 mm (RMNH 12135). — Dahab, 26-27.04.1973, coll. & det. L.B. HOLTHUIS: 4 dry specimens (RMNH 43099). — Tiran I., 23.09.1981, coll. A. KELLER: 1 ♀ 26.9 mm (TAU). — Mingar, 5 km off Hurgada, rocky platform, 25.08.1988, colls J. GOUD & W. VAN DONGEN, det. L.B. HOLTHUIS: 1 ♂ (RMNH 38558). — Sudanese Red Sea. October 1904 - May 1905, coll. C. CROSSLAND: 2 ♂ 22.0, 21.0 mm (NHM 1934.1.17.4-6). — Mersa Makdah, 16.02.1905, coll. C. CROSSLAND: 2 juvs (NHM). — WE Shubuk, 16.02.1905, coll. C. CROSSLAND: 2 juvs (NHM). — Eritrea. Dahlak Archipelago, Entedebir I., Landing Bay, 0-2 m, 20.10.1965, coll. ISRSE: 1 ♀ 29.5 mm (TAU ISRSE1509). — Umm Aabak, 23.03.1962, coll. ISRSE: 1 ♀ 27.3 mm (RMNH 24860). — Harmil, coll. STEEN: 1 ♂ 27.3 mm (RMNH 25998). — Coll. ISRSE: 2 ♂ 15.1 and 15.8 mm; 3 juvs (RMNH).

**Djibouti.** Obock, 1897, coll. F.P. JOUSSEAUME, det. A. MILNE EDWARDS: 15 ♂ 15.0-32.5 mm; 3 ♀ 24.8-28.1 mm; 3 juvs (MNHN-B 16287). — Coll. "*Calypso*": 1 ♂ 23.4 mm (MNHN-B 19560). — Nr Djibouti, 12°21.2'N, 43°27.1'E, 35-45 m, "*Meteor*", stn 236, 6.03.1987: 9 juvs (SMF).

**Socotra I.** N. coast, 22-27 m, coll. H.M.S. "*Weston*": 1 ♀ 16.7 mm; 1 juv. (NHM).

**Persian Gulf.** Janah I., 11.10.1956, coll. C.E. DAWSON: 1 ♀ 22.2 mm (RMNH 16649).

**Kenya.** Tiwi Beach, 10 km S. of Mombasa, November 1969, coll. & det. L.B. HOLTHUIS: 1 dry specimen (RMNH 43104). — Mombasa, 1973, coll. J.O. YOUNG: 2 ♂ 39.2, 36.4 mm (NHM). — Bamburi Beach, 12 km N. of Mombasa, 10-15.12.1974, coll. & det. L.B. HOLTHUIS: 2 ♂ 38.2, 30.1 mm; 1 ♀ 25.5 mm (RMNH 29911). — 4 dry specimens (RMNH 43095). — Between Bamburi and Nyali, 10 km N. of Mombasa, 12.12.1974, coll. & det. L.B. HOLTHUIS: 1 dry specimen (RMNH 43096).

**Tanzania.** Bagamoyo, coll. H.W.P. VAN BARNEVELD, det. L.B. HOLTHUIS: 1 dry specimen (RMNH 43101).

**Zanzibar.** Don. SALMIN, 1864: 1 juv. (NMW10983). — 1864: 1 juv. (NMW 10983). — 7-9 m, coll. I. GORDON: 1 ♂ 15.1 mm (NHM 1964.7.1.119).

**Seychelles.** Coll. E. WRIGHT: 2 ♂ 34.9, 36.0 mm (NHM 1875.20). — St Joseph Atoll, 5°24'S, 53°20'E, reef flat, 27.12.1992, coll. "*Tyro*" Exped.: 1 ♂ 24.7 mm (RMNH). — Mahe, Beau Vallon, 4°37'S, 55°26'E, sandy shore with beachrock, 12.12.1992, coll. "*Tyro*" Exped.: 1 ♂ 26.3 mm (RMNH). — Mahe, Terang, coll. N. POLUNIN: 2 ♂ 38.2, 34.0 mm (NHM 1974.557). — Aldabra I., coll. J.D. TAYLOR: 1 juv. (NHM 1977.77). — Passe Gronnet, coll. J.D. TAYLOR: 1 juv. (NHM 1977.71). — Île Picard, lagoon, 09°22.40'S, 46°14.40'E, 0-1 m, 3.12.1964, coll. "*Anton Bruun*", stn HA-16: 1 ♀ 32.8 mm (USNM 268809).

**Mozambique.** 3 ♂ 34.1-39.6 mm; 3 ♀ 23.4-32.2 mm (SAM 2212). — Coll. O.S. TATTERSAL: 2 ♂ 33.4, 34.1 mm; 1 ♀ 33.3 mm (NHM 1951.9.13.1-2). — Inhaca I., 22.02.1982, coll. J. WALENKAMP: 3 ♂ 25.9-35.2 mm (RMNH). — Ponta Punduini, 27.07.1982, coll. J. WALENKAMP: 1 ♀ (RMNH). — W coast, 11.01.1983: 1 ♂; 1 ♀ (RMNH). — Punta Rana, 1.08.1984, coll. J. WALENKAMP: 1 ♂ 32.4 mm (RMNH). — Tidal flat, 2.08.1984, coll. J. WALENKAMP: 1 ♂ 30.2 mm; 1 ♀ 34.9 mm (RMNH). — Tidal flat, 3.08.1984, coll. J. WALENKAMP: 1 ♂ 27.4 mm (RMNH). — 13.08.1984, coll. J. WALENKAMP: 1 ♀ (RMNH). — 8.01.1986: 1 ♂ 22.9 mm (RMNH).

**South Africa.** Durban, coll. & det. STEBBING as *C. spinosissimus*: 1 ♀ 16.9 mm (NHM 1928.12.1.209). — 1 ♂ 41.4 mm (NHM 1928.12.1.208). — Natal: 1 ♂ 35.2 mm; 2 ♀ 32.8, 25.2 mm (NHM 1896.9.30.1-3).

**Madagascar.** 1903, det. H. BALSS: 1 ♂, 1 specimen damaged (MNHN-B 16317). — 1871, coll. M. LANTZ, det. H. BALSS: 6 ♂ 25.7-44.9 mm (MNHN-B 16306). — 2 ♂ 29.8, 33.9 mm (MNHN). — *East coast*: Diégo Suarez, 1919, coll. Lt R. DECARY: 5 ♂ 19.0-35.7 mm; 1 ♀ 39.3 mm (MNHN-B 56). — Ivongo, det. A. CROSNIER: 1 ♀ 42.0 mm (MNHN). — Ile Sainte Marie, intertidal, coll. A. CROSNIER: 1 ♂ 39.6 mm (MNHN). — *North-west coast*: Nosy Be, 16.08.1958, coll. & det. A. CROSNIER: 5 ♂ 11.5-27.1 mm; 3 ♀ 18.2-21.4 mm (MNHN). — Nosy Be, intertidal, coll. A. CROSNIER: 1 ♂ 28.5 mm (MNHN). — Nosy Be, intertidal, coll. A. CROSNIER: 1 ♂ 28.3 mm; 1 ♀ 24.2 mm (MNHN). — East of Nosy Be, 8 m, May 1958, coll. & det. A. CROSNIER: 3 ♀ 26.1-37.0 mm (MNHN). — *West coast*: Morombe, coll. B. KOEHLIN: 1 specimen (MNHN-B 16314). — Tuléar, intertidal, October 1958, coll. & det. A. CROSNIER: 2 ♂ 19.6, 41.0 mm (MNHN).

**Glorieuses Is.** Grande Glorieuse, 30.01.1971, intertidal, coll. A. CROSNIER: 1 ♂ 22.8 mm (MNHN).

**Mauritius.** coll. de BELLOQUET: 4 specimens (MNHN-B 4078); 4 ♂ 40.8-46.6 mm (MNHN-B 70). — coll. REGNARD: 1 ♂ 44.3 mm; 1 ♀ 40.6 mm (ZM CRU1810). — Grand Bay, 4 m, sand, 4.10.1929, coll. Th. MORTENSEN: 12 juvs (ZM CRU1833). — October 1929, coll. Th. MORTENSEN: 2 ♂ 6.2, 43.9 mm; 1 juv. (ZM CRU1813). — Cannonius Pt., sand, October 1929, coll. Th. MORTENSEN: 1 ♂ 42.8 mm (ZM CRU1834). — Tourneau I., 20.10.1960, coll. C. MICHEL: 1 ♀ 37.6 mm (RMNH 17538). — Flic en Flac, 1-15.05.1995, coll. B. GALIL: 2 ♂ 40.1, 42.7 mm; 1 ♀ 48.4 mm; 1 juv. (NHM).

**Maldivé Is.** 15.01.1957, sand, coll. W.W. PHILIPS: 2 ♂ 41.7, 40.8 mm (NHM 1957.6.21).

**Chagos Arch.** Diego Garcia, coll. J.D. TAYLOR: 1 ♂ 33.5 mm (NHM 1969.1170.1).

**India.** Palk Str., Pamban, coll. E. THURSTON: 2 ♀ 46.1, 47.9 mm (NHM 1890.10.20).



- Sri Lanka.** 1 ♂ 32.3 mm (NHM 1894.8.1.14). — Krusadai, 12-16.10.1951, coll. H. LEMCHE: 1 ♂ 51.3 mm (ZM CRU1801).
- Thailand.** N.W. corner of Koh Lon I., 24.02.1966, 5th Thai-Danish Exped.: 1 ♂ 39.6 mm (ZM CRU1805).
- Cocos-Keeling Is.** Coll. J. GRANT: 1 ♂ 41.4 mm; 1 ♀ 35.4 mm (NHM 1926.8.24.1-2).
- Malaysia.** Borneo, Sabah, Bohaydolong, coll. D. GEORGE: 1 ♂ 39.1 mm (NHM 1985:17). — 1 ♂ 39.5 mm; 1 ♀ 30.9 mm (NHM 1985:19).
- Indonesia.** 23 dry specimens (RMNH 43091). — 18 m, "Challenger": 1 ♀ 36.5 mm (NHM 1884:31). — April 1915, coll. P. BUITENDIJK: 1 ♂; 2 ♀ (RMNH 3112). — 1915, coll. P. BUITENDIJK: 1 ♂ 35.3 mm (RMNH 3109). — Natuna Is., coll. SHELFORD: 1 ♀ 36.3 mm (NHM 1900.12.1.25). — February 1922, coll. Th. MORTENSEN: 1 ♂ 34.8 mm (ZM CRU1823).
- Sumatra.* Poeloe Weh, October 1923, coll. P. BUITENDIJK: 1 ♀ (RMNH 3111).
- Java:* 1816-1822, coll. C.G.C. REINWARDT, det. HERKLOTS as *C. (Calappa) Hepatica*, redet. L.B. HOLTHUIS: 12 + 1 *spinosissima* dry specimens (RMNH 43090).
- Komodo I.:* Slawi Bay, 8°34.5'S, 119°31.3'E, sublittoral, 17.09.1984: 1 ♂ 19.0 mm (RMNH).
- Moluccas.* Ambon, coll. E.W.A. LUDEKING: 1 ♀ 28.0 mm (RMNH 3107). — Wahai, coll. E.W.A. LUDEKING: 1 ♀ (RMNH 779). — Banda Is., Lontor, 6.06.1922, on beach at low tide, coll. Th. MORTENSEN: 2 ♂ 23.7 and 29.0 mm; 1 ♀ 39.5 mm (ZM CRU1827). — 7.06.1922, coll. Th. MORTENSEN: 3 ♂ 30.0-34.4 mm; 4 ♀ 19.8-35.1 mm (ZM CRU1826).
- Timor.* Kisar I., N.E. of Timor, 1898, coll. K. SCHADLER, det. L.B. HOLTHUIS: 1 dry specimen (RMNH 43100).
- Irian Jaya.* Sekroe, 1897, coll. K. SCHADLER, det. L.B. HOLTHUIS: 2 dry specimens (RMNH 43089). — Padaido I., Mios Woendi, 1/2 m. SE Oeriv I., 7-10 m, 28.01.1956, det. L.B. HOLTHUIS: 1 dry specimen (RMNH 43097). — Fakfak, 1952-55, coll. S. WOLFF: 1 ♀ 38.2 mm (RMNH 25997). — Kampung Saba, S.E. Biak, 30.03.1952, coll. G. VAN DEN HOEK: 1 ♀ 34.8 mm (RMNH 13002).
- "*Snellius*" EXPED.: Sulawesi, Paleleh, 22.08.1929: 1 ♀ 29.2 mm (RMNH 4215). — Kafal, Misool grp., 3-5.10.1929: 1 ♂ 22.0 mm (RMNH 4218). — Kera, nr Timor, 11-16.11.1929: 1 ♀ 31.8 mm (RMNH 4221); 1 ♀ 30.8 mm (RMNH 4236). — 22-23.11.1929: 2 ♂ 26.3, 18.0 mm; 1 ♀ 28.8 mm (RMNH 4222). — Timor, Koepang, 2.12.1929: 1 ♂ 19.1 mm (RMNH 4224).
- RUMPHIUS EXPED. *Moluccas:* Ambon, Batumerah, littoral, 9.11.1990: 1 ♂ 29.9 mm (RMNH). — Pombo, 15.11.1990, coll. C. VAN EGMOND: 1 ♀ 23.4 mm (RMNH). — Littoral, 21.11.1990: 3 ♀ 24.1-18.8 mm (RMNH). — Ambon, littoral, 2.12.1990: 1 ♂ 31.6 mm; 2 ♀ 36.9, 41.8 mm (RMNH). — Rumahtiga, littoral, 3.12.1990: 2 ♂ 37.5, 35.3 mm (RMNH).
- SULAWESI EXPED.: Bay of Tanjungnanas, 1°28'N, 125°13'E, muddy bay with algae, stones and coral patches, littoral, 12.13.19.10.1994: 2 ♂ 23.3, 26.8 mm (RMNH); — 1°30'N, 125°16'E, sandy bay, 0-5 m, 22.10.1994: 1 ♀ 20.7 mm (RMNH). — Bay S of Pulau Putus, 1°31'N, 125°16'E, rocky shore and sandy beach, 14-27.10.1994: 1 ♀ 21.1 mm (RMNH). — Selat Lembeh, Pulau Lembeh, 1°29'N, 125°15'E, sandy bay, 5-10 m, 21.10.1994: 1 ♂ 15.9 mm (RMNH). — Bay of Tanjung, 1°26'N, 125°11'E, sandy and muddy bay littoral, 23.10.1994: 1 ♂ 13.3 mm (RMNH). — 1°28'N, 125°14'E, sandy beach, 5 m, 31.10.1994: 1 ♂ 34.6 mm (RMNH).
- Papua New Guinea.** Bismarck Is., Manus I., Ndrilo, 15.06.1962, coll. T. WOLFF: 1 ♂ 38.5 mm (ZM CRU1836).
- Philippines.** Mindoro, Puerto Galera, shore, 2.02.1929, coll. Th. MORTENSEN: 2 ♂ 19.5, 30.6 mm; 1 ♀ 23.9 mm (ZM CRU1835). — 20-21.06.1936, coll. G.R. OESCH: 1 ♂ 29.9 mm (AMNH 7722). — Gulf of Davao, Padada Beach, June 1939, coll. G.R. OESCH: 1 ♂ 36.1 mm (AMNH 10385). — July 1940, coll. G.R. OESCH: 1 ♂ 38.2 mm (AMNH 12877); 2 ♂ 27.8, 35.4 mm (AMNH). — Cebu, 1978, coll. V. STORCH, det. L.B. HOLTHUIS: 1 dry specimen (RMNH 43103).
- Caroline Is.** Coll. F.W. CHRISTIAN: 6 ♂ 27.0-40.3 mm; 4 ♀ 20.7-26.6 mm (NHM 1898.11.1.6-11).
- Mariana Is.** Saipan, Garapan, 12.08.1990, coll. A. ALLSPACH: 1 ♂ 47.5 mm (SMF 19499).
- Bonin Is.** 16.06.1913, coll. C.B. CLAUSEN: 2 ♂ 42.3, 45.1 mm (ZM CRU1799).
- Japan.** Kii Peninsula, coll. T. SAKAI: 1 ♂ 35.2 mm (SMF 7632).
- Australia.** Off Clairmont I., coral reef, H.M.S. "Alert": 1 ♂ 38.4 mm (NHM 1882:7). — N.W. Cape, 3.04.1961, coll. R.W. GEORGE: 1 ♀ (RMNH 17383).
- East coast, Queensland:* Thursday I., Torres Str. 15.08.1938, coll. J. McNULTY: 1 ♀ 49.6 mm (QM W12272). — Torres Str., coll. A.C. HADDON: 2 ♀ 39.3, 29.2 mm (NHM 1954.9.14.173-175). — Torres Str. sand bank, 29.07.1974: 2 ♂ 43.1, 43.5 mm (QM W12535). — Pandora Reef, Brooke I., October 1923, coll. H. LONGMAN: 1 ♂ 46.2 mm (QM W12270). — Double I., Reef, off Cairns, coral sand, 27.08.1961, coll. J.H. BARNES: 1 ♂ 39.6 mm; 1 ♀ 36.6 mm (QM W2214). — Barron Beach, Cairns, 19.11.1940, coll. A.A. READ: 1 ♂ 41.4 mm (QM W1170). — Palm I., coll. MACKERRAS: 1 ♀ 40.4 mm (QM W12276). — Garden I., off N. Hinchinbrook I., sandy shore, 16.07.1981, coll. J. JOHNSON: 1 ♀ 37.3 mm (QM W9715). — Hannibal I., coll. A. WATSON: 1 ♂ 46.0 mm; 1 ♀ 31.2 mm (QM W12275). — Magnetic I.: 1 ♀ 44.4 mm (QM W1720). — Cockle Bay, 28.07.1944: 1 ♂ 43.0 mm (QM W12273). — Heron I., lagoon, 15.07.1975: 1 ♀ 22.8 mm (QM W4905). — Tin Can Bay, nr Gympie, 13.02.1952: 1 ♀ 41.1 mm (QM W1834). — Stradbroke I., January 1922: 1 ♀ 44.1 mm (QM W12269). — Myora, N. Stradbroke I., 22-23.04.1969: 1 ♂ 46.4 mm (QM W15934).
- New Zealand.** August 1917, coll. REISCHEK: 1 ♂ 41.2 mm (NMW 10985).



**New Caledonia.** 1 dry specimen (RMNH 43093). — Goro, April 1984: 1 ♂ 43.0 mm (MNHN). — Bourake, 2.09.1985, 1 ♂. — 8.11.1986, intertidal: 1 ♂ 26.9 mm (MNHN). — Coll. B. RICHER DE FORGES: 2 ♀ 27.5, 40.8 mm (MNHN). — Platier de Touaourou, 25.10.1988, coll. P. LABOUTE: 1 ♂ 46.2 mm; 1 ♀ 18.5 mm (MNHN). — Platier de Yate: 1 ♂ 42.8 mm (MNHN).

**Fiji Is.** Suva, Viti Levu, 29.05.1934, "*Monsunen*": 1 ♂ 39.9 mm (ZM CRU1831). — 12 km E of Mbau I., SE Viti Levu, 4.05.1965, coll. T. WOLFF: 1 ♂ 34.0 mm (ZM CRU1837). — Viti I., coll. E. GRAEFFE: 1 juv. (NMW10982).

**Tonga Is.** Tongatapu, reef, H.M.S. "*Challenger*": 1 ♂ 34.3 mm (NHM 1884.31). — Nukualofa, January 1956, tidal zone, coll. S. MIELCHE: 1 ♂ 25.7 mm (ZM CRU1847).

**Samoa Is.** 1 ♂ 48.8 mm (NHM 1875.5). — Upolu, coll. S.J. WHITNEE: 1 ♀ 17.3 mm (NHM 1874.54). — Apia, coll. BURTON & HOPKINS: 1 ♀ 27.9 mm (NHM 1931.5.26.22). — Viti I., coll. E. GRAEFFE: 1 juv. (NMW 10982).

**French Polynesia.** *Society Is:* Tahiti, July-September 1909, coll. H.E. CRAMPTON: 2 ♀ 35.1, 38.6 mm (AMNH 3411). — Tahiti, 17°40'S, 149°20'W, February-March 1994, coll. & det. J. POUPIN: 1 ♂ 26.7 mm (MNHN). — Tahaa, Tapuamu Bay, 14.09.1994, coll. & det. J. POUPIN: 1 ♂ 31.8 mm (MNHN). — *Tuamotu Is:* Takaroa I., coral reef, 16.03.1934, "*Monsunen*": 1 ♂ 41.7 mm; 2 ♀ 41.5, 44.4 mm (ZM CRU1815). — South Marutea, 9.11.1965: 1 ♂ 20.0 mm (MNHN). — Gambier Is, coll. Y. PLESSIS, det. J. POUPIN: 2 ♂ 35.0, 39.0 mm (MNHN). — Mururoa, 1966: 1 ♂ 31.9 mm (MNHN). — Mururoa, 1993, coll. BABLET, det. J. POUPIN: 1 ♂ 41.8 mm (MNHN). — *Marquesas Is:* Nuku Hiva, 8°48.8'S, 140°05'W, 52 m, 24.01.1991, coll. J. POUPIN: 1 ♂ 27.3 mm (MNHN).

**Line Is.** Tabuaeran atoll, Fanning I., Inner Lagoon, 16.12.1913, coll. F. BAKER: 1 ♂ 28.4 mm (USNM 50513).

**Hawaii.** Ohau I., 1925, coll. A.E. VERRILL: 2 ♂ (post moult) (AMNH 5744). — 5 ♂ (USNM 2307). — Honolulu, "*Challenger*": 1 ♀ 43.5 mm (NHM 1884.31). — 1 ♀ 42.4 mm (NHM 1883.22). — Hilo, rockpool, 7.04.1915, coll. Th. MORTENSEN: 1 ♂ 43.8 mm (ZM CRU1832). — Honolulu, 1915, coll. Th. MORTENSEN: 4 ♀ 39.7-40.1 mm (ZM CRU1812).

**Clipperton I.** 1966, coll. CHUITON: 1 ♂ 28.9 mm (MNHN-B 16319).

**DESCRIPTION.** — Carapace convex, 1.6-1.7 wide as long. Surface with rounded granulate tubercles on gastrocardial, hepatic and branchial regions; posteriorly granules set in transverse, setiferous rows, rows increasing in length laterally. Front small, triangulate, apically emarginate. Basal antennal article spatulate, anterior margin slightly concave, peduncle emerging from median process. Afferent branchial canal ending below orbit in rounded process. Endostomial septum visible with first maxillipeds closed, with rounded anterior margin. First maxillipeds with triangular notch on anterior margin. Anterolateral margin crenulate, irregularly dentate, setose. Clypeiform expansions markedly developed. Posterolateral margin setose, with four marginally beaded triangular teeth followed by three denticles. Posterior margin slightly convex, beaded, setose. Merus of cheliped distally with quadrilobate lamina, two distal lobes acuminate. Crest of larger chela with seven teeth, proximalmost bicuspidate. External surface of chela unevenly granulate, obliquely traversed medially by three tubercles. Two unevenly granulate rows running subparallel to lower margin from proximal ram-like tooth to base of pollex. External beaded row on lower margin running entire length of chela, internal row only distal half. Internal surface of chela unevenly granulate inferiorly, with beaded file parallel to lower margin. First male pleopod stout, curved distad, tapering apically to narrow spinulate tip; second pleopod slender, slightly curved, tip spatulate.

**Color.** — "Hellgrau oder gelb bis olivengrün, mit violetten Flecken, Strichen und Punkten. Der hintere Teil des Rückenschildes und die aussere Fläche der Scherenfüsse rot genetzt. Füsse und Unterfläche des Körpers mehr violett" (KLUNZINGER, 1906). "Varies from very pale olive green, almost white, to a full olive grey or olive yellow" (TWEEDIE, 1950). A color photograph provided by MIYAKE (1983, pl. 7 fig. 3).

**REMARKS.** — LINNAEUS' (1758: 630) preliminary account of *Cancer hepaticus* was unduly brief: "thorace verrucoso gibbo semiorbiculato: margine serrato". This was rectified (LINNAEUS, 1764: 448), and as HERBST's (1785) description of *Cancer tuberculatus* included a fine drawing (pl. 13 fig. 78), many authors were inclined to follow him.

H. MILNE EDWARDS (1837) described *C. spinosissima* as resembling *C. tuberculata* [*C. hepatica*] but "armée sur les bords d'une série de dents spiniformes très pointues et relevées... Trois épines semblables et très aiguës sur la face externe des mains.". HILGENDORF (1869) remarked that though *C. tuberculata* [*C. hepatica*] "variirt sie nur wenig. Eine geringe Verschiedenheit zeigte sich in der Ausbildung der Zähne des vorderen Theiles des Seitenrandes". HOFFMANN (1874) noted: "En comparant les extrêmes on pourrait être tenté de les considérer comme deux espèces, mais nous avons devant nous tous les degrés intermédiaires". BUITENDIJK (1939: 231) too, found intermediate specimens with some spiniform teeth indistinct or missing. ALCOCK (1896) concluded that "it is



impossible to express any opinion as to whether this species [*C. spinosissima*] is... a variety of *C. hepatica*, or not". An examination of series of specimens covering the whole distributional range of *C. hepatica* revealed it to be but one species.

DISTRIBUTION (fig. 31). — From the Red Sea to Clipperton Island; on sandy, muddy or gravelly bottoms, intertidal to 100 m.

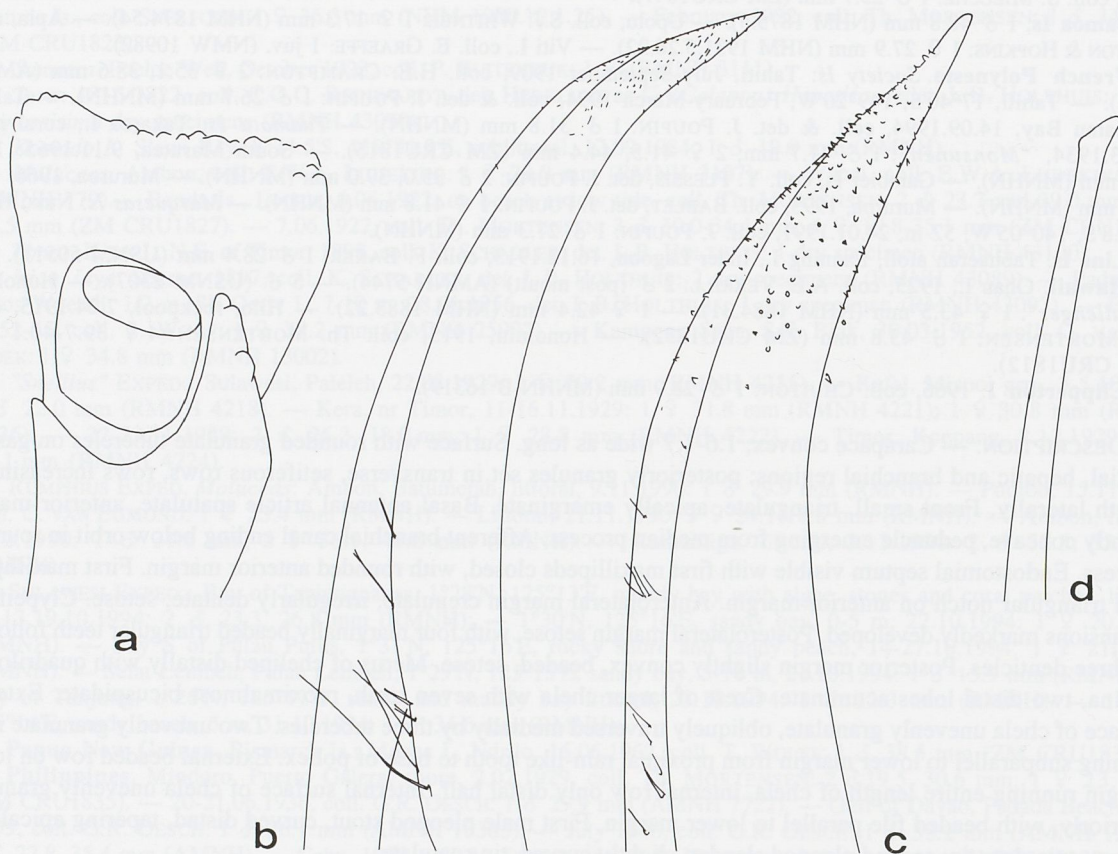


FIG. 14. — *Calappa hepatica* (Linnaeus, 1758), ♂ 39.6 mm, Madagascar, Île Sainte Marie, intertidal (MNHN): a, first article of antenna; b-c, first pleopod male with enlargement of distal part; d, second pleopod male, enlargement of distal part.

*Calappa japonica* Ortmann, 1892

Fig. 10 d, 13 d, 15, 32.

*Calappa japonica* Ortmann, 1892: 566, pl. 26 fig. 8. — PARISI, 1914: 287, pl. 11. — IHLE, 1918: 301, 308 (list). — BALSS, 1922: 123. — SAKAI, 1936: 46, text-fig. 9; 1937: 96, pl. 18 fig. 4; 1956: 8; 1965: 57, pl. 23 fig. 1; 1976: 133, pl. 40 fig. 2. — BARNARD, 1947: 372; 1950: 352, figs 66n-p. — UCHIDA, 1949: 723, fig. 2093. — UTINOMI, 1956: 71, pl. 36 fig. 1. — GRINDLEY, 1961: 132. — GUINOT, 1967: 245 (list). — SERÈNE, 1968: 40 (list). — CAMPBELL, 1971: 31. — SANKARANKUTTY & SUBRAMANIAN, 1976: 21. — MATSUZAWA, 1977, pl. 91 fig. 3. — SHIRAI, 1980: 415. — TAKEDA, 1982: 107, fig. 313. — MIYAKE, 1983: 20, pl. 7 fig. 5. — YAMAGUCHI & HOLTHUIS, 1993: 664, figs 76-78.

*Calappa exanthematosa* Alcock & Anderson, 1894: 177; 1895 pl. 15 figs 1, 1a. — ALCOCK, 1896: 146; 1899: 21. — SERÈNE, 1968: 41 (list).

*Calappa granulata* - DE HAAN, 1837: 70. [Non Linnaeus, 1758].



*Calappa flammea* - BARNARD, 1926: 120. [Non Herbst, 1794].

*Calappa frammea* - LIN, 1949: 13 (list) [erroneous spelling]. [Non Herbst, 1794].

*Calappa* cf. *pustulosa* - TÜRKAY, 1986: 150, pl. 1 fig. 4-5.

**MATERIAL EXAMINED.** — **Indian Ocean.** Bay of Bengal, 1 ♂ 58.4 mm (NHM 1896.9.8.8), syntype of *Calappa exanthematosa*.

**Red Sea.** Ras el Aswad-Jeddah, "Valdivia", stn 238, 21°22'N, 39°04'E, 383-363 m, 17.04.1979: 3 juvs (SMF 13592).

**Kenya.** Mombasa, 1974, coll. A.J. BRUCE: 1 ♂ 84.2 mm (RMNH 30335).

**South Africa.** Algoa Bay, between Bushman river & Bird I., 1905: 1 ♀ 83.2 mm (SAM 724). — Kentani coast, February 1952: 1 ♂ 77.1 mm (SAM 8495).

**Pakistan.** Mekran, 24°50'N, 61°52'E, mud, 135-148 m, 27.10.1963, coll. P. HANSEN: 1 ♂ 40.1 mm (ZM CRU1846).

**Australia.** Off Cape Moreton, March 1966, 128 m, coll. B. BEUTEL: 1 ♂ 102.8 mm (QM W2414).

**Japan.** Nagasaki, May 1909, coll. J. JORDAN: 1 ♂ 93.9 mm (ZM CRU1797). — Misaki, May 1914, coll. Th. MORTENSEN: 1 ♀ 10.7 mm (ZM CRU1794).

**DESCRIPTION.** — Carapace oval, 1.35 wide as long, markedly convex, inflated branchial region separated by furrow from gastrocardial region. Surface minutely granulate, branchial ridges indistinct, anteriorly with large flattened tubercles, granules above posterior margin. Front only slightly projecting, with two rounded teeth separated by wide sulcus. Anterior margin of basal antennal article bicuspidate, peduncle emerging from distal angle. Afferent branchial canal ending below orbit in granulate tridentate process. Endostomial septum invisible with first maxillipeds closed, with straight anterior margin. Distal margin of first maxillipeds nearly straight, with acute anterointernal angle. Anterolateral margin cristate, unevenly tuberculate, tubercles larger posteriorly. Clypeiform expansion with eight granulate, laciniate teeth. Posterior margin beaded. Merus of cheliped distally with quadridentate crest. Crest of larger chela cut into seven teeth increasing in size distally. External surface of chela minutely granulate, obliquely traversed by row of flattened tubercles; closely beaded inferiorly. Tooth proximally near lower margin small, tuberculate. Lower margin wide, with several unevenly granulate rows. First male pleopod stout, slightly curved, tapering, distally spinulate; second pleopod curved, distally crook-like.

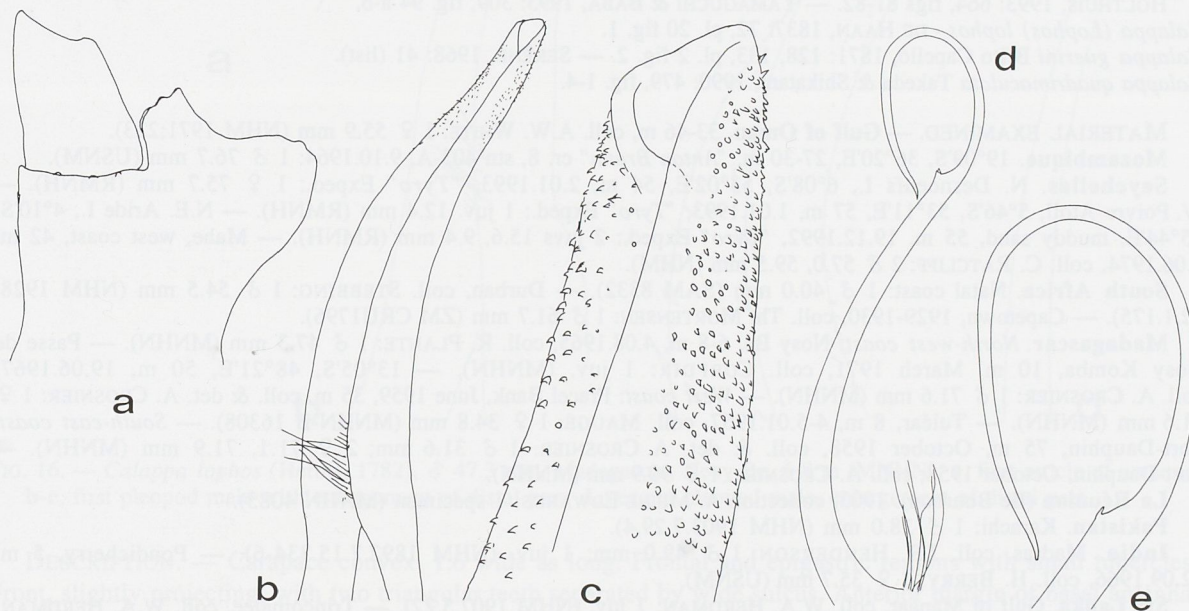


FIG. 15. — *Calappa japonica* Ortmann, 1892, ♂ 58.4 mm, Bay of Bengal, syntype of *C. exanthematosa* (NHM 1896.9.8.8): a, first article of antenna; b-c, first pleopod male with enlargement of distal part; d-e, second pleopod male with enlargement of distal part.



*Color.* — "Anterior half [of carapace] is covered with numerous large smooth tubercles, which by their colouration (red base and shining yellow apex) exactly resemble ripe small-pox postules" (ALCOCK & ANDERSON, 1894). Color photographs in MATSUZAWA (1977), MIYAKE (1983).

*REMARKS.* — *C. japonica* was compared by ORTMANN (1892) and PARISI (1914) to *C. granulata* and *C. flammea*. PARISI (1914) found it "facilmente distinguibile da tutte e due". *C. japonica* is notable for its carapace size and coloration.

*DISTRIBUTION* (fig. 32). — East Africa to Japan and New Caledonia. On sandy or shelly bottom, 30-380 m.

### *Calappa lophos* (Herbst, 1782)

Fig. 16, 17 a, 20 a, 32, 35 c

*Cancer lophos* Herbst, 1782: 201, pl.13, fig. 77.

*Calappa lophos* - FABRICIUS, 1798: 346. — BOSCH, 1802: 184; 1830: 214. — LATREILLE, 1803: 393; 1829: 139. — H. MILNE EDWARDS, 1837: 104. — WHITE, 1847: 45. — GIBBES, 1850: 183. — HERKLOTS, 1861: 25. — HELLER, 1865: 69. — MIERS, 1880: 315; 1886: 286. — NAUCK, 1880: 46. — DE MAN, 1888a: 389. — WALKER, 1887: 111. — WHITELEGGE, 1889: 231. — ORTMANN, 1892: 565 (key). — HENDERSON, 1893: 395. — ALCOCK & ANDERSON, 1895: 203. — ALCOCK, 1896: 144. — DOFLEIN, 1902: 654; 1904: 35. — LAURIE, 1906: 353. — RATHBUN, 1910: 15; 1923: 137. — PARISI, 1914: 283. — IHLE, 1918: 182. — BALSS, 1922: 123; 1935: 116. — MONOD, 1928: 124, fig. 13a. — ANDRÉ, 1931: 640. — CHOPRA, 1933: 28. — SAKAI, 1934: 284; 1936: 44, text-fig. 6a; 1937: 90, pl. 12 fig. 1; 1956: 8; 1960: 33, pl. 16 fig. 5; 1965: 56, pl. 22 figs 2-3; 1976: 129, pl. 37 fig. 1, pl. 38 fig. 2. — SHEN, 1936: 64. — SERÈNE, 1937: 78; 1968: 41 (list). — BUITENDIJK, 1939: 231, (part). — STEPHENSEN, 1945: 65, figs 5a-b. — BARNARD, 1947: 372; 1950: 351, fig. 66 j-m. — SUVATTI, 1947: 56. — LIN, 1949: 13. — PILLAI, 1951: 8. — DAWYDOFF, 1952: 139. — UTINOMI, 1956: 70, pl. 35 fig. 5. — CHHAPGAR, 1957: 404, pl. 1. — TYNDALE-BISCOE & GEORGE, 1962: 70. — GUINOT, 1967: 245 (list). — KENSLEY, 1969: 151 (list). — KIM, 1970: 11. — HOLTHUIS & SAKAI, 1970: 117, pl. 9. — GRIFFIN, 1972: 64. — MATSUZAWA, 1977, pl. 91 fig.2. — SHIRAI, 1980: 415. — TAKEDA, 1982: 105, fig. 309. — MIYAKE, 1983: 19, pl. 7 fig. 3. — DAI *et al.*, 1986: 91, fig. 49, pl. 11 fig. 4. — DAI & YANG, 1991: 103, fig. 49, pl. 11 fig. 4. — TIRMIZI & KASMI, 1991: 54, fig. 16. — CHEN, 1993: 680, fig. 3. — YAMAGUCHI & HOLTHUIS, 1993: 664, figs 81-82. — YAMAGUCHI & BABA, 1993: 309, fig. 94 a-b.

*Calappa (Lophos) lophos* - DE HAAN, 1837: 72, pl. 20 fig. 1.

*Calappa guerini* Brito Capello, 1871: 128, 133, pl. 2 fig. 2. — SERÈNE, 1968: 41 (list).

*Calappa quadrimaculata* Takeda & Shikatani, 1990: 479, fig. 1-4.

*MATERIAL EXAMINED.* — **Gulf of Oman.** 33-46 m, coll. A.W. WHITE: 1 ♀ 55.9 mm (NHM 1971:223).

**Mozambique.** 19°09'S, 36°20'E, 27-30 m, "Anton Bruun" cr. 8, stn 403-A, 9.10.1964: 1 ♂ 76.7 mm (USNM).

**Seychelles.** N. Desnoeufs I., 6°08'S, 53°02'E, 54 m, 2.01.1993, "Tyro" Exped.: 1 ♀ 75.7 mm (RMNH). — W. Poivre Atoll, 5°46'S, 53°11'E, 57 m, 1.01.1993, "Tyro" Exped.: 1 juv. 12.4 mm (RMNH). — N.E. Aride I., 4°10'S, 55°44'E, muddy sand, 55 m, 19.12.1992, "Tyro" Exped.: 2 juvs 15.6, 9.4 mm (RMNH). — Mahe, west coast, 42 m, 6.06.1974, coll. C. RATCLIFF: 2 ♂ 57.0, 59.5 mm (NHM).

**South Africa.** Natal coast: 1 ♂ 40.0 mm (SAM 8332). — Durban, coll. STEBBING: 1 ♂ 54.5 mm (NHM 1928.12.1.175). — Capetown, 1929-1930, coll. Th. MORTENSEN: 1 ♂ 61.7 mm (ZM CRU1796).

**Madagascar.** *North-west coast:* Nosy Be, 6-8 m, 4.08.1965, coll. R. PLANTE: 1 ♂ 47.3 mm (MNHN). — *Passe de Nosy Komba,* 10 m, March 1971, coll. CORFDIR: 1 juv. (MNHN). — 13°05'S, 48°21'E, 50 m, 19.06.1967, coll. A. CROSNIER: 1 ♂ 71.6 mm (MNHN). — *West coast:* Pracel Bank, June 1959, 35 m, coll. & det. A. CROSNIER: 1 ♀ 71.6 mm (MNHN). — Tuléar, 8 m, 4-5.01.1967, coll. MAUGÉ: 1 ♀ 34.8 mm (MNHN-B 16308). — *South-east coast:* Fort-Dauphin, 75 m, October 1958, coll. & det. A. CROSNIER: 1 ♂ 31.6 mm; 2 ♀ 71.1, 71.9 mm (MNHN). — Fort-Dauphin, October 1958, coll. A. CROSNIER: 1 ♀ 90.9 mm (MNHN).

**La Réunion (Ile Bourbon).** 1903, collection A. MILNE EDWARDS: 1 specimen (MNHN 4085).

**Pakistan.** Karachi: 1 ♂ 38.0 mm (NHM 1903.7.29.4).

**India.** Madras, coll. J.R. HENDERSON: 1 ♂ 49.0 mm; 1 juv. (NHM 1892.7.15.334-6). — Pondicherry, 5 m, 22.09.1966, coll. H. BERRY: 1 ♀ 35.7 mm (USNM).

**Sri Lanka.** Gulf of Manaar, coll. W.A. HERDMAN: 1 juv. (NHM 1907.5.22). — Trincomalee, coll. W.A. HERDMAN: 1 juv. (NHM 1934.1.16.9).

"**Archipel Indien**". 1 ♂ 42.2 mm; 1 ♀ 49.7 mm (MNHN-B 58).

"**Mer des Indes**". 1 ♀ 86.1 mm (MNHN-B 59).

**Coast of China.** Det. HERKLOTS as *C. (Lophos) Lophos*: 1 dry specimen (RMNH 43111).



**Japan.** 1 ♂ 77.3 mm (NHM 1894.7.8.9). — 1824-1834, colls P.F. VON SIEBOLD & H. BURGER, det. P.F. VON SIEBOLD: 6 dry specimens (RMNH 43107). — 1824-1829, coll. & det. P.F. VON SIEBOLD: 7 dry specimens (RMNH 43108). — 1826-1833, coll. H. BURGER, det. HERKLOTS as *C. (Lophos) Lophos*: 1 dry specimen (RMNH 43109). — 1823-1835, colls P.F. VON SIEBOLD & H. BURGER: 1 ♂ 65 mm; 84 juvs (RMNH 768). — Nagasaki, 1.07.1911, coll. J. JORDAN: 5 ♀ 31.8-61.7 mm (ZM CRU1798). — Shikoku I., Misaki, May 1914, coll. Th. MORTENSEN: 1 ♂ 46.9 mm (ZM CRU1795). — 1930, id. M.J. RATHBUN: 1 ♂ 35.9 mm; 1 ♀ 31.5 mm (USNM 63678). — Sagami Bay, coll. SAKAI: 1 ♂ 31.6 mm (NHM 1961.6.5.27). — Shikoku I., Kochi, 17.05.1979, colls H. SUZUKI & L.B. HOLTHUIS: 4 ♂ 22.3-42.1 mm; 1 ♀ 55.1 mm (RMNH 32772). — Saga, 10-20 m, 29.10.1979: 3 juvs (SMF).

**Taiwan.** Taichi, NE Taiwan, 3-4.08.1996, coll. P.K.L. NG: 1 juv; 29.0 mm; 1 ♂ 32.4 mm (NUS).

**Indonesia.** *Sumatra*: Poeloe Weh, January 1929, coll. P. BUITENDIJK: 1 ♀ 24.3 mm (RMNH 3116). — Poeloe Weh, 1930, coll. P. BUITENDIJK: 1 ♀ 18.1 mm (RMNH 3117). — Belawan, 1926, coll. P. BUITENDIJK: 1 ♂ 22.2 mm (RMNH 3203). — *Java*: 1839, coll. S. MULLER: 1 ♀ (RMNH 767). — *Timor*: Koepang Bay, 6-15 m, 4.12.1929, coll. P. BUITENDIJK: 1 juv. (RMNH 4239). — *Sulawesi*: Macassar, 1 ♂ 31.0 mm (NHM 1880.6). — *Moluccas*: 1821-1822, coll. C.G.C. REINWARDT, det. HERKLOTS as *C. (Lophos) Lophos*: 1 dry specimen (RMNH 43114). — Amboina, 1864, coll. E.W.A. LUDEKING: 1 ♀ ovig. 37.1 mm (RMNH 766).

**Australia.** Mission Beach, NE Qld. 17°53.7'S, 146°51.2'E, "Solea", 140-142 m, 20.01.1986: 2 ♂ 35.0 and 31.5 mm; 1 juv. (QM W16980).

**Chesterfield Is.** CORAIL 2: stn 53, 19°17.19'S, 158°36.26'E, 67-68 m, 24.08.1988, coll. B. RICHER DE FORGES: 1 ♀ 91.8 mm (MNHN).

**New Caledonia.** LAGON: stn 745, 22°13.6'S, 167°02.8'E, 78-80 m, 13.08.1986, coll. B. RICHER DE FORGES: 1 juv. (MNHN). — Stn 241, 22°22'S, 167°02'E, 35 m, Ouen I., Prony Bay, coll. B. RICHER DE FORGES: 1 ♀ 31.6 mm (MNHN).

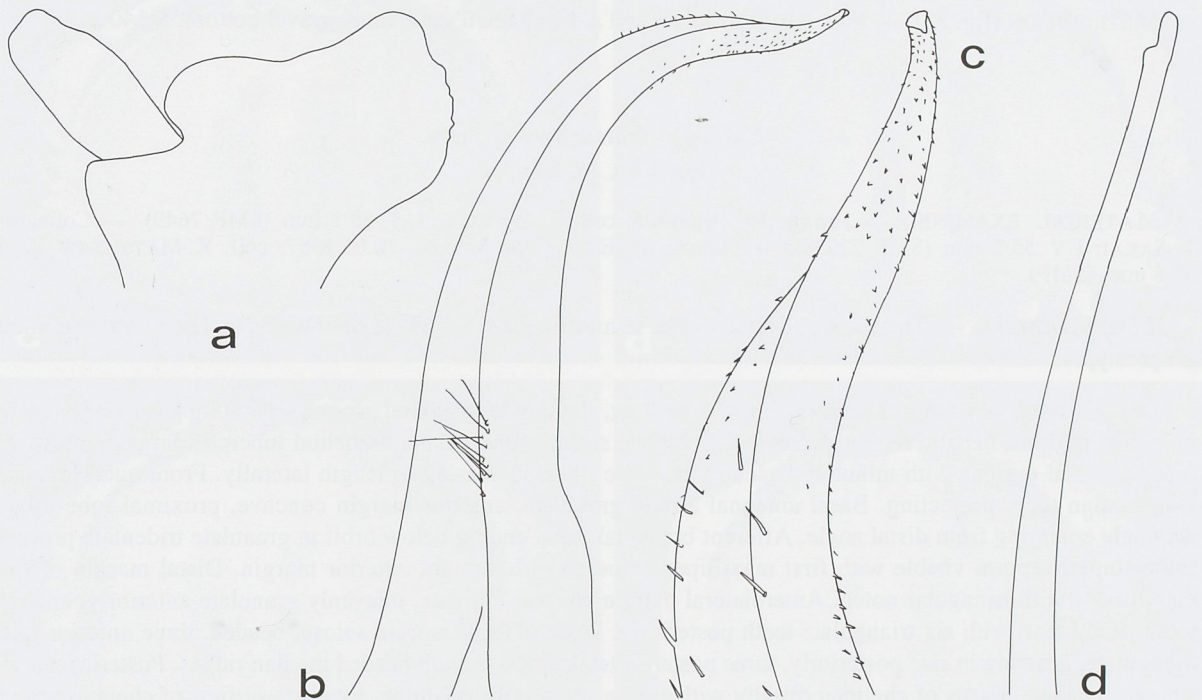


FIG. 16. — *Calappa lophos* (Herbst, 1782), ♂ 47.3 mm, Madagascar, Nosy Be, 6-8 m (MNHN): a, first article of antenna; b-c, first pleopod male with enlargement of distal part; d, second pleopod male, enlargement of distal part.

**DESCRIPTION.** — Carapace convex, 1.6 wide as long. Frontal and epigastric regions with small tubercles. Front, slightly projecting, with two triangular teeth separated by wide sulcus. Anterior margin of basal antennal article concave, proximal lobe dilate, peduncle emerging from distal angle. Afferent branchial canal ending below orbit in granulate tridentate process. Endostomial septum visible with first maxillipeds closed, with slightly rounded anterior margin. Distal margin of first maxillipeds straight. Branchial ridges, prominent in young, indistinct, anteriorly with flattened tubercles. Anterolateral margin carinate, unevenly granulate. Posterolateral margin



with four marginally beaded lacinate teeth, distalmost largest, and three granulate teeth. Posterior margin beaded. Merus of cheliped distally with quadrilobate lamina, two distalmost lobes acuminate. External surface of chela minutely granulate, few flattened tubercles below crest. Crest of larger chela cut into seven teeth increasing in size distally. Unevenly granulate ridge running subparallel to lower margin, from proximal ramlike tooth to base of fixed finger. Lower margin narrow, two beaded files contiguous distally. First male pleopod stout, markedly curved distad, tapering apically to narrow spinulate tip; second pleopod slender, slightly curved, tip short, digitate.

*Color.* — "In the juvenile form, the carapace is traversed by longitudinal stripes of reddish brown and also marked with a pair of large ocelli, one on each epibranchial region" (SAKAI, 1937). "*C. lophos* is a beautifully coloured species. The overall colour is pinkish with very small red specks; red ocelli arranged in curved lines are present along the anterolateral margin of the carapace scattered red ocelli are present in the middle of the carapace, wide transverse lines of red colour are found on the grooves separating the teeth of the clypeiform expansions and on the chelipeds. The fingers of chelipeds are yellowish." (TIRMIZI & KASMI, 1991). Color photographs in MATSUZAWA (1977), MIYAKE (1983).

REMARKS. — HERBST's (1782) description and drawing being very clear, there has never been any confusion over the identity of this handsome species. However when TAKEDA and SHIKATANI (1990) distinguished *C. quadrimaculata* from *C. lophos* "by the proportional difference of the carapace and the morphological difference of the posterior lobes of the carapace" they described features typical to young *C. lophos* specimens.

DISTRIBUTION (fig. 32). — East Africa to Japan and Australia. On sand, mud, gravel bottom, 5-140 m.

*Calappa matsuzawa* sp. nov.

Fig. 17 b, 18, 20 b, 32

MATERIAL EXAMINED. — **Japan.** Kii Peninsula, coll. T. WATABE: 1 ♂ 38.1 mm (SMF 7649). — Collection T. SAKAI: 1 ♀ 55.2 mm (SMF 22938). — Shikoku I., E. of Cape Muroto, 10.05.1987, coll. K. MATSUZAWA: 1 ♀ 57.6 mm (SMF).

TYPE MATERIAL. — The male collected at Kii Peninsula (SMF 7649) is the holotype. The other specimens are paratypes.

DESCRIPTION. — Carapace convex, 1.3 wide as long, shallow longitudinal groove separating gastrocervical from branchial regions, hepatic region depressed. Carapace surface tuberculate, branchial tubercles largest, intestinal, metabranchial regions with minutely beaded transverse lines, increasing in length laterally. Front quadridentate, two median teeth projecting. Basal antennal article granulate, anterior margin concave, proximal lobe dilate, peduncle emerging from distal angle. Afferent branchial canal ending below orbit in granulate tridentate process. Endostomial septum visible with first maxillipeds closed, with straight anterior margin. Distal margin of first maxillipeds with triangular notch. Anterolateral margin arcuate, carinate, unevenly granulate anteriorly, anterior tooth prominent, with six triangulate teeth posteriorly. Posterolateral margin setose, beaded, three anterior teeth triangulate, growing in size posteriorly, three posterior teeth shallow, with beaded median ridges. Posterior margin sinuous, beaded. Merus of cheliped distally with setose, quadrilobate lamina. External surface of chela inferiorly granulose, obliquely traversed by three rows of minutely granulate tubercles, largest tubercles just below crest. Crest of larger chela cut into seven teeth increasing in size distally, proximalmost bicuspidate. Lower margin closely beaded from proximal lamellar tooth to pollex.

ETYMOLOGY. — Celebrating the 70th birthday of Mr Keisuke MATSUZAWA, who kindly supplied me with one of the paratypes.

REMARKS. — *C. matsuzawa* is related to the "*gallus*" group, most closely to *C. undulata*. However, the two species are readily distinguished by the rugose carapace and quadridentate front in *C. matsuzawa* as compared with the smoother carapace and bidentate front of *C. undulata*.



DISTRIBUTION (fig. 32). — Known only from Japan. Depth unknown.

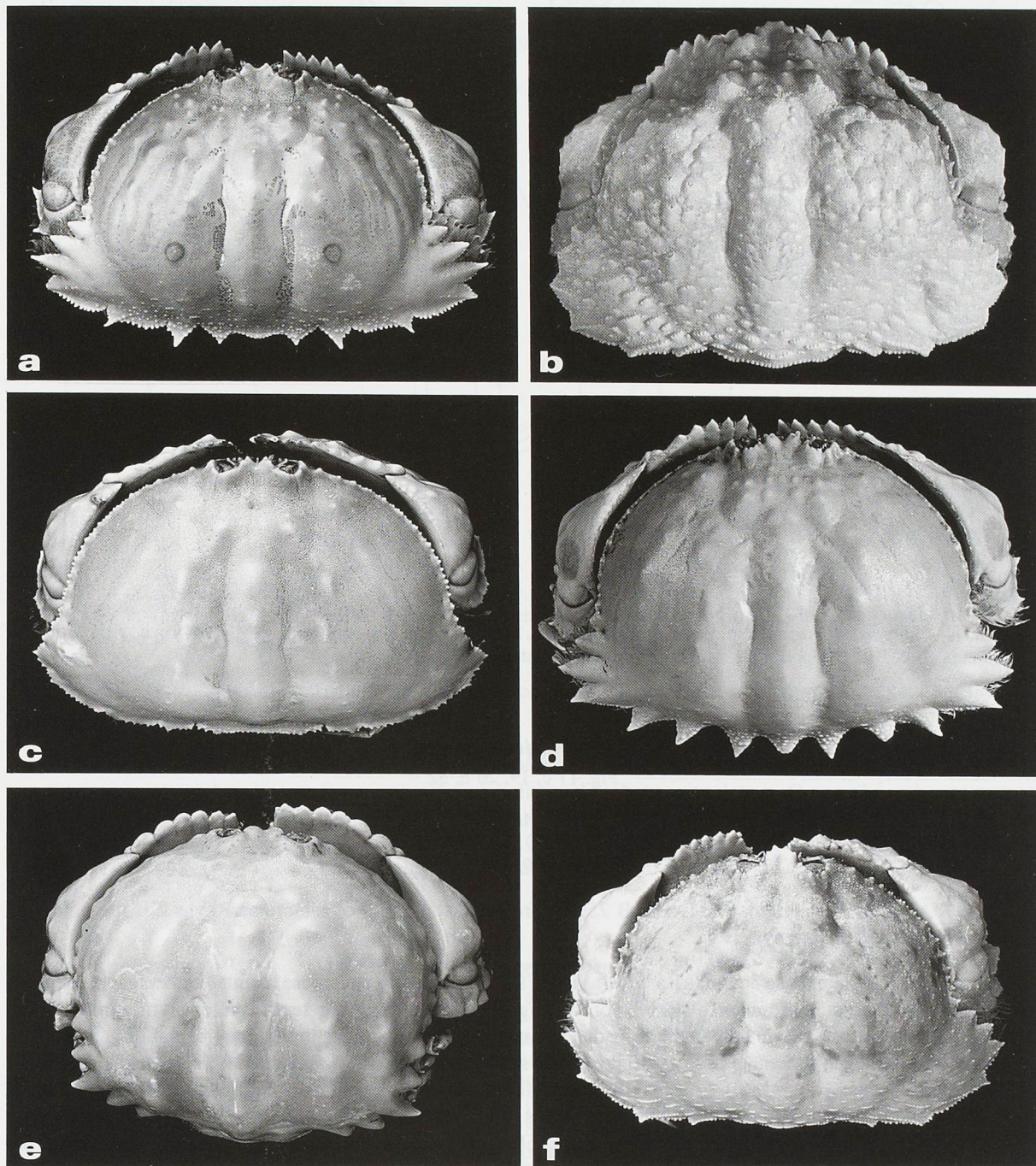


FIG. 17. — Whole crab, dorsal view: **a**, *Calappa lophos* (Herbst, 1782), ♂ 47.3 mm, Madagascar, Nosy Be, 6-8 m (MNHN). — **b**, *Calappa matsuzawa* sp. nov., ♂ paratype, 55.2 mm, Japan (SMF 22938). — **c**, *Calappa monilicanthus* sp. nov., ♂ holotype, 53.7 mm, Seychelles, "REVES 2" stn 45, 4°12.3'S, 55°59.6'E, 60-65 m (MNHN-B 25693). — **d**, *Calappa philargius* (Linnaeus, 1758), ♂ 55.5 mm, Australia, Cape Morton, 119 m (QM W3325). — **e**, *Calappa pustulosa* Alcock, 1896, ♀ 50.8 mm, Vietnam, Nha Trang Bay (MNHN-B 13464). — **f**, *Calappa sebastieni* sp. nov., ♂ holotype, 66.1 mm, Marquesas Is., stn 288, 9°20.5'S, 140°02'W, 120 m (MNHN-B 25690).



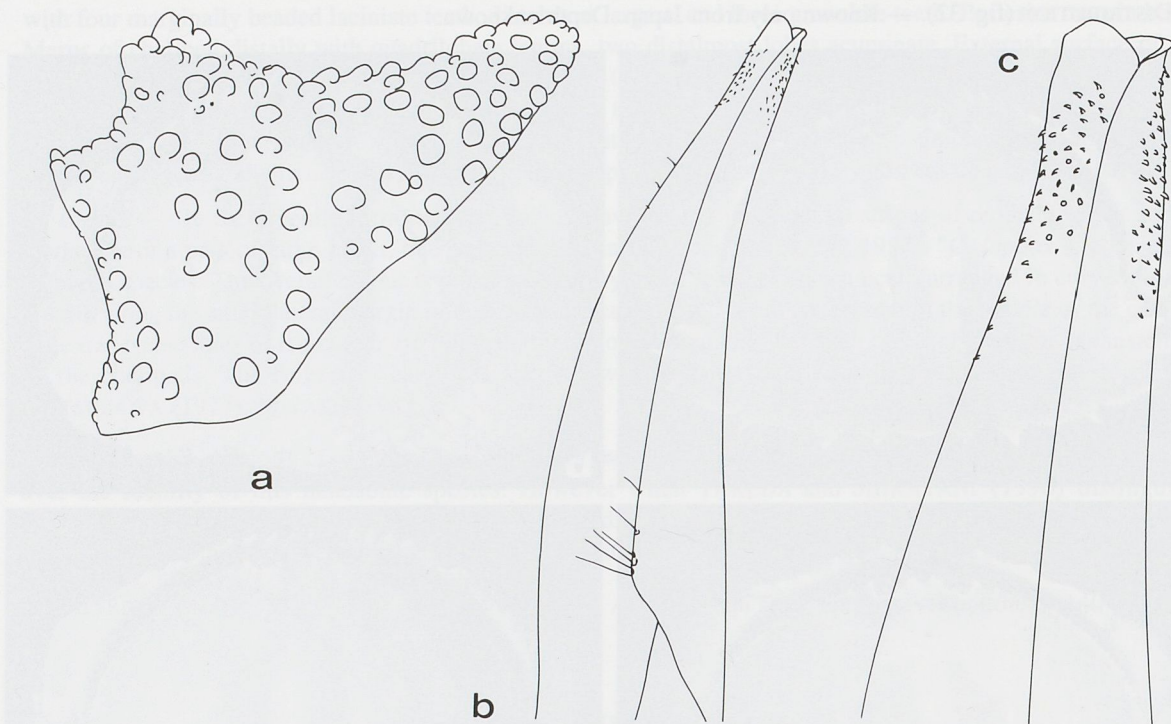


FIG. 18. — *Calappa matsuzawa* sp. nov., ♂ holotype, 38.1 mm, Japan, Kii peninsula (SMF 7649): a, first article of antenna; b-c, first pleopod male with enlargement of distal part.

*Calappa monilicanthus* sp. nov.

Fig. 17 c, 19, 20 c, 32

MATERIAL EXAMINED. — Seychelles. REVES 2 (E. MARCHAL coll.): stn 5, 5°04.4'S, 56°23.8'E, 33 m, 4.09.1980: 1 ♀ 61.7 mm (MNHN-B 25694). — Stn 45, 4°12.3'S, 55°59.6'E, 60-65 m, 14.09.1980: 1 ♂ 53.7 mm (MNHN-B 25693). — Stn 64, 50 m, 20.09.1980: 1 ♀ 61.2 mm (MNHN-B 25695).

TYPE MATERIAL. — The male (MNHN-B 25693) from the station 45 of the cruise REVES 2 is the holotype. The other specimens are paratypes.

DESCRIPTION. — Carapace convex, 1.5 wide as long, surface minutely squamose, frontal and epigastric regions more densely granulate. Front only slightly projecting, with two triangular teeth. Anterior margin of basal antennal article concave, proximal lobe dilate, peduncle emerging from distal angle. Afferent branchial canal ending below orbit in granulate tridentate process. Endostomial septum visible with first maxillipeds closed, with straight anterior margin. Distal margin of first maxillipeds obliquely cut, anterointerior angle acute. Branchial ridges indistinguished, anteriorly with few flattened lumps. Anterolateral margin carinate, unevenly granulate. Posterolateral margin lamellar, granulate, indistinctly lobate. Posterior margin sinuous, granular, separated from posterolateral margin by deep sulcus. Merus of cheliped distally with quadrilobate lamina. External surface of chela minutely granulate, few flattened tubercles below crest. Crest of larger chela cut into seven teeth increasing in size distally, proximalmost bicuspidate. Unevenly granulate ridge running subparallel to lower margin, from small proximal lamellar tooth to base of fixed finger. Lower margin narrow, two beaded files contiguous distally. First male pleopod curved distad, tapering apically to narrow spinulate tip; second pleopod slender, slightly curved, tip short, digitate.



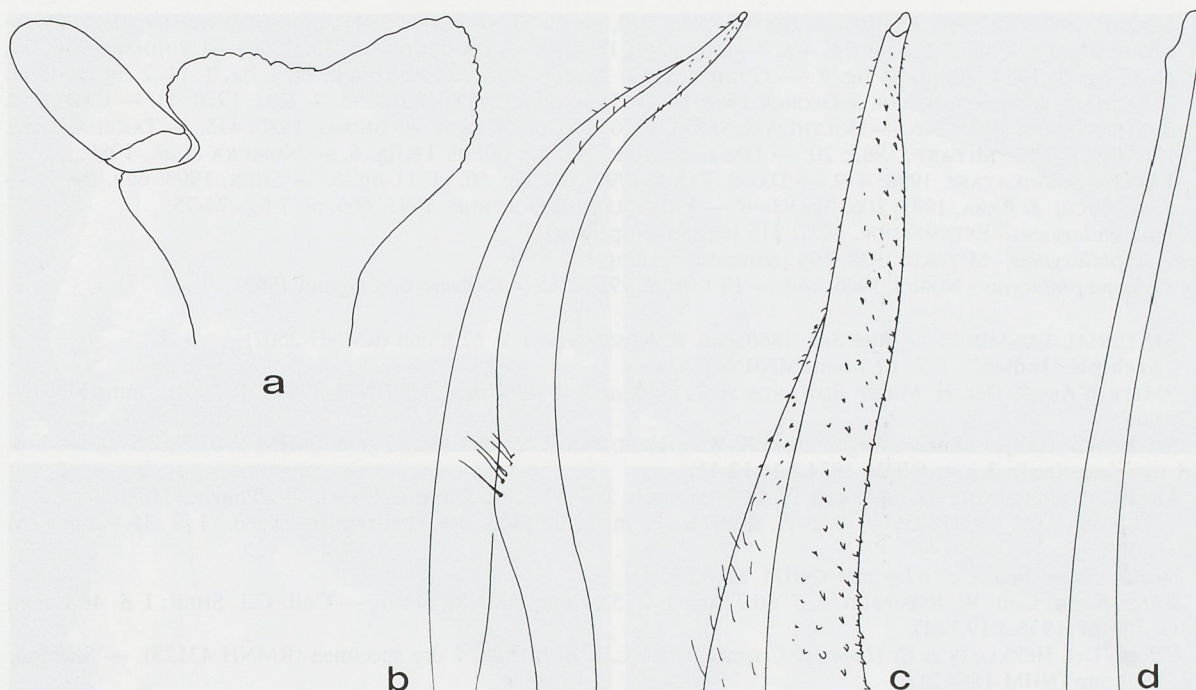


FIG. 19. — *Calappa monilicanthus* sp. nov., ♂ holotype, 53.7 mm, Seychelles, "REVES 2", stn 45, 4°12.3'S, 55°59.6'E, 60-65 m (MNHN-B 25693): a, first article of antenna; b-c, first pleopod male with enlargement of distal part; d, second pleopod male, enlargement of distal part.

ETYMOLOGY. — From the Latin, *monile* = necklace, string of beads and *canthus* = rim, edge; after the beaded margins.

REMARKS. — *C. monilicanthus* is related to *C. lophos*. However, the two are readily distinguished by the form of the posterolateral and posterior margins, being indistinctly lobate, granulate in *C. monilicanthus* as compared with the prominently lacinate margins of *C. lophos*.

DISTRIBUTION (fig. 32). — Known only from the Seychelles, at 33-65 m.

### *Calappa philargius* (Linnaeus, 1758)

Fig. 17 d, 20 d, 21, 33

*Cancer philargius* Linnaeus, 1758: 626; 1764: 432; 1767: 1042.

*Cancer philargius* - HERBST, 1785: 203. — WHITE, 1847: 44.

*Cancer inconspectus* Herbst, 1794: 162, pl. 40 fig. 3; 1799: 22.

*Calappa cristata* Fabricius, 1798: 346. — LATREILLE, 1803: 393. — BERTHOLD, 1847: 20. — GIBBES, 1850: 183. — STIMPSON, 1858a: 162; 1907: 165. — WHITELEGGE, 1890: 231. — THALLWITZ, 1892: 52. — ORTMANN, 1892: 565. — DOFLEIN, 1902: 653. — SERÈNE, 1937: 78. — SOKOLOWSKY, 1945: 71, pl. 2 figs 1-3.

*Calappa inconspecta* - BOSCH, 1801: 185; 1830: 215.

*Calappa (Lophos) philargius* - DE HAAN, 1837: 71, pl. 19 fig. 1.

*Calappa philargius* - HERKLOTS, 1861: 25. — NAUCK, 1880: 46. — DE MAN, 1888a: 388; 1888b: 196. — HENDERSON, 1893: 396. — ALCOCK, 1896: 145. — NOBILI, 1899: 249; 1900: 497; 1903: 23. — RATHBUN, 1902b: 30; 1924b: 27. — LAURIE, 1906: 353; 1915: 409 (list). — PARISI, 1914: 284. — IHLE, 1918: 183. — BALSS, 1922: 122. — McNEILL & WARD, 1930: 372. — ANDRÉ, 1931: 640. — SHEN, 1931: 104, text-figs 10-11, pl. 8. — SAKAI, 1936: 45, pl. 8 fig. 2; 1937: 93, pl. 12 fig. 3; 1956: 8; 1960: 33, pl. 16 fig. 3; 1965: 56, pl. 22 fig. 1; 1976: 130, pl. 37 fig. 2. —



SERÈNE, 1937: 78; 1968: 41 (list). — BOONE, 1938: 210, pls 72-73. — WARD, 1941: 1. — STEPHENSEN, 1945: 66. — SOKOLOWSKY, 1945: 72, pl. 2 figs 4-6. — LIN, 1949: 13 (list). — DAWYDOFF, 1952: 139. — UTINOMI, 1956: 70, pl. 35 fig. 8; 1974: 70, pl. 35 fig. 8. — GUINOT, 1962: 26, figs 11-15, 17a-b, 18a-b, pl. 1 fig. 1, pl. 2 fig. 1; 1967: 245 (list). — TYNDALE-BISCOE & GEORGE 1962: 69. — SANKARANKUTTY, 1962: 153. — KIM, 1970: 11. — CAMPBELL & STEPHENSON, 1970: 246. — HOLTHUIS & SAKAI, 1970: 116, pl. 10 fig. 1. — SHIRAI, 1980: 415. — TAKEDA, 1982: 106, fig. 310. — MIYAKE, 1983: 20. — DAI *et al.*, 1986: 93, fig. 50, pl. 11 fig. 6. — NOMURA *et al.*, 1988: 63. — TAKEDA & SHIKATANI, 1990: 479. — DAI & YANG, 1991: 104, fig. 50, pl. 11 fig. 6. — CHEN, 1993: 679, fig. 2. — YAMAGUCHI & BABA, 1993: 306, figs 93a-b. — YAMAGUCHI & HOLTHUIS, 1993: 666, pl. 7 figs 74-75.

*Calappa philargicus* - ESTAMPADOR, 1937: 515 [erroneous spelling].

*Calappa philargius* - MIYAKE, 1939: 199 [erroneous spelling].

Not *Calappa philargius* - NOBILI, 1906: 148. — HOLTHUIS, 1958a: 45 (= *C. dumortieri* Guinot 1963).

**MATERIAL EXAMINED.** — **Red Sea.** 1880, coll. R. KOSSMANN: 1 ♀ 62.8 mm (RMNH 2507).

"**Archipel Indien**". 1 ♀ 67.7 mm (MNHN-B 43).

"**Mers d'Asie**". Det. H. MILNE EDWARDS as *C. cristata*: 1 ♂ 43.4 mm (MNHN-B 3984); 1 ♂ 61.2 mm (MNHN-B 3986).

**Sri Lanka.** Gulf of Manaar, Negombo, coll. W.A. HERDMAN: 1 ♀ 29.5 mm; 2 juvs (NHM 1907.3.22.5-7). — 1 ♂ 38.1 mm (paratized); 3 juvs (NHM 1934.1.16.10-11).

**Thailand.** Aokrabi, 15.02.1966, coll. V.A. GALLARDO: 2 ♀ 57.7, 62.5 mm (USNM). — ?Phuket, 14.01.1966: 2 ♂ 59.7, 57.6 mm (ZM CRU1803). — 7°29'N, 99°07'E, 29 m, 12.02.1966, 5th Thai-Danish Exped.: 1 ♀ 35.4 mm (ZM CRU1806).

**South China Sea.** 1 ♂ 67.4 mm (NHM 1968.293.1).

**Hong Kong.** Coll. W. STIMPSON: 1 ♂ 66.7 mm; 1 ♀ 53.9 mm (USNM 2110). — Coll. C.J. SHEN: 1 ♂ 46.1 mm; 2 juvs (NHM 1935.3.19.144).

**China.** Det. HERKLOTS as *C. (Lophos) Cristata*, redet. L.B. HOLTHUIS: 1 dry specimen (RMNH 43123). — Shantou, 1 ♀ 67.9 mm (NHM 1884.2).

**Taiwan.** Tung Kang, S. Kaoshiung, SW Taiwan, 5.08.1996, coll. P.K.L. NG: 1 ♂ 44.1 mm; 1 ♀ 29.9 mm; 1 juv. 25.2 mm (NUS). — Taiwan Straits: 1 ♂ 67.0 mm; 1 ♀ 60.0 mm (ZM CRU1800).

**Japan.** 1824-1833, colls P.F. VON SIEBOLD & H. BURGER, det. J.A. HERKLOTS as *C. (Lophos) Philargius*, redet. L.B. HOLTHUIS: 8 dry specimens (RMNH 43122). — 1824-1829, coll. P.F. VON SIEBOLD, det. J.A. HERKLOTS as *C. (Lophos) Cristata*, redet. L.B. HOLTHUIS: 2 dry specimens (RMNH 43125). — 1826-1833, coll. H. BURGER, det. J.A. HERKLOTS as *C. (Lophos) Philargius*, redet. L.B. HOLTHUIS: 12 dry specimens (RMNH 43121). — 1826-1833, coll. H. BURGER, det. J.A. HERKLOTS as *C. (Lophos) Cristata*, redet. L.B. HOLTHUIS: 1 dry specimen (RMNH 43128). — Suzuki, coll. H.M. SMITH: 1 ♂ 55.7 mm (USNM 45853). — Nagasaki, June 1909, coll. J. JORDAN: 1 ♀ 44.8 mm (ZM CRU1797).

**Philippines.** Iloilo, Panay I., March-May 1929, coll. H.C. KELLER: 3 ♂ 27.7-55.8 mm; 2 ♀ 36.2 and 37.0 mm (USNM). — Gulf of Davao, Mouth of Padada River, 23-24.06.1936, coll. G.R. OESCH, det. M. WARD: 1 ♂ 36.5 mm; 1 ♀ 39.9 mm (AMNH 7892). — September 1937, coll. W.G. VAN NAME, det. M. WARD: 1 ♂ 49.9 mm (AMNH 8415). — SW Luzon, Sangay, 3.03.1981, coll. B. GINDELBERGER: 1 ♂ 37.0 mm (RMNH 35201).

**Malaysia.** N Borneo, Sandakan, 30.06.1929: 1 ♂ 60.2 mm (USNM 122953).

**Indonesia.** Java, ?det. J.A. HERKLOTS as *C. (Lophos) Cristata*, redet. L.B. HOLTHUIS: 2 dry specimens (RMNH 43129). — Balayan Bay, 27.08.1927: 2 ♂ 44.2, 45.8 mm (USNM). — Batavia Bay (= Bay of Jakarta), July 1904, coll. P. BUITENDIJK: 1 ♂ 48.9 mm (RMNH 2503). — Mollucas, April-September 1821, coll. C.G.C. REINWARDT, redet. L.B. HOLTHUIS: 1 dry specimen (RMNH 43124). — Amboina, coll. E.W.A. LUDEKING: 1 ♂ 71.1 mm (RMNH 1706).

**New Guinea.** Humboldt Bay, 25.06.1955: 1 ♀ (RMNH 12843).

**Australia.** *East coast, Queensland:* Sydney, February 1975, coll. V. CUSUMANO: 1 ♀ 44.1 mm (AMNH 16188). — SE Queensland, Bribie I.: 1 ♀ 76.9 mm (QM W1832). — 25.07.1958, coll. A. BEALE: 1 ♀ 75.7 mm (QM W1998). — Toorbul Pt, 29.04.1957: 1 ♂ 74.7 mm (QM W1977). — Maroochy River mouth, 7.03.1952: 1 ♀ 76.0 mm (QM W1800). — Moreton Bay, 7.05.1957, coll. J.T. WALKER: 1 ♂ 70.2 mm (QM W1979). — Nr Smoky Cape, 46-55 m, August 1962: 1 ♂ 29.3 mm (QM W2724). — Between Moreton I. and Stradbroke I.: 1 ♀ 74.5 mm (QM W2656). — Between Cape Moreton and Mooloolaba, 1970, coll. F. WALLACE: 1 ♀ (QM W3382). — Tin Can Bay: 1 ♂ 70.5 mm (QM W2073). — 19°04.9'S, 118°50.6'E, "Soela", 81 m, 30.10.1983: 1 ♀ 40.3 mm (QM W19784). — Off Cape Moreton, 119 m, 1969, coll. P. HARRIS: 1 ♂ 55.5 mm (QM W3325).

*North and north west coast:* Weipa, July 1961, coll. G. WEBSTER: 1 ♂ 41.3 mm (QM W2218). — 19°28.4'S, 118°55.2'E, "Soela", 39 m, 31.10.1983: 1 ♀ 18.7 mm (QM W19794). — Gulf of Carpentaria, "Southern Surveyor", 1991: 1 ♂ 19.9 mm (QM W19798). — Yirrkala, August 1987: 2 ♀ 39.0, 68.4 mm (USNM 178294). — NW Australia, coll. B. GRAY: 1 ♂ 67.0 mm (NHM 1931.5.15.39).

**New Caledonia.** Coll. ROUGIER, det. E.L. BOUVIER as *C. cristata*: 1 ♀ 65.0 mm (MNHN 42). — North-west lagoon, stn CP 1061, 20°12.4'S, 164°12.4'E, 13-17 m, 5.05.1986, coll. B. RICHER DE FORGES: 1 juv. (MNHN). — St. Vincent Bay, stn 167, 22°07'S, 166°10'E, 11 m, coll. B. RICHER DE FORGES: 1 ♀ (broken) (MNHN).



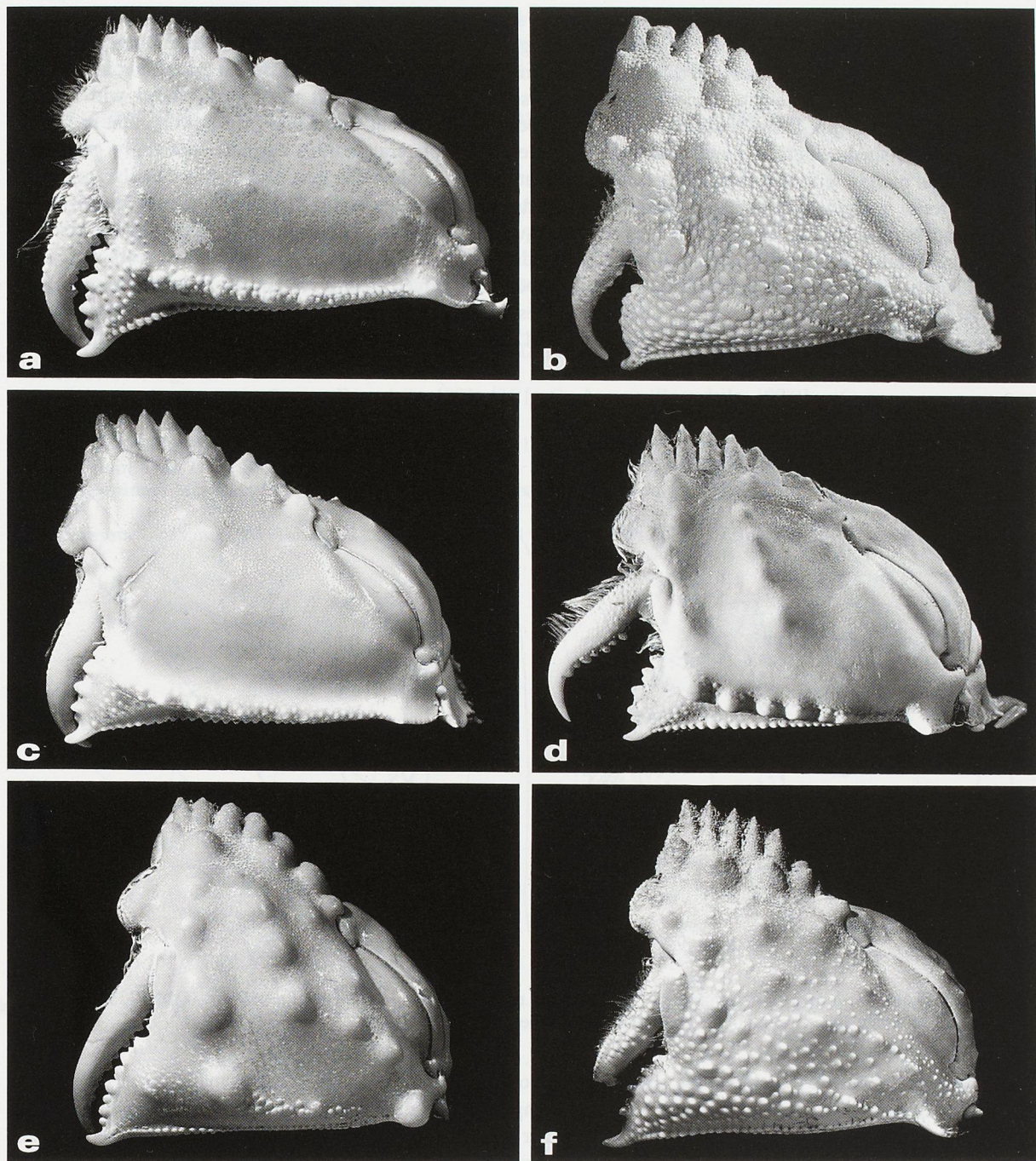


FIG. 20. — Cheliped, external view: **a**, *Calappa lophos* (Herbst, 1782), ♂ 47.3 mm, Madagascar, Nosy Be, 6-8 m (MNHN). — **b**, *Calappa matsuzawa* sp. nov., ♂ paratype, 55.2 mm, Japan (SMF 22938). — **c**, *Calappa monicanthus* sp. nov., ♂ holotype, 53.7 mm, Seychelles, "REVES 2" stn 45, 4°12.3'S, 55°59.6'E, 60-65 m (MNHN-B 25693). — **d**, *Calappa philargius* (Linnaeus, 1758), ♂ 55.5 mm, Australia, Cape Morton, 119 m (QM W3325). — **e**, *Calappa pustulosa* Alcock, 1896, ♀ 50.8 mm, Vietnam, Nha Trang Bay (MNHN-B 13464). — **f**, *Calappa sebastieni* sp. nov., ♂ holotype, 66.1 mm, Marquesas Is., stn 288, 9°20.5'S, 140°02'W, 120 m (MNHN-B 25690).



DESCRIPTION. — Carapace convex, 1.5 wide as long, surface minutely granulate, frontal and epigastric regions more densely granulate. Front only slightly projecting, with two triangular teeth. Anterior margin of basal antennal article concave, proximal lobe dilate, peduncle emerging from distal angle. Afferent branchial canal ending below orbit in granulate tridentate process. Endostomial septum visible with first maxillipeds closed, with slightly rounded anterior margin. Distal margin of first maxillipeds obliquely cut. Branchial ridges prominent in young, barely distinguished, anteriorly with flattened tubercles. Anterolateral margin carinate, unevenly granulate. Posterolateral margin with four marginally beaded lacinate teeth, distalmost largest, and three triangular, granulate teeth. Posterior margin with obtuse median tooth, shorter than adjacent teeth. Merus of cheliped distally with quadrilobate lamina, two distalmost acuminate. External surface of chela minutely granulate, vertically traversed by three flattened tubercles, similar tubercles distally above dactyl. Crest of larger chela cut into seven teeth increasing in size distally, proximalmost bicuspidate. Unevenly tuberculate ridge running subparallel to lower margin, from proximal keel-like tooth to base of fixed finger, tubercles larger distally. Lower margin narrow, two beaded files contiguous distally. First male pleopod markedly curved distad, tapering apically to narrow spinulate tip; second pleopod slender, slightly curved, tip short, digitate.

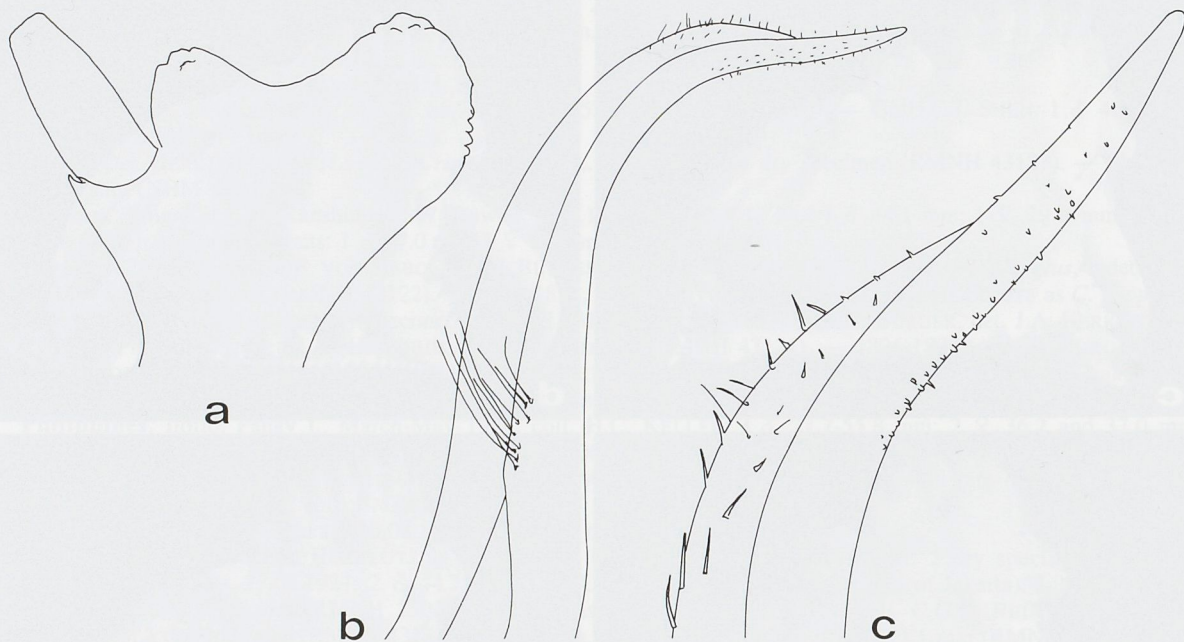


FIG. 21. — *Calappa philargius* (Linnaeus, 1758), ♂ 55.5 mm, Australia, Cape Morton, 119 m (QM W3325): a, first article of antenna; b-c, first pleopod male with enlargement of distal part.

Color. — "Pale brick-red above, the surface being covered with crowded punctae of that color. The eyes are longitudinally striped with black, the stripes or lines being about seven in number. A large, well-defined deep red spot on the carpus, and one on the front of the hand. Inner side of hand with red spots or blotches arranged in lines. Lower side of brachia deep red. Inferior surface of body white, with the exception of two oblique red lines on each cheek" (STIMPSON, 1907). "A pair of large maroon spots on either claw, and a maroon horse-shoe [marking] around each eye; the general colour fawn with a tinge of lavender centrally" (McNEILL & WARD, 1930). Color photograph in TAKEDA (1982).

REMARKS. — LINNAEUS' (1758) description of *C. philargius*: "thorace laevi integerrimo convexo: postice quindecim-dentato" is accurate but exceedingly terse. HERBST's (1794, 1799) color description and drawing of *C. inconspectus* leave no doubt that the species depicted is indeed *C. philargius*. FABRICIUS' (1798) establishment



of *C. cristata* owes much to arithmetics: whereas LINNAEUS counted 15 teeth on the posterior margin (including posterolateral), FABRICIUS counted only seven (posterior proper). LATREILLE (1803) realized that *cristata* and *inconspecta* are one and the same, but it was DE HAAN (1837) who synonymized both with *C. philargius*.

DISTRIBUTION (fig. 33). — Indian Ocean to Japan, Australia and Samoa, 8-120 m.

*Calappa pustulosa* Alcock, 1896

Pl. 17 e, 20 e, 22, 33

*Calappa pustulosa* Alcock, 1896: 147, pl. 6 fig.1. — ALCOCK & ANDERSON, 1897, pl 28 figs 1-1a. — IHLE 1918: 306 (list). — ANDRÉ, 1931: 640. — CHOPRA, 1933: 29. — SERÈNE, 1937: 78; 1968: 41 (list). — SAKAI, 1937: 97, pl. 18 figs 2-3; 1956: 8; 1965: 57, pl. 23 fig. 2; 1976: 134, pl. 41 fig 1. — DAWYDOFF, 1952: 139. — MIYAKE, 1983: 199. — DAI *et al.*, 1986: 94, text-fig. 52, pl. 12 fig. 1. — DAI & YANG, 1991: 106, text-fig. 52, pl. 12 fig. 1. — CHEN, 1993: 686, fig. 4b.

Not *Calappa pustulosa* var. *clypeata* Borradaile, 1903: 436 [= *C. clypeata* (Borradaile, 1903)].

MATERIAL EXAMINED. — **Burma.** Gulf of Martaban: 1 ♂ 17.0 mm (NHM 1899.1.20.4).

**Vietnam.** Nha Trang Bay, 1930, coll. A. KREMPF: 2 ♀ 39.7, 50.8 mm (MNHN B.13464).

**Philippines.** Marinduque I., 2.03.1909, "Albatross", stn 5376, 165 m, det. M. WARD: 2 ♀ 29.3, 30.9 mm (USNM 65429).

**Taiwan.** Kaoshiung, SW Taiwan, 24.11.1987, coll. LIN CHOON CHONG: 1 ♂ 62.3 mm (NUS).

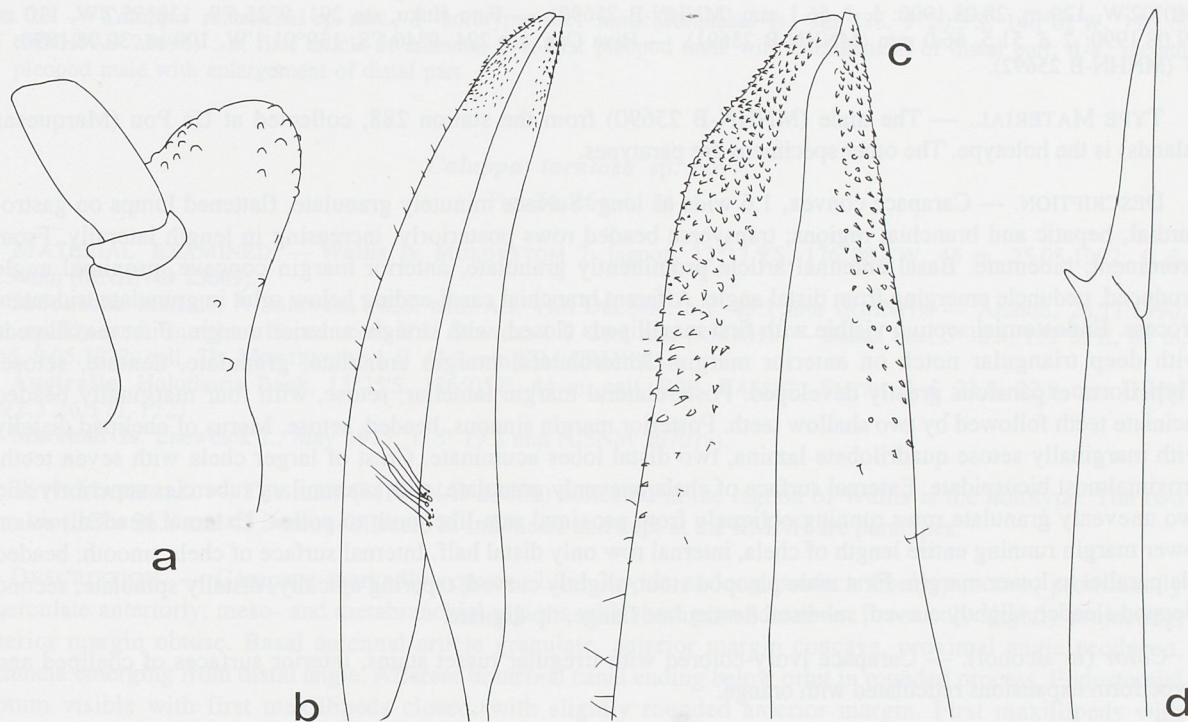


FIG. 22. — *Calappa pustulosa* Alcock, 1896, ♂ 62.3 mm, Taiwan, Kaoshiung (NUS 1995.605): **a**, first article of antenna; **b-c**, first pleopod male with enlargement of distal part; **d**, second pleopod male, enlargement of distal part.

DESCRIPTION. — Carapace prominently convex, subcircular, 1.1 wide as long, surface minutely granulate. Front only slightly projecting, with two low, rounded teeth. Basal antennal article not dilated anteriorly, peduncle



emerging from distal angle. Afferent branchial canal ending below orbit with medially-notched rounded process. Endostomial septum invisible with first maxillipeds closed, with straight anterior margin. First maxillipeds with triangular notch on anterointernal margin. Branchial ridges, prominent in young, indistinct, bullous. Anterolateral margin unevenly tuberculate. Clypeiform expansions moderate. Posterolateral margin with five triangular, granulate teeth, median longest. Posterior margin projecting, beaded. Merus of cheliped distally quadridentate, three proximal teeth rounded, distalmost tooth acuminate, ram-like. External surface of carpus with nearly obsolete tubercles. External surface of chela minutely granulate, obliquely traversed by three rows of tubercles, median row most prominent. Crest of larger chela cut into seven teeth, two proximalmost rounded. Unevenly granulate ridge running subparallel to lower margin, from proximal rounded tooth to base of pollex. Lower margin wide, two beaded files contiguous distally. Internal surface of chela inferiorly with beaded file subparallel to lower margin.

*Color.* — Carapace light brown, irregular reddish spots anteriorly (SAKAI, 1976, pl. 41 fig. 1).

REMARKS. — ALCOCK's (1896) description and drawings being accurate, the identity of *C. pustulosa* has never been in doubt. *C. pustulosa* differs from its congeners by its subcircular carapace lacking clypeiform expansions.

DISTRIBUTION (fig. 33). — India, Philippines, China, Japan. On sandy or muddy bottoms, 40-165 m.

*Calappa sebastieni* sp. nov.

Fig. 17 f, 20 f, 23, 33

MATERIAL EXAMINED. — French Polynesia (coll. J. POUPIN). *Marquesas Is*: Ua Pou, stn 288, 9°20.5'S, 140°02'W, 120 m, 28.08.1990: 1 ♂ 66.1 mm (MNHN-B 25690). — Fatu Huku, stn 291, 9°25.6'S, 138°55.7'W, 110 m, 29.08.1990: 2 ♂ 51.5, 66.0 mm (MNHN-B 25691). — Hiva Oau, stn 294, 9°46.5'S, 139°01.1'W, 100 m, 30.08.1990: 1 ♂ (MNHN-B 25692).

TYPE MATERIAL. — The male (MNHN-B 25690) from the station 288, collected at Ua Pou (Marquesas Islands) is the holotype. The other specimens are paratypes.

DESCRIPTION. — Carapace convex, 1.6 wide as long. Surface minutely granulate, flattened lumps on gastrocardial, hepatic and branchial regions; transverse beaded rows posteriorly, increasing in length laterally. Front prominent, bidentate. Basal antennal article prominently granulate, anterior margin concave, proximal angle produced, peduncle emerging from distal angle. Afferent branchial canal ending below orbit in granulate tridentate process. Endostomial septum visible with first maxillipeds closed, with straight anterior margin. First maxillipeds with deep triangular notch on anterior margin. Anterolateral margin crenulate, granulate, dentate, setose. Clypeiform expansions greatly developed. Posterolateral margin lamellar, setose, with four marginally beaded lacinate teeth followed by two shallow teeth. Posterior margin sinuous, beaded, setose. Merus of cheliped distally with marginally setose quadrilobate lamina, two distal lobes acuminate. Crest of larger chela with seven teeth, proximalmost bicuspidate. External surface of chela unevenly granulate, with mammillary tubercles superiorly and two unevenly granulate rows running obliquely from proximal ram-like tooth to pollex. External beaded row on lower margin running entire length of chela, internal row only distal half. Internal surface of chela smooth, beaded file parallel to lower margin. First male pleopod stout, slightly curved, tapering apically, distally spinulate; second pleopod slender, slightly curved, subdistal denticulate flange, tip digitate.

*Color* (in alcohol). — Carapace ivory-colored with irregular russet stains, interior surfaces of cheliped and clypeiform expansions reticulated with orange.

ETYMOLOGY. — Named after Sébastien, son of J. POUPIN, scientist of the SMSRB (Service mixte de surveillance radiologique et biologique des Armées) who collected all the specimens of this species studied here.

REMARKS. — *C. sebastieni* differs from the closely related *C. undulata* in its wider clypeiform expansion, form of lacinate teeth on posterolateral margin, lack of tubercles on branchial, gastric regions, bidentate front and color pattern.



DISTRIBUTION (fig. 33). — Known only from the Marquesas Islands, at 100-120 m.

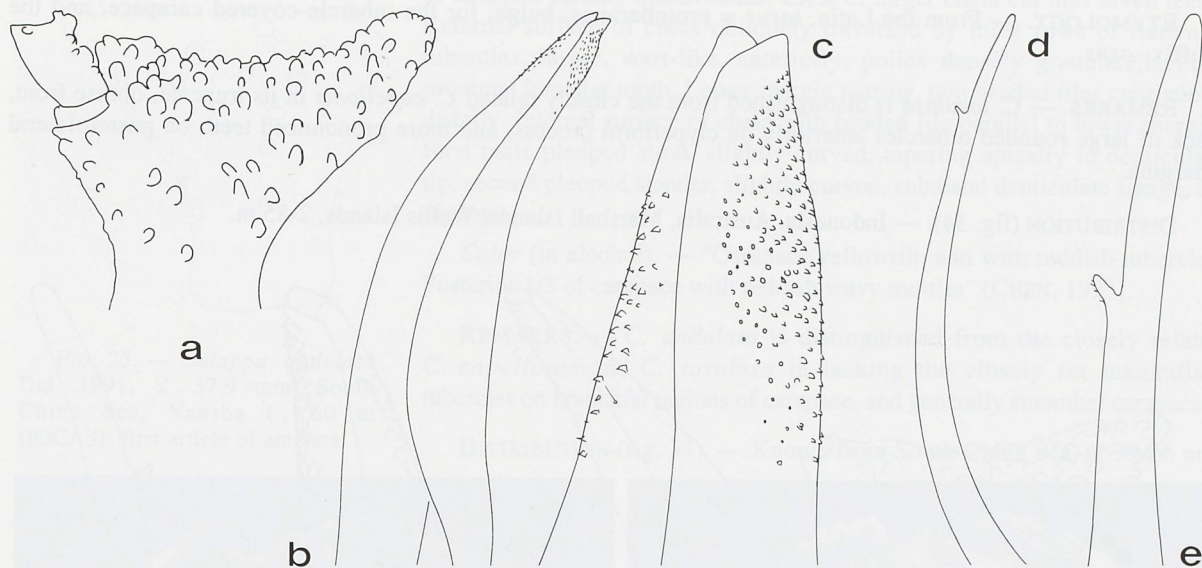


FIG. 23. — *Calappa sebastieni* sp. nov., ♂ holotype, 66.1 mm, Marquesas Is., stn 288, 9°20.5'S, 140°02'W, 120 m (MNHN-B 25690) : a, first article of antenna; b-c, first pleopod male with enlargement of distal part; d-e, second pleopod male with enlargement of distal part.

*Calappa torulosa* sp. nov.

Fig. 24, 26 a-b, 34

MATERIAL EXAMINED. — Wallis Is. MUSORSTOM 7: lagoon, 13°17.9'S, 176°08.4'W, 45 m, 25.05.1992: 1 ♂ 30.5 mm (MNHN-B 25689).

Indonesia. Menado, N Sulawesi, 1836, coll. A.J. VAN DELDEN: 1 ♀ 43.3 mm (RMNH). — Ambon, 28.11.1990, 2 m, muddy-sand, Rumphius Exped., coll. H.L. STRACK: 1 ♀ 26.8 mm (RMNH). — Banda Sea, 5°36'S, 132°55'E, 85 m, sand, 9.05.1922, coll. Th. MORTENSEN: 1 ♀ 41.2 mm (ZM CRU1825).

Australia. Holothuria Bank, 13°25'S, 126°05'E, 44 m, coll. P.W. BASSETT-SMITH: 2 ♂ 23.8, 22.9 mm (NHM 1892.3.26.171-172).

Marshall Is. Enewetok I., May 1975: 1 ♂ 19.2 mm (USNM 267079).

TYPE MATERIAL. — The male (MNHN-B 25689) collected in the lagoon of Wallis is the holotype. The two females (LC = 26.8 and 43.3 mm) collected in Indonesia and kept at the RMNH are paratypes.

DESCRIPTION. — Carapace markedly convex, 1.2-1.3 wide as long, surface finely punctate, prominently tuberculate anteriorly, meso- and metabranchial regions with short granulate rows. Front only slightly projecting, anterior margin obtuse. Basal antennal article granulate, anterior margin concave, proximal angle produced, peduncle emerging from distal angle. Afferent branchial canal ending below orbit in rounded process. Endostomial septum visible with first maxillipeds closed, with slightly rounded anterior margin. First maxillipeds with triangular notch on anterior margin. Anterolateral margin arcuate, carinate, scalloped. Posterolateral margin lamellar, with six marginally beaded triangular teeth, third and fourth teeth largest. Posterior margin produced, sinuous, closely beaded. Merus of cheliped distally with indistinctly quadrilobate lamina, anteriormost lobe keel-like. Crest of larger chela with six teeth. External surface of chela obliquely traversed by three rows of tubercles, median row most prominent, inferiorly granulate. Lower margin narrow, two beaded files contiguous distally. Internal surface of chela inferiorly minutely granulate, beaded file parallel to lower margin. First male pleopod



stout, slightly curved, tapering apically to spinulate tip; second pleopod slender, slightly curved, subdistal denticulate flange, tip digitate.

ETYMOLOGY. — From the Latin, *torus* = protuberance, bulge, for the tubercle-covered carapace, and the suffix *-osus*.

REMARKS. — *C. torulosa* is distinguished from the closely related *C. capellonis* in its truncate, obtuse front, lack of large rounded tubercles anteriorly on clypeiform process, and more pronounced teeth on posterolateral margins.

DISTRIBUTION (fig. 34). — Indonesia, Australia, Marshall Islands, Wallis Islands, 2-85 m.

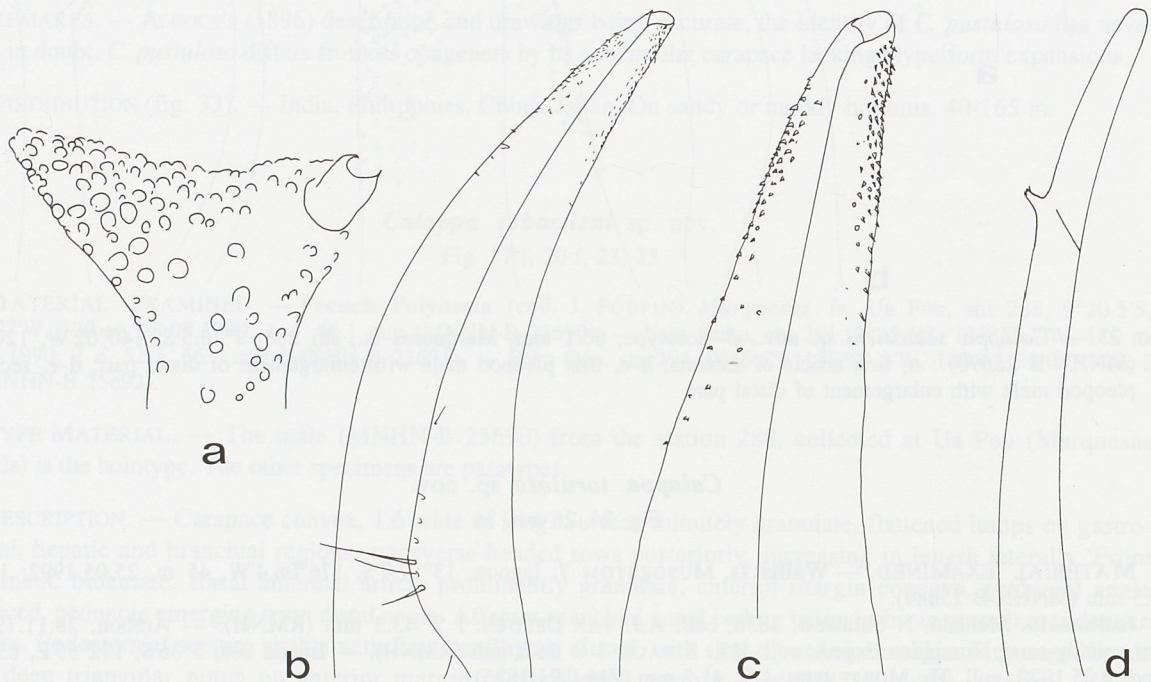


FIG. 24. — *Calappa torulosa* sp. nov., ♂ holotype, 30.5 mm, Wallis Is, "MUSORSTOM 7", 13°18'S, 176°08'W, 45 m (MNHN-B 25689): a, first article of antenna; b-c, first pleopod male with enlargement of distal part; d, second pleopod male, enlargement of distal part.

*Calappa undulata* Dai, 1991

Fig. 25, 26 c-d, 34

*Calappa undulata* Dai, 1991: 101 (key). — CHEN, 1993: 686, fig 7a-h.

MATERIAL EXAMINED. — South China Sea. Nansha Islands, 60 m, 30.05.1993: 1 ♀ 37.9 mm (IOCAS).

DESCRIPTION. — Carapace convex, 1.3 wide as long, surface minutely granulate anteriorly. Front projecting, anterior margin with v-shaped notch, bidentate. Basal antennal article granulate, anterior margin concave, peduncle emerging from distal angle. Endostomial septum visible with first maxillipeds closed, with straight anterior margin. Hepatic region slightly depressed. Gastric, cardiac regions delimited by shallow longitudinal grooves. Branchial, gastric regions with rounded tubercles, posteriorly traversed by few beaded tubercles. Anterolateral margin arcuate, anteriorly indistinctly dentate, posteriorly with six beaded denticles. Posterolateral margin setose,



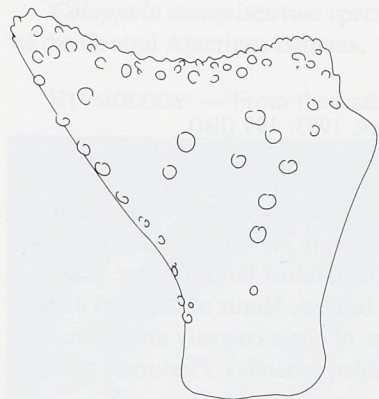


FIG. 25. — *Calappa undulata* Dai, 1991, ♀ 37.9 mm, South China Sea, Nansha I., 60 m (IOCAS): first article of antenna.

cut into six marginally beaded lacinate teeth, three posterior teeth medially beaded. Posterior margin somewhat produced, sinuous, finely beaded. Merus of cheliped distally quadrilobate. Crest of larger chela cut into seven teeth. External surface of chela obliquely traversed by three rows of flattened tubercles, larger, wart-like, anteriorly, pollex densely granulate, lacking proximal lamellar tooth. Lower margin narrow, two beaded files contiguous distally. Internal surface of chela with beaded file parallel to lower margin. First male pleopod stout, slightly curved, tapering apically to denticulate tip; second pleopod slender, slightly curved, subdistal denticulate flange, tip digitate.

*Color* (in alcohol). — "Carapace yellowish, and with reddish tubercles. Posterior 1/3 of carapace with reddish wavy mottles" (CHEN, 1993).

**REMARKS.** — *C. undulata* is distinguished from the closely related *C. capellonis* and *C. torulosa* in lacking the closely set mammilate tubercles on branchial regions of carapace, and generally smoother carapace.

**DISTRIBUTION** (fig. 34). — Known from South China Sea, at 39-66 m.

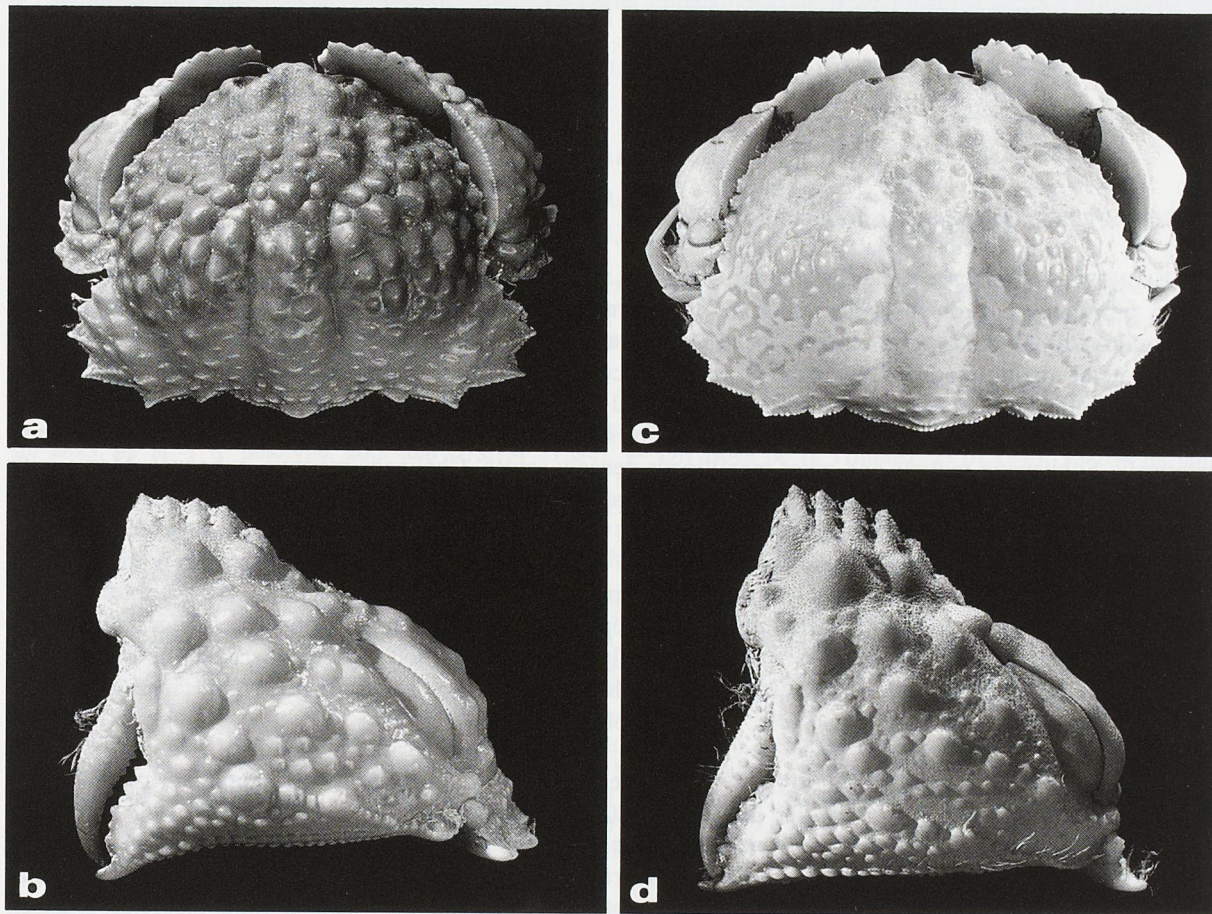


FIG. 26 a-b. — *Calappa torulosa* sp. nov., ♂ holotype, 30.5 mm, Wallis Is, "MUSORSTOM 7", 13°18'S, 176°08'W, 45 m (MNHN-B 25689): a, whole crab, dorsal view; b, cheliped, external view.

FIG. 26 c-d. — *Calappa undulata* Dai, 1991, ♀ 37.9 mm, South China Sea, Nansha I., 60 m (IOCAS): c, whole crab, dorsal view; d, cheliped, external view.



*Calappa yamasitae* Sakai, 1980

Fig. 34

*Calappa yamasitae* Sakai, 1980: 5, frontispiece fig. 2, text-figs 2a-b, 3a-c. — MIYAKE, 1983: 199 (list).

DESCRIPTION. — Carapace convex, 1.6 wide as long. Surface coarsely granulate, with large mammillate tubercles covering branchial region. Front projecting, with two obtuse teeth separated by deep U-shaped sulcus. Gastric, cardial regions delimited by shallow longitudinal grooves. Anterolateral margin coarsely dentate or serrate. Posterolateral margin setose, marginally beaded, six anterior teeth triangular, distalmost largest, three posterior teeth shallow, with prominent, beaded, median ridges. Posterior margin sinuous, beaded. Merus of cheliped distally quadrilobate. Crest of larger chela cut into 9-10 prominent teeth. External surface of chela coarsely granulate, with scattered tubercles, larger, wart-like, anteriorly. Lower margin narrow, with beaded tubercles. First male pleopod stout, slightly curved, tapering apically.

Color. — Carapace orange-red with tubercles somewhat darker (SAKAI, 1980, frontispiece fig. 2).

REMARKS. — The two known specimens of *C. yamasitae* were not available for study.

DISTRIBUTION. — Known only from type location, Mie Prefecture, Honshu I., Japan. Depth unknown.

Genus *CALAPPULA* nov.

TYPE SPECIES: *Calappa saussurei* Rathbun, 1898a.

DIAGNOSIS. — Carapace somewhat convex, granulate, tuberculate, regions undefined, furrows bordering cardiac region pronounced. Front as wide as orbit, downturned, trilobate, median lobe invisible in dorsal view. Antennules folding obliquely beneath front. Anterolateral margin arcuate, crenate, dentate or granulate. Posterolateral margin moderately expanded, laciniate, concealing flexed ambulatory legs beneath. Eyes filling orbits, eyestalk short, stocky, cornea large. Supraorbital margin swollen, unifissured. Basal article of antennae subquadrate, forming inner orbital margin, flagellum short. Buccal cavity elongate, lacking median septum anteriorly. Subhepatic regions and outer maxillipeds densely setose. Chelipeds massive, subequal. Merus with transverse dentate crest externally, distalmost tooth largest, keel-like. Carpus trigonal. External surface of chela swollen, upper margin crested, lobate; keel-like laminar tooth proximally near lower margin; lower margin with two parallel files of tubercles. Internal surface of chela densely setose along lower margin; finely milled ridge extending from mid crest to base of dactyl, preceded by smaller milled ridge on third tooth of crest. Larger dactylus proximally with crochet tooth fitting into molariform depression, dactylus' upper margin setose, granulate, with rounded tooth proximally. Pereiopods smooth, laterally compressed, dactyli styliform. Male abdomen five-segmented, second segment granulate, with prominent lateral lobes. First male pleopod stout, tapering, distally spinulose. Second male pleopod filamentose, distally crook-shaped.

REMARKS. — WILLIAMS & CHILD (1989), while establishing *Cyclozodion* to accommodate two Western Atlantic species - *C. angustum* (A. Milne Edwards, 1880) and *C. tuberatum* Williams & Child, 1989 - placed it between *Calappa* and *Paracyclois*. *Calappula*, combining features characteristic of both *Calappa* and *Cyclozodion*, is distinguished from the former by its unifissured supraorbital border, downturned trilobate front, stridulating organ consisting of milled ridge vertically transversing interior surface of chela and postorbital tubercles, and lack of median septum anteriorly in buccal cavity, features it shares in common with both *Cyclozodion* and *Paracyclois*. *Calappula* is distinguished from those in possessing expanded posterolateral margin large enough to conceal flexed ambulatory legs beneath, and keel-like tooth proximally on external surface of chela.



*Calappula* comprises two species - *C. saussurei* and *C. tortugae* (Rathbun, 1933) comb. nov., one on each side of the Central American Isthmus.

ETYMOLOGY. — From the Latin; *-ula* is a diminutive suffix to denote the smaller-sized species.

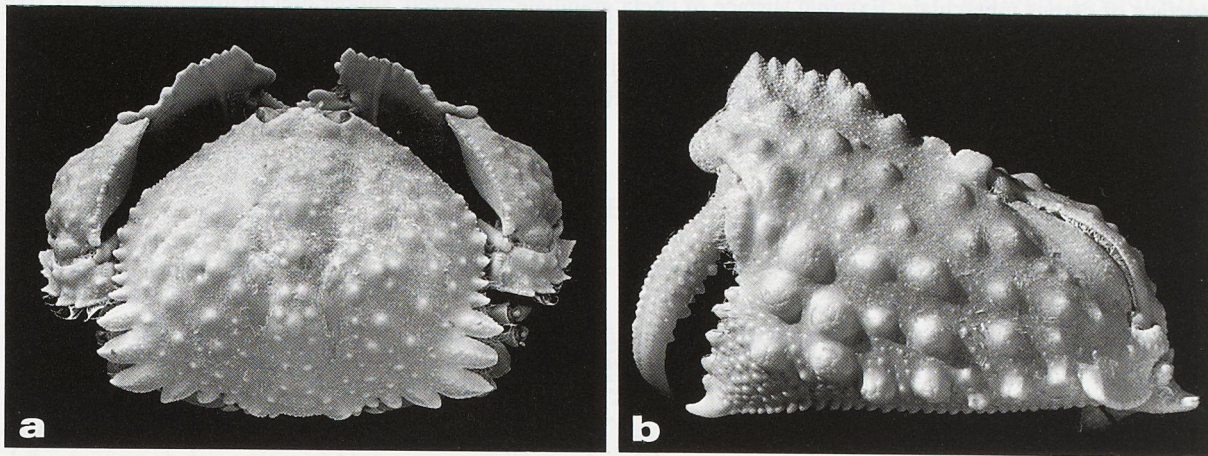


FIG. 27. — *Calappula saussurei* comb. nov., ♂ 31.5 mm, Ecuador (MNHN-B.17249) : a, whole crab, dorsal view; b, cheliped, external view.

*Calappula saussurei* (Rathbun, 1898) comb. nov.

Fig. 27, 28, 34

*Calappa saussurei* Rathbun, 1898a: 609, pl. 41 fig. 6; 1937: 206, fig. 43, pl. 63 figs 1-4. — FINNEGAN, 1931: 611. — CRANE, 1937: 98. — GARTH, 1948: 19; 1960: 121 (list); 1966: 12. — PRAHL & SANCHEZ, 1986: 24. — WILLIAMS & CHILD, 1989: 109. — LEMAITRE & ALVAREZ-LEON, 1992: 51 (list). — HENDRICKX, 1992: 9 (list); 1993a: 8 (list); 1993b: 311 (list); 1994: 577.

MATERIAL EXAMINED. — **Mexico.** Gulf of California. La Paz Bay, 24°18'N, 110°22'W, 30.04.1888, "Albatross", stn 2823, 48 m: 1 ♂ holotype, 20.3 mm (USNM 21596). — Off Boca de la Trinidad, 21.01.1940, 93-104 m, coll. J.S. GARTH: 2 ♀ 25.2, 24.1 mm (LAM). — E. of Espiritu Santo, 95-106 m, 15.02.1940: 1 ♂ 18.6 mm; 1 ♀ 21.5 mm (LAM). — California. Farallon I., off San Ignacio, 1.04.1959, 91-119 m, coll. Scripps Exped.: 2 ♂ 13.5, 23.6 mm (LAM). — 60 mi. N. of Guaymas, 55-64 m, December 1963: 1 ♂ 24.0 mm; 3 juvs (USNM). — Gulf of California. Off Rio Fuente, 20.03.1985: 1 ♂ 25.7 mm; 1 ♀ ovig. 25.5 mm (MNHN-B 20867). — Banderas Bay, 13.02.1938, 46-73 m, coll. S.A. GLASSELL: 1 ♀ 23.0 mm (USNM 207834).

**Costa Rica.** April 1968, 80 m: 1 ♂ 34.1 mm (USNM 273953).

**Panama.** Isla de Joge, 28.06.1969, 73 m: 1 ♂ 26.9 mm (USNM 300691). — Bahia Honda, btn Medidor and Pacora I., 7°44.19'N, 8°35.23'W, 21.02.1934, "Velero III", stn 244, 55-64 m, coll. W.L. SCHMITT, det. M.J. RATHBUN: 1 ♂ 18.5 mm (USNM 69227). — Secas I., 7°58.02'N, 82°00.30'W, 29.03.1939, "Velero III", stn 945-39, 46-48 m: 3 juvs (LAM).

**Colombia.** Port Utria, 24.01.1935, 45 m, coll. W.L. SCHMITT, det. M.J. RATHBUN: 1 ♂ 37.5 mm (USNM 77161).

**Ecuador.** La Plata I., 10.02.1934, 82-101 m, coll. W.L. SCHMITT, det. M.J. RATHBUN: 1 ♂ 31.2 mm; 1 ♀ 24.4 mm (USNM 69228). — Off Guayaquil, 1979, coll. A. CROSNIER: 1 ♂ 31.5 mm (MNHN-B 17249).

**Galapagos Is.** Between Seymour and Daphne Is., 0°24.50'S, 90°21.40'W, 13.12.1934, "Velero III", stn 345, 55 m, coll. W.L. SCHMITT, det. M.J. RATHBUN: 1 ♀ 17.3 mm (USNM 76671).

DESCRIPTION. — Carapace moderately convex, subcircular, 1.2 wide as long. Surface granulate, irregularly tuberculate, tubercles more prominent on midbranchial region. Distinct longitudinal groove separating gastrocardial from branchial, hepatic regions. Front barely projecting, with two rounded teeth separated by shallow sulcus. Anterior margin of basal antennal article rounded, peduncle emerging distally. Afferent branchial canal



ending below orbit with rounded process. Anterior margin of first maxilliped concave. Anterolateral margin carinate, unevenly granulate anteriorly, prominently dentate posteriorly. Posterolateral margin beaded, with four granulate, lacinate teeth, penultimate largest, followed by two rounded teeth. Posterior margin produced, sinuous, irregularly beaded. Merus of cheliped distally with four granulate teeth, distalmost largest, bicuspidate. External surface of carpus tuberculate. External surface of chela granulate, traversed, subparallel to lower margin, by five irregular rows of granulate tubercles increasing in size inferiorly. Crest of larger chela with seven teeth, proximalmost bicuspidate. Inferior proximal tooth lamellar, ram-like. Lower margin with two contiguous beaded rows. First male pleopod stout, slightly curved, somewhat tapering, distally spinulate. Second male pleopod crook-shaped.

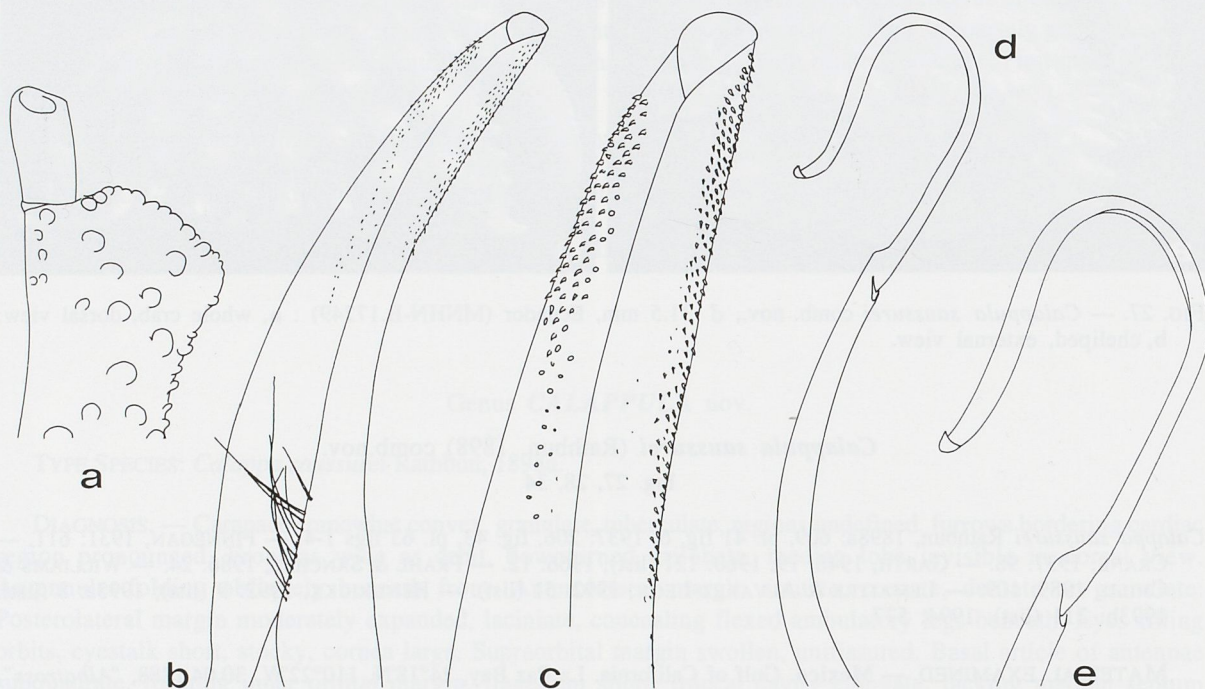


FIG. 28. — *Calappula saussurei* comb. nov., 1980, ♂ 31.5 mm, Ecuador (MNHN-B 17249): a, first article of antenna; b-c, first pleopod male with enlargement of distal part; d-e, second pleopod male with enlargement of distal part.

*Color.* — "Typical specimens from sandy bottoms were colored as follows: Carapace violet brown or tan anteriorly, fading posteriorly to white; all tubercles of carapace bright orange; chelipeds tan, the tubercles orange and white; ambulatories white banded at the joints with pale tan. Most of the specimens from muddy bottoms, on the other hand, had the entire carapace and sometimes the legs suffused with bright coral red or orange, while the tubercles were usually distinctly coral pink rather than orange... Eggs coral red to vermilion." (CRANE, 1937).

*REMARKS.* — RATHBUN (1898a), describing *C. saussurei*, recognized that "This species is analogous to *C. angusta* A. Milne Edwards of the West Indies". WILLIAMS & CHILD (1989), while clarifying the position of *C. tortugae* (Rathbun, 1933), concurred: "These two species of *Calappa* are similar enough to be regarded as a geminate pair from either side of the Central American land mass".

*C. saussurei* is distinguished from its close relative, *C. tortugae*, by the presence of five horizontal rows of granulate tubercles on external surface of chela.

*DISTRIBUTION.* — Gulf of California to Ecuador, Galapagos Is. Sand, mud, gravel, broken shell and coral bottoms, 1-300 m.



## ACKNOWLEDGEMENTS

I am indebted to L.B. HOLTHUIS and Peter DAVIE for painstakingly reviewing this manuscript. I am grateful to N. BRUCE, H. CHEN, P. CLARK, A. CROSNIER, AI-YUN DAI, P. DWORSCHAK, C. FRANSEN, D. GUINOT, T. KOMAI, R.B. MANNING, J. MARTIN, K. MATSUZAWA, P.K.L. NG, K. NOMURA, K. SAKAI, M. TÜRKAY and M. VANNINI for entrusting me with valuable material from their collections, to Mr. M. MUNBODH, Albion Fisheries Research Center, for enabling me to collect in Mauritius and to A. SHOOB for the photographs.

## REFERENCES

- ALCOCK, A., 1896. — Materials for a carcinological fauna of India. No. 2. The Brachyura Oxystoma. *Journal of the Asiatic Society of Bengal*, **65** (2): 134-296, pls 6-8.
- ALCOCK, A., & ANDERSON, A.R., 1895. — Natural History notes from H.M. Indian marine survey steamer "Investigator". Ser. II, N°17. List of the shore and shallow-water Brachyura collected during the season 1893-1894. *Journal of the Asiatic Society of Bengal*, **63** (2): 197-209.
- ALLEN, G.R., & STEENE, R., 1994. — Indo-Pacific Coral Reef Field Guide. 378 pp. Tropical Reef Research, Singapore.
- ANDRÉ, M., 1931. — Crustacés Décapodes provenant de l'Institut océanographique de Nha-Trang (Annam). *Bulletin du Muséum d'Histoire naturelle*, Paris, sér. 2, **3** (7): 638-650.
- BALSS, M., 1915. — Die Decapoden des Roten Meeres. II. Anomuren, Dromiaceen und Oxystomen. In: Expeditionen S.M. Schiff "Pola" in das Rote Meer. Nördliche und Südliche Hälfte. 1895-96, 1897-98. Zoologische Ergebnisse XXXI. *Denkschriften der Akademie der Wissenschaften, Wien*, **92** (10): 1-20, 9 pls.
- BALSS, H., 1921. — Decapoda Anomura (Paguridea) und Brachyura (Dromiacea bis Brachygnatha): Crustacea VI. In: W. MICHAELSEN, *Beiträge zur Kenntnis der Meeresfauna Westafrikas*, **3** (2): 37-67, figs 1-7. Hamburg.
- BALSS, H., 1922. — Ostasiatische Decapoden. III. Die Dromiaceen, Oxystomen und Parthenopiden. *Archiv für Naturgeschichte*, Berlin, **88A** (3): 104-140, figs 1-9.
- BALSS, H., 1935. — Brachyura of the Hamburg Museum Expedition to South-Western Australia, 1905. *Journal and Proceedings of the Royal Society of Western Australia*, **21**: 113-151, figs 1-5, pl. 13.
- BALSS, H., 1938. — Die Dekapoda Brachyura von Dr. Sixten Bocks Pazifik-Expedition 1917-18. *Göteborgs Kungl. Vetenskaps och Vitterhets Samhälles Handlingar*, (5B) **7**: 1-85, 18 figs, 2 pls.
- BARNARD, K. H., 1926. — Report on a collection of Crustacea from Portuguese East Africa. *Transactions of the Royal Society of South Africa*, **13**: 119-129, pls 10, 11.
- BARNARD, K. H., 1947. — Descriptions of new species of South African Decapod Crustacea with notes on synonymy and new records. *Annals and Magazine of Natural History*, London, (11), **13**, 1947 (1946): 361-392.
- BARNARD, K. H., 1950. — Descriptive Catalogue of South African Decapod Crustacea (Crabs and Shrimps). *Annals of the South African Museum*, **38**: 1-837, figs 1-154.
- BERTHOLD, A.A., 1847. — Über verschiedene neue oder seltene Reptilien aus Neu-Granada und Crustaceen aus China. *Abhandlungen der Königlichen Gesellschaft der Wissenschaften zu Göttingen*, **3**: 3-32, pls 1-3.
- BOONE, L., 1927. — The littoral Crustacean fauna of the Galapagos Islands. Part I. Brachyura. *Zoologica, New York*, **8**: 127-288.
- BOONE, L., 1934. — Crustacea: Stomatopoda and Brachyura. Scientific results of the world cruise of the Yacht "Alva", 1931, W.K. Vanderbilt, commanding. *Bulletin of the Vanderbilt Marine Museum*, **5**: 1-210, pls 1-109.
- BOONE, L., 1938. — V. Crustacea. Scientific Results of the World Cruises of the Yachts "Ara", 1928-1929, and "Alva", 1931-1932, "Alva" Mediterranean Cruise, 1933 and "Alva" South American Cruise, 1935, W.K. Vanderbilt, commanding. *Bulletin of the Vanderbilt Marine Museum*, **7**: 197-281, pls 71-109.
- BORRADAILE, L.A., 1903. — Marine Crustaceans VI. The Sand Crabs (Oxystomata). In: J.S. GARDINER (ed.), *The Fauna and Geography of the Maldive and Laccadive Archipelagoes*, **6**: 434-439, figs 115-117, pl. 22.



- BOSC, L.A.G., 1801-1802. — Histoire naturelle des Crustacés, contenant leur description et leurs mœurs, avec figures dessinées d'après nature, 2 : 1-296, pls 9-18. Paris.
- BOSC, L.A.G., 1828-1830. — Manuel de l'Histoire Naturelle des Crustacés, contenant leur description et leurs mœurs; avec figures dessinées d'après nature. Edition mise au niveau des connaissances actuelles par A.G. DESMAREST, 1: 1-328, pls 1-9. Paris.
- BOUVIER, E.L., 1906. — Sur une petite collection de Crustacés (Décapodes et Stomatopodes) recueillis par M. Charles Gravier à l'île San Thomé (Afrique occidentale). *Bulletin du Muséum d'Histoire naturelle, Paris*, 12 (7): 491-499.
- BOUVIER, E.L., 1915. — Décapodes marcheurs (Reptantia) et Stomatopodes recueillis à l'île Maurice par M. Paul Carié. *Bulletin scientifique de la France et de la Belgique*, sér. 7, 48 : 178-318, pl. 4-7, figs 1-42.
- BOUVIER, E.L., 1922. — Observations complémentaires sur les Crustacés Décapodes (abstraction faite des Carides) provenant des campagnes de S.A.S. le Prince de Monaco. *Résultats des campagnes scientifiques accomplies par le Prince Albert I.*, 62: 1-106, pls 1-6. Monaco.
- BRITO-CAPELLO, F. DE, 1871. — Algumas especies novas ou pouco conhecidas de Crustaceos pertencentes aos generos *Calappa e Telphusa*. *Jornal de ciencias mathematicas, physicas e naturaes*, Lisboa, 3: 128-134, pl. 2, figs 1-20.
- BROCCHI, P., 1875. — Recherches sur les organes génitaux des Crustacés Décapodes. *Annales des Sciences naturelles, Zoologie*, Paris, sér. 6, 2: 1-131, pls 13-19.
- BUITENDIJK, A.M., 1939. — Biological results of the Snellius Expedition. V. The Dromiacea, Oxystomata and Oxyrhyncha of the Snellius Expedition. *Temminckia*, 4: 223-276, text-figs 1-27, pls 7-11.
- CALMAN, W.T., 1900. — On a collection of Brachyura from Torres Straits. *Transactions of the Linnean Society of London*, (Zool.), (2) 8: 1-50, pls 1-3.
- CAMPBELL, B.M., 1971. — New records and new species of crabs (Crustacea: Brachyura) trawled off southern Queensland: Dromiacea, Homolidea, Gymnopleura, Corystoidea, and Oxystomata. *Memoirs of the Queensland Museum*, 16 (1): 27-48, figs 1-4, pls 2-3.
- CAMPBELL, B.M. & STEPHENSON, W., 1970. — The sublittoral Brachyura (Crustacea: Decapoda) of Moreton Bay. *Memoirs of the Queensland Museum*, 15 (4): 235-302, figs 1-49, pl. 22, tab. 1.
- CANO, G., 1889. — Crostacei Brachiuri ed Anomuri raccolti nel viaggio della R. Corvetta "Vettor Pisani" intorno al globo. Studio preliminare. *Bollettino della Società di Naturalisti in Napoli*, (1) 3: 79-106, 169-269, pl. 7.
- CHACE, F.A., 1966. — Decapod crustaceans from St. Helena Island, South Atlantic. *Proceedings of the United States National Museum*, 118: 623-661, figs 1-15, pls 1-2.
- CHEN, H.L., 1993. — The Calappidae (Crustacea: Brachyura) of Chinese waters. In: B. MORTON (ed.), *The Marine Biology of the South China Sea. Proceedings of the First International Conference on the Marine Biology of Hong Kong and the South China Sea*: 675-704.
- CHHAPGAR, B.F., 1957. — On the marine crabs (Decapoda: Brachyura) of Bombay state, Part I. *Journal of the Bombay Natural History Society*, 54 (2): 399-439, figs 1-2, pls 1-11.
- CHOPRA, B.N., 1933. — Further notes on Crustacea Decapoda in the Indian Museum. III. On the Decapod Crustacea collected by the Bengal Pilot Service off the mouth of the River Hugli. Dromiacea and Oxystomata. *Record of the Indian Museum*, Calcutta, 35: 25-52.
- CHOPRA, B.N. & DAS, K.N., 1937. — Further notes on Crustacea Decapoda in the Indian Museum. IX. On three collections of crabs from Tavoy and Mergui Archipelago. *Record of the Indian Museum*, Calcutta, 39 (4): 377-434, figs 1-21, pl. 6.
- COELHO, P.A., 1971. — A distribuição dos crustaceos decapodos reptantes do norte do Brazil. *Trabalhos do Instituto Oceanografico, Universidade Federal de Pernambuco*, Recife, 9/11 [1967/69,1970]: 223-238.
- COELHO, P.A. & RAMOS, M. DE A., 1972. — A constituição e a distribuição da fauna de decapodos do litoral leste da America do sul entre as latitudes de 5 N e 39 S. *Trabalhos do Instituto Oceanografico, Universidade Federal de Pernambuco*. Recife, 13: 133-236.
- CRANE, J., 1937. — The Templeton Crocker Expedition. VI. Oxystomatous and Dromiaceus crabs from the Gulf of California and the west coast of Lower California. *Zoologica, New York*, 22: 97-108, pls 1-2.
- CURTISS, A., 1938. — A Short Zoology of Tahiti. In: *The Society Islands*, xvi + 193 pp. Guide Printing Company, N.Y.



- DAI, A. & YANG, S., 1991. — Crabs of the China Seas, 21 + 682 pp., figs 1-295, pls 1-74. China Ocean Press, Beijing and Springer-Verlag, Berlin [English Edition].
- DAI, A., YANG, S., SONG, Y. & CHEN, C., 1986. — Crabs of China Seas, 642 pp., figs 1-295, pls 1-74. Ocean Press, Beijing.[in Chinese].
- DANA, J. D., 1853. — Crustacea. In: United States Exploring Expedition during the Years 1838, 1839, 1840, 1841, 1842, under the Command of Charles Wilkes, U.S.N., **13** [1852], viii + 685 pp. C. Sherman, Philadelphia.
- DAWYDOFF, C., 1952. — Contribution à l'étude des invertébrés de la faune marine benthique de l'Indochine. *Bulletin scientifique de la France et de la Belgique*, **9**: 1-158.
- DESMAREST, A.G., 1825. — Considérations générales sur la classe des Crustacés, et descriptions des espèces de ces animaux, qui vivent dans la mer, sur les côtes, ou dans les eaux douces de la France, xix + 446 pp., pls 1-56, 5 tabl. F. G. Levrault, Paris.
- DOFLEIN, F., 1901. — Weitere Mitteilungen über dekapode Crustaceen der k. bayerischen Staatssammlungen. *Sitzungsberichte der Bayerischen Akademie der Wissenschaften zu München, mathematisch-physikalische Klasse*, **30**, 1900 (1901): 125-145, figs 1-3.
- DOFLEIN, F., 1902. — Ostasiatische Dekapoden. *Abhandlungen der Bayerischen Akademie der Wissenschaften*, **21** (3): 613-670, figs 1-4, pls 1-6.
- DOFLEIN, F., 1904. — Brachyura. *Wissenschaftliche Ergebnisse der Deutschen Tiefsee-Expedition auf dem Dampfer "Valdivia"*, **6**, xiv + 314 pp., 68 figs, 1 pl., Atlas, 58 pls.
- ESTAMPADOR, E.P., 1937. — A check list of Philippine Crustacean Decapods. *Philippine Journal of Science*, **62** (4): 465-559.
- EYDOUX, F. & SOULEYET, L.F.A., 1842. — Zoologie, In: A.N. VAILLANT, Voyage autour du monde exécuté pendant les années 1836 et 1837 sur la corvette "La Bonite", commandée par M. Vaillant, **1** (2): 107-328. — 1846-49, Atlas, 150 pls.
- FABRICIUS, J.C., 1781. — Species Insectorum exhibentes eorum differentias specificas, synonyma auctorum, loca natalia, metamorphosis adjectis observationibus, descriptionibus, **2**, ii + 517 pp. Hamburg & Kilonii.
- FABRICIUS, J.C., 1793. — Entomologia systematica emendata et aucta, secundum classes, ordines, genera, species, adjectis synonymis, locis, observationibus, descriptionibus, **2**, viii + 519 pp. Hafniae.
- FABRICIUS, J.C., 1798. — Supplementum Entomologiae systematicae, 572 pp. Proft et Storch, Hafniae.
- FAUSTO-FILHO, J., 1967. — Sobre os calapideos do norte e nordeste do Brasil. *Arquivos da Estação de Biologia Marinha da Universidade do Ceara*, **7** (1): 41-62.
- FILHOL, H., 1886. — Crustacés. In: Recueil de Mémoires, Rapports et Documents relatifs à l'observation du passage de Vénus sur le soleil du 9 décembre 1874. Mission de l'île Campbell. Zoologie., **3** (2): 349-510, pls 38-55. Gauthier Villars, Paris.
- FINNEGAN, S., 1931. — Report on the Brachyura collected in Central America, the Gorgona and Galapagos Islands, by Dr. Crossland on the 'St. George' Expedition to the Pacific, 1924-25. *Journal of the Linnean Society of London*, **37**: 607-673, text-figs 1-6.
- FOREST, J. & GUINOT, D., 1961. — Crustacés Décapodes Brachyours de Tahiti et des Tuamotu. In: Expédition française sur les récifs coralliens de la Nouvelle-Calédonie. Volume préliminaire, xi + 195 pp., 178 figs, 18 pls. Éditions de la fondation Singer-Polignac, Paris.
- FOREST, J. & GUINOT, D., 1966. — Crustacés Décapodes: Brachyours. In: Campagne de la Calypso dans le Golfe de Guinée et aux îles Principe, São Tomé et Annobon (1956). *Annales de l'Institut océanographique*, Monaco, **4**: 23-124, figs 1-19.
- GARTH, J.S., 1946a. — Littoral brachyuran fauna of the Galapagos Archipelago. *Allan Hancock Pacific Expedition*, **5** (10): i-iv + 341-601, 1 fig., 39 pls.
- GARTH, J.S., 1946b. — Distribution studies of the Galapagos Brachyura. *Allan Hancock Pacific Expedition*, **5** (11): 603-638.
- GARTH, J.S., 1948. — The Brachyura of the "Askoy" Expedition with remarks on carcinological collecting in the Panama bight. *Bulletin of the American Museum of Natural History*, **92** (1): 1-66, pls 1-8, text-figs 1-5.



- GARTH, J.S., 1960. — Distribution and affinities of the Brachyuran Crustacea. *Systematic Zoology*, **9** (3): 105-123.
- GARTH, J.S., 1965. — The brachyuran decapod crustaceans of Clipperton Island. *Proceedings of the California Academy of Sciences*, **33** (1): 1-46, 26 figs.
- GARTH, J.S., 1966. — Oxystomatous and allied crabs from the West Coast of Tropical America. In: Eastern Pacific Expeditions of the New York Zoological Society. XLVI. *Zoologica, New York*, **51** (1): 1-16.
- GAULD, D.T., 1960. — An annotated check-list of the Crustacea of Ghana, IV. Brachyura. *Journal of the West African Science Association*, **6** (1): 68-72.
- GIBBES, L.R., 1850. — On the carcinological collections of the United States, and an enumeration of species contained in them, with notes on the most remarkable, and descriptions of new species. *Proceedings of the American Association for the Advancement of Science*, Charleston [1850]: 167-201.
- GORDON, I., 1934. — Crustacea Brachyura. In: Résultats scientifiques. Voyage aux Indes Orientales Néerlandaises du Prince et de la Princesse Léopold de Belgique, volume 3, fascicule 15. *Mémoires du Musée royal d'Histoire naturelle de Belgique*, hors sér., 78 pp., 37 figs.
- GRANT, F.E. & McCULLOCH, A.R., 1906. — On a collection of Crustacea from the Port Curtis district, Queensland. *Proceedings of the Linnean Society of New South Wales*, **31**: 2-53, pls 1-4.
- GRAVELY, F.H., 1927. — Orders Decapoda (except Paguridae) and Stomatopoda. In: The littoral fauna of Krusadai Island in the Gulf of Manaar with Appendices on the vertebrates and plants. *Bulletin of the Madras Government Museum*, **1** (1): 135-155, figs 1-2, pls 19-26.
- GRAVIER, C., 1920. — Sur une collection de Crustacés recueillis à Madagascar par M. le Lieutenant Decary. *Bulletin du Muséum d'Histoire naturelle, Paris*, **26** (5): 376-383; (6): 465-472, 7 figs.
- GRIFFIN, D.J.G., 1972. — Brachyura collected by Danish expeditions in south-eastern Australia (Crustacea, Decapoda). *Steenstrupia*, **2** (5): 49-90, figs 1-3.
- GRINDLEY, J.R., 1961. — On some crabs trawled off the Natal Coast. *Durban Museum Novitates*, **6** (10): 127-134, figs 1-4.
- GUÉRIN MÉNEVILLE, F.E., 1827-1830. — Planches du cabinet de Seba, accompagnées d'un texte explicatif mis au courant de la Science, et rédigé par M. le baron de Cuvier et une réunion de savants distingués. 45 livraisons de 10 pls in folio. Levrault, Strasbourg et Paris.
- GUÉRIN MÉNEVILLE, F.E., 1829-1844. — Iconographie du Règne animal de G. Cuvier ou représentation d'après nature de l'une des espèces les plus remarquables et souvent non encore figurées, de chaque genre d'animaux. Avec un texte descriptif mis au courant de la Science. Ouvrage pouvant servir d'atlas à tous les traités de Zoologie, vol. 2, Crustacés, pl. 1-35; vol. 3, Crustacés: 1-48.
- GUINOT, D., 1962. — Sur une collection de Crustacés Brachyours de mer Rouge et de Somalie. Remarques sur les genres *Calappa* Weber, *Menaethiops* Alcock, *Tyche* Bell, *Ophthalmias* Rathbun et *Stilbognathus* Von Martens. *Bollettino del Museo civico di Storia naturale de Venezia*, (1962) 1964, **15**: 7-63, figs 1-39, pls 1-4.
- GUINOT, D., 1967. — La faune carcinologique (Crustacea Brachyura) de l'océan Indien occidental et de la mer Rouge: Catalogue, remarques biogéographiques et bibliographie. In: Réunion de spécialistes C.S.A. sur les Crustacés. *Mémoires de l'Institut français d'Afrique noire*, **77**, 1966 (1967): 235-352.
- GUINOT, D. & RIBEIRO, A., 1962. — Sur une collection de Crustacés Brachyours des îles du Cap Vert et de l'Angola. *Memórias da Junta de Investigações do Ultramar*, Lisboa, ser. 2., **40**: 9-89, figs 1-33, pls 1-4.
- HAAN, W. DE, 1833-1850. — Crustacea. In: P.F. VAN SIEBOLD, *Fauna Japonica, sive Descriptio animalium, quae in itinere per Japoniam, jussu et auspiciis superiorum, qui summum in India Batava imperium tenent, suscepto, annis 1823-1830 collegit, notis, observationibus et adumbrationibus illustravit: i-xvii + i-xxxii + ix-xvi + 1-243*, pls 1-55, A-J, L-Q, circ., 2 pls. Lugundi-Batavorum.
- HALE, H.M., 1927. — The Crustaceans of South Australia. Part I. In: *Handbooks of the Flora and Fauna of South Australia*, 201 pp., 202 figs. Adelaide.
- HASWELL, W.A., 1882. — Catalogue of the Australian Stalk- and Sessile-eyed Crustacea, i-xxiv + 324 pp., figs 1-8, pls 1-4. The Australian Museum, Sydney.
- HELLER, C., 1861a. — Synopsis der im Rothen Meere vorkommenden Crustaceen. *Verhandlungen der Zoologisch-botanischen Gesellschaft in Wien*, **11**: 3-32.



- HELLER, C., 1861b. — Beiträge zur Crustaceenfauna des Rothen Meeres. *Sitzungsberichte der Akademie der Wissenschaften in Wien, mathematisch-physikalische Klasse*, **43** (1): 297-374, pls 1-4.
- HELLER, C., 1865. — Crustaceen. In: Reise der österreichischen Fregatte "Novara" um die Erde in den Jahren 1857, 1858, 1859 unter den Befehlen des Commodore B. von Wüllerstorff-Urbair, Zoologischer Theil, **2** (3), n°1: 1-280, pls 1-25. Kaiserlich-Königliche Hof- und Staatsdruckerei, Wien.
- HENDERSON, J.R., 1893. — A contribution to Indian Carcinology. *Transactions of the Linnean Society of London*, (Zool.), (2) **5**: 325-458, pls 36-40.
- HENDRICKX, M.E., 1992. — Distribution and zoogeographic affinities of Decapod Crustaceans of the Gulf of California, Mexico. *Proceedings of the San Diego Society of Natural History*, **20**: 1-12.
- HENDRICKX, M.E., 1993a. — Crustáceos Decápodos bentónicos del sur de Sinaloa, México. *Anales del Instituto de Biología Universidad Nacional Autónoma de México*, Serie Zoología, **64** (1): 1-16.
- HENDRICKX, M.E., 1993b. — Crustáceos Decápodos del Pacífico Mexicano. In: S.I. SALAZAR-VALLEJO & N.E. GONZÁLEZ (eds), Biodiversidad marina y costera de México. Com. Nal. Biodiversidad y CIQRO, México: 271-318.
- HENDRICKX, M.E., 1994. — Crabs. In: W. FISCHER (ed.), FAO species identification guide for fishery purposes, Eastern Central Pacific: 562-632. Roma.
- HERBST, J.F.W., 1782-1804. — Versuch einer Naturgeschichte der Krabben und Krebse nebst einer systematischen Beschreibung ihrer verschiedenen Arten. 3 vols, 1-274, 1-225, 1-66, 1-46, 1-54, 1-49, 62 pls. Berlin and Stralsund.
- HERKLOTS, J.A., 1851. — Additamenta ad faunam carcinologicam Africae occidentalis, sive descriptiones specierum novarum e Crustaceorum ordine, quas in Guinea collegit vir strenuus H.S. Pel., vi + 27 pp., 2 pls. Lugduni-Batavorum.
- HERKLOTS, J.A., 1861. — Symbolae Carcinologicae. I. Catalogue des Crustacés, qui ont servi de base au système carcinologique de M.W. de Haan, rédigé d'après la collection du Musée des Pays-Bas et les Crustacés de la faune du Japon. 43 pp. Leyden.
- HESS, W., 1865. — Beiträge zur Kenntniss der Decapoden-Krebse Ost-Australiens. *Archiv für Naturgeschichte*, **31** (1): 127-173, pls 6-7.
- HILGENDORF, F., 1869. — Crustaceen. In: C. VON DER DECKEN, Reisen in Ostafrika in den Jahren 1859-1865, **3** (1): 67-116, pls 1-6. Heidelberg-Leipzig.
- HILGENDORF, F., 1878. — Die von Herrn W. Peters in Moçambique gesammelten Crustaceen. *Monatsberichte der Deutschen Akademie der Wissenschaften zu Berlin*, [1878]: 782-851, pls 1-4.
- HOFFMANN, C.K., 1874. — Crustacés et Échinodermes de Madagascar et de l'île de la Réunion. In: Recherches sur la Faune de Madagascar et de ses dépendances, d'après les découvertes de François P.L. Pollen et D.C. van Dam, 5ème partie. 58 pp., 10 pls. Leiden.
- HOLTHUIS, L.B., 1953. — Enumeration of the Decapod and Stomatopod Crustacea from Pacific Coral Islands. *Atoll Research Bulletin*, **24**: 1-66.
- HOLTHUIS, L.B., 1958. — Crustacea Decapoda from the northern Red Sea (Gulf of Aqaba and Sinai Peninsula) II. Hippidea and Brachyura (Dromiacea, Oxystomata, and Grapsoidea). Contributions to the knowledge of the Red Sea. No. 9. *Bulletin Sea Fisheries Research Station*, Israel, **17**: 41-54, figs 1-4.
- HOLTHUIS, L.B., 1959. — The Crustacea Decapoda of Suriname (Dutch Guiana). *Zoologische Verhandelingen*, **44**: 1-296, 68 figs.
- HOLTHUIS, L.B. & SAKAI, T., 1970. — P.H.F. Siebold and Fauna Japonica. A History of Early Japanese Zoology, xviii + 323 pp., pls i-xxxii. Academic Press of Japan, Tokyo.
- IHLE, J.E.W., 1918. — Die Decapoda Brachyura der Siboga-Expedition. III. Oxytomata: Calappidae, Leucosiidae, Raninidae. *Siboga-Expeditie*, **39**(b2): 159-322, figs 78-148.
- KENSLEY, B.F., 1969. — Decapod Crustacea from the South-West Indian Ocean. *Annals of the South African Museum*, **52** (7): 149-181, 16 figs.
- KIM, H.S., 1970. — A checklist of the Anomura and Brachyura (Crustacea, Decapoda) of Korea. *Seoul University Journal, Biology and Agriculture* (Serie B), **21**: 1-34, pls 1-5.
- KLUNZINGER, C.B., 1906. — Die Spitz- und Spitzmundkrabben (Oxyrhyncha und Oxystomata) des Roten Meeres, viii + 91 pp., figs 1-13, pls 1-2. Stuttgart.



- KOSSMANN, R., 1877. — III. Malacostraca, (I. Theil: Brachyura). *In*: R. KOSSMANN, Zoologische Ergebnisse einer im Auftrage der Königlichen Academie der Wissenschaften zu Berlin ausgeführten Reise in der Küstengebiete des Rothen Meeres, 66 pp., pls 1-3. Leipzig.
- KRAUSS, F., 1843. — Die Südafrikanischen Crustaceen. Eine Zusammenstellung aller bekannten Malacostraca, Bemerkungen über deren Lebensweise und geographische Verbreitung, nebst Beschreibung und Abbildung mehrerer neuer Arten, 68 pp., pls 1-4. Stuttgart.
- LATREILLE, P.A., 1803. — Histoire naturelle générale et particulière des Crustacés et des Insectes; Ouvrage faisant suite aux Oeuvres de Leclerc de Buffon, et partie du Cours complet d'Histoire naturelle, rédigé par C.S. Sonnini, membre de plusieurs Sociétés savantes. **5**: 346-394. Paris.
- LATREILLE, P.A., 1806. — Genera Crustaceorum et Insectorum secundum ordinem naturalem in familias disposita, iconibus exemplisque plurimis explicata, **1**: xviii + 302 pp., 16 pls. Parisii et Argentorati, Koening.
- LATREILLE, P.A., 1817. — Crustacés, Arachnides et Insectes. *In*: G. CUVIER: Le Règne animal, distribué d'après son organisation. III, 653 pp. Paris.
- LATREILLE, P.A., 1829. — Les Crustacés, les Arachnides et les Insectes distribués en familles naturelles, **1**: 1-584. Paris.
- LAURIE, R.D., 1906. — Report on the Brachyura collected by Professor Herdman, at Ceylon, in 1902. *In*: W. A. HERDMAN, Report to the government of Ceylon on the Pearl Oyster fisheries of the Gulf of Manaar. Report Pearl Oyster Fisheries, **5**, 349-432, figs 1-12, pls 1-2. The Royal Society, London.
- LAURIE, R.D., 1915. — Report on the Marine Biology of the Sudanese Red Sea. XXI. On the Brachyura. *Journal of the Linnean Society of London, (Zool.)*, **31**: 407-475, pls 42-45.
- LEMAITRE, R. & ÁLVAREZ-LEÓN, R., 1992. — Crustáceos decápodos del Pacífico Colombiano: lista de especies y consideraciones zoogeograficas. *Anales del Instituto de Investigaciones Marinas de Punta de Betín*, **21**: 33-76.
- LENZ, H., 1905. — Ostafrikanische Dekapoden und Stomatopoden, gesammelt von Herrn Prof. Dr. A. Voeltzkow. *In*: Wissenschaftliche Ergebnisse der Reise in Madagaskar und Ostafrika in den Jahren 1889-1895 von Dr. A. Voeltzkow. Bd. III. *Abhandlungen der Senckenbergischen naturforschenden Gesellschaft*, **27** (4): 341-392, pls 47-48.
- LENZ, H. & RICHTERS, F., 1881. — Beitrag zur Krustaceenfauna von Madagaskar. *Abhandlungen der Senckenbergischen naturforschenden Gesellschaft*, **12** (3-4): 421-428, figs 20-27.
- LIN, C., 1949. — A catalogue of Brachyurous Crustacea of Taiwan. *Quarterly Journal of the Taiwan Museum*, **2** (1): 10-33.
- LINNAEUS, C., 1758. — Systema Naturae per Regna tria Naturae, secundum Classes, Ordines, Genera, Species, cum Characteribus, Differentiis, Synonymiis, Locis, ed. 10, **1**: 1-824. Holmiae, Stockholm.
- LINNAEUS, C., 1764. — Museum S:ae R:ae M:tis Ludovicae Ulrica Reginae Suecorum, Gothorum, Vandalorumque, etc., 720 pp., Holmiae, Stockholm.
- LINNAEUS, C., 1767. — Systema Naturae per Regna tria Naturae, secundum Classes, Ordines, Genera, Species, cum Characteribus, Differentiis, Synonymiis, Locis, ed. 12, **1**: 1-1327. Holmiae, Stockholm.
- LONGHURST, A.R., 1958. — An ecological survey of the west African marine benthos. *Colonial Office, Fishery Publications, HMSO, London*, **11**: 1-102, figs 1-11.
- MCNEILL, F.A., 1926. — The Biology of North-West Islet, Capricorn Group. I. Crustacea. *Australian Zoologist*, **4**: 299-318, figs 1-2, pl. 41.
- MCNEILL, F.A., 1968. — Crustacea, Decapoda & Stomatopoda. *Scientific Reports. Great Barrier Reef Expedition 1928-29*, **7** (1): 1-98, 2 pls.
- MCNEILL, F.A. & WARD, M., 1930. — Carcinological Notes. No. 1. *Record of the Australian Museum*, **17**: 357-383, fig. 1, pls 59-61.
- MAN, J.G. DE, 1880. — On some podophthalmous Crustacea presented to the Leyden Museum by Mr. J.A. Kruyt, collected in the Red Sea near the city of Djeddah. *Notes from the Leyden Museum*, **2**: 171-185.
- MAN, J.G. DE, 1888a. — Bericht über die von Dr. J. Brock im indischen Archipel gesammelten Decapoden und Stomatopoden. *Archiv für Naturgeschichte*, **53**, 1887 (1888): 215-600, pls 7-22a.
- MAN, J.G. DE, 1888b. — Report on some Podophthalmous Crustacea of the Mergui Archipelago, collected for the Trustees of the Indian Museum, Calcutta, by Dr. John Anderson, F.R.S., Superintendent of the Museum. *Journal of the Linnean Society of London, (Zool.)*, **22** (139): 177-240.



- MAN, J.G. DE, 1896. — Bericht über die von Herrn Schiffscapitän Storm zu Atjeh, an den westlichen Küsten von Malakka, Borneo und Celebes sowie in der Java-See gesammelten Decapoden und Stomatopoden. *Zoologischer Jahresbericht* (Syst.), **9**: 339-386, figs 40-49.
- MAN, J.G. DE, 1902. — Die von Herrn Professor Kükenthal, im Indischen Archipel gesammelten Dekapoden und Stomatopoden. In: *Ergebnisse einer zoologischen Forschungsreise in den Molukken und Borneo, im Auftrage der Senckenbergischen naturforschenden Gesellschaft ausgeführt von Dr. Willy Kükenthal, ordentl. Professor der Zoologie an der Universität Breslau. Abhandlungen der Senckenbergischen naturforschenden Gesellschaft*, **25**: 465-929, pls 19-27.
- MANNING, R.B. & CHACE, F.A., 1990. — Decapod and Stomatopod Crustacea from Ascension Island, South Atlantic Ocean. *Smithsonian Contributions to Zoology*, (503), v + 91 pp., 47 figs.
- MANNING, R.B. & HOLTHUIS, L.B., 1981. — West African Crabs (Crustacea: Decapoda). *Smithsonian Contributions to Zoology*, (306), xii + 379 pp, figs 1-88.
- MARTENS, E. VON, 1866. — Verzeichniss der von Dr. E. Schweinfurth im Sommer 1864 auf seiner Reise am Rothen Meere gesammelten und nach Berlin eingesandten zoologischen Gegenstände. II. Crustaceen. *Verhandlungen der Zoologisch-botanischen Gesellschaft in Wien*, **16**: 377-382.
- MATSUZAWA, K., 1977. — Sea Shore Animals of Muroto, unnumbered pages, 126 pls. Kansai-Insatsu-Kogyo, Japan [in Japanese].
- MICHEL, C., 1964. — Brachyura from Mauritius. *Bulletin of the Mauritius Institute*, **6**: 1-48.
- MIERS, E.J., 1876. — Catalogue of the stalk- and sessile-eyed Crustacea of New Zealand, xii + 136 pp., 3 pls. London.
- MIERS, E.J., 1879. — Crustacea of Rodriguez. An account of the petrological, botanical & zoological Collections made in Kerguelen's Land and Rodriguez during the Transit of Venus Expedition, carried out by order of Her Majesty's Government in the years 1874-75. *Philosophical Transactions of the Royal Society of London*, **168**: 485-496.
- MIERS, E.J., 1880. — On a collection of Crustacea from the Malaysian Region. Part II. Telphuseida, Catometopa, and Oxytostomata. *Annals and Magazine of Natural History*, (5) **5**: 304-317, pl. 14.
- MIERS, E.J., 1884. — Crustacea. In: Report on the zoological collections made in the Indo-Pacific Ocean during the voyage of H.M.S. "Alert" 1881-1882: 178-322, 513-575, pls 18-32, 46-52. London.
- MIERS, E.J., 1886. — Report on the Brachyura collected by H.M.S. Challenger during the years 1873-76. *Report on the Scientific Results of the Voyage of H.M.S. Challenger during the years 1873-1876*, Zoology, **17** (2): i-1 + 1-362, pls 1-29.
- MILNE EDWARDS, A., 1862. — Faune carcinologique de l'île de La Réunion. In: L. MAILLARD, Notes sur l'île de la Réunion (Bourbon). Annexe F: 1-16, pls 17-19.
- MILNE EDWARDS, A., 1868. — Description de quelques Crustacés nouveaux provenant des voyages de M. Alfred Grandidier à Zanzibar et à Madagascar. *Nouvelles Archives du Muséum d'Histoire naturelle*, Paris, **4**: 69-92, pls 19-21.
- MILNE EDWARDS, A., 1874. — Recherches sur la faune carcinologique de la Nouvelle-Calédonie. 3ème Partie. Groupe des oxytostomes. *Nouvelles Archives du Muséum d'Histoire naturelle*, Paris, **10**: 39-58, pls 2-3.
- MILNE EDWARDS, H., 1837. — Histoire naturelle des Crustacés, comprenant l'Anatomie, la Physiologie et la Classification de ces Animaux, **2**: 1-532. Paris.
- MIYAKE, S., 1936. — Reports on the Brachyura of Riu-Kiu Islands, collected by the Yaeyama Expeditions during the years 1932-1934. II. A list of the known species of the Brachyura from Ishigaki-Shima. *Annotationes zoologicae japonenses*, **15** (4): 506-513.
- MIYAKE, S., 1939. — Notes on Crustacea Brachyura collected by Prof. Teiso Esaki's Micronesia Expeditions 1937-1938. II. A check list of Micronesian Brachyura. *Record of Oceanographic Works in Japan*, **10** (2): 168-247, 13 figs, 6 pls.
- MIYAKE, S., 1983. — Japanese Crustacean Decapods and Stomatopods in color. Vol. II Brachyura (Crabs). 277 pp., 64 pls. Hoikusha, Osaka [in Japanese].
- MONOD, Th., 1927. — Crustacea IV. Decapoda (excl. Palaemonidae, Atyidae et Potamonidae). In: Contribution à l'étude de la faune du Cameroun. *Faune des colonies françaises*, **1** (6): 593-624, figs 1-3. Paris.
- MONOD, Th., 1928. — Les *Calappa* de la côte occidentale d'Afrique. *Bulletin de la Société des Sciences naturelles du Maroc*, **8** (4-6): 109-127.



- MONOD, Th., 1935. — VIII. Decapoda Brachyura. In: Mission Robert Ph. Dollfus en Egypte. *Mémoires de l'Institut d'Egypte*, **37**: 1-162, 29 figs.
- MONOD, Th., 1956. — Hippidea et Brachyura ouest-africains. *Mémoires de l'Institut français d'Afrique noire*, **45**: 1-674, figs 1-884, tabs 1-10.
- MONOD, Th., 1967. — Crevettes et crabes de la côte occidentale d'Afrique. In: Réunion de Spécialistes C.S.A. sur les Crustacés. *Mémoires de l'Institut français d'Afrique noire*, **77**: 103-234, pls 1-26.
- MÜLLER, F., 1887. — Zur Crustaceenfauna von Trincomali. *Verhandlungen der Naturforschenden Gesellschaft in Basel*, **8**: 470-485, pls 4-5.
- NAUCK, E., 1880. — Das Kaugerüst der Brachyuren. *Zeitschrift für Wissenschaftliche Zoologie*, Leipzig, **34**: 1-69, pl. 1.
- NOBILI, G., 1899. — Contribuzioni alla cognoscenza della fauna carcinologica della Papuasias, delle Mollucche e dell'Australia. *Annali del Museo civico di Storia naturale di Genova*, **40**: 230-282.
- NOBILI, G., 1900. — Decapodi e Stomatopodi Indo-Malesi. *Annali del Museo civico di Storia naturale di Genova*, **40**: 473-523, figs 1-4.
- NOBILI, G., 1901. — Decapodi e Stomatopodi del viaggio del Dr. Enrico Festa nella Repubblica dell'Ecuador e regione vicine. *Bollettino dei Musei di Zoologia e di Anatomia comparata della R. Università di Torino*, **16** (415): 1-58.
- NOBILI, G., 1903. — Crostacei di Singapore. *Bollettino dei Musei di Zoologia e di Anatomia comparata della R. Università di Torino*, **18** (455): 1-39, fig. 1, pl. 1.
- NOBILI, G., 1906. — Faune carcinologique de la Mer Rouge. Décapodes et Stomatopodes. *Annales des Sciences naturelles (Zool.)*, (9) **4**: 1-347, figs 1-12, pls 1-11.
- NOMURA, K., KAMEZAKI, N., HAMANO, T. & MISAKI, H., 1988. — The guidebook of marine animals and plants of Okinawa. Vol. 7 (Crustacea (Brachyura)). 1-250 pp., Southern Press, Okinawa [in Japanese].
- ORTMANN, A. E., 1892. — Die Decapoda-Krebse des Strassburger Museum. Theil-5, Die Abtheilungen Hippidea, Dromiidea und Oxystomata, mit besonderer Berücksichtigung der von Herrn Dr. Döderlein bei Japan und bei den Liu-Kiu-Inseln gesammelten und zur Zeit im Strassburger Museum aufbewahrten Formen. *Zoologischer Jahresbericht (Syst.)*, **6**: 532-588, figs 1-18.
- OSORIO, B., 1887a. — Liste des Crustacés des possessions portugaises d'Afrique occidentale dans les collections du Muséum d'Histoire Naturelle de Lisbonne. *Jornal de Sciencias mathematicas, physicas e naturaes*, Lisboa, **11**: 220-231.
- OSORIO, B., 1887b. — Liste des Crustacés des Possessions portugaises d'Afrique occidentale dans les collections du Muséum d'Histoire naturelle de Lisbonne. *Jornal de Sciencias mathematicas, physicas e naturaes*, Lisboa, **12**: 186-191.
- OSORIO, B., 1889. — Nouvelle contribution pour la connaissance de la faune carcinologique des îles Saint Thomé et du Prince. *Jornal de Sciencias mathematicas, physicas e naturaes*, Lisboa, (2) **1**: 129-139.
- OSORIO, B., 1890. — Note sur quelques espèces de crustacés des îles S. Thomé, du Prince et Ilheo das Rolas. *Jornal de Sciencias mathematicas, physicas e naturaes*, Lisboa, (2) **2**: 45-49.
- OSORIO, B., 1898. — Da distribuição geographica dos Peixes e Crustaceos colhidos nas possessões portuguezas d'Africa occidental e existentes no Museum Nacional de Lisboa. *Jornal de Sciencias mathematicas, physicas e naturaes*, Lisboa, (2), **5**: 185-202.
- PARISI, B., 1914. — I Decapodi giapponesi del Museo di Milano. I. Oxystomata. *Atti della Società italiana di Scienze naturali e del Museo civico di Storia naturale*, Milano, **53**: 282-312, figs 1-5, pls 11-13.
- PAULSON, O., 1875. — Podophthalmata and Edriophthalmata (Cumacea). Studies on Crustacea of the Red Sea with notes regarding other Seas, Part I. xiv + 144 pp., pls 1-21. Kiev. [Original in Russian. Reprinted 1961, with different pagination, by the Israel Program for Scientific Translations, Jerusalem].
- PESTA, O., 1911. — Botanische und zoologische Ergebnisse einer wissenschaftlichen Forschungsreise nach den Samoainseln, dem Neuguinea-Archipel und den Salomoninseln von März bis Dezember 1905. Crustaceen. I. Teil. Decapoda Brachyura aus Samoa. *Denkschriften der Akademie der Wissenschaften*, Wien, **88**: 36-66, 5 text-figs.
- PILLAI, N.K., 1951. — Decapoda (Brachyura) from Travancore. *Bulletin of the Research Institute*, Travancore, **2**: 1-46.
- PRAHL, H. VON & SÁNCHEZ, O.F., 1986. — Cangrejos Calápidos (Crustacea: Brachyura: Calappidae) del Pacífico Colombiano. *Boletim Ecotropica*, Bogota, **14**: 21-33.



- RATHBUN, M.J., 1897. — List of the Decapod Crustacea of Jamaica. *Annals of the Institute of Jamaica*, Kingston, **1** (1): 1-46.
- RATHBUN, M.J., 1898a. — The Brachyura collected by the U.S. Fisheries Commission Steamer "Albatross" on the voyage from Norfolk, Virginia, to San Francisco, California, 1887-1888. *Proceedings of the United States National Museum*, **21**: 567-616, pls 41-44.
- RATHBUN, M.J., 1898b. — The Brachyura of the Biological Expedition to the Florida Keys and the Bahamas in 1893. *Bulletin from the Laboratories of Natural History of the State University of Iowa*, **4** (3): 250-294, 9 pls.
- RATHBUN, M.J., 1900. — The Decapod Crustaceans of West Africa. *Proceedings of the United States National Museum*, **22**: 271-316.
- RATHBUN, M.J., 1902a. — The Brachyura and Macrura of Porto Rico. *Bulletin of the United States Fish Commission*, **20** (2): 1-127, text-figs 1-24, pls 1-2.
- RATHBUN, M.J., 1902b. — Japanese stalk-eyed crustaceans. *Proceedings of the United States National Museum*, **26**: 23-55, figs 1-24.
- RATHBUN, M.J., 1906. — The Brachyura and Macrura of the Hawaiian Islands. *Bulletin of the United States Fish Commission*, **23**: 827-930, figs 1-79, pls 1-24.
- RATHBUN, M.J., 1907. — Reports on the scientific results of the expedition to the tropical Pacific, in charge of Alexander Agassiz, by the U.S. Fish Commission Steamer "Albatross", from August 1899 to March 1900, Commander Jefferson F. Moser, U.S.N., Commanding. X. The Brachyura. *Memoirs of the Museum of Comparative Zoology of Harvard College*, **35** (2): 23-74, pls 1-9.
- RATHBUN, M.J., 1910a. — The Danish Expedition to Siam, 1899-1900. *Kongelige Danske Videnskabernes Selskabs Skrifter, Kjøbenhavn*, (7) **5**: 301-367, 44 figs, pls 1-2.
- RATHBUN, M.J., 1910b. — The stalk-eyed Crustacea of Peru and the adjacent coast. *Proceedings of the United States National Museum*, **38**: 531-620, 3 figs, pls 36-56.
- RATHBUN, M.J., 1911. — Brachyura of the Percy Sladen Trust Expedition to the Indian Ocean in 1905. *Transactions of the Linnean Society of London*, (Zool.), (2) **14**: 191-261, 2 figs, pls 15-20.
- RATHBUN, M.J., 1920. — Stalk-eyed Crustaceans of the Dutch West Indies, collected by Dr. J. Boeke, 1904-1905. In: Rapport betreffende een voorloopig Onderzoek naar den Toestand van de Visscherij en de Industrie van Zeeproducten in de Kolonie Curaçao, **2**: 317-349. Den Haag.
- RATHBUN, M.J., 1921. — Report on the Brachyuran collected by the Barbados-Antigua Expedition from the University of Iowa in 1918. *Studies in Natural History, Iowa University*, **45**: 65-90, pls 1-3.
- RATHBUN, M.J., 1923. — Report on the crabs obtained by the F.I.S. "Endeavour" on the Coasts of Queensland, New South Wales, Victoria, South Australia, and Tasmania. *Biological Results of the Fishing Experiments carried out by the F.I.S. "Endeavour" 1909-14*, **5**: 95-156, 3 figs, pls 16-42.
- RATHBUN, M.J., 1924a. — Brachyuran crabs collected by the Williams Galapagos Expedition, 1923. *Zoologica, New York*, **5** (14): 153-159, 1 fig., pl. 7.
- RATHBUN, M.J., 1924b. — Brachyura, Albuneidae and Porcellanidae. Results of Dr. E. Mjöberg's Swedish Scientific Expeditions to Australia 1910-1913. *Arkiv för Zoologi*, **16** (23): 1-33, 7 figs, 1 pl.
- RATHBUN, M.J., 1936. — Brachyuran Crustacea from Bonaire, Curaçao and Aruba. Zoologische Ergebnisse einer Reise nach Bonaire, Curaçao und Aruba im Jahre 1930. No. 17. *Zoologischer Jahresbericht (Syst.)*, **67**: 379-388.
- RATHBUN, M.J., 1937. — The Oxystomatous and allied Crabs of America. *Bulletin of the United States National Museum*, **116**: i-iv, 1-272, 47 figs, pls 1-86.
- RIBEIRO, A., 1964. — Crustáceos Decápodos Braquiuros do Arquipélago de Cabo Verde (Coleção do Centro de Biologia Piscatoria). *Notas mimeografadas do Centro de Biologia piscatoria*, Lisboa, **38**: 1-27.
- RIBEIRO, A., 1973. — Crustaceos Decapodos capturados em Aguas do Arquipélago de Cabo Verde Pelo Navio de Pesquisas "Walther Herwig" em 1970. *Notas do Centro de Biologia Aquática Tropical*, Lisboa, **36**: 1-21, figs 1-7.
- RICHTERS, F., 1880. — Decapoda. In: K. MÖBIUS, Beiträge zur Meeresfauna der Insel Mauritius und der Seychellen: 139-178, pls 15-18. Berlin.
- ROMIMOHTARTO, K., 1967. — The Oxystomatous crabs of the Baruna Expedition. *Marine Research in Indonesia*, **8** (1): 1-28, figs 1-7, pls 1-3.



- ROSSIGNOL, M., 1957. — II. Crustacés Décapodes marins de la région de Pointe-Noire. In: J. COLLIGNON, M. ROSSIGNOL & Ch. ROUX, Mollusques, Crustacés, Poissons marins des côte d'A.E.F. en collection au Centre d'Océanographie de l'Institut d'Études Centrafricaines de Pointe-Noire: 71-136, figs 1-20, pls 1-3. Paris.
- ROSSIGNOL, M., 1962. — Catalogue des Crustacés Décapodes Brachyours, Anomours et Macrours littoraux en collection au Centre d'Océanographie de Pointe-Noire. O.R.S.T.O.M. *Travaux du Centre de Recherches océanographiques de Pointe-Noire*, 2: 11-138, pls 1-4.
- RUMPHIUS, G.E., 1741. — D'Amboinsche Rariteitkamer, behelzende eene Beschryvinge van allerhande zoo weeke als harde Schaalvisschen, te weeten raare Krabben, Kreeften, en diergelyke Zeedieren, als mede allerhande Hoortjes en Schulpen, die men in d'Amboinsche Zee vindt: daar beneven zommige Mineraalen, Gesteenten, en soorten van Aarde, die in d'Amboinsche, en zommige omleggende Eilanden gevonden worden, ed. I: 1-340, pls 1-60.
- RÜPPEL, F.W., 1830. — Beschreibung und Abildung von 24 Arten kurzschwänzigen Krabben, als Beitrag zur Naturgeschichte des Rothen Meeres: 1-28, pl. 1-6. Frankfurt a. M., H.L. Brönnner.
- SAKAI, T., 1934. — Brachyura from the coast of Kyushu, Japan. *Scientific Reports. Tokyo Bunrika Daigaku*, 1 (25): 281-330, 26 figs, pls 17-18.
- SAKAI, T., 1936. — Crabs of Japan, 66 plates in life colours with descriptions. [1935], x + 239 pp., figs 1-122, 27 pages of bibliography and index, frontispiece (colour), pls 1-66 (colour). Sanseido, Tokyo. [in Japanese].
- SAKAI, T., 1937. — Studies on the crabs of Japan. II. Oxystomata. *Scientific Reports. Tokyo Bunrika Daigaku* (sect. B, suppl. 2) 3: 67-192, figs 1-45, 1 tab., pls 10-19.
- SAKAI, T., 1956. — Crabs, 224 pp., 71 textfigs, appendix 60 pp., 6 pls. Tokyo.
- SAKAI, T., 1960. — Arthropoda, Crustacea, Decapoda, Brachyura In: K. OKADA and T. UCHIDA (eds), *Encyclopedia Zoologica Illustrated in Colours*, volume 4: 28-87, pls 14-43. Tokyo, Hokuryukan.
- SAKAI, T., 1965. — The Crabs of Sagami Bay collected by His Majesty the Emperor of Japan : i-xvi + 1-206 [in English], figs 1-27, pls 1-100 : 1-92 [in Japanese] : 1-26 [Bibliography & Index in English] : 27-32 [Index in Japanese], 1 map. Maruzen, Tokyo.
- SAKAI, T., 1976. — Crabs of Japan and the adjacent Seas. [In 3 volumes: (1) English text, xxix + 773 pp., figs 1-379; (2) Plates volume, 16 pp., pls 1-251; (3) Japanese text, 461 pp., figs 1-2]. Kodansha, Tokyo.
- SAKAI, T., 1980. — New species of crabs of the families Lithodidae and Calappidae. *Researches on Crustacea*, 10: 1-11, frontispiece, text-figs 1-3, pl. 1.
- SANKARANKUTTY, C., 1961. — On some crabs (Decapoda-Brachyura) from the Laccadive Archipelago. *Journal of the Marine Biological Association of India*, 3 (1 & 2): 102-136, figs 1-2.
- SANKARANKUTTY, C., 1962. — On Decapoda Brachyura from the Andaman and Nicobar Islands. *Journal of the Marine Biological Association of India*, 4 (1 & 2): 151-164, 23 figs.
- SANKARANKUTTY, C. & SUBRAMANIAN, S., 1976. — Taxonomic notes on Crustacea Decapoda collected by deep-sea trawling off Dar es Salaam. *University Science Journal (Dar es Salaam University)*, 2 (2): 17-24, 1 fig.
- SAUSSURE, M.H., 1853. — Description de quelques Crustacés nouveaux de la côte occidentale du Mexique. *Revue et Magasin de Zoologie pure et appliquée*, Paris, 8: 1-15, pls 12-13.
- SCHENKEL, E., 1902. — Beiträge zur Kenntnis der Dekapodenfauna von Celebes. *Verhandlungen der Naturforschenden Gesellschaft in Basel*, 13 (3): 485-585, pls 7-13.
- SEBA, A., 1759. — Locupletissimi revum naturalium thesauri accurata descriptio et iconibus artificiosissimis expressio per universam physices historiam, 3: 1-212, pls 1-116. Amsterdam.
- SERÈNE, R., 1937. — Inventaire des Invertébrés marins de l'Indochine (1ère liste). *Notes de l'Institut océanographique d'Indochine*, (30): 1-84.
- SERÈNE, R., 1968. — The Brachyura of the Indo-West Pacific region. In: *Prodromus for a check list of the (non-planctonic) marine fauna of South East Asia*. Unesco, Singapore, special publication, (1): 33-112.
- SHEN, C.J., 1931. — The Crabs of Hong Kong. I. *Hong Kong Naturalist*, 2: 92-110, 11 figs, pls 4-10. *Idem*. II. *Ibidem*: 185-197, 13 figs, pls 12-14.
- SHEN, C.J., 1936. — On a collection of brachyuran Decapoda from Hainan Island with descriptions of three new species. *Chinese Journal of Zoology*, 2: 63-80, 4 figs.
- SHIRAI, S., 1980. — Ecological Encyclopedia of the marine animals of the Ryukyu Islands in colour. 636 pp. Okinawa Kyoiku Shuppan, Okinawa.



- SOKOLOWSKY, P.A., 1945. — Biologisch-morphologische Betrachtung einiger Calappinea, Ortmann. Nebst Beschreibung einer anscheinend neuen Art aus dem Oestlichen Sued-Amerika. *Annali del Museo civico di Storia naturale di Genova*, **62**: 62-75, pls 1-2.
- STEBBING, T.R.R., 1910. — General Catalogue of South African Crustacea. *Annals of the South African Museum*, **6** (4): 281-593, pls 15-22.
- STEBBING, T.R.R., 1917. — The Malacostraca of Natal. *Annals of Durban Museum*, **2**: 1-33, pls 1-6.
- STELLA, E., 1953. — Crostacei Decapodi e Stomatopodi. Spedizione Subacquea Italiana nel Mar Rosso. *Rivista di Biologia coloniale*, Roma, **13**: 51-70.
- STEPHENSEN, K., 1945. — Brachyuran of the Iranian Gulf. With an Appendix: The Male Pleopoda of the Brachyura. In: Danish scientific Investigations in Iran, **4**: 57-237, text-figs 1-60.
- STEPHENSON, T.A., STEPHENSON, A., TANDY, G. & SPENDER, M., 1931. — The Structure and Ecology of Low Isles and other Reefs. *Scientific Reports. Great Barrier Reef Expedition*, **3** (2): 17-112, 15 text-figs, 27 pls.
- STIMPSON, W., 1858. — Prodromus descriptionis animalium evertibratorum, quae in Expeditione ad Oceanum Pacificum Septentrionalem, a Republica Federata missa, Cadwaladaro Ringgold et Johanne Rodgers Ducibus, observavit et descripsit W. Stimpson. Pars VI. Crustacea Oxystomata. *Proceedings of the Academy of Natural Science of Philadelphia*, **9**: 159-163.
- STIMPSON, W., 1859. — Notes on North American Crustacea, I. *Annals of the Lyceum of Natural History of New York*, **7**: 49-93, pl. 1.
- STIMPSON, W., 1860. — Notes on North American Crustacea, in the Museum of the Smithsonian Institution. II. *Annals of the Lyceum of Natural History of New York*, **7**: 176-246, pls 2, 5.
- STIMPSON, W., 1889. — On the Crustacea and Echinodermata of the Pacific Shores of North America. *Journal of Natural History*, **4**: 444-532, pls 18-23.
- STIMPSON, W., 1907. — Report on the Crustacea (Brachyura and Anomura) collected by the North Pacific Exploring Expedition, 1853-1856. *Smithsonian Miscellaneous Collections*, **49** (1717): 1-240, pls 1-26.
- STREETS, T.H., 1877. — Contributions to the Natural History of the Hawaiian and Fanning Islands and Lower California. *Bulletin of the United States National Museum*, **7**: 1-172.
- SUVATTI, C., 1947. — A Check-List of Aquatic Fauna in Siam, 155 pp. Bangkok.
- TAKEDA, M., 1973. — Studies on the Crustacea Brachyura of the Palau Islands. I. Dromiidae, Dynomenidae, Calappidae, Leucosiidae, Hymenostomatidae, Majidae and Parthenopidae. *Bulletin of the Liberal Arts & Science Course, Nihon University School of Medicine.*, **1**: 75-122, figs 1-6, pls 2-3.
- TAKEDA, M., 1982. — Keys to the Japanese and Foreign Crustaceans fully illustrated in colors. vi + 284 pp., 779 pls. Hokuryukan, Tokyo. [in Japanese].
- TAKEDA, M., 1983. — Crustacea. In: Crustaceans and Mollusks trawled off Suriname and French Guiana: 1-185. Japan Marine Fishery Resource Research Center, Tokyo.
- TAKEDA, M. & KOYAMA, Y., 1974. — On some rare crabs from Kii Province. *Researches on Crustacea*, **6**: 103-121, 3 text-figs, pls 10-12.
- TAKEDA, M. & NUNOMURA, N., 1976. — Crabs collected by the Melanesia Expedition of the Osaka Museum of Natural History, 1958. *Bulletin of the Osaka Museum of Natural History*, **30**: 61-92, figs 1-3.
- TAKEDA, M. & SHIKATANI, N., 1990. — Crabs of the genus *Calappa* from the Ryukyu Islands, with description of a new species. *Zoological Science*, **7**: 477-484, figs 1-4.
- TAKEDA, M. & SUGA, H., 1979. — Feeding habits of box crabs, *Calappa*. *Researches on Crustacea*, **9**: 43-47, 1 pl.
- THALLWITZ, J., 1891. — Decapoden-Studien, insbesondere basirt auf A.B. Meyer's Sammlungen im Ostindischen Archipel, nebst einer Aufzählung der Decapoden und Stomatopoden des Dresdener Museums. *Abhandlungen und Berichte des K. Zoologischen u. anthropologisch-ethnographischen Museums zu Dresden 1890-1891*, **3**: 1-55, 1 pl.
- THURSTON, E., 1890. — Notes on the Pearl and Chank Fisheries and Marine Fauna of the Gulf of Manaar, 124 pp. Govt. Press, Madras.
- TINKER, S. W., 1965. — Pacific Crustacea. An illustrated handbook on the reef-dwelling Crustacea of Hawaii and the South Seas, 134 pp, 52 pls. C.E. Tuttle, Tokyo.



- TIRMIZI, N.M. & KAZMI, Q.B., 1991. — Marine Fauna of Pakistan. 4. Crustacea: Brachyura (Dromiacea, Archaeobrachyura, Oxystomata, Oxyrhyncha). Publication I, BCCI Foundation Chair, Institute of Marine Sciences, University of Karachi: 1-246, text-figs 1-65.
- TWEEDIE, M.W.F., 1950. — The fauna of the Cocos-Keeling Islands. Brachyura and Stomatopoda. *Bulletin of the Raffles Museum*, **22**: 105-148, figs 1-4, pls 16-17.
- TYNDALE-BISCOE, M. & GEORGE, R.W., 1962. — The Oxystomata and Gymnopleura (Crustacea, Brachyura) of Western Australia with descriptions of two new species from Western Australia and one from India. *Journal of the Royal Society of Western Australia*, **45** (3): 65-96, figs 1-8, pls 1-3.
- UCHIDA, S., 1949. — Illustrated Encyclopedia of the fauna of Japan (Exclusive of Insects), 1898 pp., 5213 figs. Tokyo. [in Japanese].
- URITA, T., 1926. — A check list of Brachyura found in Kagoshima Prefecture, Japan, iv + 41 pp., 1 map. Tsingtao.
- UTINOMI, H., 1956. — Coloured Illustrations of Seashore Animals of Japan. [2] xvii + 166 pp., 76 pls. Hoikusha, Osaka. [in Japanese].
- UTINOMI, H., 1974. — Coloured Illustrations of Seashore Animals of Japan. [2] xvii + 166 pp., 1-76 pls. Hoikusha, Osaka. [in Japanese].
- WALKER, A.O., 1887. — Notes on a collection of Crustacea from Singapore. *Journal of the Linnean Society of London*, **20** (118): 107-117, pls 6-9.
- WARD, M., 1928. — The Crustacea of the Capricorn and Bunker Groups, Queensland. *Australian Zoologist*, **5**: 241-246, pls 27-29.
- WARD, M., 1936. — Crustacea Brachyura from the coasts of Queensland. *Memoirs of the Queensland Museum*, **11** (1): 1-3, pls 1-3.
- WARD, M., 1941. — New Brachyura from the Gulf of Davao, Mindanao, Philippine Islands. *American Museum Novitates*, (1104): 1-15, figs 1-30.
- WARD, M., 1942. — Notes on the Crustacea of the Desjardins Museum, Mauritius Institute, with descriptions of new genera and species. *Bulletin of the Mauritius Institute*, **2** (2): 49-113, pls 5-6.
- WEBER, F., 1795. — Nomenclator entomologicus secundum entomologiam systematicam ill. Fabricii, adjectis speciebus recens detectis et varietatibus, viii + 172 pp. Chilonii [Kiel] & Hamburgi.
- WHITE, A., 1847. — List of the specimens of Crustacea in the collection of the British Museum, viii + 143 pp. London.
- WHITELEGGE, T., 1889. — List of the Marine and Fresh-water Invertebrate Fauna of Port Jackson and Neighbourhood. *Journal and Proceedings of the Royal Society of New South Wales*, **23**: 163-323.
- WILLIAMS, A.B., 1984. — Shrimps, Lobsters, and Crabs of the Atlantic coast of the Eastern United States, Maine to Florida, 550 p., 379 figs. Smithsonian Institution Press, Washington.
- WILLIAMS, A.B. & CHILDS, C.A., 1989. — Comparison of some genera and species of box crabs (Brachyura: Calappidae), southwestern north Atlantic, with description of a new genus and a new species. *U.S. Fish and Wildlife Service Fisheries Bulletin*, **87**: 105-121.
- YAMAGUCHI, T. & BABA, K., 1993. — Crustacean specimens collected in Japan by Ph. F. Von Siebold and H. Burger and held by Nationaal Natuurhistorisch Museum in Leiden and other Museums In: Ph. F. Von Siebold and Natural History of Japan: 145-539, figs 1-200. Carcinological Society of Japan.
- YAMAGUCHI, T. & HOLTHUIS, L.B., 1993. — Kurimoto Suiken and his *Kai-ka Rui Siya-sin*. In: Ph. F. Von Siebold and Natural History of Japan: 647-668, figs 1-9. Carcinological Society of Japan.
- ZARENKOV, N., 1971. — Benthos of the Red Sea. 296 pp., 88 figs. Naukova Dumka, Kiev.
- ZIMSEN, E., 1964. — The type material of I.C. Fabricius. 656 pp. Copenhagen.



## GEOGRAPHICAL DISTRIBUTION MAPS

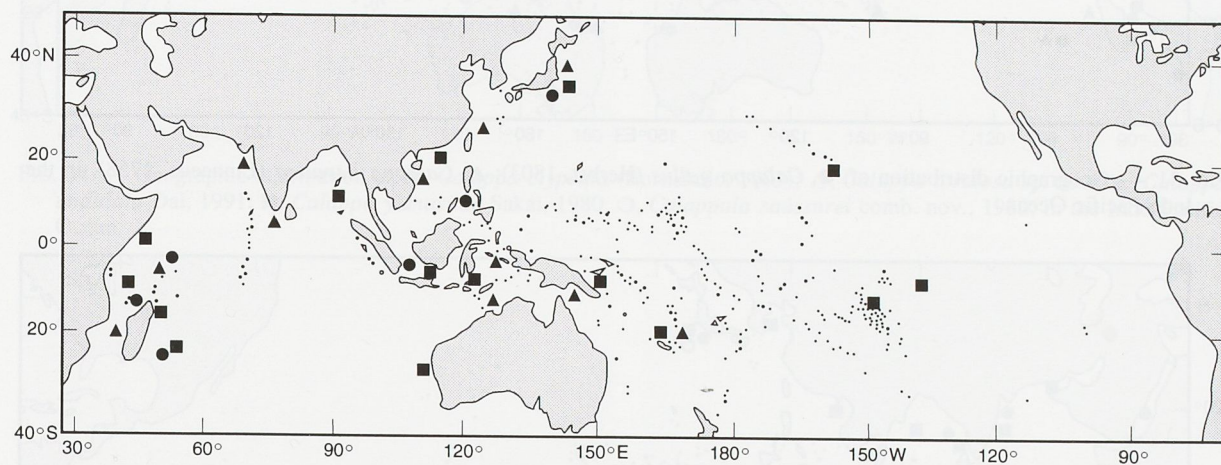


FIG. 29. — Geographic distribution of: ●, *Calappa bicornis* Miers, 1884; ■, *Calappa calappa* (Linnaeus, 1758); ▲, *Calappa capellonis* (Laurie, 1906), in the Indo-Pacific Ocean.

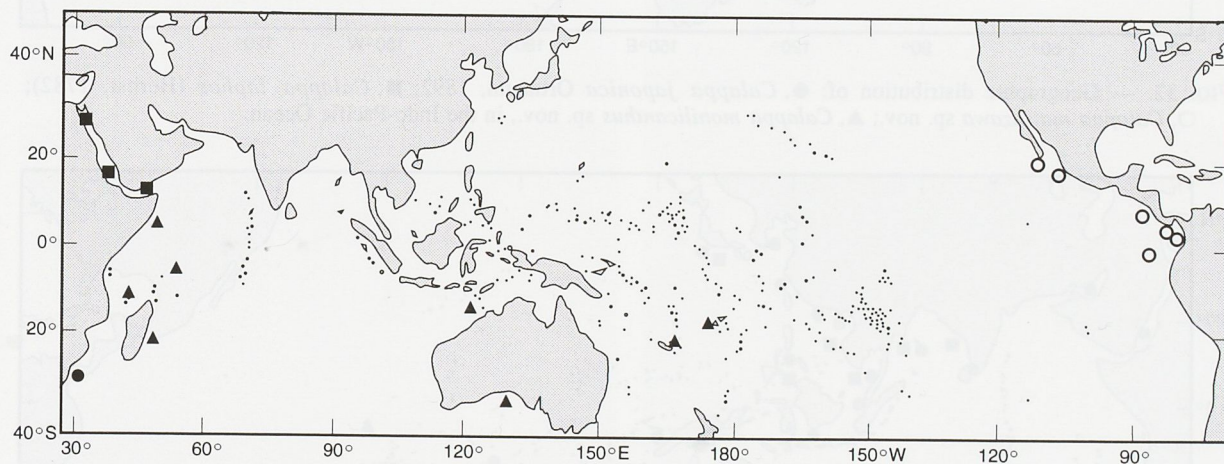


FIG. 30. — Geographic distribution of: ●, *Calappa conifera* sp. nov.; ○, *Calappa convexa* Saussure, 1853; ▲, *Calappa depressa* Miers, 1886; ■, *Calappa dumortieri* Guinot, 1962, in the Indo-Pacific Ocean.



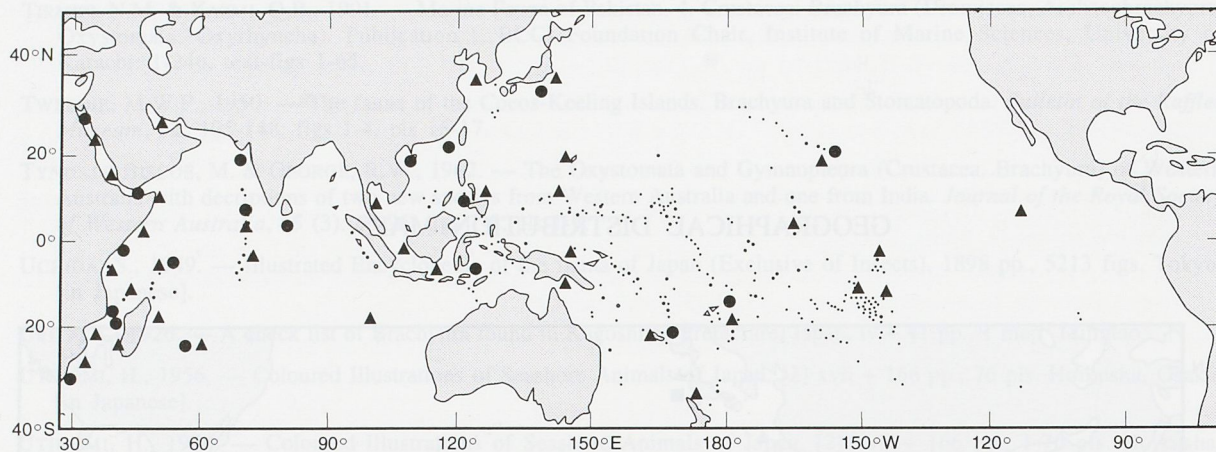


FIG. 31. — Geographic distribution of: ●, *Calappa gallus* (Herbst, 1803); ▲, *Calappa hepatica* (Linnaeus, 1758), in the Indo-Pacific Ocean.

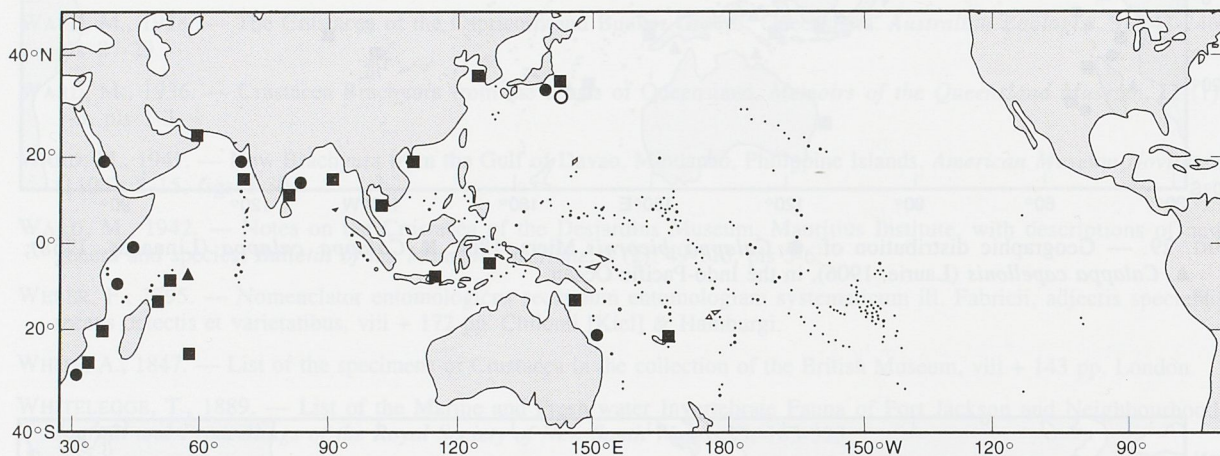


FIG. 32. — Geographic distribution of: ●, *Calappa japonica* Ortmann, 1892; ■, *Calappa lophos* (Herbst, 1782); ○, *Calappa matsuzawa* sp. nov.; ▲, *Calappa monilicanthus* sp. nov., in the Indo-Pacific Ocean.

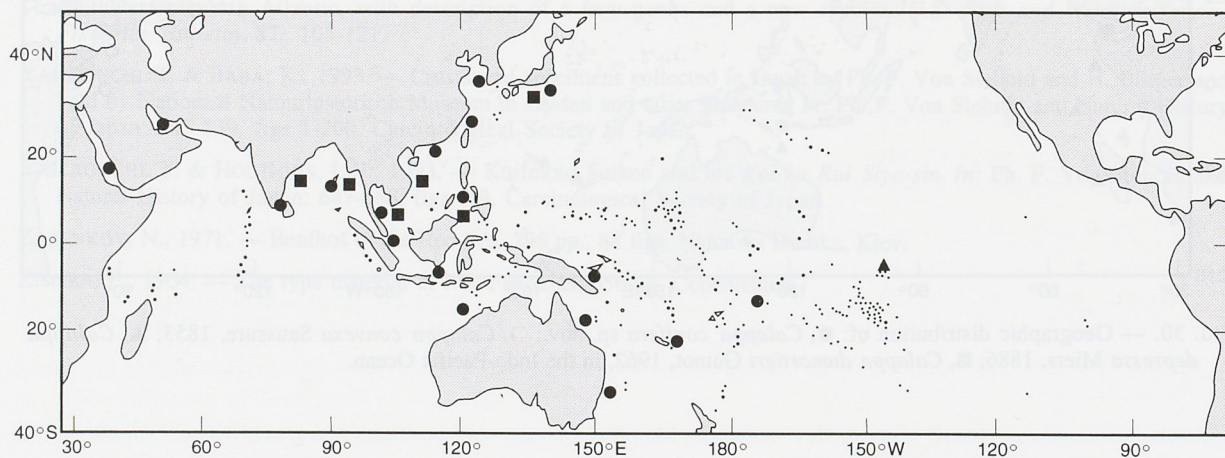


FIG. 33. — Geographic distribution of: ●, *Calappa philargius* (Linnaeus, 1758); ■, *Calappa pustulosa* Alcock, 1896; ▲, *Calappa sebastieni* sp. nov., in the Indo-Pacific Ocean.



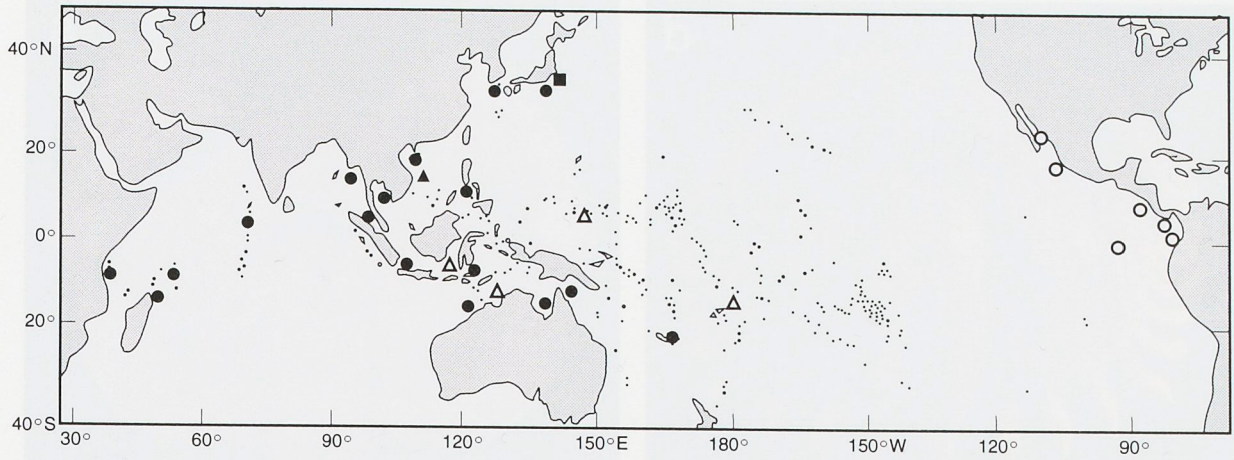


FIG. 34. — Geographic distribution of: ●, *Calappa clypeata* (Borradaile, 1903); △, *Calappa torulosa* sp. nov.; ▲, *Calappa undulata* Dai, 1991; ■, *Calappa yamasitae* Sakai, 1980; ○, *Calappula saussurei* comb. nov., 1980, in the Indo-Pacific Ocean.





FIGURES IN COLOUR

- FIG. 35 a. — *Calappa capellonis* (Laurie, 1906). New Caledonia, north lagoon, 30 m.  
 FIG. 35 b. — *Calappa dumortieri* Guinot, 1962. Red Sea, Eilath.  
 FIG. 35 c. — *Calappa lophos* (Herbst, 1782), young specimen. New Caledonia, east lagoon, 78-80 m.  
 FIG. 35 d. — *Calappa clypeata* (Borradaile, 1903). New Caledonia, north lagoon, 22-24 m.  
 FIG. 35 e. — *Calappa depressa* (Miers, 1886). New Caledonia, east lagoon, 20 m.  
 FIG. 35 f. — *Calappa depressa* (Miers, 1886), young specimen. New Caledonia, east lagoon, 42 m.

Photographs 35a, 35 b, 35 d by Pierre LABOUTE and 35 e, 35 f by Jean-Louis MENU, both from ORSTOM.

FIG. 32. — Geographic distribution of: ●, *Calappa japonica* Ortmann, 1911; ■, *Calappa lophos* (Herbst, 1782); □, *Calappa mactracosa* sp. nov.; ▲, *Calappa menicanthus* sp. nov., in the Indo-Pacific Ocean.

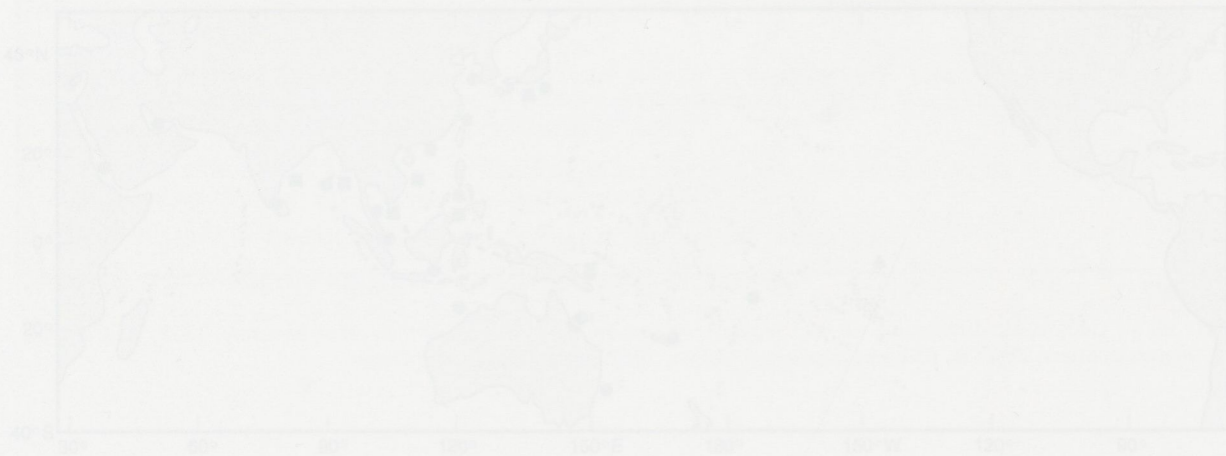


FIG. 33. — Geographic distribution of: ●, *Calappa philargius* (Linnaeus, 1758); ■, *Calappa punctata* Alcock, 1896; ▲, *Calappa subulicini* sp. nov., in the Indo-Pacific Ocean.



