

台灣蝦蛄誌

A CATALOG OF THE MANTIS SHRIMPS (STOMATOPODA) OF TAIWAN

SHANE T. AHYONG
TIN-YAM CHAN
YUN-CHIH LIAO



台灣蝦蛄誌

A CATALOG OF THE MANTIS SHRIMPS
(STOMATOPODA) OF TAIWAN

S. AHYONG, T. Y. CHAN &
Y. C. LIAO

國立台灣海洋大學

ISBN 978-986-01-5060-5



G P N : 1009702133
工本費 : 385元

國立台灣海洋大學
National Taiwan Ocean University



台灣蝦蛄誌

A CATALOG OF THE MANTIS SHRIMPS (STOMATOPODA) OF TAIWAN

SHANE T. AHYONG

Marine Biosecurity & Biodiversity, National Institute of Water and Atmospheric Research,
Private Bag 14901, Kilbirnie, Wellington, New Zealand

TIN-YAM CHAN

Institute of Marine Biology, National Taiwan Ocean University,
2 Pei-Ning Road, Keelung 202, Taiwan, R.O.C.

YUN-CHIH LIAO

Biodiversity Research Center, Academia Sinica,
Nangang Taipei, Taiwan, R.O.C.

國立台灣海洋大學

National Taiwan Ocean University
Keelung

2008年9月

序

大型甲殼類一般是指十足目的蝦蟹和口足目的蝦蛄，十足目的大鉗為步足所特化，而口足目的大鉗則是由第二顎足特化而成，故兩者在演化上有很大的差距。蝦蛄都是棲息在海洋且主要生活於淺海，可在台灣的珊瑚礁及岩礁海岸常見其蹤跡，而不少棲息於沙泥底的蝦蛄更是具有經濟價值的漁獲物，唯蝦蛄因為身體多刺不易處理，除大型的種類之外，價格普遍不高。台灣最早的蝦蛄學術記錄是在1880年，英人 E. J. Miers 根據台灣的標本發表一種圓尾綠蝦蛄 *Clorida rotundicauda*，之後都只有少數國外學者的零散記錄，1966年本土生物學者開始研究台灣蝦蛄，在此之前僅記錄有14種。近年來行政院國家科學委員會大力支持台灣的生物多樣性調查研究，使台灣的學者能積極的在台灣各地採集蝦蛄標本並做深入的研究，再經由行政院國家科學委員會補助的研究計畫『編撰台灣無脊椎動物誌—台灣甲殼類』，邀請國際最著名的蝦蛄分類專家共同編撰台灣蝦蛄誌，共整理出5總科9科28屬63種，其中有1總科1科8屬32種是台灣的新記錄或首次正式的記錄。雖然仍未有台灣特有的種類，但其中6種的正模 (holotype) 或新模 (neotype) 是選自台灣的標本。

本誌之編輯及印刷是行政院國家科學委員會補助，由國立台灣海洋大學出版，是繼“台灣寄居蟹類誌”後第二本台灣甲殼類誌（初版登錄於TaiBNET台灣生物多樣性資訊網<http://www.taibif.org.tw/nbrpp/nbrpp.php>），誌中對台灣目前發現的63種蝦蛄全都有提供型態描述、重要特徵線繪圖和檢索等，其中48種亦附有彩色標本照，以利參考鑑別。本誌之出版獲行政院國家科學委員會及國立台灣海洋大學水產生物科技頂尖研究中心大力支持及補助，謹致上由衷謝意，並感謝林芝君小姐在編輯上的協助。台灣目前記錄的蝦蛄種類已達全世界已知蝦蛄的七分之一，希望能藉本誌讓國內外人士更深入了解台灣豐富的海洋生物多樣性，進而關懷及永續利用這一項得天獨厚的自然資源。

INTRODUCTION

The mantis shrimps (Stomatopoda) are marine, predatory species, characterized by the greatly developed second maxilliped modified as large powerful raptorial appendages. Prey is captured by ‘spearing’ or ‘smashing’, depending on whether the dactyl is extended or held folded during the strike. The two methods of prey capture distinguish two broad functional groups — the ‘smashers’ and the ‘spearers’ (Caldwell & Dingle, 1976). Stomatopods occur in a wide range of habitats, from the shore down to about 1500 m, being common and conspicuous on coral reefs, and abundant on soft, level substrates less than about 200 m depth. More than 450 described species are known, distributed in seven superfamilies and 17 families (Ahyong, 2001). Many species that inhabit soft bottoms are fished commercially in many countries, though generally as bycatch with low economic value except for those very large species (e.g., *Harpiosquilla raphidea* (Fabricius, 1798) with maximum total length of 33 cm and *Lysiosquillina maculata* (Fabricius, 1793) reaching a total length of 38 cm).

Miers (1880) described the first stomatopod from Taiwan: *Clorida rotundicauda*. Balss (1910a) reported five species from Taiwan [now known as *Acanthosquilla multifasciata* (Wood-Mason, 1895), *Bigelowina phalangium* (Fabricius, 1798), *Pseudosquilla ciliata* (Fabricius, 1787), *Harpiosquilla harpax* (de Haan, 1844), and *Oratosquilla oratoria* (de Haan, 1844)], and Kemp (1913) reported the first Taiwanese record of *Oratosquillina interrupta* (Kemp, 1911). As part of broader studies of Japan and adjacent localities, Komai (1927) recorded additional species from Taiwan, and Schmitt (1927) listed the 14 species then known from the island. Since then, only a few studies have dealt with Taiwanese stomatopods, the most important of which is Lee & Wu (1966), reporting 21 species from Taiwan. Manning (1978b, c; 1980b), Hwang & Yu (1980), Manning & Chan (1997), Jeng (1998), Ahyong *et al.* (1998, 2000), Ahyong & Naiyanetr (2000), Huang & Hsueh (2006) and Ahyong & Chan (2008) reported additional species from Taiwan. Liu & Wang (1999) listed 101 stomatopod species from the China Seas including a preliminary list of 53 species from Taiwan based on our unpublished data (including new records of 1 family, 7 genera and 24 species). Those specimens on which Liu & Wang’s (1999) ‘new’ Taiwanese records were based are formally reported herein.

Through recent projects supported by the National Science Council, Taiwan, R.O.C., extensive surveys on the stomatopods of Taiwan revealed a total of 63 species distributed in 5 superfamilies, 9 families, and 28 genera of which 1 family and superfamily, 8 genera and 32 species are new records for Taiwan. A preliminary version of this catalog is available online at TaiBent (<http://www.taibif.org.tw/nbrpp/nbrpp.php>), supported by the National Science Council, Taiwan, R.O.C. In this printed version the contents of the original catalogue have been revised with supplementary data and illustrations. All stomatopod species known from Taiwan are included herein.

The number of species now recorded from Taiwan represents slightly less than one-seventh of the stomatopod species currently known worldwide. Most specimens studied herein were collected by commercial trawling on soft, level, inshore substrates. As in other Asian countries, stomatopods are common as by-catch in local trawl fisheries and generally of low economic value (about NT\$150/kg retail price and NT\$300/kg retail for large specimens), presumably because of their hard, spiny shells and wide availability of other crustaceans such as penaeid prawns. Squilloids, bathysquilloids, parasquilloids and lysiosquilloids typically burrow in the soft substrata of the seabed. Bathysquilloids and parasquilloids are deepwater species and thus are relatively seldom captured. Lysiosquilloids, although often present in shallow water, occupy deep burrows and rarely forage, and are also seldom captured by trawling. Squilloids actively forage and are most frequently captured by demersal trawls. Interestingly, of the squilloids previously reported from Taiwan, *Clorida rotundicauda* (Miers, 1880), *C. japonica* Manning, 1978, and *Cloridopsis scorpio* (Latreille, 1828) are known only from very few specimens. This apparent ‘rarity’ is probably related to lack of sampling in intertidal and shallow subtidal

estuarine and mangrove habitats, and also to habitat loss or degradation in many parts of coastal Taiwan. Although Squilloidea is the most speciose of stomatopod superfamilies (Ahyong, 2005b), the high proportion of squilloids in the known Taiwanese fauna (66.7%) probably also reflects sampling bias. Most specimens were collected by commercial trawlers which employ the method most likely to capture squilloids. In contrast to species of the aforementioned superfamilies, gonodactyloids occupy hard substrates on coral and rocky reefs, habitats that require different methods of sampling. Gonodactyloidea is also a very diverse superfamily, but only 11 species are presently known from Taiwan. Numbers of gonodactyloids from neighbouring waters, however, are considerably higher with at least 40 species occurring in Japanese waters (Hamano, 2005; Ahyong, unpublished), and at least 30 in the northern South China Sea and Philippines (Kemp 1915; Liu & Wang 1999; Ahyong 2004). When more intensive sampling is conducted in coral and rocky habitats, particularly on the coral reefs of southern Taiwan, the known gonodactyloid fauna will also certainly increase. The percentage composition of the fauna according to superfamily is given below in Table 1. Currently, no known Taiwanese stomatopods are endemic, and most are widespread in the western Pacific. Nevertheless, 6 species, namely *Alima orientalis* Manning, 1978, *Busquilla quadraticauda* (Fukuda, 1911), *Clorida rotundicauda* (Miers, 1880), *Faughnia formosae* Manning & Chan, 1997, *Oratosquillina manningi* Ahyong, Chan & Liao, 2000, and *O. nordica* Ahyong & Chan, 2008, have their respective holotypes or neotypes based on Taiwanese specimens. *Oratosquillina megalops* (Manning, 1980) and *Harpiosquilla ocellata* Ahyong, Chan & Liao, 1998, which are junior synonyms of *O. inornata* (Tate, 1883) and *H. sinensis* Liu & Wang, 1998, respectively, were also described from Taiwan. Of the known Taiwanese stomatopods, only *Clorida japonica* Manning, 1978, and *Quollastris imperialis* (Manning, 1965) are restricted to the northwestern Pacific, both being known only from Japan and Taiwan.

	No. species in Taiwan	% of fauna
Bathysquilloidea	1	1.6%
Gonodactyloidea	11	17.5%
Lysiosquilloidea	6	9.5%
Parasquilloidea	3	4.8%
Squilloidea	42	66.7%

Table 1. Percentage composition of Taiwanese stomatopod fauna according to superfamily.

The majority of specimens reported herein are housed in the collections of the National Taiwan Ocean University, Keelung (NTOU). Other specimens studied are deposited in the Australian Museum, Sydney (AM); Academia Sinica Institute of Zoology, Taipei (ASIZ); Muséum national d'Histoire naturelle, Paris (MNHN); National Institute of Water and Atmospheric Research, Wellington, New Zealand (NIWA); Natural History Museum, London (NHM); Raffles Museum of Biodiversity Research, National University of Singapore (ZRC); Taiwan Museum, Taipei (TMCS); National Museum of Natural History, Smithsonian Institution, Washington D.C. (USNM); Zoological Museum, Hamburg (ZMH); and Zoologische Staatsammlung, Munich (ZSM).

For each species in the catalog, restricted synonymies are presented that cover the original citation, primary synonyms, major works, and references relevant to Taiwan. Each species, genus, family and superfamily is diagnosed. Line drawings illustrating distinguishing characters are given for all the species based on Taiwanese specimens except for one species, *Cloridina verrucosa* (Hansen, 1926), for which the Taiwan specimen could not be located during the preparation of the catalog. The diagnosis and line drawings of this species are based on a specimen from Australia (AM). Color photographs are provided for 48 species, all based on Taiwanese

material. Coloration is often very useful in distinguishing species, particularly the color markings on the tailfan.

Terminology and size descriptors generally follow Ahyong (2001) and general morphology is illustrated in Morphological Terms. All specimen measurements are in millimeters (mm). The size measure given for most specimens is total length (TL), which is measured along the midline from the apex of the rostral plate to the apices of the submedian teeth of the telson. For broken or damaged specimens, carapace length (CL) is indicated, measured along the midline excluding the rostral plate. Relative eye size is a useful taxonomic feature and is measured by the corneal index (CI). The CI is given as $100CL$ divided by corneal width. Other abbreviations: antennule (A1), antenna (A2), abdominal somite (AS), and thoracic somite (TS).

Moose specimens were collected by commercial trawlers. For specimens collected by the "TAIWAN 2001" and "2002" cruises, gear types are abbreviated as CP and CH and indicated before the station number. The abbreviations for gear types CP and CH refer to the four-meter French beam trawl, and the otter trawl used by commercial trawlers, respectively.

We gratefully acknowledge our many colleagues for assistance and loan of specimens used in this study. In particular, we thank Stephen Keable and Penny Berents (AM), Regis Cleva (MNHN), Peter Davie (Queensland Museum), J. T. Lin (TMCS), Miranda Lowe (NHM), Karen Reed and the late Ray Manning (USNM), Peter Ng, Swee Hee Tan and the late K. L. Yeo (ZRC), and Andreas Allspach (ZSM). We also thank Miss Chih-Chun Lin for her efforts in editing the manuscript. The first author gratefully acknowledges the financial support from a Sydney Grammar School Fellowship, the NIWA Capability Fund, and the New Zealand Foundation for Research, Science and Technology (BBBI091). The first author also gratefully acknowledges Rachel Ahyong for her support and forbearance during the preparation of this book. We sincerely thank the Center for Marine Bioscience and Biotechnology of the National Taiwan Ocean University for support in publishing this catalog. This catalog is a contribution from a grant supported by the National Science Council, Taiwan, R.O.C.

Table of Contents

Systematics	1
Morphological Terms	4
Bathysquilloidea	7
Bathysquillidae	7
<i>Bathysquilla</i>	7
<i>Bathysquilla crassispinosa</i>	8
Gonodactyloidea	10
Gonodactylidae	10
<i>Gonodactylellus</i>	11
<i>Gonodactylellus erdmanni</i>	12
<i>Gonodactylellus</i> aff. <i>viridis</i>	13
<i>Gonodactylus</i>	15
<i>Gonodactylus childi</i>	16
<i>Gonodactylus chiragra</i>	17
<i>Gonodactylus platysoma</i>	19
<i>Gonodactylus smithii</i>	21
Odontodactylidae	24
<i>Odontodactylus</i>	24
<i>Odontodactylus cultrifer</i>	25
<i>Odontodactylus japonicus</i>	27
<i>Odontodactylus scyllarus</i>	29
Protosquillidae	31
<i>Haptosquilla</i>	31
<i>Haptosquilla glyptocercus</i>	32
Pseudosquillidae	33
<i>Pseudosquilla</i>	33
<i>Pseudosquilla ciliata</i>	34
Lysiosquilloidea	36
Lysiosquillidae	36
<i>Lysiosquilla</i>	36
<i>Lysiosquilla sulcirostris</i>	38
<i>Lysiosquilla tredecimdentata</i>	40
Nannosquillidae	42
<i>Acanthosquilla</i>	42
<i>Acanthosquilla derijardi</i>	43
<i>Acanthosquilla manningi</i>	45
<i>Acanthosquilla multifasciata</i>	47
<i>Bigelowina</i>	49

<i>Bigelowina phalangium</i>	50
Parasquilloidea	52
Parasquillidae	52
<i>Faughnia</i>	52
<i>Faughnia formosae</i>	54
<i>Faughnia haani</i>	57
<i>Faughnia serenei</i>	59
Squilloidea	61
Squillidae	61
<i>Alima</i>	63
<i>Alima hieroglyphica</i>	64
<i>Alima orientalis</i>	66
<i>Anchisquilla</i>	68
<i>Anchisquilla fasciata</i>	69
<i>Busquilla</i>	71
<i>Busquilla quadraticauda</i>	72
<i>Carinosquilla</i>	74
<i>Carinosquilla multicarinata</i>	75
<i>Clorida</i>	78
<i>Clorida albolitura</i>	79
<i>Clorida bombayensis</i>	81
<i>Clorida denticauda</i>	83
<i>Clorida japonica</i>	85
<i>Clorida rotundicauda</i>	87
<i>Cloridina</i>	89
<i>Cloridina verrucosa</i>	90
<i>Cloridopsis</i>	92
<i>Cloridopsis scorpio</i>	93
<i>Erugosquilla</i>	95
<i>Erugosquilla grahami</i>	96
<i>Erugosquilla serenei</i>	98
<i>Erugosquilla woodmasoni</i>	100
<i>Harpiosquilla</i>	103
<i>Harpiosquilla annandalei</i>	105
<i>Harpiosquilla harpax</i>	108
<i>Harpiosquilla indica</i>	111
<i>Harpiosquilla japonica</i>	114
<i>Harpiosquilla melanoura</i>	117
<i>Harpiosquilla sinensis</i>	119
<i>Kempina</i>	122
<i>Kempina mikado</i>	123

<i>Kempina stridulans</i>	125
Lenisquilla	127
<i>Lenisquilla lata</i>	128
Levisquilla	130
<i>Levisquilla inermis</i>	131
Lophosquilla	133
<i>Lophosquilla costata</i>	134
Miyakea	137
<i>Miyakea holoschista</i>	138
<i>Miyakea nepa</i>	140
Oratosquilla	142
<i>Oratosquilla fabricii</i>	143
<i>Oratosquilla oratoria</i>	146
Oratosquillina	149
<i>Oratosquillina asiatica</i>	150
<i>Oratosquillina gravieri</i>	152
<i>Oratosquillina inornata</i>	154
<i>Oratosquillina interrupta</i>	157
<i>Oratosquillina manningi</i>	159
<i>Oratosquillina nordica</i>	161
<i>Oratosquillina perpensa</i>	164
Quollaestia	166
<i>Quollaestia gonypetes</i>	167
<i>Quollaestia imperialis</i>	170
<i>Quollaestia ornata</i>	172
<i>Quollaestia subtilis</i>	174
Squilloides	176
<i>Squilloides leptosquilla</i>	177
Taxonomic and Nomenclatural Decisions Made in This Work	180
Literature Cited	181
Map of Taiwan	189
List of Localities in English and Chinese	190

SYSTEMATICS

Order STOMATOPODA

The mantis shrimps belong to subclass Hoplocarida and Order Stomatopoda. The phylogenetic position of the hoplocarids has been widely debated (Schram, 1969), with controversy largely surrounding the interrelationships of the major malacostracan subclasses: Hoplocarida, Eumalacostraca, and Phyllocarida. Burnett & Hessler (1973) and Hessler (1983) regarded hoplocarids as eumalacostracans on the basis of the 'caridoid facies' (Calman, 1909). Using functional morphology, Kunze (1981, 1983) concluded that the hoplocarids evolved from a phyllocarid-like ancestor, separate from the eumalacostracans. Schram (1986) proposed that the hoplocarids and eumalacostracans were sister taxa, but included the malacostracan phyllocarids with several non-malacostracan groups in the Class Phyllopoda. Currently, the hoplocarids are widely accepted as the sister to eumalacostracans, which together are sister to the phyllocarids (Martin & Davis, 2001; Richter & Scholtz, 2001).

The fossil record suggests that the hoplocarid ancestors diverged from other eumalacostracans during the Devonian (Hof, 1998b). Until recently, three hoplocarid orders were recognized: Aeschronectida,

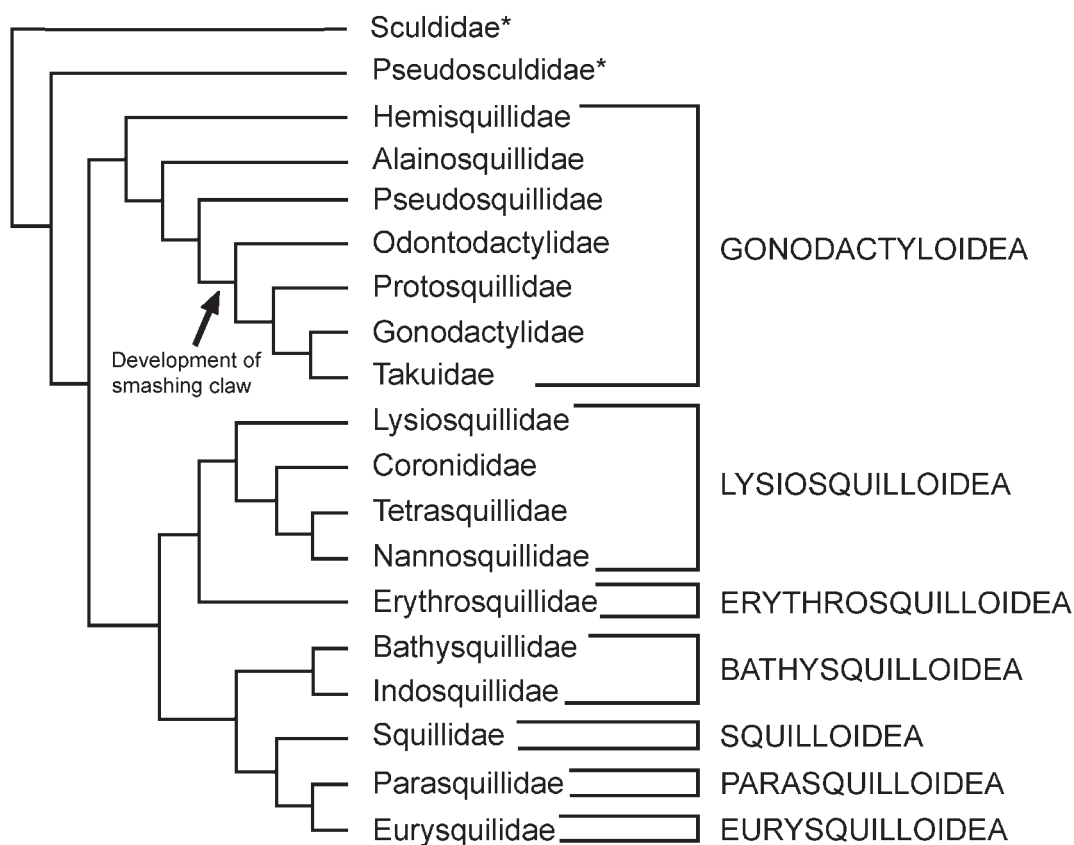


Fig. 1. Phylogenetic relationships of the unipeltatan stomatopod families; * extinct. Based on Ahyong & Harling (2000).

Palaeostomatopoda and Stomatopoda. Recent detailed analysis of the palaeozoic forms, however, showed that the palaeostomatopods form a paraphyletic grade leading to Stomatopoda (Jenner *et al.*, 1998; Schram, 2007). Thus, the most appropriate classification recognizes two orders, Aeschronectida and an expanded Stomatopoda which includes the paleostomatopods. The aeschronectids were shrimp-like and the least specialized. Stomatopoda, on the other hand witnessed the evolution of the massive raptorial claw (Schram, 2008). The palaeostomatopods and archaeostomatopodeans form a paraphyletic ‘transition series’ with increasing differentiation of the second maxilliped as a powerful raptorial claw, which reaches maximum development in the Unipeltata. Unipeltata includes all modern stomatopods, the ‘true’ mantis shrimp. The archaeostomatopodeans first appeared in the Carboniferous families, Daidalidae Schram, 2007, Gorgonophontidae Schram, 2007, and Tyrannophontidae Schram, 1969. Of the three known archaeostomatopodean families, Tyrannophontidae is the likely sister group of the Unipeltata (see Schram, 2007).

Unipeltata comprises the Jurassic–Cretaceous stem-lineage families Sculdidae and Pseudosculdidae (see Hof, 1998b, Ahyong *et al.*, 2007), and the extant, crown-group superfamilies (Manning, 1980b, 1995, Ahyong & Harling, 2000, Ahyong, 2001, 2005b). The major crown-group superfamilies, Gonodactyloidea, Lysiosquilloidea and Squilloidea, are known to have diverged by the late Cretaceous and have displayed little major morphological divergence since then.

The taxonomy of the Stomatopoda has been extensively revised over the past four decades, e.g., Manning (1963b, 1968c, 1980b, 1995) and Ahyong (2001). Prior to Manning’s work, only the single family, Squillidae was recognized for crown-group taxa. Giesbrecht (1910) proposed several subfamilies based on larval morphology, but his work was largely ignored by those working with the adults. Using larval, maxillipedal and telson morphology, Manning (1968c) recognized 37 genera in four families: Squillidae; Lysiosquillidae; Bathysquillidae; and Gonodactylidae. Giesbrecht’s subdivisions, based on larvae, correspond to the families recognized by Manning (1968c). Manning (1980b) further reviewed stomatopod classification and recognized four superfamilies: Squilloidea, Lysiosquilloidea, Bathysquilloidea, and Gonodactyloidea. Manning & Camp (1993) recognized Erythrosquilloidea for *Erythrosquilla megalops* Manning & Bruce, 1984, previously assigned tentatively to the Lysiosquilloidea. Manning (1995) recognized 19 families and 5 superfamilies for living taxa, containing more than 100 genera and 450 species.

Phylogenetic analyses of the modern stomatopods have been conducted only in the last decade or so (e.g., Ahyong, 1997; Hof, 1998b; Ahyong & Harling, 2000; Barber & Erdmann, 2000; Ahyong, 2005). Interrelationships of the genera of the largest stomatopod superfamily, Squilloidea, were studied by Ahyong (2005b). Relationships among the selected gonodactyloids were studied by Barber & Erdmann (2000), and are the subject of more extensive studies currently underway by Barber, Erdmann and Ahyong. The most comprehensive overall study of stomatopod interrelationships recognized 7 superfamilies and 17 families (Ahyong & Harling, 2000).

The Unipeltata appears to have diverged in two broad directions from the outset — one towards highly efficient ‘Spearing’ with multispinous dactyli on the raptorial claws, and the other towards ‘Smashing’. These two major stomatopod lineages also correlate broadly with habitat type. The gonodactyloid clade, members of which primarily occupy cavities and crevices on hard substrates, have become the dominant stomatopods on coral reefs. Most are small species, with body size apparently constrained by available hard substrate domiciles. The largest gonodactyloids (*Hemisquilla* spp. and *Odontodactylus* spp.) live in burrows in sand or sandy-mud. Almost all gonodactyloids are ‘Smashers’, and within this clade, the smashing claw attains its greatest development, ideal for preying on molluscs and crabs that are common on reefs. The other major lineage, comprising the remaining superfamilies, developed large, efficient spearing claws, occupying burrows in soft

substrates (note that a few lysiosquilloids and squilloids both ‘Spear’ and ‘Smash’). Prey is typically soft bodied, such as shrimp, cephalopods and fish. Habitat is apparently a lesser constraint on body size than for gonodactyloids, for the largest known stomatopods are all ‘Speakers’. Of this group, the parasquilloids and squilloids are generalist foraging predators, the bathysquilloids are restricted to deep water, and the euryquilloids, lysiosquilloids and erythroquilloids are specialized for burrow habitation in soft substrata. Members of five of seven stomatopod superfamilies are presently known from Taiwan.

Key to Superfamilies of the Stomatopoda from Taiwan

1. Propodi of maxillipeds 3–4 ovate, usually longer than broad, without distal ribbing. 2
- Propodi of maxillipeds 3–4 subquadrate, broader than long, usually with distal ribbing.
 **Lysiosquilloidea**
2. All primary teeth of telson with articulated apices **Bathysquilloidea**
- At most, submedian teeth of telson with articulated apices 3
3. Telson with 4 or more closely spaced intermediate denticles arranged in regular row **Squilloidea**
- Telson with no more than 3 (usually 2) ‘intermediate’ denticles 4
4. Uropodal protopod with three primary spines. Cornea asymmetrically bilobed, with outer margin of eye longer than inner margin; with 2 or 3 rows of hexagonal ommatidia in the mid-band **Parasquilloidea**
- Uropodal protopod with two primary spines. Cornea subglobular or symmetrically bilobed, with 6 rows of rectangular ommatidia in mid-band **Gonodactyloidea**

Morphological Terms

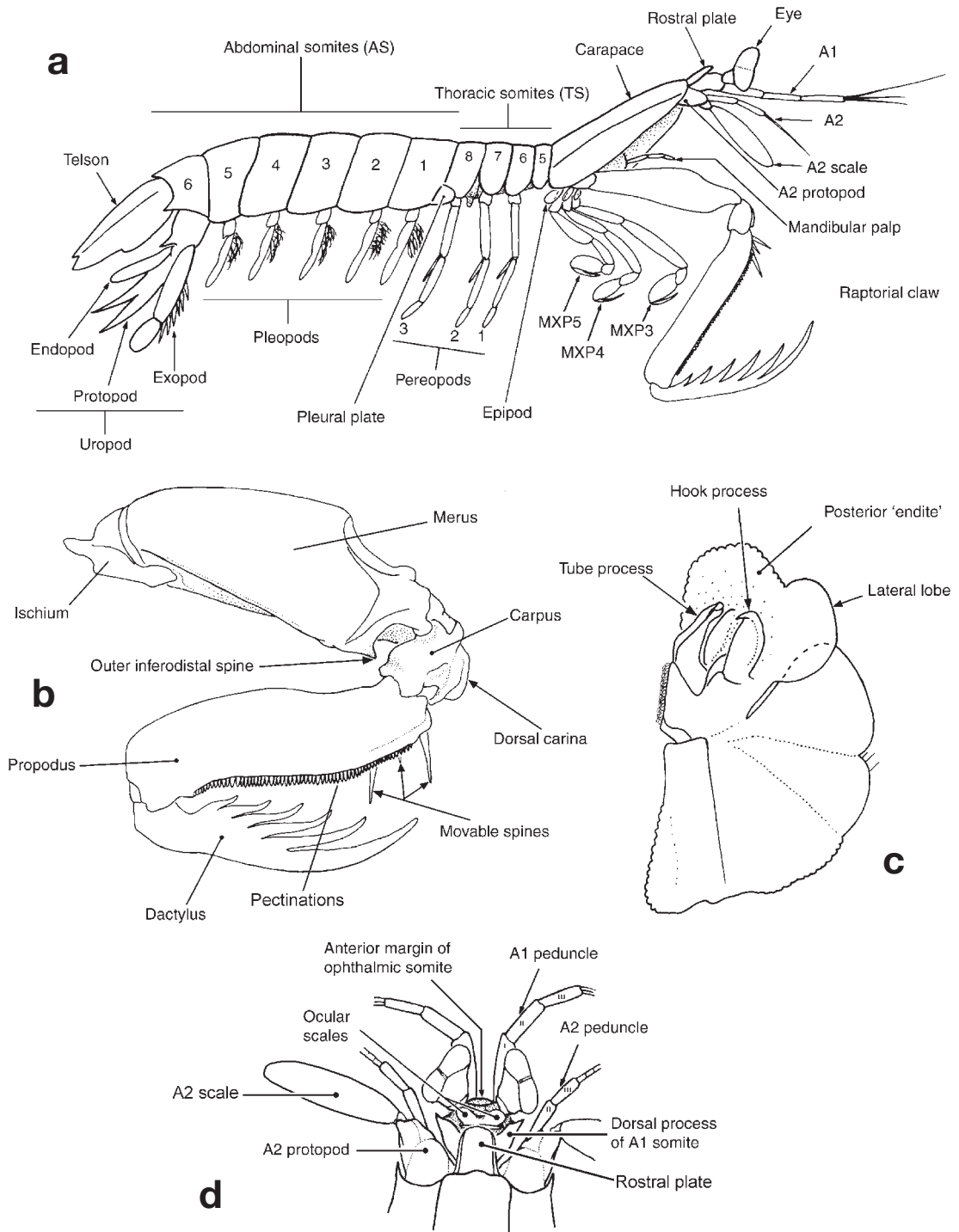


Fig. 2. Morphology: **a**, general; **b**, right raptorial claw; **c**, right male pleopod 1 endopod, anterior view; **d**, anterior.

Morphological Terms

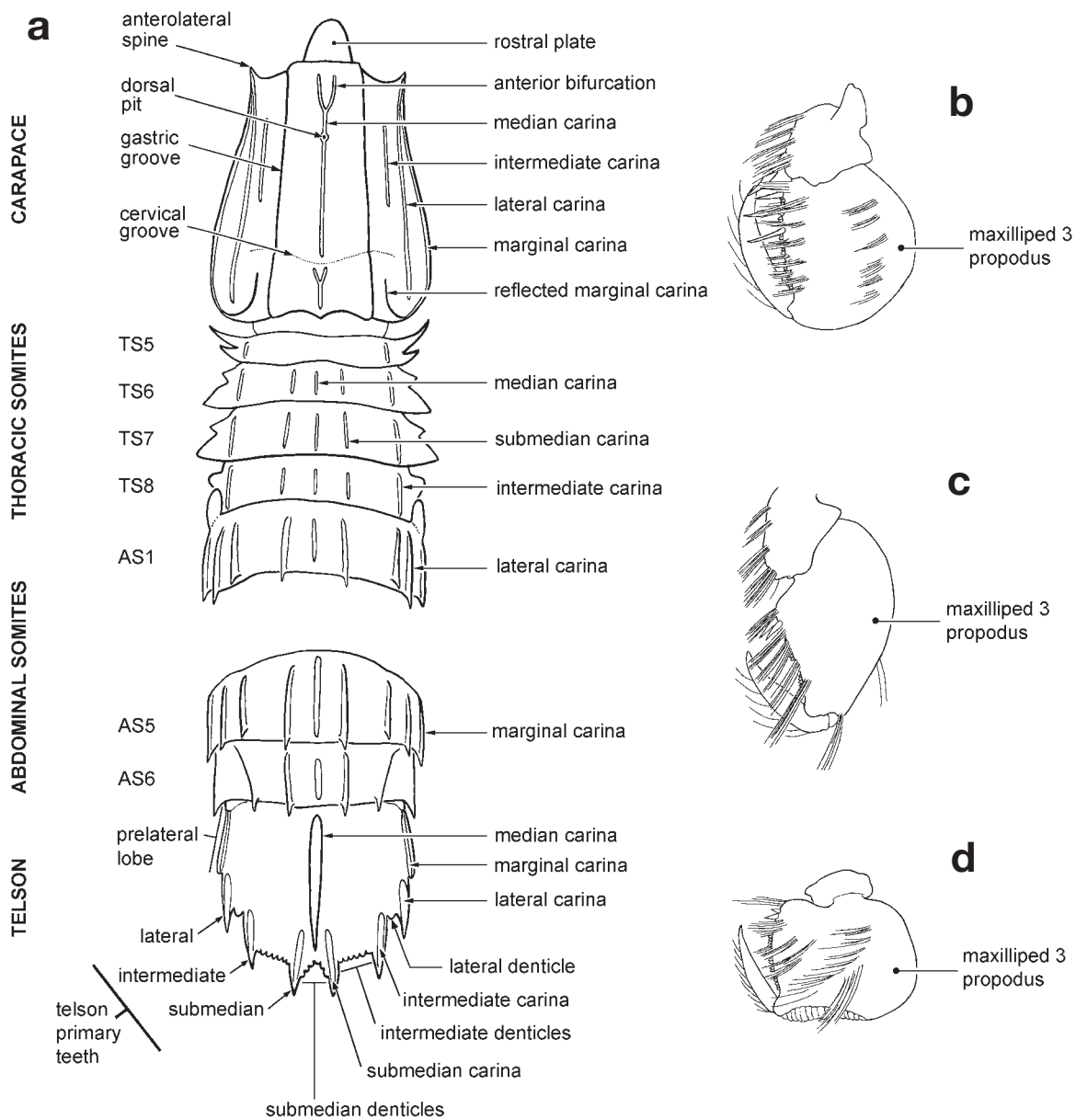


Fig. 3. Morphology: **a**, dorsal carinae; **b**, maxilliped 3 (Squilloidea); **c**, maxilliped 3 (Gonodactyloidea); **d**, maxilliped 3 (Lysiosquilloidea).

Morphological Terms

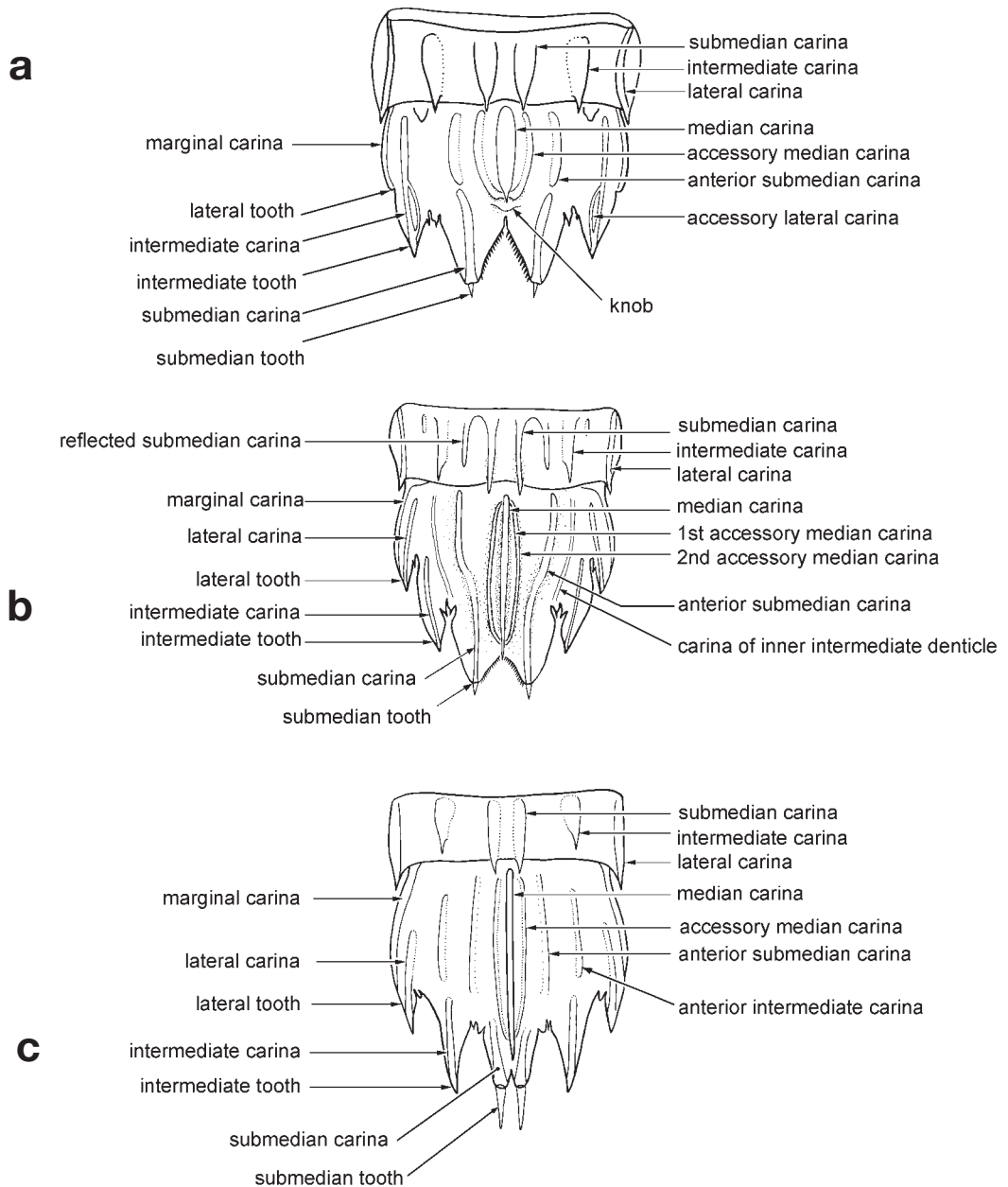


Fig. 4. Telson morphology: **a**, Gonodactylidae; **b**, Odontodactylidae; **c**, Eurysquilloidea, Parasquilloidea, Pseudosquillidae.

BATHYSQUILLOIDEA Manning, 1967

Diagnosis.— Cornea without rows of midband ommatidia. Corneal facets hexagonal, but poorly defined. Propodi of maxillipeds 3–4 ovate, not ribbed or beaded ventrally. Body depressed, articulation compact. Raptorial claw with terminal ischiomeral articulation, dactylus not inflated basally. Telson with distinct median carina; all primary teeth with articulated apices; intermediate denticles absent. Uropodal protopod with two primary spines; exopod segments articulated or separated by diaeresis.

Remarks.— Whereas stomatopods are known for their excellent vision, the bathysquilloids are the exception because of their reduced or degenerate eyes. The bathysquilloids live in deep water on the outer continental shelf and slope, with *B. microps* occurring to about 1500 m (Manning, 1991). Bathysquilloids further differ from all other extant stomatopods by having articulated apices of all primary teeth on the telson. In other stomatopods the primary teeth are either all fixed or have articulated apices of only the submedian primary telson teeth. Bathysquilloidea includes two families, Indosquillidae Manning, 1995, and Bathysquillidae Manning, 1967, of which the latter is represented in Taiwan.

Family BATHYSQUILLIDAE Manning, 1967

Bathysquillidae Manning, 1967a: 238.

Diagnosis.— AS5 without long, posteriorly directed median spine. Telson broader than long; dorsum rugose, tuberculate. Segments of uropodal exopod fully articulated; distal segment longer than proximal segment.

Remarks.— Of the two known bathysquillid genera, only *Bathysquilla* is found in Taiwan.

Genus *Bathysquilla* Manning, 1963

Bathysquilla Manning, 1963b: 323–324. Type species *Lysiosquilla microps* Manning, 1961, by original designation. Gender feminine.

Diagnosis.— Carapace with cervical groove distinct across dorsum. Male pleopod 1 endopod with lateral lobe on posterior ‘endite’. Telson posterior margin with 4 pairs of primary teeth, each with movable apex.

Remarks.— *Bathysquilla* includes two species, *B. microps* (Manning, 1961) and *B. crassispinosa* (Fukuda, 1909), of which the latter occurs in Taiwan.

Bathysquilla crassispinosa (Fukuda, 1909)



Fig. 5. Male, TL 225 mm, Dasi fishing port, Yilan County, 17 Aug 1989.

Lysiosquilla crassispinosa Fukuda, 1909: 61, pl. 5 [type locality: Tosa Bay, Japan].

Bathysquilla crassispinosa.— Liu & Wang, 1999: 574.— Ahyong, 2001: 11, fig. 6.

Material examined.— Dasi fishing port, Yilan County, 17 Aug 1989: 1 male (TL 225 mm) (USNM 252428).— Nov 1989: 1 male (TL 258 mm) (NTOU).— 19 Oct 1995: 1 male (TL 236 mm) (ZRC 1999.2312).— 14 Feb 1997: 1 male (TL 383 mm) (NTOU).— 12 Sep 1997: 1 female (TL 302 mm) (TMCS-0060).— Feb 1998: 1 male (TL 383 mm) (NTOU).— 1 Nov 1998: 1 male (TL 233 mm) (NTOU).— 5 Feb 1999: 1 female (TL 283 mm) (NTOU).— 2000: 2 males (TL 225–290 mm) (ZRC 2001.0119).— no date: 1 male (TL 304 mm), 1 female (TL 284 mm) (NTOU). Nanfang-ao fishing port, Yilan County, 7 Nov 1985: 1 female (TL 256 mm) (TMCS-0001). Donggang fishing port, Pingtung County, 7 Dec 1968: 1 male (TL 214 mm) (ASIZ 54201).— 7 Dec 1968: 1 male (TL 252 mm) (ASIZ 53860).

Diagnosis.— Eye large, cornea subglobular, pigmented. Rostral plate longer than broad; dorsally with broad median sulcus. Raptorial claw dactylus with 9–11 teeth; carpus dorsal margin with 2 slender spines. Uropodal protopod with tuberculate dorsal carina; outer margin with short ventral spine anterior to exopod articulation.

Size.— To 320 mm TL (Osawa *et al.*, 2004).

Coloration.— Carapace, thorax, abdomen and uropodal protopod. Raptorial claw merus and carpus orange; propodus and dactylus diffuse translucent orange. Uropodal exopod and endopod, and pereopods white.

Habitat.— Soft substrates between 170 and 420 m.

Distribution.— Indo-West Pacific from Japan, the Philippines, Taiwan and Australia to Madagascar and

South Africa.

Remarks.— The present specimens are the first to be reported from Taiwan. According to Ingle & Merrett (1971), the holotype of *B. crassispinosa* was destroyed during the Second World War, leading Ahyong (2001) to establish a neotype. Osawa *et al.* (2004), however, recently rediscovered a series of ‘lost’ stomatopod specimens of Fukuda including the holotype of *B. crassispinosa*. Therefore, the neotype of *B. crassispinosa* designated by Ahyong (2001) was set aside with the rediscovery of the Fukuda’s holotype.

The presence of 4 pairs of movable spines on the posterior margin of the telson distinguishes *B. crassispinosa* from all other Taiwanese stomatopods.

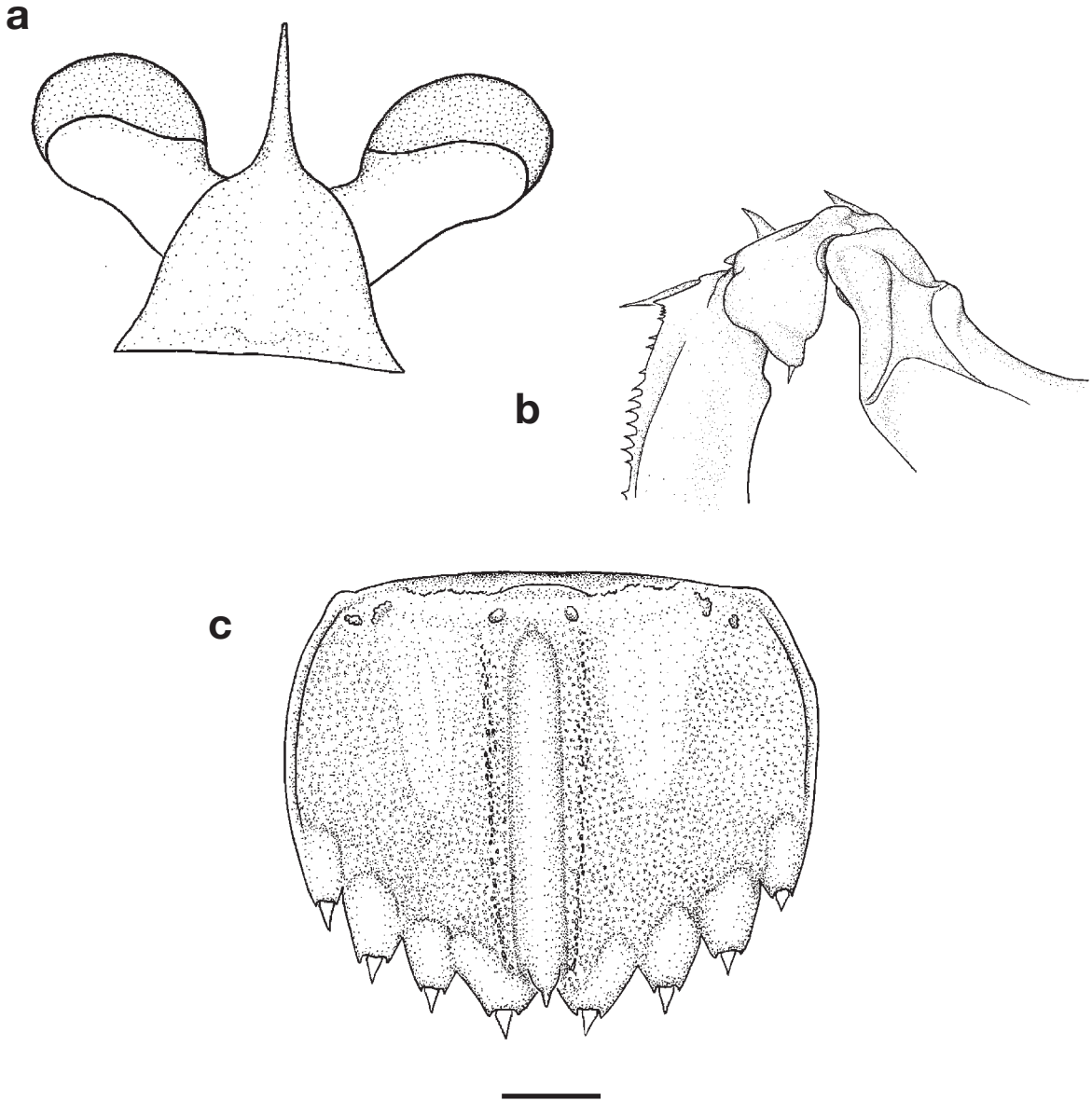


Fig. 6. Male, TL 258 mm, Dasi fishing port, Yilan County, Nov 1989: **a**, eyes and rostral plate; **b**, carpus of left raptorial claw; **c**, telson. Scale: a, b = 5 mm; c = 10 mm.

Superfamily GONODACTYLOIDEA Giesbrecht, 1910

Diagnosis.— Cornea with of 6 rows of rectangular ommatidia in the midband. Propodi of maxillipeds 3–4 ovate, not ribbed or beaded ventrally. Body subcylindrical, articulation compact. Raptorial claw with terminal or subterminal ischiomeral articulation; dactylus inflated or not inflated basally. Telson with distinct median carina; submedian teeth with articulated apices; at most with 3 ‘intermediate’ denticles, arising marginally. Uropodal protopod with 1 or 2 primary spines; articulation of exopod segments terminal or subterminal.

Remarks.— Four families of the Gonodactyloidea are known from Taiwan, distinguished in the key below. The gonodactyloids formerly included all stomatopods bearing the combination of ovate, unribbed propodi of maxillipeds 3–4, a median carina on the telson and two intermediate denticles on the telson (Manning, 1980, 1995). Recent phylogenetic studies, however, showed that two families originally placed in Gonodactyloidea, Parasquillidae and Eurysquillidae, are more closely related to the Squilloidea and belong in separate superfamilies, Parasquilloidea and Eurysquilloidea (see Ah Yong & Harling, 2000; Ah Yong, 2001). In particular, the eurysquilloids and parasquilloids differ from gonodactylids in having 2 or 3 (Parasquilloidea) or 2 or 6 (Eurysquilloidea) rows of ommatidia in the corneal midband in which all ommatidial facets are hexagonal. In gonodactyloids, however, the ommatidial midband always comprises 6 rows of rectangular facets. The parasquilloids further differ from gonodactyloids in having 3 instead of 1 or 2 primary teeth on the uropodal protopod. Eurysquilloids further differ from gonodactyloids in having the intermediate telson denticles arising ventrally instead of marginally (Ah Yong & Harling, 2000).

Gonodactyloidea includes the majority of coral reef and rocky shore stomatopods, most notably the ‘smashers’ of the families Gonodactylidae, Protosquillidae and Odontodactylidae.

Key to families of the Gonodactyloidea in Taiwan

1. Raptorial claw with terminal ischiomeral articulation; dactylus with 3 teeth, outer proximal margin not inflated **Pseudosquillidae**
- Raptorial claw with subterminal ischiomeral articulation; base of dactylus strongly inflated, forming blunt heel 2
2. Articulation of uropodal exopod segments terminal 3
- Articulation of uropodal exopod segments subterminal **Gonodactylidae**
3. Dactylus of raptorial claw with short teeth on inner margin. A2 protopod with articulated dorsal plate. AS6 articulating with telson. Telson with distinct median carina **Odontodactylidae**
- Dactylus of raptorial claw without teeth on inner margin. A2 protopod with fixed dorsal spine. AS6 fused with telson. Telson with low median boss **Protosquillidae**

Family GONODACTYLIDAE Giesbrecht, 1910

Gonodactylinae Giesbrecht, 1910: 148.

Gonodactylidae.— Manning, 1968c: 137.

Diagnosis.— Raptorial claw with subterminal ischiomeral articulation; dactylus with smooth or microscopically serrated inner margin and strongly inflated heel on outer proximal margin. Telson and AS6 fully articulated, not fused. Distal segment of uropodal exopod articulating on inner margin of proximal segment;

distal spines on outer margin of proximal segment all movable, none recurved anteriorly.

Remarks.— All gonodactylids are ‘smashers’, with all distal spines on the outer margin of proximal segment movable and relatively straight, and with the distal segment of the uropodal endopod articulating on the inner margin of the proximal segment. The gonodactylids are the most common stomatopods of coral reef and rocky habitats, where they live in preformed cavities and small holes. Of the nine recognized gonodactylid genera, so far only two are known from Taiwan.

Key to genera of Gonodactylidae from Taiwan

1. Ocular scales wider than base of apical spine of rostral plate, truncate *Gonodactylus*
- Ocular scales narrower than base of apical spine of rostral plate, rounded or angular
..... *Gonodactylellus*

Genus *Gonodactylellus* Manning, 1995

Gonodactylellus Manning, 1995: 56–57. Type species *Gonodactylus affinis* de Man, 1902, by original designation. Gender masculine.

Gonodactylinus Manning, 1995: 66. Type species *Gonodactylus viridis* Serène, 1954, by original designation and monotypy. Gender masculine.

Diagnosis.— Eye subcylindrical, cornea not broader than stalk in dorsal view. Ocular scales small, narrower than basal width of median spine of rostral plate, usually, rounded dorsally. Rostral plate with slender median spine and short, broad, trapezoid basal portion. Anterolateral margins of carapace convex, extending anteriorly beyond base of rostral plate. Mandibular palp present. Propodus of raptorial claw with proximal movable spine in adults. Telson with 3 or 5 mid-dorsal carinae; intermediate carina of telson without accessory longitudinal carina on mesial margin; anus located ventrally. Uropodal protopod without lobes between terminal spines; endopod without spines on inner margin.

Remarks.— *Gonodactylellus* is the most speciose gonodactylid genus, currently comprising 19 species, all from the Indo-West Pacific (Ahyong, 2001; Ahyong & Erdmann, 2007). Nevertheless, only two species of the genus are presently known from Taiwan. Telson morphology in *Gonodactylellus* exhibits significant heterogeneity and it is likely that the genus is not monophyletic (Ahyong, 2001; Ahyong & Erdmann, 2007). Species of *Gonodactylellus* generally do not exceed about 30 mm TL and are abundant on tropical coral reefs living in holes in coral rock, coralline algae, rubble and sponge.

Key to species of *Gonodactylellus* from Taiwan

1. TS6 with lateral margin truncate *G. erdmanni*
- TS6 with lateral margin rounded *G. viridis*

Gonodactylellus erdmanni Ah Yong, 2001

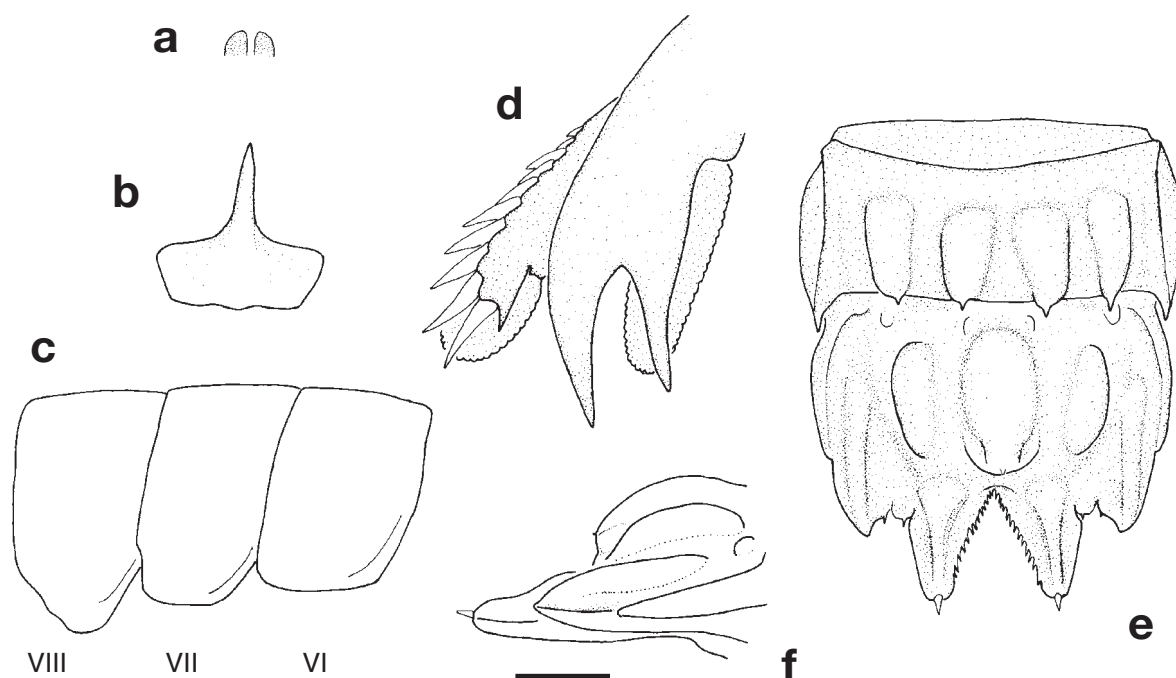


Fig. 7. Male, TL 29 mm, Haitzukou, SiaoLiouciou, Pingtung County, 19 May 1988: **a**, ocular scales; **b**, rostral plate; **c**, TS6–8, right lateral; **d**, right uropod, ventral; **e**, AS6 and telson; **f**, telson, right lateral view. Scale = 1.0 mm.

Gonodactylellus erdmanni Ah Yong, 2001: 51–53, fig. 24 [type locality: Townsville, Australia].

Material examined.— Kending, Pingtung County, coral reef, from dead coral and encrusted rock, 2 Oct 2004: 1 male (TL 17 mm), 0.5–3.0 m (NIWA). Haitzukou, SiaoLiouciou, Pingtung County, 20 Mar 1992: 1 male (TL 30 mm), 1 female (TL 30 mm) (NTOU).— 19 May 1988: 1 male (TL 29 mm) (TMCS-0098).

Diagnosis.— Ocular scales separate. Rostral plate with anterolateral angles usually rounded, anterior margins transverse or sloping posteriorly. TS6 lateral process truncate, broader than that of TS7. AS1–5 without posterolateral spine. Telson intermediate teeth distinct, with apices extending posteriorly well beyond apices of intermediate denticles. Telson without numerous spinules over surface of mid-dorsal carinae; median carina with or without blunt posterior tubercle; emargination between submedian and intermediate teeth acute; accessory median carinae short, not extending anteriorly beyond posterior third of median carina, unarmed posteriorly; anterior submedian carina unarmed posteriorly, inflated but relatively straight.

Size.— To 31 mm TL (Ah Yong, 2001).

Coloration.— Uniform or mottled olive green to reddish brown. Raptorial claw with pale pinkish meral spot.

Habitat.— Crevices in rocks, coral, sponge and corallinae algae on intertidal and shallow subtidal coral reefs.

Distribution.— Australia, Indonesia, the South China Sea and now from Taiwan.

Remarks.— The present specimens of *G. erdmanni* are the first to be recorded from Taiwan. *Gonodactylellus erdmanni* and *G. viridis* closely resemble each other, and are best distinguished by the form of the lower lateral margin of TS6 — truncate and wider than that of TS7 in the former, versus rounded and about as wide as TS7 in the latter.

Gonodactylellus aff. *viridis* (Serène, 1954)



Fig. 8. Female, TL 47 mm, South Bay, Pingtung County, 1 Jul 1989.

Gonodactylus chiragra var. *viridis* Serène, 1954: 6, 7, 10, 74, 75, 76, 87, fig. 13–3 [type locality: Cauda Bay, Vietnam].

Gonodactylus viridis.— Jeng, 1998: 28.

Gonodactyllinus viridis.— Liu & Wang, 1999: 575 [misspelling].

Gonodactylellus viridis.— Ahyong, 2001: 63–65, fig. 31.

Material examined.— Sansiiantai, Taitung County, 12 Jul 1978: 1 female (TL 38 mm) (USNM 304664). Shanyuan, Taitung County, 20 Apr 1992: 1 female (TL 32 mm) (NTOU). South Bay, Pingtung County, 1 Jul 1989: 1 female (TL 47 mm) (NTOU).

Diagnosis.— Ocular scales separate, rounded. Rostral plate with anterolateral angles rounded, anterior margins transverse. TS6 lateral process rounded, about as broad as that of TS7. AS1–5 without posterolateral spine. Telson intermediate teeth distinct, with apices extending posteriorly well beyond apices of intermediate denticles. Telson without numerous spinules over surface of mid-dorsal carinae; median carina with or without blunt posterior tubercle; emargination between submedian and intermediate teeth acute; accessory median carinae short, not extending anteriorly beyond posterior third of median carina, unarmed posteriorly; anterior submedian carina unarmed posteriorly, inflated but relatively straight.

Size.— To 55 mm TL (Ahyong, 2001).

Coloration.— Uniform or mottled light to dark green.

Habitat.— Intertidal and shallow subtidal coral reefs, in coralline rock, sponge and under rocks or oysters on seagrass.

Distribution.— Andaman Sea to Australia, Indonesia, Vietnam, Japan and Taiwan.

Remarks.— *Gonodactylellus viridis* is presently attributed a wide distribution, ranging from the Andaman Sea to Vietnam, the South China Sea, Japan, Australia, New Caledonia and Samoa (Ahyong, 2001). Ongoing studies by S. Ahyong, M. Erdmann and P. Barber, however, indicate that *G. viridis* as currently understood, is a species complex. *Gonodactylellus viridis* may be distinguished from the similar *G. erdmanni* by having a rounded instead of truncate lower lateral margin of TS6.

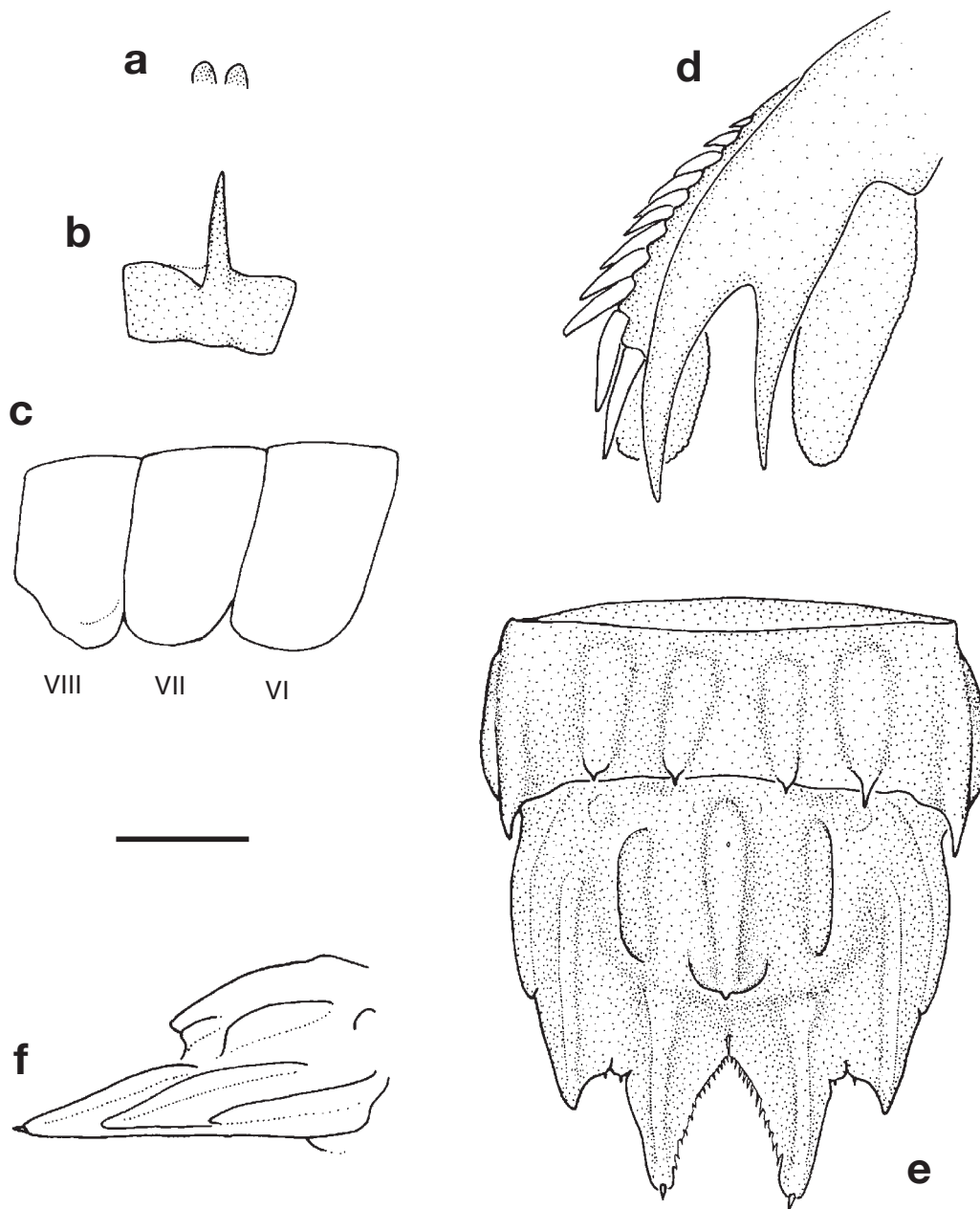


Fig. 9. Female, TL 47 mm, South Bay, Pingtung County, 1 Jul 1989: **a**, ocular scales; **b**, rostral plate; **c**, TS6–8, right lateral view; **d**, right uropod, ventral view; **e**, AS6 and telson; **f**, telson, right lateral view. Scale = 2.0 mm.

Genus *Gonodactylus* Berthold, 1827

Gonodactylus Berthold, 1827: 271. Type species *Squilla chiragra* Fabricius, 1781, by subsequent designation by the International Commission of Zoological Nomenclature under its plenary powers in Opinion 785. Name on *Official List* of International Commission on Zoological Nomenclature. Gender masculine.

Diagnosis.— Eye subcylindrical, cornea not broader than stalk in dorsal view. Ocular scales large, wider than basal width of median spine of rostral plate, distinctly wider than high, flattened dorsally. Rostral plate with slender median spine and short, broad, trapezoid basal portion. Mandibular palp present. Propodus of raptorial claw with proximal movable spine in adults. Anterolateral margins of carapace convex, extending anteriorly beyond base of rostral plate. Telson with 3 mid-dorsal carina; Intermediate carina of telson without accessory longitudinal carina on mesial margin; anus located ventrally. Uropodal protopod without lobes between primary terminal spines; endopod without spines on inner margin.

Remarks.— *Gonodactylus* includes the largest members of the Gonodactylidae, with some species exceeding 100 mm TL. The five species of *Gonodactylus* occur only in the Indo-West Pacific region, four of which are known from Taiwan. All occur on coral on rocky reefs in cavities in coral rubble and rock.

Key to species of *Gonodactylus* known from Taiwan

1. Telson without lateral tooth, with margin of telson between anterolateral angle and apex of intermediate tooth unbroken. Ocular scales extending laterally almost to anterolateral angle of rostral plate *G. platysoma*
- Telson with lateral tooth, indicated by shallow notch in margin of telson between anterolateral angle and apex of intermediate tooth. Ocular scales not extending laterally to anterolateral angle of rostral plate 2
2. Lateral margins of rostral plate strongly divergent *G. smithii*
- Lateral margins of rostral plate subparallel or slightly divergent 3
3. Rostral plate with distinctly concave anterior margins *G. chiragra*
- Rostral plate with transverse or faintly concave anterior margins *G. childi*

Gonodactylus childi Manning, 1971

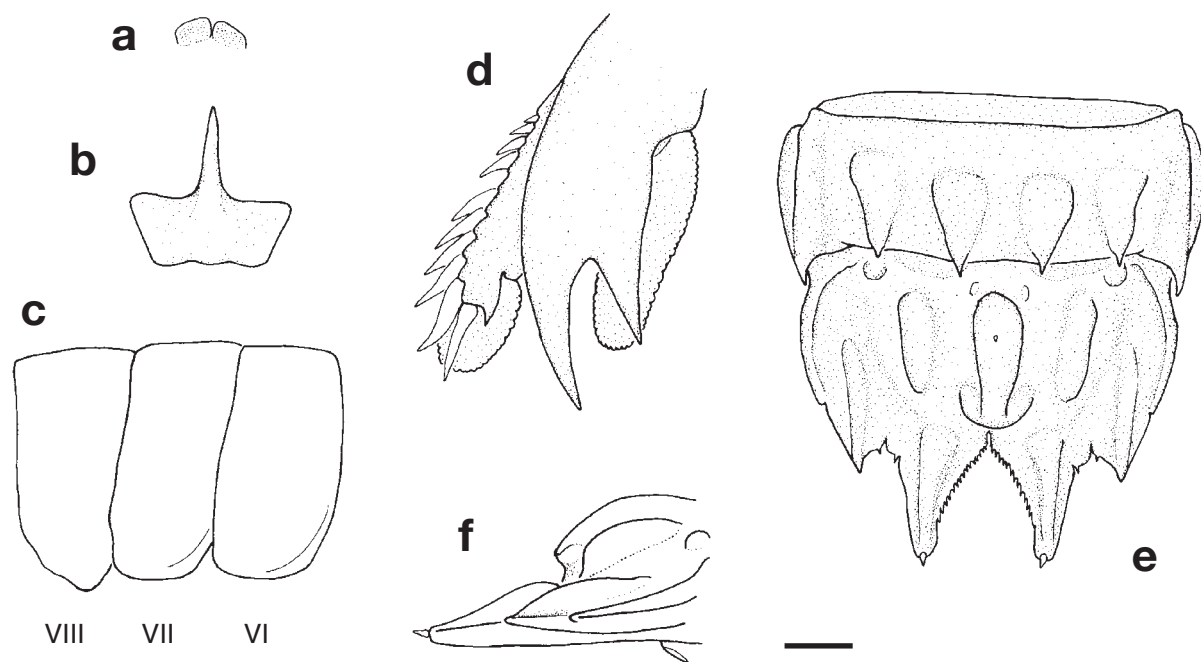


Fig. 10. Female, TL 37 mm, no specific locality: **a**, ocular scales; **b**, rostral plate; **c**, TS6–8, right lateral view; **d**, right uropod, ventral view; **e**, AS6 and telson; **f**, telson, right lateral view. Scale = 1.0 mm.

Gonodactylus childi Manning, 1971a: 75–77 [type locality: Runit (Yvonne) Id., Eniwetok Atoll, 11°32'47"S, 162°21'56"E].— Ahyong, 2001: 67, fig. 33.

Material examined.— No specific locality: 1 female (TL 37 mm) (TMCS-0096).

Diagnosis.— Ocular scales broad, flattened, separate, together slightly broader than half rostral plate width. Rostral plate basal portion with anterior margins straight or slightly concave; anterolateral angles rounded; lateral margins divergent anteriorly; apical spine longer than basal portion. Lateral margin of TS6 broader than TS7. Telson appearing short, with lateral tooth indicated by shallow notch in margin of telson between anterolateral angle and apex of intermediate tooth; mid-dorsal carinae blunt, neither sharp nor cristate dorsally; median carina unarmed posteriorly; accessory median carinae forming ‘anchor’.

Size.— To 57 mm TL (Osawa *et al.*, 2004).

Coloration.— Mottled light and dark green.

Habitat.— Intertidal and shallow subtidal coral reefs.

Distribution.— Enewetak Atoll, Pacific Ocean, French Polynesia, Australia, Japan and now from Taiwan.

Remarks.— *Gonodactylus childi* is a common shallow water species on Central and Western Pacific coral reefs. The species was recently recorded from Japan (Osawa *et al.*, 2004) and is recorded for the first time from Taiwan.

Gonodactylus childi closely resembles *G. chiragra* but is readily distinguished by the shape of the rostral plate whereby the anterior margin on either side of the median spine is transverse rather than concave. The species is a common shallow water species on Central and Western Pacific coral reefs, and attains a smaller maximum size than *G. chiragra* (TL 57 mm versus 105 mm).

Gonodactylus chiragra (Fabricius, 1781)



Fig. 11. Male, TL 57 mm, South Bay, Pingtung County, 23 Jan 1992.



Fig. 12. Female, Wanlitong, Pingtung County, Mar 1995.

Squilla chiragra Fabricius, 1781: 515 [type locality: restricted to Ambon, Indonesia, 3°43'S, 128°12'E, by neotype selection (Manning, 1981a: 217)].

Gonodactylus chiragra.— Komai, 1927: 328.— Schmitt, 1931: 147.— Lee & Wu, 1966: 43–44, fig. 1A–C.— Dong et al., 1983, pl. 3: figs. 5–6.— Suzuki, 1985: 52.— Jeng, 1998: 28, 30.— Ahyong, 2001: 67–70, fig. 34.— Liu & Wang, 1999: 575.— Wang & Liu, 2004: 601.

Material examined.— Danshuei, Taipei County, 23 Jul 1990: 1 female (TL 70 mm) (NTOU). Liandong, Taipei County, 1 Dec 1993: 1 male (TL 72 mm) (NTOU). Chenggong, Taitung County, 19 Aug 2006: 1 female (TL 49 mm) (NTOU). Sansiiantai, Taitung County, 12 Jul 1978: 4 males (TL 48–90 mm), 6 females (TL 29–89 mm) (USNM 304663). Siao gang, Taitung County, 20 Sep 2006: 2 females (TL 67–73 mm) (NTOU). Hou Bay, Pingtung County, 22 Oct 1991: 1 male (TL 72 mm), 2 females (TL 84–87 mm) (NTOU).— Kending, Pingtung County, 11 Jun 1987: 1 male (TL 79 mm) (TMCS-0055). South Bay, Pingtung County, 1 Jul 1989: 1 male (TL 76 mm), 1 female (TL 80 mm) (NTOU).— 23 Jan 1992: 1 male (TL 57 mm) (NTOU). Wanlitong, Pingtung County, 5 Apr 1992: 4 females (TL 89–92 mm) (NTOU).— 5 Mar 1996: 1 male (77 mm), 1 female (99 mm) (NTOU).— 21 May 1996: 4 males (TL 45–63 mm), 2 females (TL 94–96 mm) (NTOU).— May 1996: 1 male (TL 93 mm) (NTOU). Daliao, SiaoLiouciou, Pingtung County, 15 Oct 1987: 2 females (broken. CL 5.0–5.7 mm) (TMCS-0056). Haitzukou, SiaoLiouciou, Pingtung County, 19 May 1988: 1 female (TL 62 mm) (TMCS-0081).— 19 May 1988: 2 males (TL 94–95 mm) (TMCS-0093).— 24 Nov 1988: 2 males (TL 63 mm) (TMCS-0080). SiaoLiouciou, Pingtung County, 24 Nov 1987: 1 female (TL 70 mm) (TMCS-0057). Pingtung County, 23 Jun 1992: 1 male (TL 81 mm) (NTOU).— no date: 1 female (TL 80 mm) (NTOU). No specific locality: 1 female (TL 67 mm).— 1 female (TL 45 mm) (NTOU).— 1993: 1 male (TL 74 mm) (NTOU).

Diagnosis.— Ocular scales broad, flattened, separate, together broader than half rostral plate width. Rostral plate basal portion with anterior margins strongly concave; anterolateral angles blunt or rounded; lateral margins subparallel or slightly divergent anteriorly; apical spine shorter or longer than base. Lateral margin of TS6 and TS7 subequal. Telson with lateral tooth indicated by shallow notch in margin of telson between anterolateral angle and apex of intermediate tooth; mid-dorsal carinae blunt, neither sharp nor cristate dorsally; median carina unarmed posteriorly; accessory median carinae forming 'anchor'.

Size.— To 105 mm TL (Kemp, 1913).

Coloration.— Males with dark green to brownish body; pereopods yellow with orange-red tips. Females mottled grey-green and white; pereopods distally yellow.

Habitat.— Intertidal and shallow subtidal coral reefs.

Distribution.— Western Indian Ocean to Australia, Japan, Taiwan and French Polynesia.

Remarks.— *Gonodactylus chiragra* is a common and widespread coral reef species, and is the most common gonodactylid on the coral reefs of Taiwan.

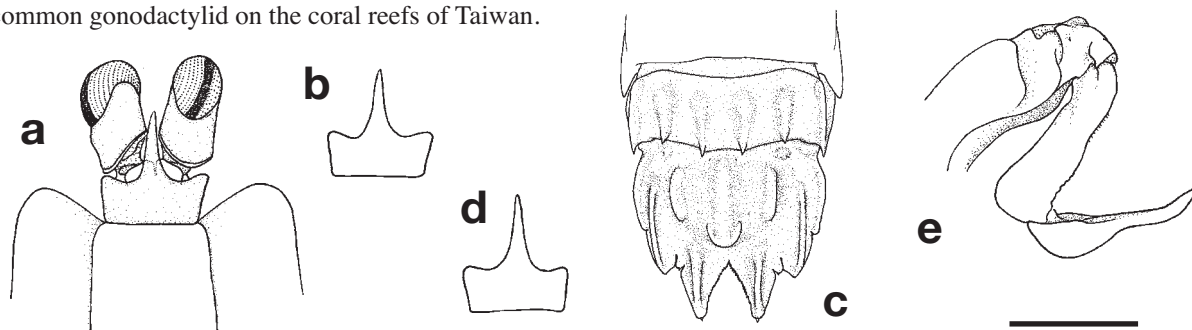


Fig. 13. Male, TL 76 mm, South Bay, Pingtung County, 1 Jul 1989: **a**, anterior cephalothorax; **b**, rostral plate; **c**, AS6 and telson. Female, TL 80 mm, Pingtung County, no date: **d**, rostral plate; **e**, right raptorial claw. Scale: a, b = 5.0 mm; c = 8.8 mm; d, e = 7.0 mm.

Gonodactylus platysoma Wood-Mason, 1895

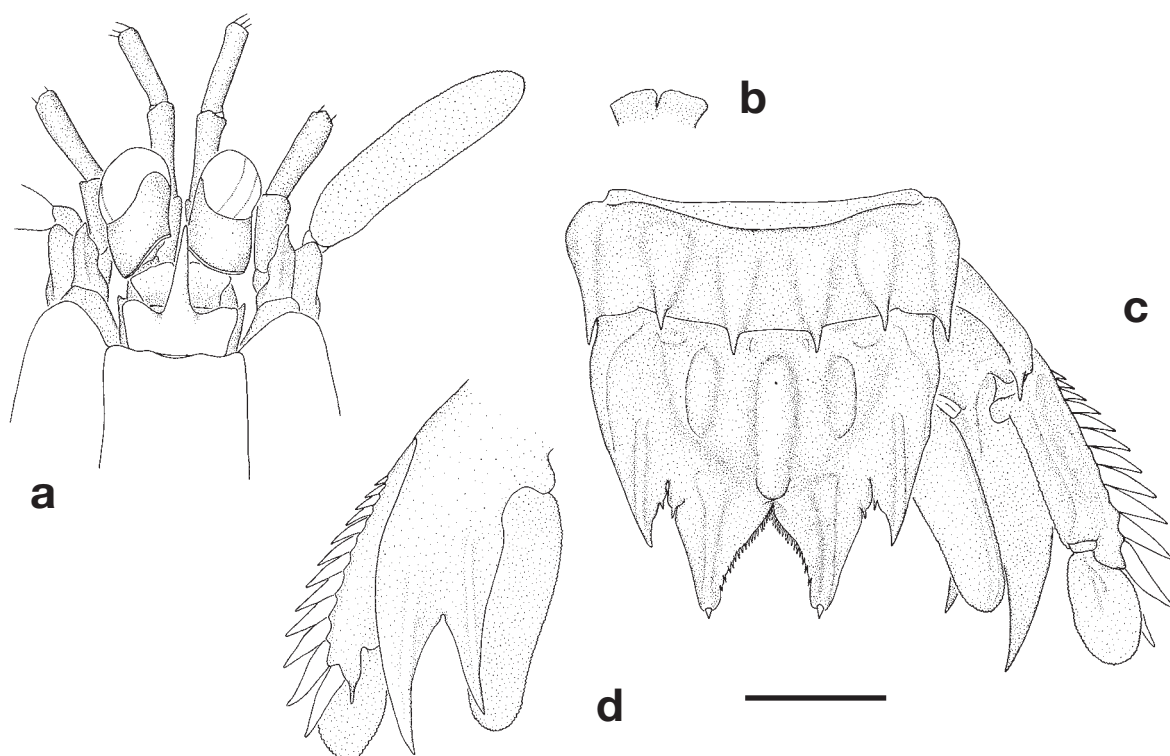


Fig. 14. Male, TL 76 mm, no specific locality, 10 Mar 1989: **a**, anterior cephalothorax; **b**, ocular scales; **c**, AS6, telson and uropod; **d**, right uropod, ventral. Scale = 5.0 mm.

Gonodactylus platysoma Wood-Mason, 1895: 11, pl. 3, figs. 3–9 [type locality: restricted to Society Ids., 17°00'S, 150°00'W, by lectotype selection (Ghosh & Manning, 1988: 654)].— Ahyong, 2001: 71–72, fig. 35.

Gonodactylus chiragra var. *tumidus* Lanchester, 1903: 447, 456, pl. 23: fig. 1 [type locality: Minikoi, Laccadive Ids. (= Lakshadweep), 8°17'S, 73°02'E].

Gonodactylus chiragra var. *acutus* Lanchester, 1903: 447, 456, pl. 23: fig. 3 [type locality: Minikoi, Laccadive Ids. (= Lakshadweep), 8°17'S, 73°02'E].

Material examined.— No specific locality, 10 Mar 1989: 1 male (TL 76 mm) (TMCS-0090).

Diagnosis.— Ocular scales broad, flattened, separate, together almost as broad as rostral plate. Rostral plate basal portion with anterior margins strongly concave; anterolateral angles rounded; lateral margins subparallel or slightly divergent anteriorly; apical spine longer than base. Lateral margin of TS6 and TS7 subequal. Telson without lateral tooth, margin of telson unbroken between anterolateral angle and apex of intermediate tooth; dorsal carinae blunt, neither sharp nor cristate dorsally; median carina unarmed posteriorly; accessory median carinae indistinct or obsolete.

Size.— To 110 mm (Kemp, 1915).

Coloration.— Dorsally mottled with white brown and green. TS8 and AS5 with posterolateral "eyespot". Raptorial claw with white meral depression; carpus red; propodus reddish proximally, bluish distally; dactylus blue.

Habitat.— Intertidal and shallow subtidal coral reefs.

Distribution.— Western Indian Ocean to Australia, the South China Sea, and Japan to French Polynesia.

Remarks.— *Gonodactylus platysoma* resembles *G. chiragra* but is readily distinguished by having markedly broader ocular scales and by lacking the notch in the lateral margin of the telson that indicates the position of the lateral tooth. The two species also differ in colour pattern, with *G. platysoma* having a dark ‘eyespot’ on either side of AS5.

The single specimen, from southern Taiwan, was almost certainly taken from coral reef and is a new record for Taiwan.

Gonodactylus smithii Pocock, 1893



Fig. 15. Female, TL 70 mm Danshuei, Taipei County, 23 Jul 1990.



Fig. 16. Hongchaikeng, Pingtung County, 23 Mar 2005, body more brownish.

Gonodactylus Smithii Pocock, 1893: 475, pl. 20B [type locality: Arafura Sea].

Gonodactylus chiragra var. *anancyrus* Borradaile, 1900: 395, 397, 401 [type localities: Talili Bay (4°12'S, 152°08'E), New Britain and Lifou (20°53'S, 167°13'E), Loyalty Ids.].

Pseudosquilla ornata.— Hwang & Yu, 1980: 53, pl. 12: fig. 4 [not *P. ornata* Miers, 1880].

Gonodactylus minikoimensis Ghosh, 1990: 201, 202, fig. 1 [type locality: Minikoi, 8°17'S, Lakshadweep, 73°02'E].

Gonodactylus arabica Ghosh, 1990: 201, 205, figs. 2, 3e [type locality: Kavaratti, Lakshadweep, 10°33'N, 72°38'E].

Gonodactylus smithii.— Liu & Wang, 1999: 575.— Ahyong, 2001: 72–75, fig. 36.

Material examined.— Danshuei, Taipei County, 23 Jul 1990: 1 female (TL 70 mm) (NTOU).— 23 Jul 1990: 1 female (TL 74 mm) (USNM 252433). Shihmen, Taipei County, 7 Oct 1986: 1 female (TL 64 mm) (TMCS-0082). Liandong, Taipei County, 1993: 1 male (TL 74 mm) (NTOU). Yeh-Liu Pi (? = Yeliou, Taipei County), 1.8 m, 28 Jun 1978: 2 males (TL 34–72 mm), 4 females (TL 13–52 mm) (USNM 304665). Magong fishing port, Penghu County, 10 Sep 1986: 1 male (TL 73 mm) (TMCS-0053). Penghu County, no date: 1 female (TL 27 mm) (NTOU).

Diagnosis.— Ocular scales broad, flattened, separate, together as broad as half rostral plate width. Rostral plate basal portion with anterior margins concave; anterolateral angles acute but not spiniform; lateral margins strongly divergent anteriorly; apical spine longer than base. Telson with lateral tooth indicated by shallow notch in margin of telson between anterolateral angle and apex of intermediate tooth; dorsal carinae often sharp or cristate dorsally; median carina usually armed posteriorly with stout spine, but often obsolete in adult males; accessory median carinae forming 'anchor'.

Size.— To 90 mm TL (Ahyong, 2001).

Coloration.— Overall uniform or mottled light green to black green, sometimes brownish. Juveniles usually with small, white dorsal spots on abdomen. Raptorial claw with meral spot dark red to purple with white outline; propodus blue distally; dactylus pink. Uropodal protopod with bright red dorsal spot basally; setae on exopod and endopod often purple. Antennal scale clear yellow.

Habitat.— Cavities in and under rock, coral, sponge and oysters on intertidal and shallow subtidal coral reefs.

Distribution.— Western Indian Ocean to the western Pacific including Australia, the South China Sea, Taiwan and New Caledonia.

Remarks.— *Gonodactylus smithii* is a common coral reef species, and is readily distinguished from the sympatric *G. chiragra* and *G. platysoma* by features of the rostral plate: the lateral margins are strongly divergent and the anterolateral corners are angular, often sharp. As in Australian and South China Sea specimens of *G. smithii*, the uropodal endopod bears a convex mesial margin. Although presently accorded a wide distribution in the Indian and Pacific Oceans, *G. smithii* sensu stricto probably has a narrower range. *Gonodactylus smithii*, as presently recognized, constitutes a species complex (Ahyong, 2005a); several undescribed 'smithii-like' species are presently under study (Ahyong, in prep.).

Hwang & Yu's (1980) record of *Pseudosquilla ornata* from Lanyu Island appears to be based on *G. smithii*, based on their plate 12: fig. 4. Although details of the telson of the specimen are not visible, the rostral plate is of the characteristic form of *G. smithii*. Thus, the species is now formally reported from Taiwan.

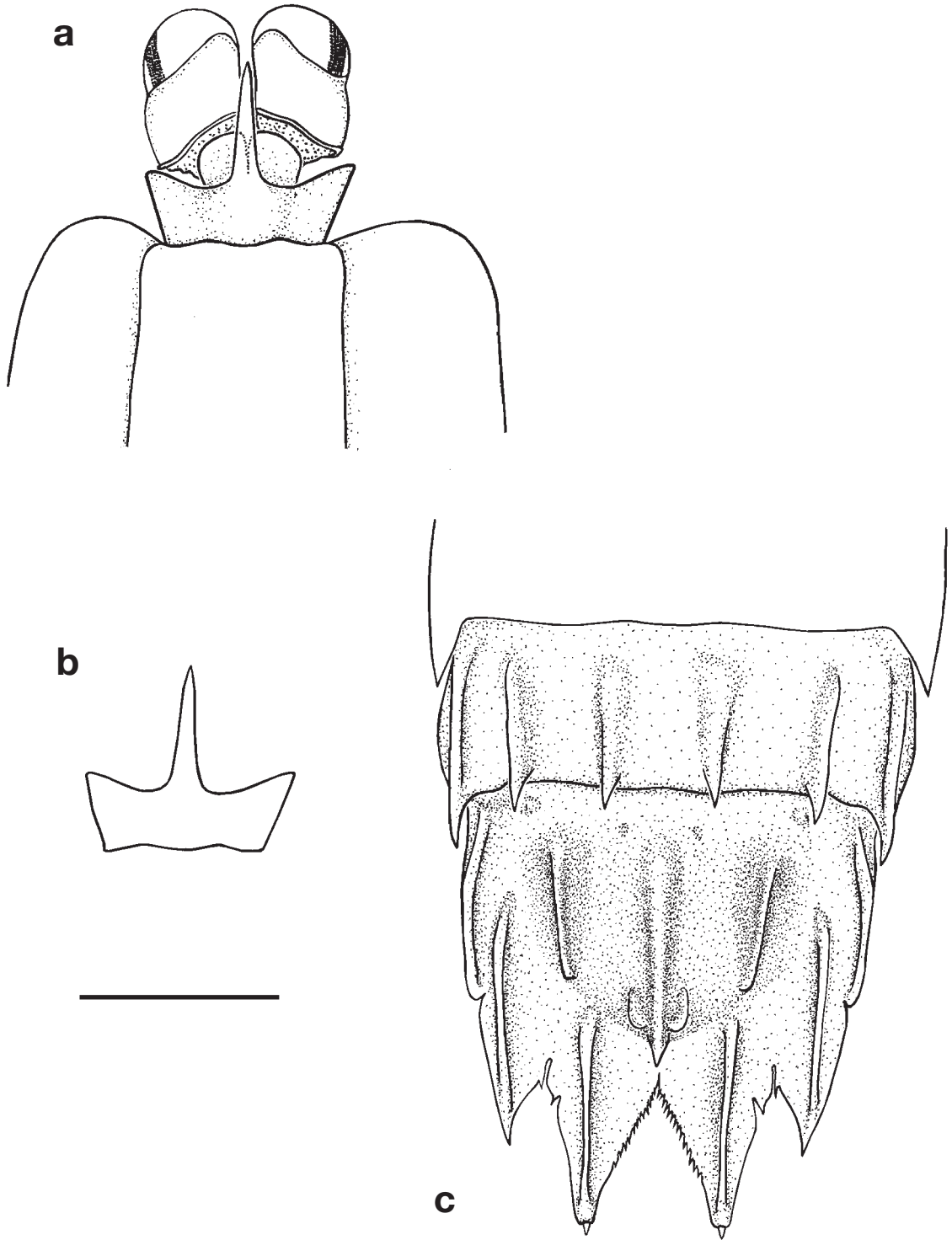


Fig. 17. Female, TL 70 mm, Danshuei, Taipei County, 23 Jul 1990: **a**, anterior cephalothorax; **b**, rostral plate; **c**, telson. Scale = 5.0 mm.

Family ODONTODACTYLIDAE Manning, 1980

Odontodactylidae Manning, 1980a: 366, 369.

Diagnosis.— Raptorial claw with subterminal ischiomeral articulation; dactylus with short teeth on inner margin and strongly inflated heel on outer proximal margin. Telson and AS6 fully articulating, not fused. Distal segment of uropodal exopod articulating at distal end of proximal segment; distal movable spines on outer margin of proximal segment not recurved anteriorly.

Remarks.— Odontodactylidae includes only the type genus, *Odontodactylus* Bigelow, 1893. Odontodactylids are all smashers, but as suggested by their name, differ from gonodactylids and protosquillids by having teeth on the inner margin of the dactylus of the raptorial claw.

Genus *Odontodactylus* Bigelow, 1893

Odontodactylus Bigelow, 1893: 100. Type species *Cancer scyllarus* Linnaeus, 1758, by subsequent designation by Bigelow (1931: 144). Name on *Official list* of International Commission on Zoological Nomenclature. Gender masculine.

Diagnosis.— As for family.

Remarks.— *Odontodactylus* includes the most colourful species of ‘smashing’ stomatopods, namely *Odontodactylus scyllarus* (Linnaeus, 1758). Species of *Odontodactylus* occur only in the Indo-West Pacific and Western Atlantic regions. Of the eight known species of *Odontodactylus*, four are known from Taiwan.

Key to species of *Odontodactylus* from Taiwan

1. Ocular scales separated by distinct U-shaped cavity. Telson with single accessory median carina. Median carina of telson in adults forming a high, thin crest *O. cultrifer*
- Ocular scales appressed medially. Telson with double accessory median carina. Median carina of telson in adults low, not forming a high, thin crest 2
2. Dactylus of raptorial claw with more than 5 or more small teeth on inner margin. AS5 without posterolateral spine in adults. Telson with longitudinal carina extending anteriorly from inner intermediate denticle *O. japonicus*
- Dactylus of raptorial claw with more than 2 or 3 small teeth on inner margin. AS5 with posterolateral spine. Telson without longitudinal carina extending anteriorly from inner intermediate denticle *O. scyllarus*

Odontodactylus cultrifer (White, 1851)



Fig. 18. Male, TL 102 mm, Jhongjhou fishing port, Kaohsiung, 3 Dec 1995.

Gonodactylus cultrifer White, 1851: 96, pl. 16: figs. 1, 2 [type locality: China].

Gonodactylus carinifer Pocock, 1893: 478, pl. 20B, fig. 4 [type locality: Holothuria Bank, 13°25'S, 126°00'E].

Odontodactylus mindanaoensis Roxas & Estampador, 1930: 94, 115, pl. 4: figs. 1–3 [type locality: Cotabato, Mindanao, Philippines, 7°13'S, 124°15'E].

Odontodactylus cultrifer var. *tridentata* Serène, 1954: 6, 7, 8, 72, pl. 6: figs. 7, 8 [type locality: Nhatrang Bay, Vietnam].

Raoulius cultrifer.— Liu & Wang, 1999: 575.

Odontodactylus cultrifer.— Ahyong, 2001: 79–81, fig. 38.

Material examined.— Jhongjhou fishing port, Kaohsiung County, 3 Dec 1995: 2 males (TL 102–104 mm) (NTOU). CP168, 22°26.54'N, 120°17.33'E, 25 May 2002: 1 female (67mm) (NTOU).— CP174, 22°20.35'N, 120°28.86'E, 26 May 2002: 1 male (47mm) (NTOU).

Diagnosis.— Ocular scales broad, rounded, widely separate. Raptorial claw dactylus with 2 or 3 small teeth on inner margin. AS5 with small subposterolateral spine. AS6 with distinct submedian, intermediate and lateral carinae, armed posteriorly; without reflected submedian carina. Telson dorsal surface with distinct median carina and 2 longitudinal carinae either side of midline; median carina thin, high, height about one third to one half telson width in males and about one fifth to one quarter in females. Uropodal exopod distal segment equal to or greater than 1.5 times length of proximal segment.

Size.— To 125 mm TL (Manning, 1967b).

Coloration.— Dorsally pastel metallic pink, with grey green medially; ventrally white. Telson median crest

deep pink. A2 scale pink to purple. Uropodal protopod and endopod off white to yellow-brown; exopod distal segment deep pink to purple fringed with red setae.

Habitat.— Level, sandy-mud substrates from 7–51 m (Ahyong, 2001).

Distribution.— Andaman Sea to the South China Sea, Indonesia, Taiwan, Australia, New Caledonia.

Remarks.— *Odontodactylus cultrifer* is easily recognized by the high, thin median crest on the telson. This is the first formal record of the species from Taiwan.

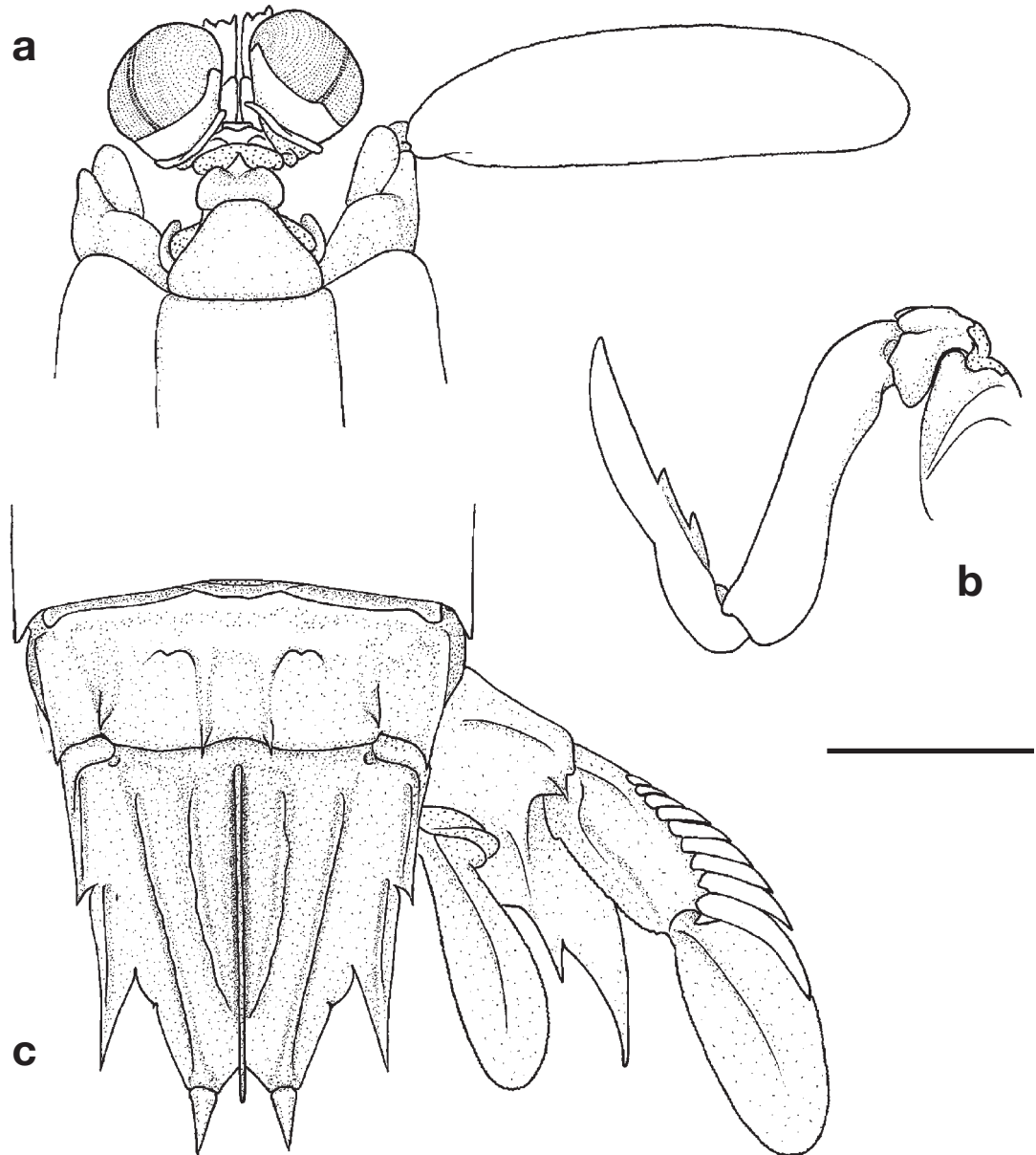


Fig. 19. Male, TL 104 mm, Jhongjhou fishing port, Kaohsiung County, 3 Dec 1995: **a**, anterior cephalothorax; **b**, left raptorial claw; **c**, AS6, telson and uropod. Scale = 10.0 mm.

Odontodactylus japonicus (de Haan, 1844)



Fig. 20. Male, TL 125 mm, Dasi fishing port, Yilan County, 18 Jun 2004.

Gonodactylus japonicus de Haan, 1844, pl. 51: fig. 7 [type locality: Japan].

Gonodactylus Edwardsii Berthold, 1845: 48 [type locality: China].

Odontodactylus japonicus.— Liu & Wang, 1999: 575.— Ahyong, 2001: 81–83, fig. 39.

Material examined.— Dasi fishing port, Yilan County, 18 Jun 2004: 1 male (TL 125 mm) (NTOU). Gushan fishing port, Kaohsiung City, 14 Jan 1985: 1 male (TL 134 mm), 1 female (TL 103 mm) (NTOU). Kaohsiung harbor, Kaohsiung city, 10 Feb 1966: 1 male (TL 192 mm) (NTOU). Donggang fishing port, Pingtung County, from stomach of fish, 5 Aug 1996: 1 female postlarva (TL 24 mm) (NTOU).

Diagnosis.— Ocular scales oblique to bodyline, appressed medially. Rostral plate triangular, but appearing trapezoid in dorsal view; apex deflexed. A2 scale with anterior margin smooth, without setae in adults. Raptorial claw dactylus with 5 or more small teeth on occlusal margin. AS1–5 posterolateral angles rounded, unarmed in adults. Telson mid-dorsal surface with distinct median carina and 4 longitudinal carinae either side of midline (double accessory median; anterior submedian; carina of inner intermediate denticle) in addition to carinae of primary teeth. Uropodal exopod proximal segment distinctly longer than distal segment; outer margin with flattened movable spines, distalmost evenly tapering (juveniles) to spatulate with blunt or minute spinular apex (adults).

Size.— To 192 mm TL (present record).

Coloration.— Overall salmon pink. Antennal scale salmon proximally, pink distally. Uropods yellow; exopod with outer movable spines yellow orange with blue posterior margin; endopod and distal segment of exopod with red setae.

Habitat.— Level sand, mud or shelly substrates from 30–200 m depth (Ahyong, 2001).

Distribution.— Western Indian Ocean to Australia, Taiwan and Japan.

Remarks.— The Taiwanese specimens represent the first formal records of *O. japonicus* from Taiwan and agree closely with published accounts (Manning, 1967b; Ahyong, 2001). In the present specimens, the dactyli of the raptorial claws are armed with 6–8 teeth and the outer margin of the proximal segment of the uropodal exopod bears 12 movable spines. The posterolateral margins of AS3–5 in the 24 mm postlarva are spinous, juvenile characters that are lost in adult *O. japonicus* (see Ahyong, 2001). The 192 mm male reported here is the largest known specimen of any odontodactylid.

Odontodactylus japonicus is readily distinguished from other Taiwanese odontodactylids by bearing five or more teeth on the inner margin of the dactylus of the raptorial claw. *Odonotodactylus scyllarus* and *O. cultrifer* both bear only two or three teeth on the inner margin of the raptorial dactylus.

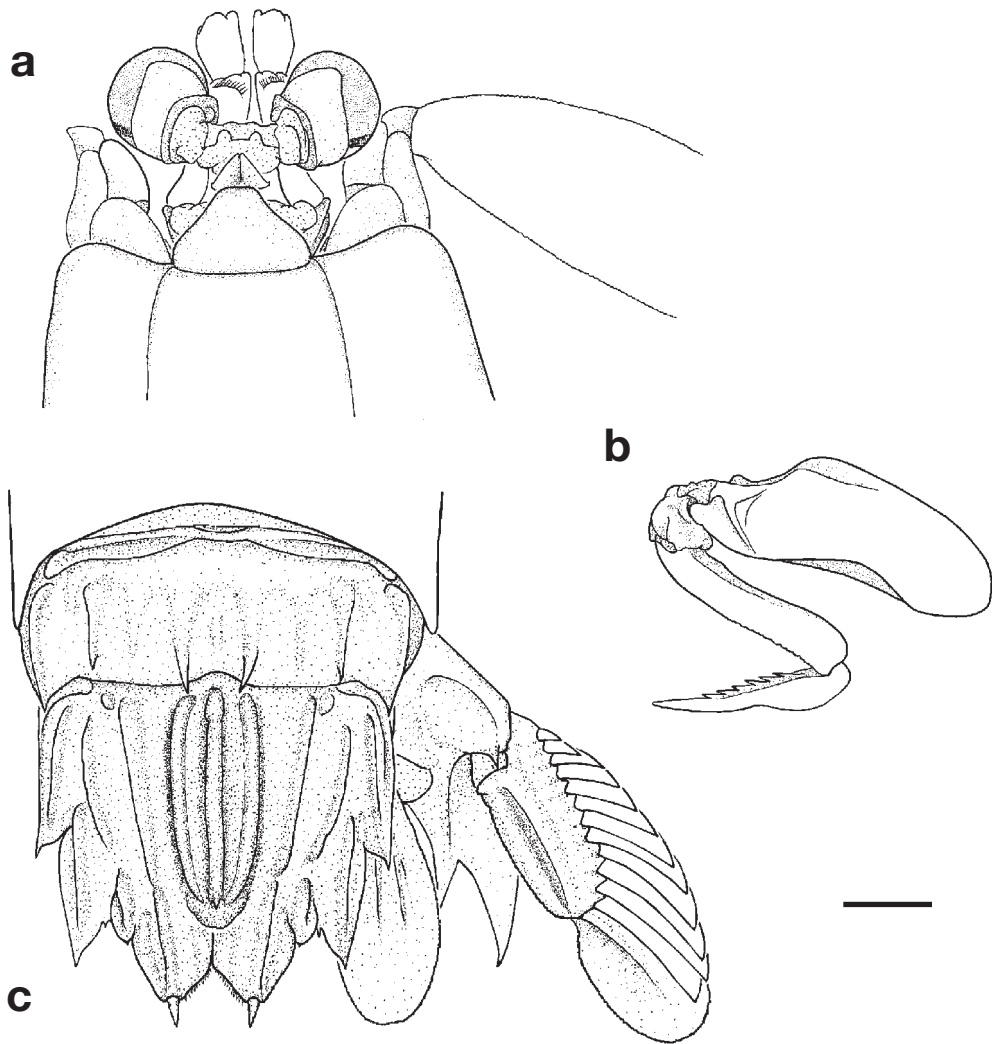


Fig. 21. Male, TL 192 mm, Kaohsiung Harbour, Kaohsiung City, 10 Feb 1966: **a**, anterior cephalothorax. Female, TL 103 mm, Gushan fishing port, Kaohsiung City, 14 Jan 1985: **b**, left raptorial claw; **c**, AS6, telson and uropod. Scale: a, c = 5.0 mm; b = 6.3 mm.

Odontodactylus scyllarus (Linnaeus, 1758)

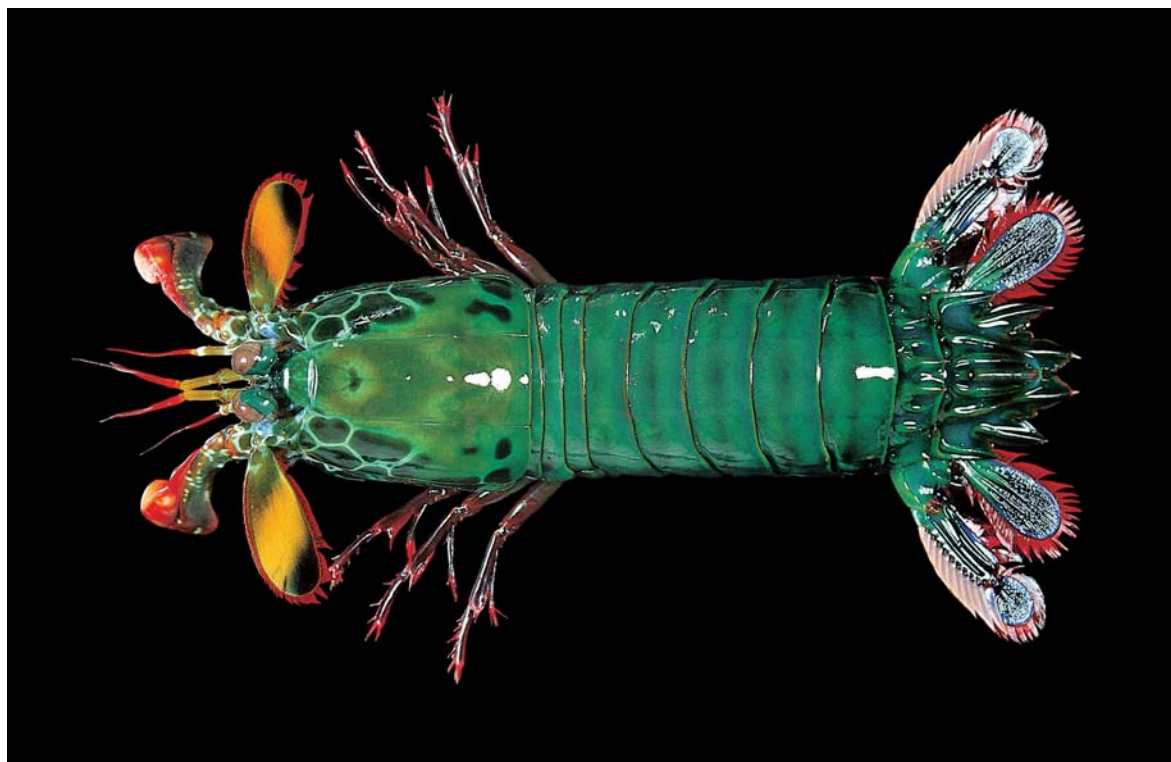


Fig. 22. Male, TL 138 mm, Hepingdao fishing port, Keelung City, Nov 1993.

Cancer Scyllarus Linnaeus, 1758: 633 [type locality: Sulawesi, Indonesia, by neotype selection (Ahyong, 2001)].

Gonodactylus Bleekeri A. Milne Edwards, 1868: 65, footnote [type locality: Batavia, Indonesia (= Jakarta, 6°10'S, 106°48'E)].

Gonodactylus elegans Miers, 1884: 566, 575, pl. 52: fig. b [type localities: Providence Id. (9°14'S, 51°02'E) and Providence Reef (9°23'S, 51°03'E), Seychelles].

Odontodactylus scyllarus.— Jeng, 1998: 29.— Liu & Wang, 1999: 575.— Ahyong, 2001: 85, fig. 41.

Material examined.— Hepingdao fishing port, Keelung City, Nov 1993: 1 male (TL 138 mm) (NTOU). — 15 Aug 1999: 1 female (TL 125.1 mm) (NTOU).— Feb 2002: 1 male (TL 135 mm) (NTOU). Dasi fishing port, Yilan County, 19 Oct 1995: 1 female (TL 105 mm) (NTOU). Yeh-Liu (? = Yeliou, Taipei County), 17 m, 28 Jun 1978: 1 male (TL 78 mm) (USNM 304666). No specific locality: Mar 2005: 1 male (TL 110 mm) (NTOU).

Diagnosis.— Ocular scales oblique to bodyline, appressed medially, margin truncate. A2 scale with entire margin setose, anterior setae shorter. Rostral plate triangular; lateral margins convex; apex deflexed. Raptorial claw dactylus with 2 or 3 small teeth on opposable margin. AS(3)4–5 with posterolateral spine. Telson mid-dorsal surface with distinct median carina and 3 longitudinal carinae either side of midline (double accessory median, anterior submedian) in addition to carinae of primary teeth. Uropodal exopod proximal distinctly longer than distal segment; outer margin with flattened movable spines, apices sharp, evenly tapering.

Size.— To 171 mm TL (Manning, 1967b).

Coloration.— Overall dorsal colour reddish brown to green, often with diffuse banding and dark lateral

spot on each somite. Large males bottle-green. Posterior margin of thoracic and abdominal somites orange-red. Carapace with anterolateral and usually posterolateral areas with large dark brown spots outlined in white. Antennal scale orange yellow with dark apex; setae red. Ventral surface, dactylus of raptorial claw and pereopods red. Uropodal protopod pale basally; exopod blue with iridescent blue outline and red marginal setae; endopod dark blue with iridescent blue outline and red marginal setae.

Habitat.— Coral and rocky reefs from the reef flat to the base of rocky or coral reefs where it burrows under coral and boulders to a depth of 30 m.

Distribution.— Eastern Africa to Japan, Taiwan, New Caledonia and eastern Australia.

Remarks.— *Odontodactylus scyllarus* is one of the most colourful stomatopods. Its colour and large size make it popular in the aquarium trade. In life, the body is bright-green or green-brown with a red ventral surface, the dactyli of the raptorial claws are red and the the anterolateral portions of the carapace bear the characteristic reticulated pattern of dark spots. Apart from the highly distinctive colouration, *O. scyllarus* can be immediately distinguished from *O. japonicus* by having 2 or 3 instead of 5 or more teeth on the inner occlusal margin of the dactylus of the raptorial claw, and from *O. cultrifer* by the appressed rather separate ocular scales, and low instead of tall, thin median carina on the telson.

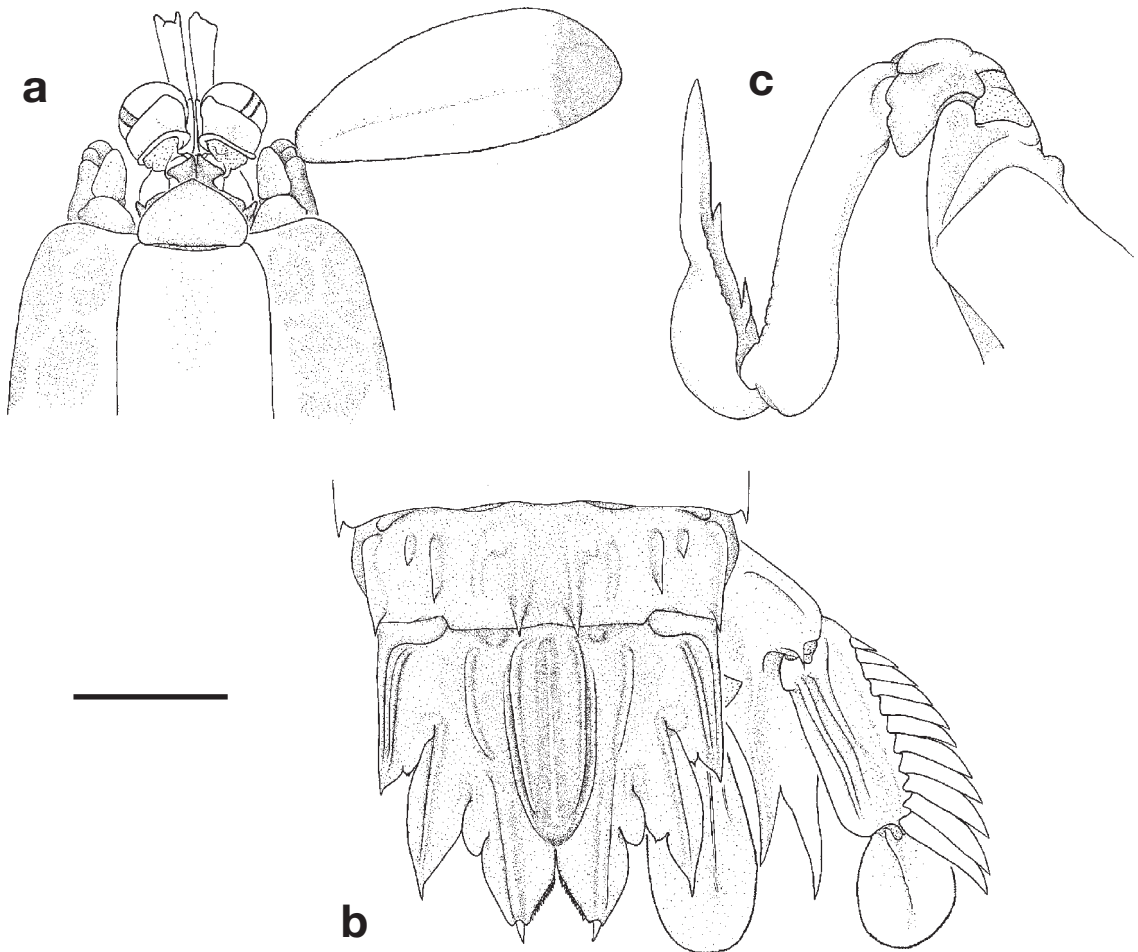


Fig. 23. Male, TL 138 mm, Hepingdao fishing port, Keelung City, Nov 1993: **a**, anterior cephalothorax; **b**, left raptorial claw; **c**, AS6, telson and uropod. Scale: a, c = 10.0 mm, b = 15.0 mm.

Family PROTOSQUILLIDAE Manning, 1980

Protosquillidae Manning, 1980a: 366, 369.

Diagnosis.— Raptorial claw with subterminal ischiomerall articulation; dactylus with smooth or microscopically serrated inner margin and strongly inflated heel on outer proximal margin. Telson and AS6 fused (though demarcation usually visible). Distal segment of uropodal exopod articulating at distal end of proximal segment; distal movable spines on outer margin of proximal segment not recurved anteriorly.

Remarks.— Protosquillids are unique in the Stomatopoda for having the telson and AS6 immovably fused (though the demarcation is usually visible). This unusual feature was interpreted by Brooks (1886) to indicate a 'primitive' or 'proto' lineage, hence *Protosquilla* Brooks, 1886. Phylogenetic analyses of the stomatopods, however, show that protosquillids, far from being 'primitive' are highly derived within the Gonodactyloidea (Ahyong, 1997; Hof, 1998b; Ahyong & Harling, 2000). Five protosquillid genera are known worldwide, of which one occurs in the eastern Atlantic and four in the Indo-West Pacific. Only one genus and species of protosquillid is presently known from Taiwan, but when focussed sampling on coral reefs and subtidal hard substrates is conducted, the known protosquillid fauna of Taiwan can be expected to considerably increase.

Genus *Haptosquilla* Manning, 1969

Haptosquilla Manning, 1969c: 159. Type species *Gonodactylus pulchellus* Miers, 1880, by original designation.

Gender feminine.

Diagnosis.— Eye cylindrical; cornea subglobular. Mandibular palp 2-segmented or absent. Maxillipeds 1–5 with epipod. AS1 with articulated pleural plate anterolaterally. Dorsal groove present, demarcating AS6 from telson. Posterior margin of telson divided posteriorly by narrow median fissure. Uropodal endopod without dorsal spines.

Remarks.— Only one of the fifteen currently recognized species of *Haptosquilla* is known from Taiwan. Species of *Haptosquilla* are abundant on coral reefs and subtidal habitats where they live in holes in coral, rock, sponge and encrusting algae. Adults rarely exceed 50 mm TL and most species do not exceed 30 mm TL.

Haptosquilla glyptocercus (Wood-Mason, 1875)

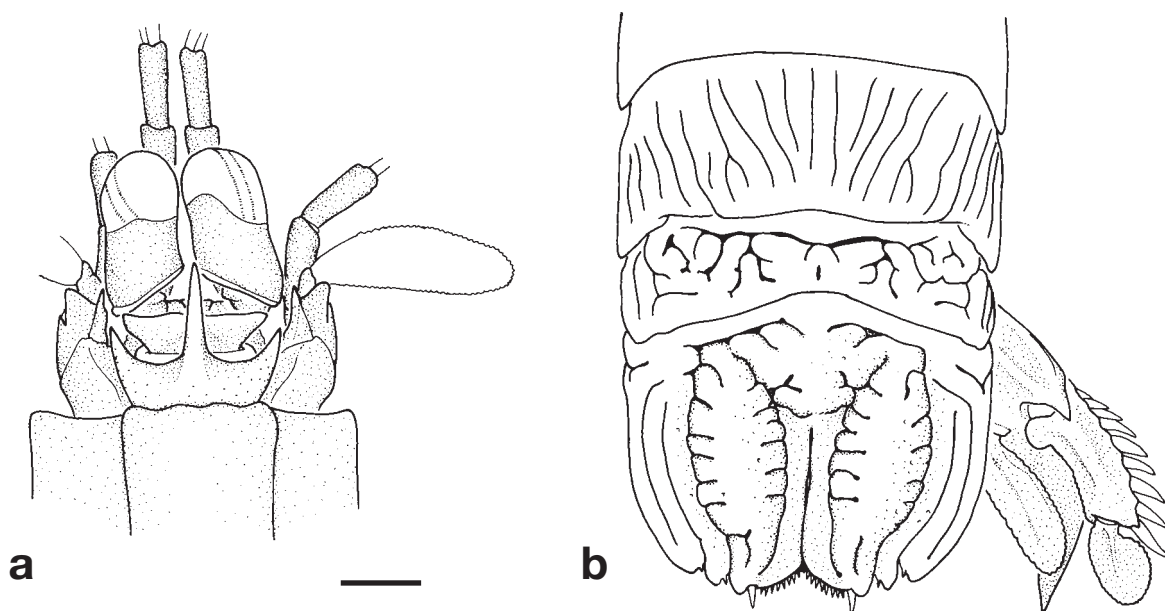


Fig. 24. Female, TL 28 mm, Haitzukou, SiaoLiouciou, Pingtung County, 19 May 1988: **a**, anterior cephalothorax; **b**, AS5–6, telson and uropod. Scale = 1.0 mm.

Gonodactylus glyptocercus Wood-Mason, 1875: 232 [type locality: Nicobar Ids., 8°00'N, 93°30'E].

Protosquilla cerebralis Brooks, 1886: 22, 72, pl. 14: figs. 2, 3, pl. 16: figs. 2, 3 [type locality: Levuka, Fiji, 17° 42'S, 178°50'E].

Haptosquilla glyptocercus.— Ahyong, 2001: 104–105, fig. 50.— Huang & Hsueh, 2006: 97–101, fig. 1b–e.

Material examined.— Haitzukou, SiaoLiouciou, Pingtung County, 19 May 1988: 2 females (TL 28–34 mm) (TMCS-0097).

Diagnosis.— Rostral plate sharply trispinous, with lateral spines slender, directed anterolaterally. Mandibular palp present. AS1–4 smooth dorsally. AS1–5 unarmed posterolaterally. AS5 wrinkled with fine longitudinal grooves medially and laterally. AS6 wrinkled with fine grooves; with low submedian, intermediate and lateral bosses, unarmed posteriorly. Telson with 3 pairs of primary teeth; dorsal surface with median and submedian bosses, fissured and convoluted, without setae or spines; median boss circular to ovate in outline; submedian bosses longer than median boss, extending beyond midlength of telson, but not to posterior margin.

Size.— To 46 mm (Ahyong, 2001).

Coloration.— Mottled green and grey to dark brown or black, often with white marks laterally on thoracic and abdominal somites; raptorial claw with pinkish dactylus (Ahyong, 2001).

Habitat.— Coral reef flats in preformed cavities in reef rock.

Distribution.— Andaman Sea to Australia, the South China Sea, Taiwan and the central Pacific. The report of *H. glyptocercus* from Taiwan by Huang & Hsueh (2006) was from the same locality of the present specimens (i.e. Little Liugiu Island = SiaoLiouciou).

Remarks.— *Haptosquilla glyptocercus* is a common Indo-Pacific coral reef species that usually occupies preformed cavities in reef rock.

Family PSEUDOSQUILLIDAE Manning, 1977

Pseudosquillidae Manning, 1977a: 95.

Diagnosis.— Raptorial claw with terminal ischiomeral articulation; dactylus with 3 teeth on inner margin and uninflated outer proximal margin. Telson and AS6 fully articulated, not fused. Distal segment of uropodal exopod articulating at distal end of proximal segment; distal movable spines on outer margin of proximal segment not recurved anteriorly.

Remarks.— Pseudosquillidae currently includes 4 genera and 11 species worldwide (Ahyong, 2001, 2005a). One species of pseudosquillid, *Pseudosquilla ciliata* (Fabricius, 1787), is presently known from Taiwan. The record of *Raoulserenea ornata* (Miers, 1880) (as *Pseudosquilla ornata*) from Lanyu Island reported by Hwang & Yu (1980) is based on *Gonodactylus smithii* Pocock, 1893 (see account of that species herein).

Genus *Pseudosquilla* Dana, 1852

Pseudosquilla Dana, 1852: 615. Type species *Squilla ciliata* Fabricius, 1787, by subsequent designation by the International Commission on Zoological Nomenclature under its plenary powers in Opinion 785. Name on *Official List* of International Commission on Zoological Nomenclature. Gender feminine.

Diagnosis.— Eye cylindrical, cornea subglobular, not broadened anteriorly. Rostral plate without anterior spinule. Carapace without pair of large dark spots. Telson with 3 carinae either side of median carina. Uropodal protopod terminating in 2 slender, flattened spines, inner spine longer.

Remarks.— One species of *Pseudosquilla* is recognized.

Pseudosquilla ciliata (Fabricius, 1787)

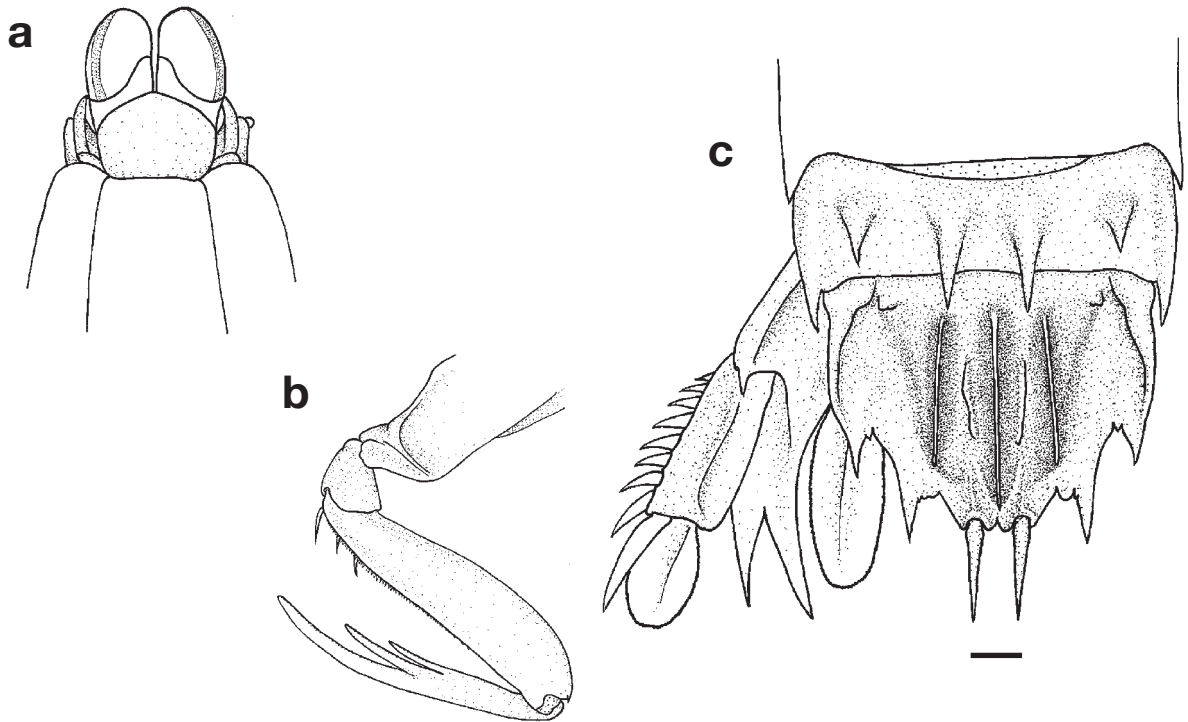


Fig. 25. Female, TL 42 mm, Haikou fishing port, Pingtung County, 18 Dec 1969: **a**, anterior cephalothorax; **b**, raptorial claw; **c**, AS6, telson and uropod. Scale: a, b = 1.1 mm; c = 1.0 mm.

Squilla ciliata Fabricius, 1787: 333 [type locality: Exmouth Gulf, Western Australia, restricted by neotype selection (Ahyong, 2001)].

Squilla stylifera Lamarck, 1818: 189 [type locality unknown].

Squilla quadrispinosa Eydoux & Souleyet, 1842: 362, pl. 5: fig 1 [type locality; Sandwich Islands (= Hawaii), 24°00'N, 167°00'E].

Pseudosquilla ciliata var. *occidentalis* Borradaile, 1900: 398, 402 [type locality: West Indies].

Pseudosquilla ciliata.— Balss, 1910a: 6.— Fukuda, 1913: 72.— Schmitt, 1931: 147.— Liu & Wang, 1999: 576.— Ahyong, 2001: 112–115, fig. 55.

Material examined.— Haikou, Pingtung County, 18 Dec 1969: 1 female (TL 42 mm) (ASIZ).

Diagnosis.— As for genus.

Size.— To 90 mm TL (Ahyong, 2001).

Coloration.— Highly polymorphic, with the background varying from yellow to almost black. The colour pattern may be uniform, mottled or longitudinally striped. A dark patch is often present laterally on TS6, AS1 and on the proximal margin of the telson behind the intermediate spine of AS6.

Habitat.— Under boulders and coral rubble on coral and rocky reef flats and in burrows in seagrass beds, sand and mudflats; shore to at least 86 m (Ahyong, 2001).

Distribution.— Widely distributed throughout the tropical Indo-West Pacific region and both sides of the Atlantic Ocean.

Remarks.— Balss (1910a) first recorded *P. ciliata* from Taiwan, from Takao (= Kaohsiung City). *Pseudosquilla ciliata* is a generally shallow water species that lives in all types of habitat ranging from rocky or coral reefs, burrows in sand and mud or amongst seagrass and rubble (Ahyong, 2001). The species is readily recognized by the combination of the subglobular cornea, presence of three teeth on the dactylus of the raptorial claw, and uropodal propod terminating in two primary spines. Species of *Faughnia* (Parasquilloidea) also have three teeth on the dactylus of the raptorial claw, but are easily distinguished by having a bilobed cornea and three primary teeth on the uropodal protopod. Additionally, species of *Faughnia* are restricted to deepwater, usually around 100 m or greater.

Superfamily LYSIOSQUILLOIDEA Giesbrecht, 1910

Diagnosis.— Cornea with 6 (rarely 2) rows of hexagonal ommatidia in the mid-band. Propodi of maxillipeds 3–4 subquadrate, ribbed or beaded ventrally. Body flattened, loosely articulated or compact. Raptorial claw with terminal ischiomerall articulation, dactylus inflated or not inflated basally. Telson without distinct median carina; at most with movable submedian teeth. Uropodal protopod with 1 or 2 primary spines; articulation of exopod segments terminal.

Remarks.— Lysiosquilloidea includes four families, of which two are presently known from Taiwan. Although some species of this family are commercially harvested elsewhere in the Indo-Pacific, the two species found in Taiwan are uncommon.

Key to families of Lysiosquilloidea known from Taiwan

1. Uropodal endopod with strong dorsal fold proximally Nannosquillidae
- Uropodal endopod without strong dorsal fold proximally Lysiosquillidae

Family LYSIOSQUILLIDAE Giesbrecht, 1910

Lysiosquillinae Giesbrecht, 1910: 148.

Lysiosquillidae.— Manning, 1968c: 109.

Diagnosis.— Cornea strongly bilobed, set obliquely on stalk. A2 protopod with 1 mesial and 2 ventral papillae. Raptorial claw with dactylus not inflated basally. Abdominal segments depressed, loosely articulated. Pereopods 1–3 with slender or ovate endopods. Dorsal margin of uropodal endopod with without strong dorsal proximal fold. Telson with primary teeth fused into margin, presenting at most appearance of short projections.

Remarks.— Lysiosquillidae comprises large species, including the largest known stomatopod, *Lysiosquillina maculata* (Fabricius, 1793), which attains a TL of 385 mm (Ahyong, 2001). Lysiosquillids live in monogamous pairs in long, deep burrows in coral reef flats, mud flats and soft subtidal substrates. Three lysiosquillid genera are currently recognized, of which one is known from Taiwan.

Genus *Lysiosquilla* Dana, 1852

Lysiosquilla Dana, 1852: 615. Type species *Lysiosquilla inornata* Dana, 1852 (a junior subjective synonym of *Lysiosquilla scabricauda* (Lamarck, 1818)), by subsequent designation by Fowler (1912: 539). Name on Official List of International Commission on Zoological Nomenclature. Gender feminine.

Diagnosis.— Eye large, T-shaped, cornea strongly bilobed, mesial lobe rounded. A2 scale slender, length 3.0 or more times width. Mandibular palp present or absent. Maxillipeds 1–5 with epipod. A2 protopod with dorsal spine or angled projection. Pereopods 1–3 endopod with distal segment slender. Telson submedian teeth with fixed apices in adults; submedian denticles fused into smooth margin in adults.

Remarks.— *Lysiosquilla* currently includes 12 species (Ahyong, 2001, 2004), of which two are known from Taiwan.

Key to species of *Lysiosquilla* known from Taiwan

1. Dactylus of raptorial claw with 7 or 8 teeth. Rostral plate triangular, broadest at base
..... *L. sulcirostris*
- Dactylus of raptorial claw with 9 or more teeth. Rostral plate cordiform, broadest in advance of base
..... *L. tredecimdentata*

Lysiosquilla sulcirostris Kemp, 1913



Fig. 26. Male, TL 90 mm, Donggang fishing port, Pingtung County, 21 Oct 1995.

Lysiosquilla maculata var. *sulcirostris* Kemp, 1913: 166, pl. 8: figs. 92–93 [type locality: Andaman Islands]. — Lee & Wu, 1966: 53.

Lysiosquilla sulcirostris.— Manning, 1995: 132.— Ahyong, 2001: 132–133, fig. 64.— Liu & Wang, 1999: 576.— Wang & Liu, 2004: 601.

Material examined.— Wuci fishing port, Taichung County, 12 Oct 1994: 1 male (TL 159 mm) (AM). Jhongjhou fishing port, Kaohsiung City, 25 Mar 1996: 1 male (TL 100 mm) (NIWA). Donggang fishing port, Pingtung County, 21 Oct 1995: 1 male (TL 90 mm) (NTOU).— 5 Aug 1996: 1 male (TL 67 mm) (NTOU).— 30 May 1997: 1 male (TL 74 mm) (ZRC).

Diagnosis.— Ocular scales triangular, erect, inclined anteriorly. A1 somite dorsal processes directed anterolaterally. Rostral plate triangular, broadest at base; with median carina anteriorly flanked by grooves. Raptorial claw dactylus with 7 or 8 teeth. Mandibular palp present. TS8 sternal keel produced as a posteriorly directed spine. Uropodal protopod usually without spine anterior to endopod articulation.

Size.— To 325 mm TL (Manning, 1978a).

Coloration.— With dark brown-black and light yellow transverse bands across dorsum. Uropodal exopod with distal half of proximal segment and proximal two-thirds of distal segment black; endopod with distal two-thirds black.

Habitat.— Soft substrates to a depth of 33 m (Ahyong, 2001).

Distribution.— Indo-West Pacific region, from the Andaman Sea to Australia, Vietnam, Taiwan, Japan and Hawaii.

Remarks.— The present specimens agree well with published accounts (Manning, 1978a, Ahyong, 2001). *Lysiosquilla sulcirostris* differs from *L. tredecimdentata*, also known from Taiwan, in bearing seven or eight instead of ten or more teeth on the dactylus of the raptorial claw and in having a triangular instead of cordiform rostral plate that is broadest basally.

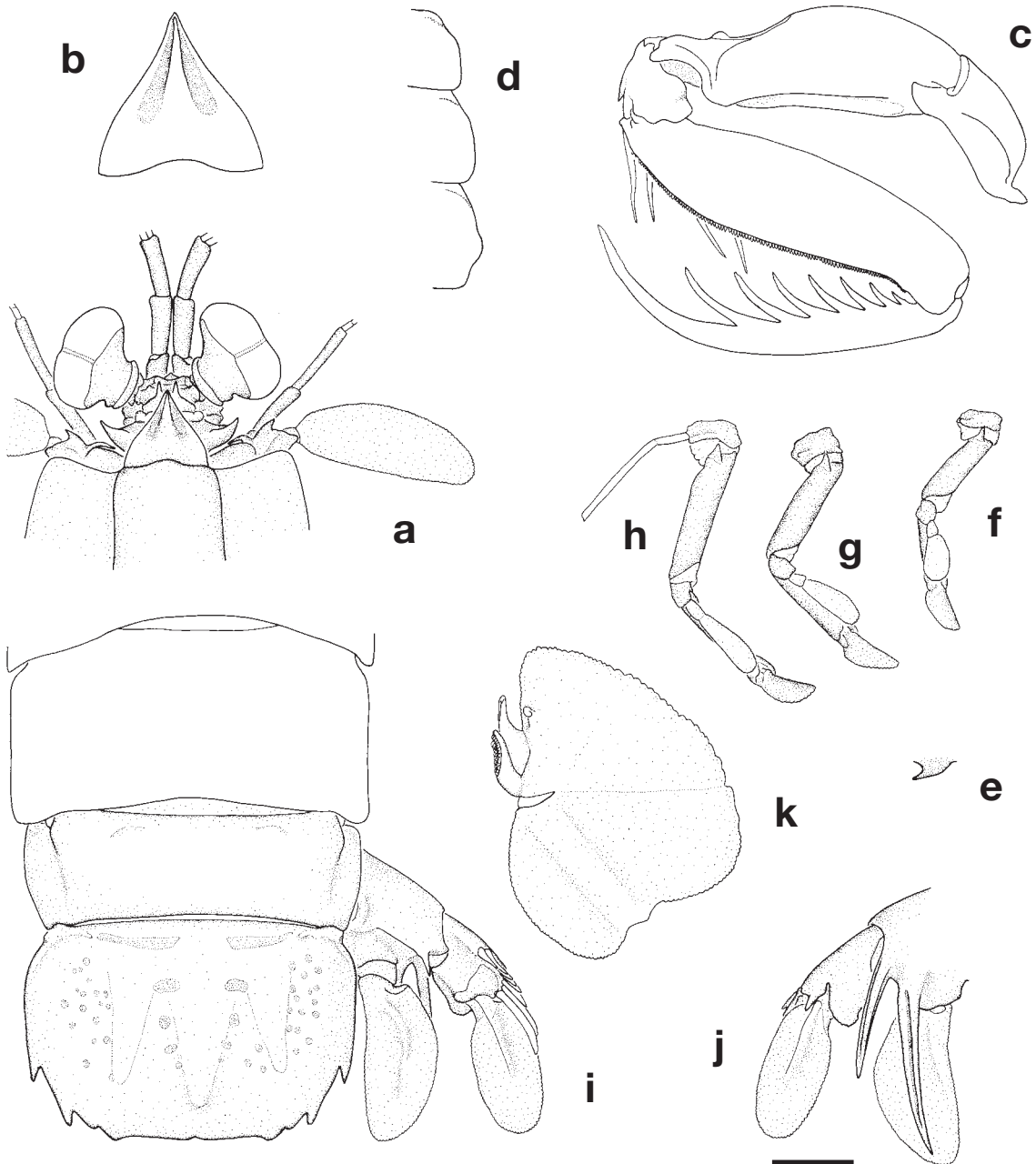


Fig. 27. Male, TL 100 mm, Jhongjhough fishing port, Kaohsiung City, 25 Mar 1996: **a**, anterior cephalothorax; **b**, rostral plate; **c**, left raptorial claw; **d**, TS6–8, right lateral margins; **e**, TS8 sternal keel, right lateral view; **f–h**, right pereopods 1–3, posterior view; **i**, AS5–6, telson & uropod; **j**, right uropod, ventral view; **k**, right pleopod 1 endopod, anterior view. Scale: a, c–j = 4.0 mm; b, k = 2.0 mm.

Lysiosquilla tredecimdentata Holthuis, 1941



Fig. 28. Male, Donggang fishing port, Pingtung County, 5 Aug 1996.



Fig. 29. Tail fan, dorsal view. Donggang fishing port, Pingtung County, 5 Aug 1996.

Lysiosquilla maculata var. *tredecimdentata* Holthuis, 1941: 273–274, fig. 6 [type locality: Hedjaff, near Aden].
Lysiosquilla maculata.— Schmitt, 1931: 147.— Lee & Wu, 1966: 52–53.— Manning, 1995: 137 [not *L. maculata* (Fabricius, 1793)].

Lysiosquilla tredecimdentata.— Ahyong, 2001: 135–137, fig. 66.— Liu & Wang, 1999: 576.

Material examined.— Dasi fishing port, Yilan County, 14 Oct 2004: 1 male (TL 217 mm) (NTOU). Dongshih fishing port, Chiayi County, 14 Nov 1990: 1 male (TL 254 mm) (NTOU). Cijin fishing port, Kaohsiung City, 2 Oct 1989: 1 male (TL 257 mm) (NTOU). Donggang fishing port, Pingtung County, 5 Aug 1996: 4 males (TL 67–257 mm) (NTOU), 1 male (TL 235 mm) (ZRC 1999.2313).— 1 Nov 1996: 1 male (TL 228 mm) (NTOU).

Diagnosis.— Ocular scales triangular, erect, inclined anteriorly. A1 somite dorsal processes directed anteriorly. Rostral plate cordiform, broadest in advance of base; with median carina anteriorly, not flanked by grooves or carinae. Raptorial claw dactylus with 9–13 teeth (often fewer in very large females). Mandibular palp present. TS8 sternal keel produced as a posteriorly directed spine. Uropodal protopod usually with small spine anterior to endopod articulation.

Size.— To 276 mm TL (Ahyong, 2001).

Coloration.— Dorsum base colour pale yellow, with black transverse bands. Carapace with three dark, broad, transverse bands intervened by narrower pale bands. Uropodal exopod with distal half of proximal segment and proximal two-thirds of distal segment black; outer, movable spines dark red. Uropodal endopod with distal two-thirds black. A2 scale with dark-brown outline. Pereopods with distal setae pink.

Habitat.— Deep burrows on intertidal sand and mudflats, and level subtidal substrates to 30 m.

Distribution.— Western Indian Ocean to India, Thailand, Vietnam, Taiwan, Australia and the central Pacific.

Remarks.— *Lysiosquilla tredecimdentata* superficially resembles *L. sulcirostris*, but differs in the triangular instead of cordiform rostral plate and greater number of teeth on the dactylus of the raptorial claw (9 or more instead of 7 or 8). This is the first formal record of the species from Tawian.

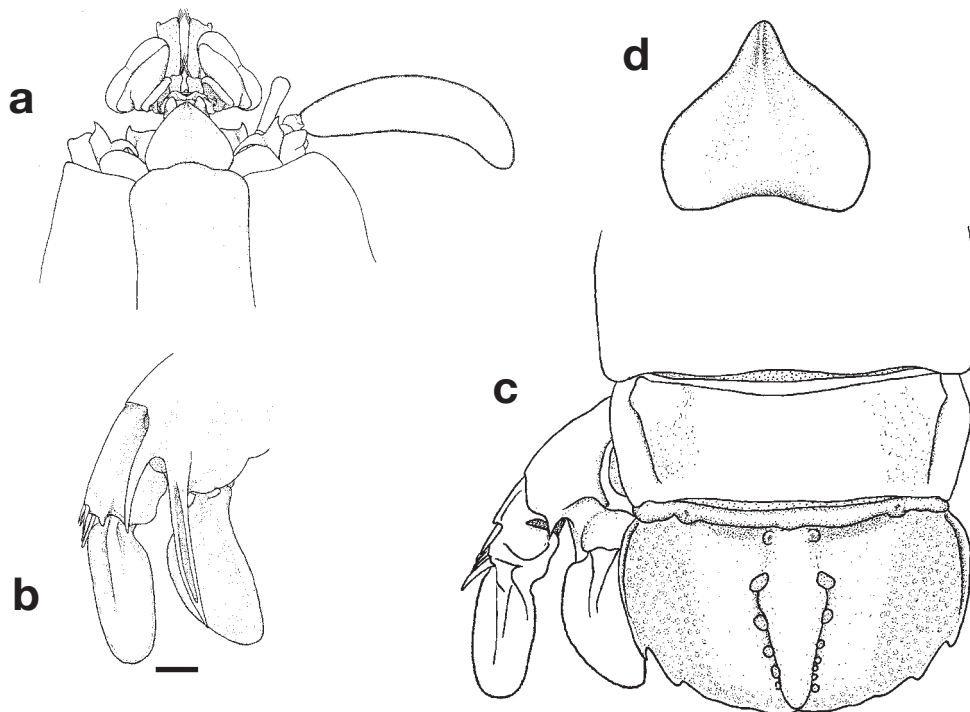


Fig. 30. Male, TL 254 mm, Dongshih fishing port, Chiayi County, 14 Nov 1990: **a**, anterior cephalothorax; **b**, right uropod, ventral. **c**, AS5–6, telson and uropod. **d**, rostral plate. Scale: a–c = 5 mm; d = 2.2 mm.

Family NANNOSQUILLIDAE Manning, 1980

Nannosquillidae Manning, 1980a: 368.

Diagnosis.— Cornea subglobular. Raptorial claw dactylus not inflated basally; ischium exceeding 1/3 merus length. Pereopods 1–2 with subcircular endopod. Pereopod 3 with ovate endopod. Abdominal segments loosely articulated. Telson with primary teeth and denticles distinct, slender. Uropodal endopod with strong dorsal proximal fold.

Remarks.— Nannosquillidae is distinctive in the Lysiosquilloidea by the presence of a strong proximal dorsal fold on the uropodal endopod. Like most other lysiosquilloids, nannosquillids rarely leave their burrows and therefore difficult to sample via trawling. Nannosquillids are generally small species — most species are smaller than 30 mm TL and the largest (*Bigelowina phalangium*) does not exceed 100 mm TL. Thirteen nannosquillid genera are recognized worldwide, of which two are known from Taiwan.

Key to genera of the Nannosquillidae in Taiwan

1. Cornea broadened or faintly bilobed. A2 protopod without mesial papilla. Telson submedian denticles forming inverted V in posterior view. *Acanthosquilla*
- Cornea subglobular. A2 protopod with mesial papilla. Telson submedian denticles forming transverse row in posterior view *Bigelowina*

Genus *Acanthosquilla* Manning, 1963

Acanthosquilla Manning, 1963b: 319. Type species *Lysiosquilla multifasciata* Wood-Mason, 1895, by original designation. Gender feminine.

Diagnosis.— Rostral plate with single median spine. Cornea broadened or faintly bilobed. A2 protopod with ventral papilla, without mesial papilla. Mandibular palp present. Maxillipeds 1–5 with epipod. Ischium of raptorial claw unarmed distally. AS6 with posterolateral spines; posterior margin of sternum unarmed. Telson postero-dorsal surface with fan-shaped row of slender, posteriorly directed spines above marginal armature; with movable submedian teeth and 2 or 4 pairs of fixed primary teeth; submedian denticles of telson forming inverted V in posterior view. Uropodal protopod terminating in 2 slender spines, ventrally carinate, inner longer, without ventral spine anterior to endopod articulation.

Remarks.— *Acanthosquilla* includes at least seven species, all from the Indo-West Pacific (Ahyong, 2001, 2002); three are known from Taiwan.

Key to species of *Acanthosquilla* known from Taiwan

1. Telson with row of 5 spines on upper posterior margin *A. multifasciata*
- Telson with row of 7 or more spines on upper posterior margin 2
2. Telson with patches of numerous spinules on upper posterior surface *A. manningi*
- Telson with row of 7 or more spines on upper posterior margin *A. derijardi*

Acanthosquilla derijardi Manning, 1970

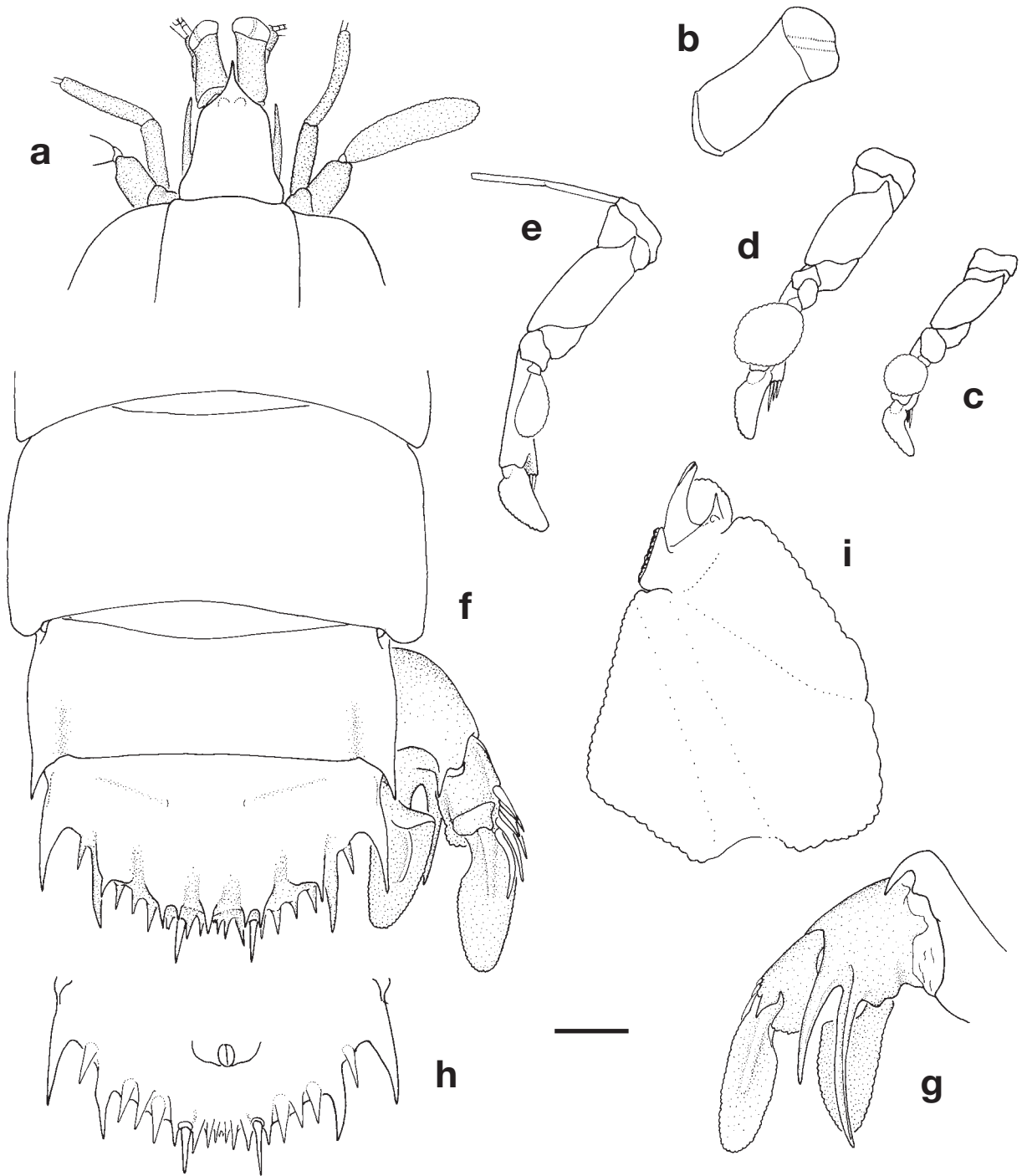


Fig. 31. Male, TL 63 mm, Donggang fishing port, Pingtung County, 5 Aug 1996: **a**, anterior cephalothorax; **b**, right eye; **c–e**, right pereopods 1–3; **f**, AS5–6, telson and uropod; **g**, right uropod, ventral; **h**, telson, ventral; **i**, right pleopod 1 endopod. Scale: a, c–h = 1.0 mm; b, i = 0.5 mm.

Acanthosquilla derijardi Manning, 1970: 1434–1438, fig. 2 [type locality: Grand Recif, Tulear, Madagascar].—

Liu & Wang, 1999: 577.— Ahyong, 2001: 144, fig. 70 [part, not Shelburne Bay specimens].

Acanthosquilla sirindhorn Naiyanetr, 1995: 409–417, pl. 1, figs. 1, 2 [type locality: Pattani, Gulf of Thailand].

Material examined.— Donggang fishing port, Pingtung County, 5 Aug 1996: 1 male (TL 63 mm) (NTOU).

Diagnosis.— Dactylus of raptorial claw with two angular lobes on outer proximal margin but with distal lobe distinctly larger than proximal. Telson upper posterior margin with row of 7 or more spines in the same plane; with 4 intermediate denticles.

Size.— To 66 mm TL (Moosa, 1991).

Coloration.— Body with light and dark transverse bands. Telson and uropod with dark, diffuse pigmentation. Uropodal exopod distal segment dark on inner half.

Habitat.— Soft substrates to a depth of at least 12 m.

Distribution.— Western Indian Ocean to the Gulf of Thailand, Australia, New Caledonia and now from Taiwan.

Remarks.— The present specimen, lacking both raptorial claws is tentatively identified with *A. derijardi* based on the spination of the upper posterior margin of the telson. In *A. derijardi* sensu stricto, the upper posterior telson armature consists of a median spine and two groups of one or more spines (submedian and lateral) in the same plane on either side of the midline. The submedian and lateral groups of spines lie in the same plane and the spines of each group are typically basally connected. In the case that only a single spine is present in one of the ‘groups’, the single spine is usually the submedian ‘group’. The upper telson spination of the Taiwanese specimen differs from the usual arrangement in *A. derijardi* in having a single lateral spine. The significance of upper telson spination in the Taiwanese specimen is not readily apparent, and further material is required for evaluation. More significant, however, is the unusual morphology of the pleopod 1 endopod of the Taiwanese specimen in which a distinct spine is present behind the ‘hook process’ instead of the usual low, rounded lobe (compare with Ahyong, 2001: fig. 70F). The Taiwanese specimen might represent an undescribed species, but in view of its incompleteness, we tentatively refer it to *A. derijardi*.

As discussed under the account of *A. manningi*, below, *A. derijardi* sensu Manning (1995) and Ahyong (2001) is a species complex. Hence, *A. manningi* and *A. multispinosa*, treated as synonymous with *A. derijardi* by Manning (1995) and Ahyong (2001), appear to be valid species (Ďuriš, 2007; Ahyong, in press).

The present specimen constitutes the first formal record and only known specimen of *A. derijardi* from Taiwan. *Acanthosquilla derijardi* is readily distinguished from other Taiwanese species of the genus by the presence of seven spines in a transverse row on the upper posterior margin of the telson.

Acanthosquilla manningi Makarov, 1978



Fig. 32. Male, TL 60 mm, Donggang fishing port, Pingtung County, 5 Aug 1996, raptorial claws missing.



Fig. 33. Tail fan, dorsal view. Male, TL 60 mm, Donggang fishing port, Pingtung County, 5 Aug 1996.

Acanthosquilla manningi Makarov, 1978: 177, fig. 1 [type locality: Tonkin Bay, Vietnam, 15°58'N, 109°22'E].
— Ďuriš, 2007: 136–138, fig. 73D, 74.

Material examined.— Donggang fishing port, Pingtung County, 5 Aug 1996: 1 male (TL 60 mm) (NTOU).

Diagnosis.— Upper posterior margin of telson with median spine and two clusters of 3 or more spines above field of numerous spines covering posterior surface; ‘true’ marginal armature consisting of movable submedian primary teeth, fixed intermediate and lateral primary teeth, 4 intermediate and 1 lateral denticle.

Size.— To 60 mm TL.

Coloration.— Body with light and dark transverse bands. Telson and uropod with dark, diffuse pigmentation. Uropodal exopod with pale distal segment.

Habitat.— Not known, but presumably soft substrates suitable for burrow construction.

Distribution.— Vietnam and Taiwan.

Remarks.— Manning (1995) synonymized *A. manningi* Makarov, 1978, and *A. multispinosa* Blumstein, 1974 with *A. derijardi* Manning, 1970, and Ahyong (2001) subsequently added *A. sirindhorn* Naiyanetr, 1995 to the list of synonyms. Recent independent reevaluations of *A. derijardi* and its synonyms suggest that *A. manningi* and *A. multispinosa*, both described from Vietnam, are valid species (Ďuriš, 2007; Ahyong, in press). *Acanthosquilla manningi* is readily distinguished from all other congeners by having a field of numerous spines covering the posterior surface of the telson instead of the transverse arrangement of spines on the upper posterior margin. The present specimen is the first record of the species from Taiwan and the first record outside of Vietnam.

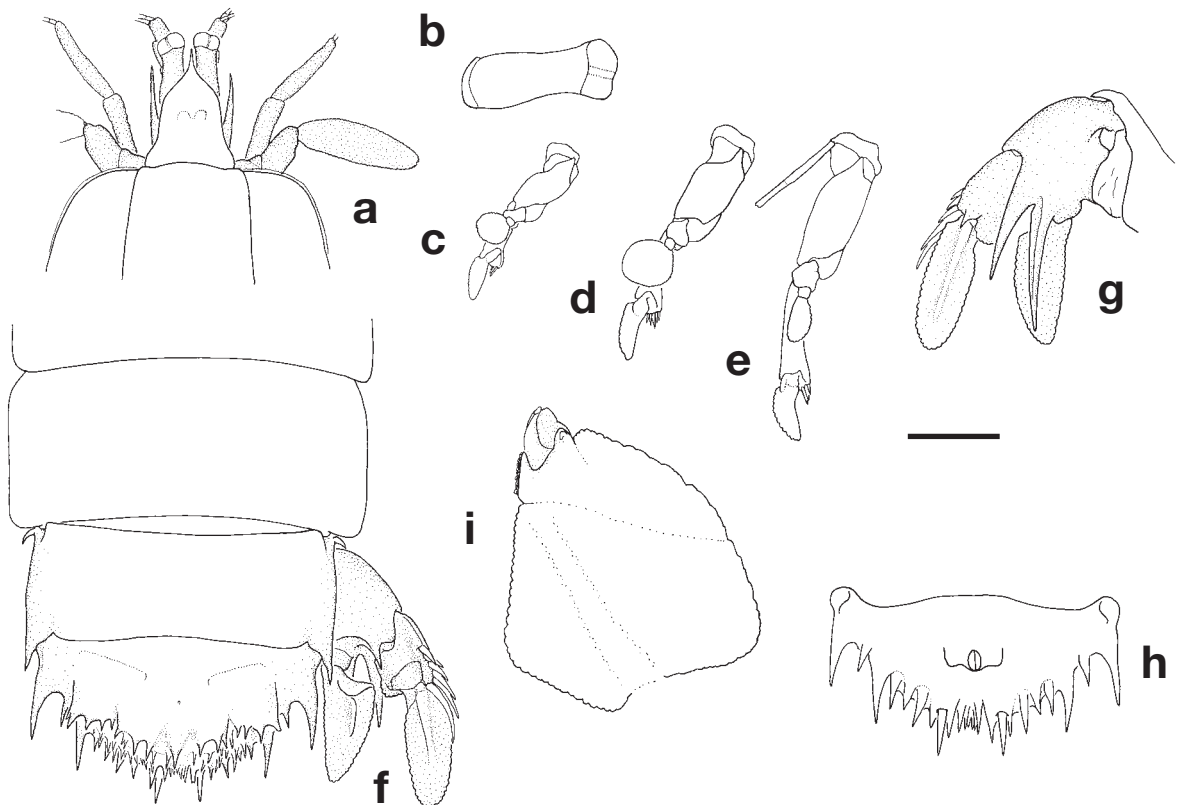


Fig. 34. Male, TL 60 mm, Donggang fishing port, Pingtung County, 5 Aug 1996: **a**, anterior cephalothorax; **b**, right eye; **c–e**, right pereopods 1–3; **f**, AS5–6, telson and uropod; **g**, right uropod, ventral; **h**, telson, ventral; **i**, right pleopod 1 endopod. Scale: a, c–h = 3.0 mm; b, i = 1.5 mm.

Acanthosquilla multifasciata (Wood-Mason, 1895)



Fig. 35. Male, TL 78 mm, Donggang fishing port, Pingtung County, 5 Aug 1996, raptorial claws missing.



Fig. 36. Tail fan, dorsal view. Male, TL 78 mm, Donggang fishing port, Pingtung County, 5 Aug 1996.

Lysiosquilla multifasciata Wood-Mason, 1895: 1–2, figs. 22–24 [type locality: Bombay, India].— Balss, 1910a: 6.— Fukuda, 1913: 72.— Kemp, 1913: 122–124.— Komai, 1927: 333.— Schmitt, 1931: 144, 147.

Lysiosquilla Valdiviensis Jurich, 1904: 372, pl. 26: fig. 2 [type locality unknown].

Lysiosquilla biminiensis var. *pacificus* Borradaile, 1900: 395, 398, 403 [type locality: Blanche Bay, New Britain, 4°16'S, 152°13'E].

Acanthosquilla multifasciata.— Lee & Wu, 1966: 54.— Manning, 1995: 147.— Liu & Wang, 1999: 577.— Ahyong, 2001: 144–146, fig. 71.— Wang & Liu, 2004: 601.

Material examined.— Dasi fishing port, Yilan County, 3 Aug 1996: 2 females (TL 33–38 mm) (NTOU); Siangshan, Hsinchu City, 10 Feb 1965: 1 male (TL 53 mm) (USNM 113651). Tainan County, 10 Feb 1965: 1 female, (ASIZ 53385). Mituo, Kaohsiung County, 31 Oct 1992: 1 female (TL 49 mm) (NTOU). Donggang fishing port, Pingtung County, 5 Aug 1996: 5 males (TL 49–78 mm), 2 females (TL 36–64 mm) (NTOU), 1 female (TL 58 mm) (ZRC 1999.2337).

Diagnosis.— Dactylus of raptorial claw with 2 angular lobes on outer proximal margin but with distal lobe distinctly larger than proximal. Telson with row of 5 spines on upper posterior margin; with 4 intermediate denticles.

Size.— To 78 mm TL (this study).

Coloration.— Body marked with yellowish and dark brown transverse bands. Uropodal endopod black; exopod distal segment pale.

Habitat.— Mud or sand substrates; shore down to 73 m.

Distribution.— Red Sea to Vietnam, Taiwan, Japan, Hawaii and Australia.

Remarks.— *Acanthosquilla multifasciata* is readily distinguished from other Taiwanese congeners by the presence of a row of five spines on the upper posterior margin.

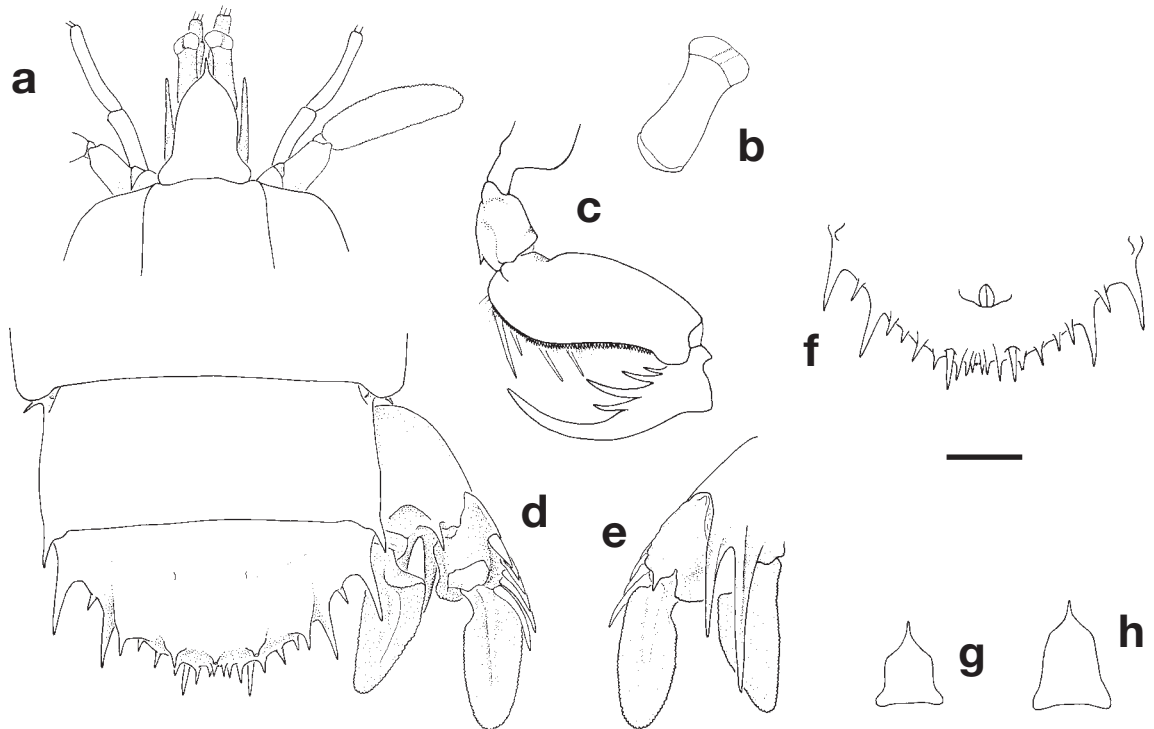


Fig. 37. Male, TL 78 mm, Donggang fishing port, Pingtung County, 5 Aug 1996: **a**, anterior cephalothorax; **b**, right eye; **c**, left raptorial claw; **d**, AS6, telson and uropod; **e**, right uropod, ventral view; **f**, telson, ventral view. Male (TL 49 mm): **g**, rostral plate. Female (TL 65 mm): **h**, rostral plate. Scale a, d, e = 3.0 mm; b = 1.5 mm; c = 5.0 mm.

Genus *Bigelowina* Schotte & Manning, 1993

Bigelowina Schotte & Manning, 1993: 574. Type species *Lysiosquilla biminiensis* Bigelow, 1893, by original designation. Gender feminine.

Diagnosis.— Rostral plate quadrate with median spine. Cornea subglobular. A2 protopod with mesial and ventral papillae. Mandibular palp present. Maxillipeds 1–5 with epipod. Ischium of raptorial claw unarmed. AS6 with posterolateral spines; posterior margin of sternum unarmed. Telson postero-dorsal surface with fan-shaped row of 5 slender, posteriorly directed spines above marginal armature; with movable submedian and 2 pairs of fixed primary teeth (intermediate, lateral); with 4 ‘intermediate’ denticles; submedian denticles of telson forming transverse row in posterior view. Uropodal protopod terminating in 2 slender spines, ventrally carinate, inner longer, without ventral spine anterior to endopod articulation.

Remarks.— *Bigelowina* includes three species of which one is known from Taiwan.

Bigelowina phalangium (Fabricius, 1798)

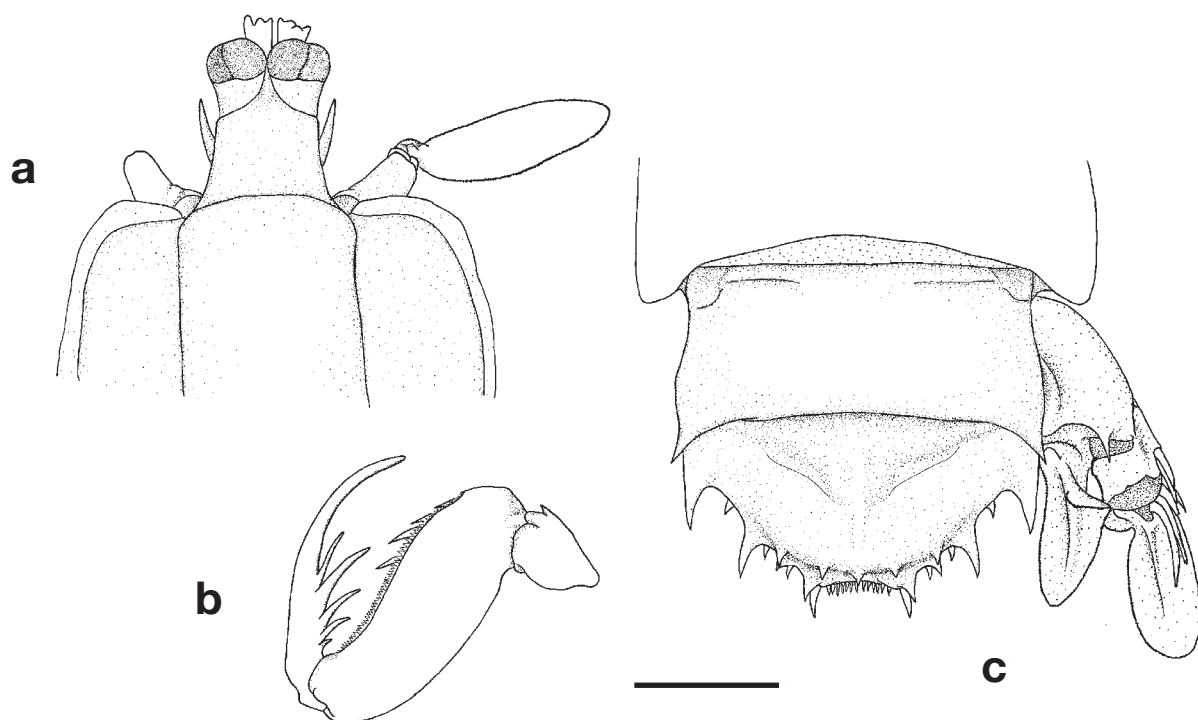


Fig. 38. Female, TL 87 mm, Tainan, no date: **a**, anterior cephalothorax; **b**, left raptorial claw; **c**, AS5, 6, telson and uropod. Scale: a, c = 5 mm; b = 8 mm.

- Squilla phalangium* Fabricius, 1798: 416 [type locality: Bombay India, by neotype selection (Holthuis, 2000)].
Coronis acanthocarpus White, 1847: 85 [*nomen nudum*; type locality: Port Essington, Northern Territory, Australia, 11°10'S, 132°08'E].
Coronis acanthocarpus Claus, 1871: 129 [type locality: Port Essington, Northern Territory, Australia, 11°10'S, 132°08'E].
Lysiosquilla acanthocarpus Miers, 1880: 3, 11, pl. 1: figs. 7–9 [type locality: Port Essington, Northern Territory, Australia, 11°10'S, 132°08'E]. Balss, 1910a: 6.— Fukuda, 1913: 72.— Komai, 1927: 331–332.
Acanthosquilla sarasinorum Müller, 1886: 471, 478, pl. 4: fig. 3 [type locality: Trincomali, Ceylon, 8°34'N, 81°14'E].
Acanthosquilla acanthocarpus.— Schmitt, 1931: 147.— Lee & Wu, 1966: 53–54, fig. 8A–C.— Manning, 1995: 141.— Liu & Wang, 1999: 577.— Moosa, 2000: 430.— Wang & Liu, 2004: 601.
Acanthosquilla humesi Manning, 1968b: 33–36, fig. 11 [type locality: Ambatozavary, Nosy Bé, Madagascar].
Acanthosquilla phalangium.— Holthuis, 2000: 16, figs. 1, 2.
Bigelowina phalangium.— Ahyong, 2001: 159–161, fig. 79.

Material examined.— Tainan County, no date: 1 male (TL 58 mm), 3 females (TL 65–87 mm) (ASIZ). Singda Harbor, Kaohsiung County, 19 Jul 1988: 1 female (TL 84 mm) (TMCS-0064).

Diagnosis.— Dactylus of raptorial claw with 2 angular subequal lobes on outer proximal margin. Telson with row of 5 spines on upper posterior margin; with 4 intermediate denticles.

Size.— To 94 mm TL (Shanbogue, 1986).

Coloration.— Base colour translucent yellow-white with overall dark brown transverse banding. Carapace with three black-brown transverse bands, tending forwards laterally; posterolateral angles black-brown. Thoracic and abdominal somites each with broad black-brown transverse band medially. Telson with 4 broad black brown patches corresponding to dorsolateral teeth. Uropodal protopod with black-brown patch basally; exopod with black-brown patch on distal half of proximal segment extending across articulation onto inner one-third of distal segment; endopod black brown.

Habitat.— U-shaped burrows are constructed in sand or sandy-mud flats from the shore to less than 10 m depth.

Distribution.— Western Indian Ocean to the western Pacific including Taiwan.

Remarks.— Balss (1910a) first recorded *Bigelowina phalangium* from Taiwan as *Lysiosquilla acanthocarpus*. The species now known as *Bigelowina phalangium* was long known as *Acanthosquilla acanthocarpus* (Claus, 1871). The identity of Fabricius' species was indeterminate and thus ignored by carcinologists until Holthuis (2000) selected a specimen of *A. acanthocarpus* as a neotype to fix the identity of the species. *Squilla phalangium* thus became a senior synonym of *A. acanthocarpus*, and was subsequently transferred to *Bigelowina* by Ahyong (2001).

Bigelowina phalangium is uncommon in collections from Taiwan, though probably not because of rarity, but because it burrows deeply in intertidal and shallow subtidal habitats, and as such is rarely accessible to trawling.

Superfamily PARASQUILLOIDEA Manning, 1995

Diagnosis.— Cornea with 2 or 3 rows of hexagonal midband ommatidia. Propodi of maxillipeds 3–4 ovate, not ribbed ventrally. Raptorial claw dactylus with 3 well developed spearing teeth; ischiomeral articulation terminal. Telson with distinct median carina. Uropodal protopod with 3 primary spines; articulation of exopod segments terminal.

Remarks.— Recent phylogenetic studies showed that Parasquillidae and Eurysquillidae, originally placed in Gonodactyloidea, are more closely related to the Squilloidea and belong in separate superfamilies, Parasquilloidea and Eurysquilloidea, respectively (Ahyong & Harling, 2000; Ahyong, 2001). Parasquilloids are most closely related to the Eurysquilloidea, differing in having three instead of four or more teeth on the dactylus of the raptorial claw, three instead of two primary teeth on the uropodal protopod and intermediate denticles on the telson that arise marginally instead of ventrally. Additionally, the parasquilloids have a much more robust, subcylindrical body, resembling that of gonodactyloids. Conversely, most eurysquilloids have a depressed, usually loosely articulated body that resembles that of the lysiosquilloids. Parasquilloidea includes the single family Parasquillidae.

Family PARASQUILLIDAE Manning, 1995

Parasquillidae Manning, 1995: 91.

Diagnosis.— As for superfamily.

Remarks.— Of the three parasquillid genera, only *Faughnia* is known from Taiwan.

Genus *Faughnia* Serène, 1962

Faughnia Serène, 1962: 12. Type species *Pseudosquilla haani* Holthuis, 1959, replacement name for preoccupied *Squilla empusa* de Haan, 1844, by original designation and monotypy. Gender feminine.

Diagnosis.— Cornea with 2 rows of midband ommatidia. Rostral plate broader than long, without median spine. AS1–5 without submedian carinae.

Remarks.— *Faughnia* includes four species, three of which occur in Taiwan from depths exceeding 70 m.

Key to species of *Faughnia*

1. Dorsal surface of telson with median and 5 pairs of carinae lateral to median carina. Carinae of submedian, intermediate and lateral teeth extending onto surface of telson; those of submedian and lateral teeth sometimes interrupted. Uropodal protopod with well developed spinules on inner proximal margin *F. formosae*
- Dorsal surface of telson with median and at most 3 pairs of carinae lateral to median carina. Carinae of submedian, intermediate and lateral teeth not extending onto surface of telson. Uropodal protopod with smooth or crenulate inner margin 2
2. Carapace with anterolateral angles produced anteriorly, forming an acute angle. AS5–6 with posteriorly armed intermediate carinae *F. profunda*
- Carapace with anterolateral angles not produced anteriorly, forming an obtuse angle 3

- 3. Telson lacking accessory median carina, occasionally with low pits or shallow, irregular groove; with anterior intermediate and marginal carinae only. AS5 with intermediate carina usually armed posteriorly ····
 *F. serenei*
- Telson with distinct, entire, accessory median carina in addition to anterior intermediate and marginal carinae. AS5 with intermediate carina unarmed posteriorly ····
 *F. haani*

Faughnia formosae Manning & Chan, 1997



Fig. 39. Male, TL 88 mm, Dasi fishing port, Yilan County, 7 Mar 2008.

Pseudosquilla empusa.— Komai, 1927: 325, 346, pl. 13: fig. 1.— Schmitt, 1931: 147.— Dong et al., 1983: 90, pl. 4: fig. 3 [not *Squilla empusa* de Haan, 1844].

Faughnia formosae Manning & Chan, 1997: 546–551, figs. 1–4 [type locality: Tai-Shi (=Dasi), northeastern Taiwan].— Liu & Wang, 1999: 575.— Moosa, 2000: 422.— Ahyong & Naiyanetr, 2002: 289.

Material examined.— Dasi fishing port, Yilan County, 10 Dec 1983: 1 female (TL 98 mm) (TMCS-0058).— 12 Jan 1984: male paratypes (TL 87–110 mm), female paratype (TL 129 mm) (NTOU).— 22 Sep 1984: female paratype (TL 113 mm) (NTOU).— 14 Oct 1984: female paratype (TL 119 mm) (NTOU).— 16 Jul 1985: 1 male (TL 116 mm), 2 females (TL 125–130 mm) (TMCS-0028).— 5 Aug 1985: 2 female paratypes (TL 95–120 mm) (NTOU).— 8 Aug 1985: 2 males (TL 76–131 mm), 2 females (TL 129–142 mm) (TMCS-0005).— 22 Nov 1985: 1 male (TL 101 mm), 1 female (TL 102 mm) (TMCS-0002).— 5 Sep 1987: 2 female paratypes (117–120 mm) (USNM 252437).— 16 May 1988: 2 males (TL 108–134 mm) (TMCS-0117).— 1 male (TL 138 mm), 1 female (TL 108 mm) (TMCS-0135).— 18 May 1989: 1 male (TL 90 mm) (TMCS-0078).— 5 Sep 1989: male paratype (TL 90 mm) (NTOU).— 11 Sep 1989: male paratype (TL 126 mm) (NTOU).— 6 Nov 1989: male paratype (TL 123 mm), female paratype (TL 142 mm) (NTOU).— 18 Oct 1991: female paratype (TL 116 mm) (NTOU).— Oct 1991: female paratype (TL 137 mm) (NTOU).— 7–8 Nov 1991, male holotype (TL 136 mm) (USNM 268640).— 25 Nov 1994: female paratype (TL 117 mm) (NTOU).— 13 Jan 1995: male paratype (TL 125 mm) (NTOU).— 16 Mar 1995: female paratype (TL 85 mm) (NTOU).— 28 Sep 1995: 2 male paratypes (TL 110–142 mm), 2 female paratypes (TL 107–115 mm) (NTOU).— 16 Nov 1995: 1 female (TL 89 mm) (NTOU).— 1995: 1 male (TL 116 mm), 6 female paratypes (TL 98–131 mm) (NTOU).— 4 Aug 1996: 3

males (TL 115–144 mm) (NTOU).— 17 Nov 1997: 1 female (TL 84 mm) (ZRC 1999.2311).— 25 May 1998: 6 males (TL 95–148 mm), 3 females (TL 112–135 mm) (AM P67936).— 7 Mar 2008: 1 male (TL 88 mm) (NTOU), 3 males (TL 95–137 mm), 1 female (TL 86 mm) (NIWA). Nanfang-ao fishing port, Yilan County, 4–5 Nov 1985: male paratype (TL 117 mm) (NTOU). — 17 Dec 1985: 1 female (TL 137 mm) (TMCS-0019).— Dec 1991: male paratype (TL 114 mm), female paratype (TL 96 mm) (NTOU).— 30 Jan 1993: male paratype (TL 130 mm), female paratype (TL 150 mm) (NTOU).— Nov 1995: 3 males (TL 91–130 mm), 1 female (TL 120 mm) (NIWA).— 14 May 1998: 1 female (TL 96 mm) (ZRC). Donggang fishing port, Pingtung County, 18 Jan 1985: male paratype (TL 113 mm) (NTOU).— 22 Nov 1985: female paratype (TL 129 mm) (NTOU). NE Taiwan, Jun 1993: 2 males (TL 113–132 mm) (ZRC 1999.2111). CP116, 24°55.4'N, 122°00.4'E, 100 m, 21 May 2001: 1 male (TL 113 mm) (MNHN). No specific locality: 1 male (TL 110 mm), 1 female (TL 105 mm) (TMCS-0077).— 1 male (TL 110 mm) (TMCS-0123).

Diagnosis.— Dorsal surface of telson with 5 carinae lateral to median carina. Carinae of submedian, intermediate, and lateral teeth extending onto surface of telson; those of submedian and lateral teeth sometimes interrupted. Uropodal protopod with well developed spinules on inner proximal margin.

Size.— To 155 mm TL (Manning & Chan, 1997).

Coloration.— Body orange or yellow dorsally; whitish laterally appearing as a white band along each side of the body. Antennules orange. Raptorial claw mostly white; dactylus of claw orange or yellow. Pereopods white with reddish orange tips. Proximal half of uropodal protopod and proximal exopod segment white; distal half of uropodal protopod, endopod and distal exopod segment red-brown. Spines on outer margin of exopod reddish.

Habitat.— Sand and mud; 100–200 m.

Distribution.— Japan, Taiwan, the Philippines and the Andaman Sea (Ahyong, 2004).

Remarks.— *Faughnia formosae* was fully described by Manning & Chan (1997). It is easily distinguished from *F. haani* and *F. serenei* by the presence of multiple carinae on the dorsolateral surfaces of the telson and the multispinose rather than crenulate inner margin of the uropodal protopod. *Faughnia formosae* is sufficiently abundant in Taiwanese waters to be of commercial importance. Ripe females sell for about NT\$150/kg (Manning & Chan, 1997).

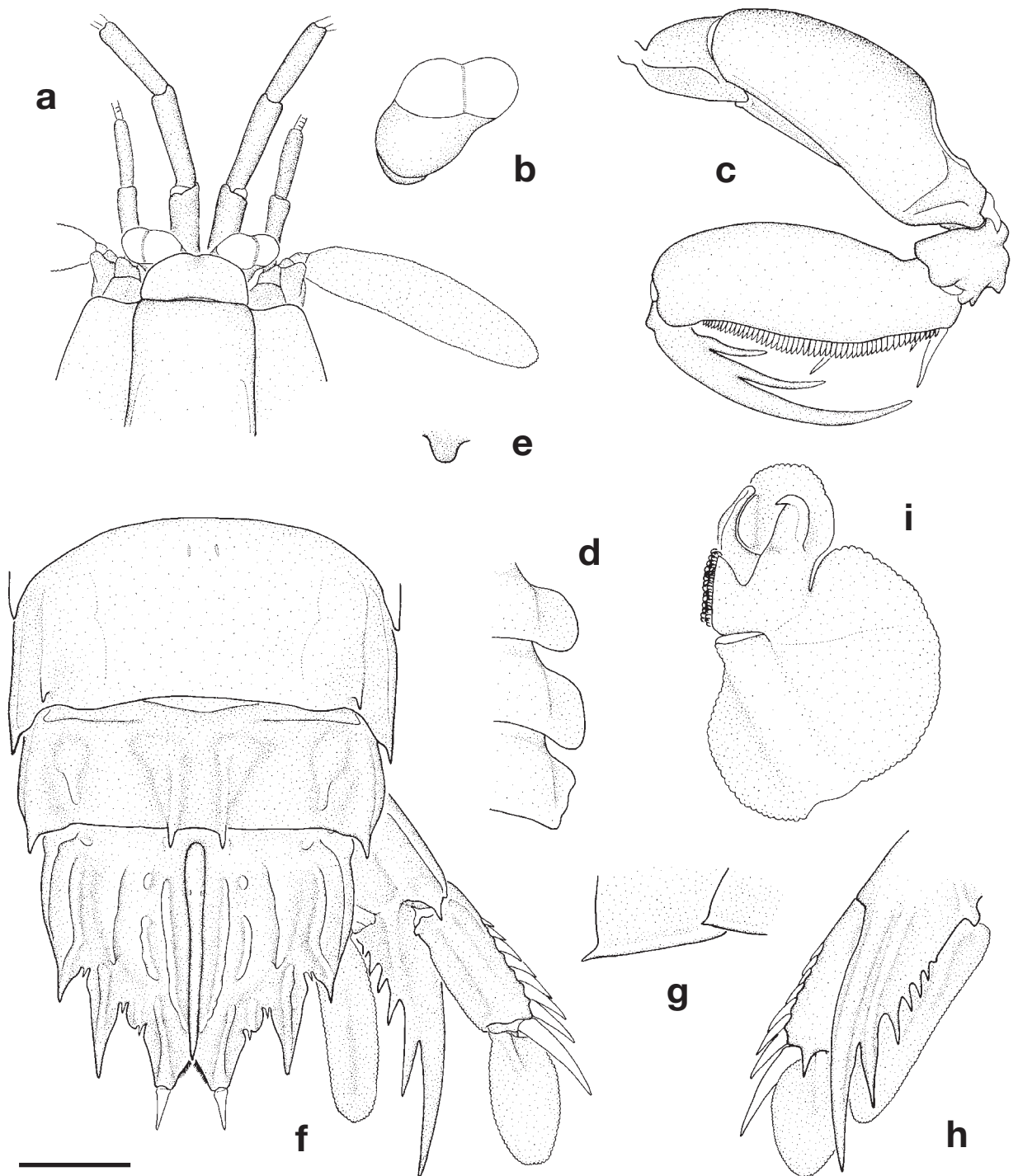


Fig. 40. Female, TL 83 mm, Dasi fishing port, Yilan County, 7 Mar 2008: **a**, anterior cephalothorax; **b**, right eye; **c**, right raptorial claw; **d**, right TS6–8 lateral processes; **e**, TS8 sternal keel, right lateral view; **f**, AS5–6, telson and uropod; **g**, right posterolateral angle of AS5–6, lateral view; **h**, right uropod, ventral view. Male, TL 95 mm: **i**, right pleopod 1 endopod, anterior view. Scale a, c–h = 5.0 mm; b, i = 2.5 mm.

Faughnia haani (Holthuis, 1959)



Fig. 41. Female, TL 149 mm, Nanfang-ao fishing port, Yilan County, 30 Jun 1993.

Squilla Empusa de Haan, 1844: pl. 51, fig. 6 [preoccupied by *Squilla empusa* Say, 1818; type locality: Japan].

Pseudosquilla haani Holthuis, 1959: 179 [replacement name for *Squilla Empusa* de Haan, 1844, preoccupied] [type locality: Japan].

Parasquilla haani.— Lee & Wu, 1966: 44, fig. 2A–D [part, 2 males from Keelung, Taiwan].

Faughnia haani.— Manning & Chan, 1997: 551–552, figs. 2, 4.— Liu & Wang, 1999: 575.— Moosa, 2000: 423.— Ahyong, 2001: 179–181, fig. 89.

NOT *Parasquilla haani*.— Lee & Wu, 1966: 44, legend [part, male from Tungkang (= Donggang), Taiwan = *F. serenei* Moosa, 1982].

Material examined.— Keelung fish market, Keelung City, 5 Aug 1996: 4 males (TL 107–154 mm) (NTOU). Dasi fishing port, Yilan County, no date: 1 male (TL 118 mm) (USNM 268641). Nanfang-ao fishing port, Yilan County, 30 Jun 1993: 1 female (TL 149 mm) (NTOU). Donggang fishing port, Pingtung County, 6 Aug 1996: 2 females (TL 120–126 mm) (NTOU).— Nov 1998: 1 male (TL 167 mm) (NTOU).— Aug 1999: 1 male (TL 145 mm) (NTOU).

Diagnosis.— Carapace with anterolateral angles rounded, not projecting anteriorly. Dorsal surface of telson with 3 carinae lateral to median carina: distinct, entire, accessory median carina in addition to anterior intermediate and marginal carinae. AS5 with intermediate carina unarmed posteriorly. Uropodal protopod with smooth or crenulate inner margin.

Size.— To 149 mm.

Coloration.— Body whitish with broad orange patches on central carapace and each thoracic and

abdominal somite. Lateral margins of carapace, lateral process of thoracic somites and lateral portions of abdomen whitish. Telson whitish with posterior margins and teeth orange-red. Antennular peduncles whitish. Raptorial claw merus white; propodus and dactylus pale orange. Uropodal protopod and proximal exopod segments outlined with red; endopod and distal exopod segment dark brown.

Habitat.— Sand and mud substrate; 73–200 m.

Distribution.— Japan, Taiwan, Hong Kong and northwestern Australia.

Remarks.— *Faughnia haani* was recently treated and figured by Manning & Chan (1997) and Ah Yong (2001). It differs from *F. serenei* in the presence of the accessory median carina on the telson, and differs from *F. formosae* in having only one instead of three carinae lateral to each accessory median carina on the telson, and in having a crenulated rather than spinose inner proximal margin of the uropodal protopod. Of the three species of *Faughnia* from Taiwan, *F. haani* is apparently rather rare.

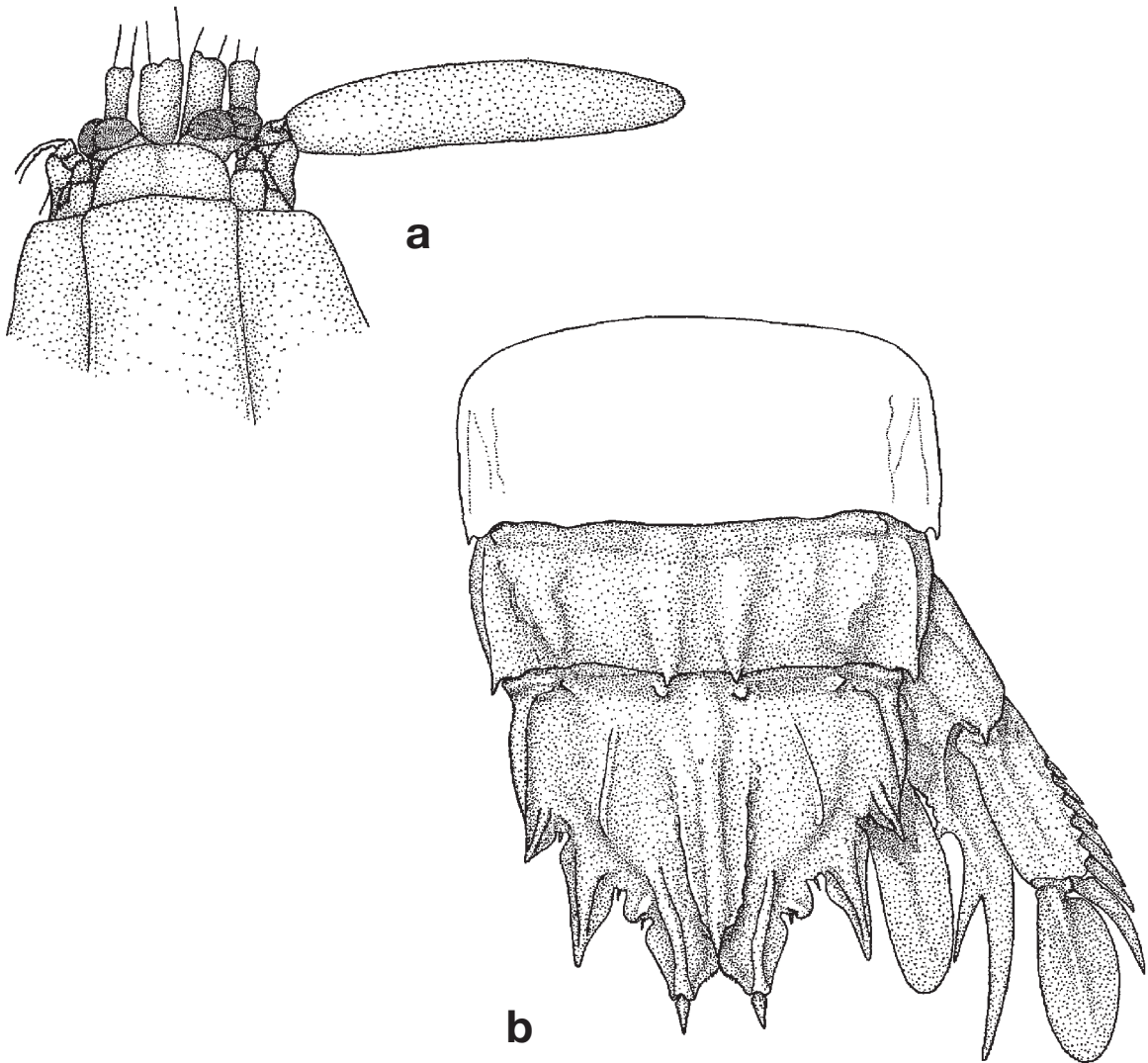


Fig. 42. Male, TL 118 mm, Dasi fishing port, Yilan County, no date: **a**, anterior cephalothorax; **b**, AS5–6, telson and uropod. (Modified after Manning & Chan, 1997).

Faughnia serenei Moosa, 1982



Fig. 43. Male, TL 128 mm, Dasi fishing port, Yilan County, 7 Mar 2008.



Fig. 44. Male, TL 126 mm, Nanfang-ao fishing port, Yilan, 21 May 1992, body orangish.

Parasquilla haani.— Lee & Wu, 1966: 44, legend [part, male from Tungkang (= Donggang), Taiwan, not *P. haani* Holthuis, 1959].

Faughnia serenei Moosa, 1982: 600, figs. 1–5 [type locality: Gulf of Thailand, South China Sea, 15°40'N, 109°22.9–28.4'E]; 1986: 385.— Manning & Chan, 1997: 552–553, figs. 3, 4.— Liu & Wang, 1999: 575.— Moosa, 2000: 423.— Ahyong, 2001: 181–182, fig. 90.

Material examined.— Dasi fishing port, Yilan County, 22 Sep 1984: 1 female (TL 118 mm) (NTOU).— 26 Mar 1985: 1 female (TL 130 mm) (NTOU).— 7 Mar 1986: 2 females (TL 120 mm) (TMCS-0033).— 28 Apr 1986: 1 male TL 140 mm) (TMCS-0048).— 19 Jun 1990: 1 female (TL 130 mm) (USNM 252441).— 19 Jun 1990: 1 male (TL 137 mm) (NTOU).— 27 May 1992: 3 males (TL 133–144 mm), 1 female (TL 150 mm) (NTOU).— 27 May 1994: 1 male (TL 139 mm), 2 females (TL 143–145 mm) (NTOU).— 27 Apr 1995: 1 female (TL 155 mm) (NTOU).— Nov 1995: 1 male (TL 150 mm) (NTOU).— 25 Feb 1997: 2 males (TL 128–133 mm), 1 female (TL 147 mm) (AM).— 25 May 1998: 4 males (TL 103–142 mm), 1 female (TL 77 mm) (NIWA).— 7 Dec 2004: 1 female (TL 130 mm) (NTOU).— 7 Mar 2008: 1 male (TL 128 mm) (NTOU). Nanfang-ao fishing port, Yilan County, 21 May 1992: 1 male (TL 126 mm) (NTOU).— 22 Jul 1992: 1 male (TL 127 mm) (NTOU).— 30 Jun 1993: 1 male (TL 143 mm) (NTOU).— 27 Jul 1995: 1 male (TL 129 mm) (NTOU).— 9 Nov 1995: 1 female (TL 145 mm) (NTOU). Donggang fishing port, Pingtung County, 26 Jan 1994: 1 female (TL 134 mm) (NTOU).— 4 Jun 1995: 1 male (TL 82 mm) (NTOU).— CP110, 24°48.3'N, 122°04.0'E, 316–350 m, 20 May 2001: 1 female (TL 160 mm) (MNHN). No specific locality, 13 Jan 1995: 3 males (TL 143–150 mm), 2 females (TL 140–145 mm) (NTOU).— 1 female (TL 157 mm) (NTOU).

Diagnosis.— Carapace with anterolateral angles rounded, not projecting anteriorly. Dorsal surface of telson with at most 2 carinae lateral to median carina: accessory median carina absent, occasionally with low pits or shallow, irregular groove; with anterior intermediate and marginal carinae only. AS5 with intermediate carina usually armed posteriorly. Uropodal protopod with smooth or crenulate inner margin.

Size.— To 159 mm (Manning & Chan, 1997).

Coloration.— Overall pale yellowish (more often) to pink-orange. Pereopods white with red distal setae. Uropodal exopod distal segment dark brown.

Habitat.— Sand and mud substrates at depths of 73–310 m (Ahyong, 2001).

Distribution.— Japan, Taiwan, the Philippines, the Gulf of Thailand and Australia.

Remarks.— *Faughnia serenei* was recently treated and figured by Manning & Chan (1997) and Ahyong (2001). The absence of the accessory median carina on the telson will distinguish *F. serenei* from *F. haani* and *F. formosae*, both of which have an accessory median carina on the telson.

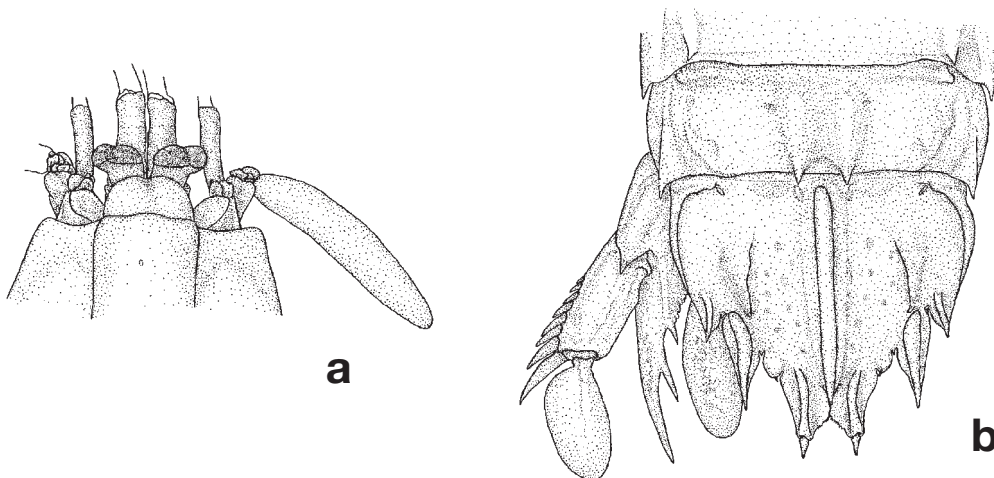


Fig. 45. Female, TL 130 mm, Dasi, fishing port, Yilan County, 19 Jun 1990: **a**, anterior cephalothorax; **b**, AS5–6, telson and uropod. (Modified after Manning & Chan, 1997).

Superfamily SQUILLOIDEA Latreille, 1802

Diagnosis.— Cornea with 2 rows of hexagonal ommatidia in the midband. Propodi of maxillipeds 3–4 ovate, not ribbed ventrally. Body depressed, compact. Raptorial claw with terminal ischiomerall articulation; dactylus not inflated basally. Telson with distinct median carina; at most, submedian teeth movable; with 4 or more intermediate denticles. Uropodal protopod with two primary spines; articulation of exopod segments terminal.

Remarks.— Squilloidea includes only a single family Squillidae Latreille, 1802. Some classifications (e.g., Manning, 1980; 1995; Ah Yong, 1997; Hof, 1998a; Schram & Müller, 2004) have variously recognized additional squilloid families: Harpiosquillidae Manning, 1980, and the late Cretaceous family Ursquillidae Hof, 1998a (type genus *Ursquilla* Hof, 1998a), the oldest known squilloid. Both of these families, however, are deeply nested among other squillid genera (Ahyong & Harling, 2000; Ah Yong, 2005). Notably, characters of *Ursquilla* are highly derived indicating that the squilloids had already undergone significant diversification by the end of the Cretaceous (Ahyong, 2005). The phylogenetic relationships of the squilloid genera have been studied in detail (Ahyong, 2005). Phylogenetic trends show a general increase in armature of the raptorial claw dactylus, increased dorsal carination, a tendency for bilobation of the lateral processes of the exposed thoracic somites, and a change in telson shape from trianguloid with movable submedian teeth, to quadriform with fixed submedian teeth (Ahyong, 2005). Thus, the most speciose squilloid genera, such as *Oratosquillina* Manning, 1995, and *Squilla* Fabricius, 1787, are also among the most highly derived members of the Squilloidea.

Ahyong & Harling (2000) established the phylogenetic position and monophyly of the Squilloidea, and identified Eurysquilloidea + Parasquilloidea as the sister group. Each of the three superfamilies were maintained as distinct. Schram & Müller (2004) proposed expansion of Squilloidea to encompass eurysquilloids and parasquilloids into a single superfamily. Expanding the concept of Squilloidea, however, to include eurysquilloids and parasquilloids would compromise effective diagnosis of the superfamily. Moreover, the squilloids, eurysquilloids and parasquilloids are each morphologically, ecologically, and developmentally (in the case of squilloid larvae) distinct (Ahyong, 2005). Therefore, we recognize a single squilloid family, Squillidae, following Ah Yong (2001, 2005).

Family SQUILLIDAE Latreille, 1802

Squillares Latreille, 1802: 36

Squillinae.— Giesbrecht, 1910: 148

Squillidae.— Manning, 1968c: 109, 113.

Harpiosquillidae Manning, 1980b: 367, 369.

Ursquillidae Hof, 1998a: 92–93.

Diagnosis.— As for superfamily.

Remarks.— Squillidae is the most diverse stomatopod comprising more than 40 genera (Ahyong, 2005b). Eighteen genera and 42 species of Squillidae are known from Taiwan.

Key to genera of Squillidae known from Taiwan

1. Carapace posterolateral margin deeply excavated. Propodus of raptorial claw lined with fixed spines on

occlusal margin	.....	<i>Harpiosquilla</i>
- Carapace posterolateral margin entire, rounded. Propodus of raptorial claw lined with pectinations on occlusal margin	.....	2
2. Lateral process of TS5 bilobed, comprising a laterally and anterolaterally directed spine	.....	10
- Lateral process of TS5 single, forming a laterally or anterolaterally directed lobe of spine	.....	3
3. Lateral process of TS6–7 bilobed	.....	<i>Kempina</i>
- Lateral process of TS6–7 single	.....	4
4. Inner margin of uropodal protopod lined with spines or small teeth	.....	5
- Inner margin of uropodal protopod smooth or crenulate	.....	9
5. Cornea not wider than stalk; stalk inflated, flask-shaped	.....	6
- Cornea wider than stalk; stalk not inflated	.....	7
6. Cornea distinctly narrower than stalk	.....	<i>Clorida</i>
- Cornea as wide as stalk	.....	<i>Cloridina</i>
7. Telson submedian teeth with articulated apices	.....	<i>Levisquilla</i>
- Telson submedian teeth with fixed apices	.....	8
8. Telson with rows of carinae either side of median carina	.....	<i>Anchisquilla</i>
- Telson without rows of carinae either side of median carina	.....	<i>Lenisquilla</i>
9. Raptorial claw with 4 teeth. Telson submedian teeth with fixed apices	.....	<i>Squilloides</i>
- Raptorial claw with 5 or 6 teeth. Telson submedian teeth with movable fixed apices (apices occasionally minute)	.....	<i>Cloridopsis</i>
10. Dorsal surface of thorax and abdomen with numerous carinae between submedian, intermediate and lateral carinae	.....	11
- Dorsal surface of thorax and abdomen without additional, numerous longitudinal carinae between submedian, intermediate and lateral carinae	.....	12
11. Carapace with numerous longitudinal carinae in addition to median intermediate and lateral carinae. Median carina of carapace not interrupted at base of anterior bifurcation	.....	<i>Carinosquilla</i>
- Carapace with tubercles but not longitudinal carinae in addition to median intermediate and lateral carinae. Median carina of carapace interrupted at base of anterior bifurcation	.....	<i>Lophosquilla</i>
12. Anterior bifurcation of carapace opening posterior to dorsal pit	.....	<i>Miyakea</i>
- Anterior bifurcation of carapace, if present opening anterior to dorsal pit	.....	13
13. Dorsal surface of carapace and abdomen appearing smooth, polished	.....	14
- Dorsal surface of carapace and abdomen pitted, variously rugose	.....	15
14. Raptorial claw with 5 teeth on dactylus. Eye large, cornea about one-third carapace length or greater.	.....	<i>Busquilla</i>
- Raptorial claw with 6 or 7 teeth on dactylus. Cornea width less than one-third carapace length	.....	<i>Erugosquilla</i>
15. Median carina of carapace not interrupted at base of anterior bifurcation	.....	<i>Oratosquilla</i>
- Median carina of carapace interrupted at base of anterior bifurcation or bifurcation absent	.....	16
16. Merus of raptorial claw with spine on outer inferodistal margin	.....	<i>Oratosquillina</i>
- Merus of raptorial claw without spine on outer inferodistal margin	.....	17
17. TS6–7 distinctly bilobed. Mandible with palp	.....	<i>Quollastria</i>
- TS6–7 unilobate or with sinuous margins. Mandible without palp	.....	<i>Alima</i>

Genus *Alima* Leach 1818

Alima Leach, in Tuckey, 1818, unnumbered plate. Type species *Alima hyalina* Leach, 1818 (a junior subjective synonym of *Alima neptuni* (Linnaeus, 1768)), by monotypy. Gender feminine.

Diagnosis.— Cornea bilobed, width about 1/4 CL or less. Ocular scales separate. Carapace with anterolateral spines; median carina distinct; posterolateral angles broadly rounded. Raptorial claw dactylus with 5 or 6 teeth; carpus dorsal carina undivided; merus without outer inferodistal spine. Mandibular palp absent. Maxillipeds 1–4 with epipod. TS5 lateral process bilobed; anterior lobe a slender spine directed anterolaterally; posterior lobe on higher plane, spatulate, directed laterally. TS6–7 lateral process faintly bilobed, margins siunuous. AS1–6 with submedian carinae. Telson submedian teeth with fixed apices; dorsolateral surface without supplementary longitudinal carinae. Uropodal protopod inner margin crenulate.

Remarks.— *Alima* includes six species (Ahyong, 2001, 2002b) of which two are known from Taiwan.

Key to species of *Alima* from Taiwan

1. TS6 lateral process with small but distinct anterior lobe. Telson with dark ovate anterior patch on median carina *A. orientalis*
- TS6 lateral process with indistinct anterior lobe. Telson with dark elongate triangular patch on either side of median carina *A. hieroglyphica*

Alima hieroglyphica (Kemp, 1911)

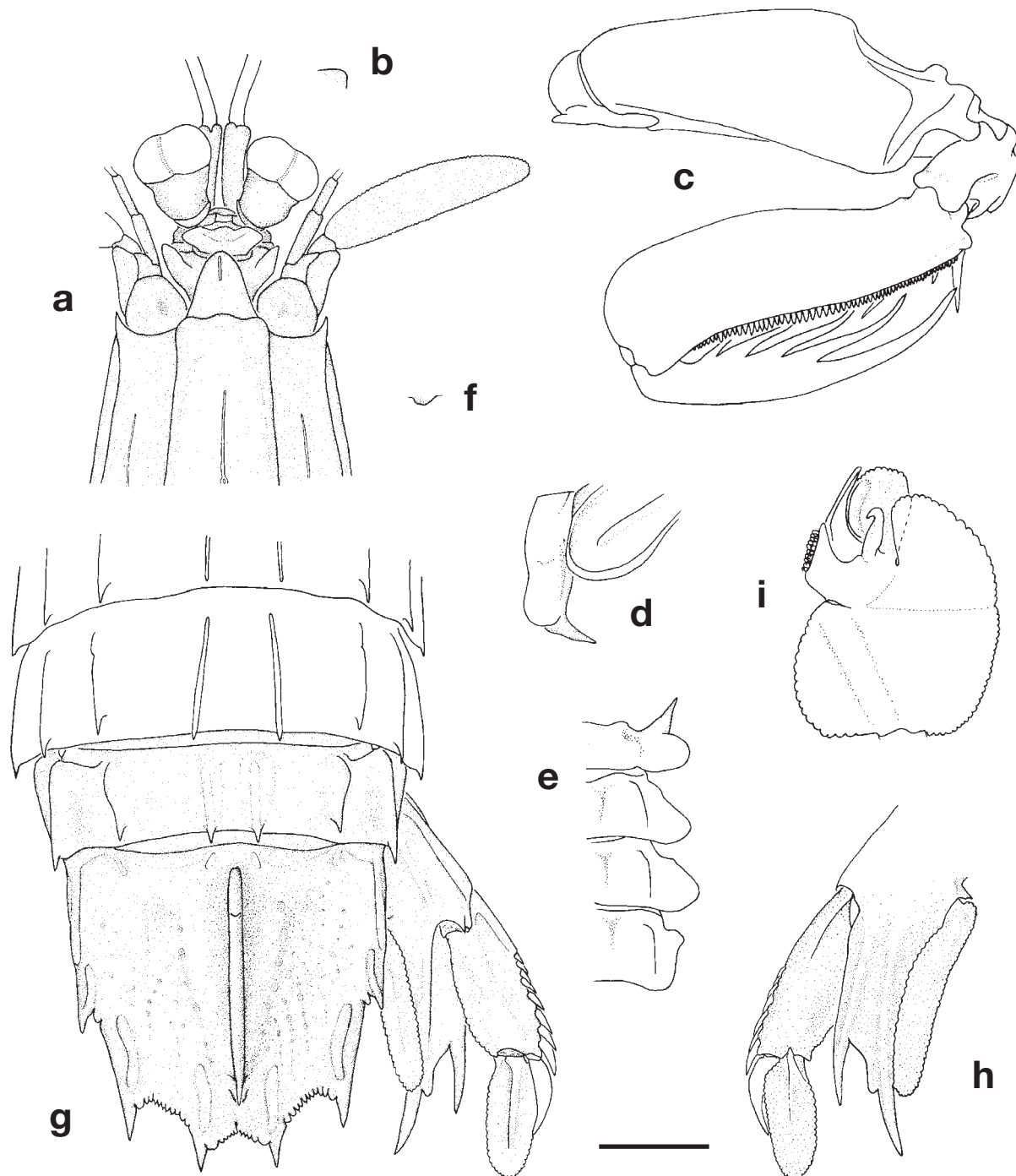


Fig. 46. Male, TL 52 mm, Tainan, 10 Apr 1965: **a**, anterior cephalothorax; **b**, right dorsal process of antennular somite, lateral; **c**, right raptorial claw; **d**, TS5 and posterolateral margin of carapace, right lateral; **e**, TS5-8 lateral processes; **f**, TS8 sternal keel; **g**, AS5-6, telson and uropod; **h**, right uropod, ventral; **i**, right pleopod 1 endopod. Scale a-h = 3.0 mm, i = 1.5 mm.

Squilla hieroglyphica Kemp, 1911: 96 [type locality: not known, probably Indian coast].

Alima hieroglyphica.— Ahyong, 2001: 188, 189.

NOT *Alima hieroglyphica*.— Liu & Wang, 1999: 577 [= *Alima orientalis* Manning, 1978].

Material examined.— Tainan County, 10 Apr 1965: 1 male (TL 52 mm), 1 female (TL 47 mm) (USNM 125321).

Diagnosis.— Raptorial claw with 5 teeth on dactylus. TS6 lateral process with sinuous anterior margin, not bilobed. Telson with dark, elongate triangular anterior patch on either side of median carina; prelateral lobe absent; postanal carina short. Uropodal protopod with 1 rounded lobe on outer margin of inner spine.

Habitat.— Fine sand, with mud or gravel; shallow water to at least 30 m (Ahyong, 2002).

Size.— To 53 mm TL (Kemp, 1911).

Coloration.— Telson median carina flanked on either side by dark, elongate triangles.

Distribution.— Western Indian Ocean to French Polynesia; now from Taiwan.

Remarks.— *Alima hieroglyphica* closely resembles *A. orientalis*, also known from Taiwan, but is readily distinguished by lacking prelateral lobes on the telson. *Alima hieroglyphica* was regarded by Manning (1969b, 1977a) as a near cosmopolitan species with the Atlantic *A. hildebrandi* (Schmitt, 1940) in its synonymy. Ahyong (2001) showed that the Indo-Pacific and Atlantic forms were distinct based on the presence (Atlantic) or absence (Pacific) of the prelateral lobe on the telson, and therefore resurrected *A. hildebrandi* for the Atlantic population. *Alima hieroglyphica* is recorded for the first time from Taiwan, and both specimens agree well with Kemp's (1911, 1913) account, having abdominal spination (submedian 5–6, intermediate 4–6, lateral 3–6, marginal 2–5) and CI 443–523.

Alima orientalis Manning, 1978

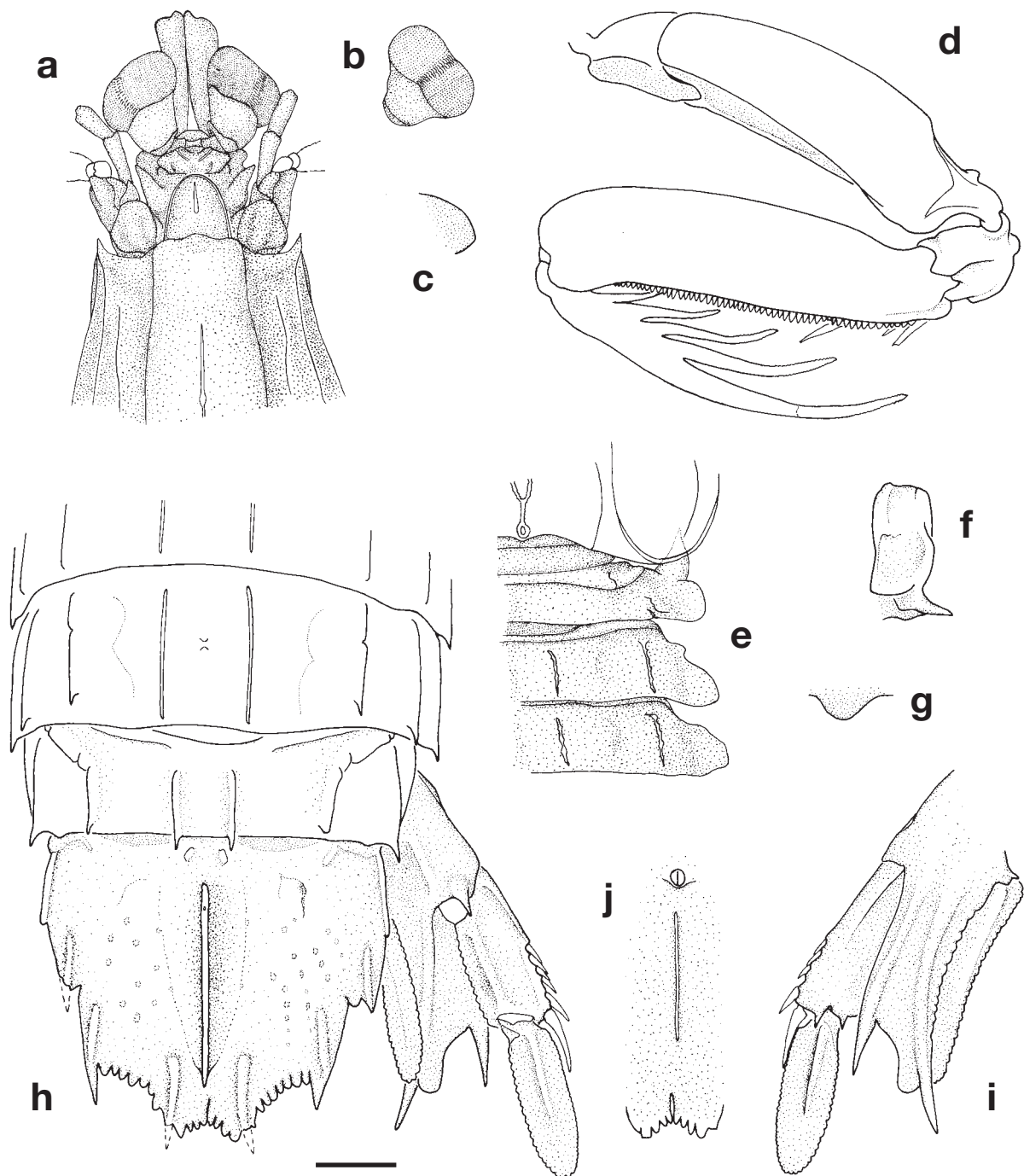


Fig. 47. Female holotype, TL 52 mm, Takao (= Kaohsiung City), Jun 1903: **a**, anterior cephalothorax; **b**, right eye; **c**, dorsal process of antennular somite, right lateral; **d**, right raptorial claw; **e**, TS5–7; **f**, TS5, right lateral; **g**, TS8 sternal keel, right lateral; **h**, AS4–6, telson and uropod; **i**, right uropod, ventral; **j**, postanal carina. Scale: a, b, d–f, h–j = 2.0 mm; c, g = 1.0 mm.

Alima orientalis Manning, 1978b: 21–23, fig. 10 [type locality: Takao (= Kaohsiung City), Taiwan].— Kemp, 1915: 171.— Komai, 1927: 313.— Ahyong, 2001: 189–191, fig. 92.

Alima hieroglyphica.— Liu & Wang, 1999: 577 [not *Alima hieroglyphica* (Kemp, 1911)].

Material examined.— Takao(= Kaohsiung City), Jun 1903: female holotype (TL 52 mm) (ZSM A20010121).

Diagnosis.— Raptorial claw with 5 teeth on the dactylus. TS6 lateral process with small but distinct anterior lobe. Telson with dark oval anterior patch on median carina; with prelateral lobe and postanal carina. Uropodal protopod with 1 rounded lobe on outer margin of inner spine.

Size.— To 62 mm TL (Naiyanetr *et al.*, 2000).

Coloration.— Overall dorsal colour pale tan. A1 peduncle segments dark distally. Carapace with grooves and carinae dark brown. TS6–8, AS1–6 with carinae and posterior margin dark brown. Telson with carinae of primary teeth dark brown; median carina with dense, black, rectangular patch anteriorly and with dark brown apex. Median portion of proximal segment of exopod, and inner half of distal segment of exopod dark brown.

Habitat.— Burrows in sand and mud from the shore to 43 m (Ahyong, 2001).

Distribution.— Japan, Taiwan, Philippines, the Gulf of Thailand, Australia and the Seychelles.

Remarks.— The holotype of *A. orientalis* Manning, 1978b, constitutes the only record of the species from Taiwan. *Alima orientalis* is readily distinguished from *A. hieroglyphica* (Kemp, 1911) by the presence of the prelateral lobe on the telson. Kemp (1915) referred a Philippine specimen to *A. hieroglyphica* (as *Squilla hieroglyphica*), noting among other features that it differed from the type in having a prelateral denticle (i.e., Kemp's term for the prelateral lobe). Komai (1927) made similar observations of a Japanese specimen that he referred to *A. hieroglyphica*. Kemp's (1915) and Komai's (1927) records of *A. hieroglyphica* are referable *A. orientalis*.

Genus *Anchisquilla* Manning, 1968

Anchisquilla Manning, 1968c: 120, 127–128. Type species *Squilla fasciata* de Haan, 1844, by original designation. Gender feminine.

Diagnosis.— Cornea bilobed, wider than stalk; stalk not inflated. Carapace with anterolateral spines; without median carina; posterolateral margin rounded. Mandibular palp present. Maxillipeds 1–4 with epipod. Raptorial claw with 6 teeth. TS5–7 single. AS1–5 without submedian carinae. Telson with numerous dorsolateral carinae; submedian teeth with fixed apices. Uropodal protopod with spinose inner margin.

Remarks.— *Anchisquilla* includes at least four species (Ahyong, 2001; Ahyong, in press), of which one occurs in Taiwan.

Anchisquilla fasciata (de Haan, 1844)



Fig. 48. Male, TL 40 mm, Dasi fishing port, Yilan County, 16 Nov 1995.

Squilla fasciata de Haan, 1844: pl. 51: 4 [type locality: Japan].— Lee & Wu, 1966: 47, fig. 4A–B.

Anchisquilla fasciata.— Manning, 1995: 169.— Liu & Wang, 1999: 577.

Material examined.— Dasi fishing port, Yilan County, 5 Aug 1981: 1 female (TL 44 mm) (NTOU).— 22 Nov 1985: 1 female (TL 60 mm) (TMCS-0011).— 18 May 1989: 1 male (TL 54 mm), 2 females (TL 52–54 mm) (TMCS-0095).— 13 Mar 1991: 1 female (TL 60 mm) (NTOU).— 27 Mar 1994: 1 female (TL 42 mm) (NTOU).— 16 Nov 1995: 4 males (TL 40–50 mm) (NTOU).— 12 Dec 1995: 1 male (TL 57 mm), 2 females (TL 37–45 mm) (NTOU).— 4 Aug 1996: 3 males (TL 47–60 mm), 1 female (TL 61 mm) (NTOU).— 3 Dec 1996: 9 males (TL 63–96 mm), 6 females (TL 64–87 mm) (NTOU).— 19 Jan 1999: 1 male (TL 103 mm) (NTOU).— 10 Apr 2000: 1 male (TL 55 mm) (ZRC 2002.0384).— 7 Mar 2008: 1 male (TL 43 mm) (NIWA). Nanfang-ao fishing port, Yilan County, 9 Dec 1992: 1 male (TL 53 mm) (NTOU).— 27 July 1995: 1 male (TL 51 mm) (NTOU). Wuci fishing port, Taichung County, 4 Nov 1995: 1 male (TL 132 mm), 1 female (TL 97 mm) (NTOU).— 26 Nov 1995: 2 males (TL 93–106 mm) (NTOU).— 16 Dec 1995: 1 male (TL 103 mm), 1 female (TL 107 mm) (NTOU). Cijin, Kaohsiung City, no date: 2 males (TL 59–86 mm) (NTOU). Jhongjhou fishing port, Kaohsiung City, 22 Nov 1988: 1 female (TL 54 mm) (TMCS-0083). Donggang fishing port, Pingtung County, 26 Nov 1994: 1 male (TL 42 mm) (NTOU).— 5 Aug 1995: 1 female (TL 72 mm) (NTOU).— 5 Aug 1996: 1 male (TL 56 mm) (NTOU).— 1 Nov 1996: 2 males (TL 72–106 mm) (NTOU). Magong fishing port, Penghu County, 23 Apr 1986: 2 males (TL 57–65 mm), 1 female (TL 51 mm) (TMCS-0040).— 16 Sep 1996: 2 males (TL 132–143 mm) (NTOU). No specific locality: 1 male (TL 70 mm) (NTOU).— 1 male (TL 39 mm), 1 female (TL 51 mm) (NTOU).

Diagnosis.— Telson with accessory median carina and well-developed rows of dorsal carinae on surface; prelateral lobe with blunt apex; ventral surface with 1 or 2 carinae flanking postanal carina.

Size.— To 100 mm TL.

Coloration.— Overall light gray-green. Primary telson spines with red apices.

Habitat.— Sandy, muddy and shelly substrates to about 50 m.

Distribution.— Andaman Sea to Malaysia, Singapore, the Philippines, Taiwan and Japan.

Remarks.— *Anchisquilla fasciata*, first described from Japan, is a common species in Taiwan. It has long been regarded as widespread in the Indo-West Pacific, with regional morphological heterogeneity. Ah Yong (2001) noted that Australian specimens identified as *A. fasciata* had numerous ventral telson carinae, whereas northern hemisphere specimens (Japan, Singapore, and Thailand) bear few supplementary telson carinae. A recent reevaluation of *A. fasciata* sensu lato showed that *A. fasciata* sensu stricto occurs only in the northern hemisphere, from the Andaman Sea to Malaysia, the Philippines, Taiwan and Japan (Ah Yong, in press). Other records of *A. fasciata* are based on *A. chani* Ah Yong, 2001 (Vietnam to Australia and New Caledonia), and *A. subfasciata* (Tate, 1883) (Australia), previously considered a synonym of *A. fasciata*. The Taiwanese specimens agree in all respects with *A. fasciata* sensu stricto from Japan.

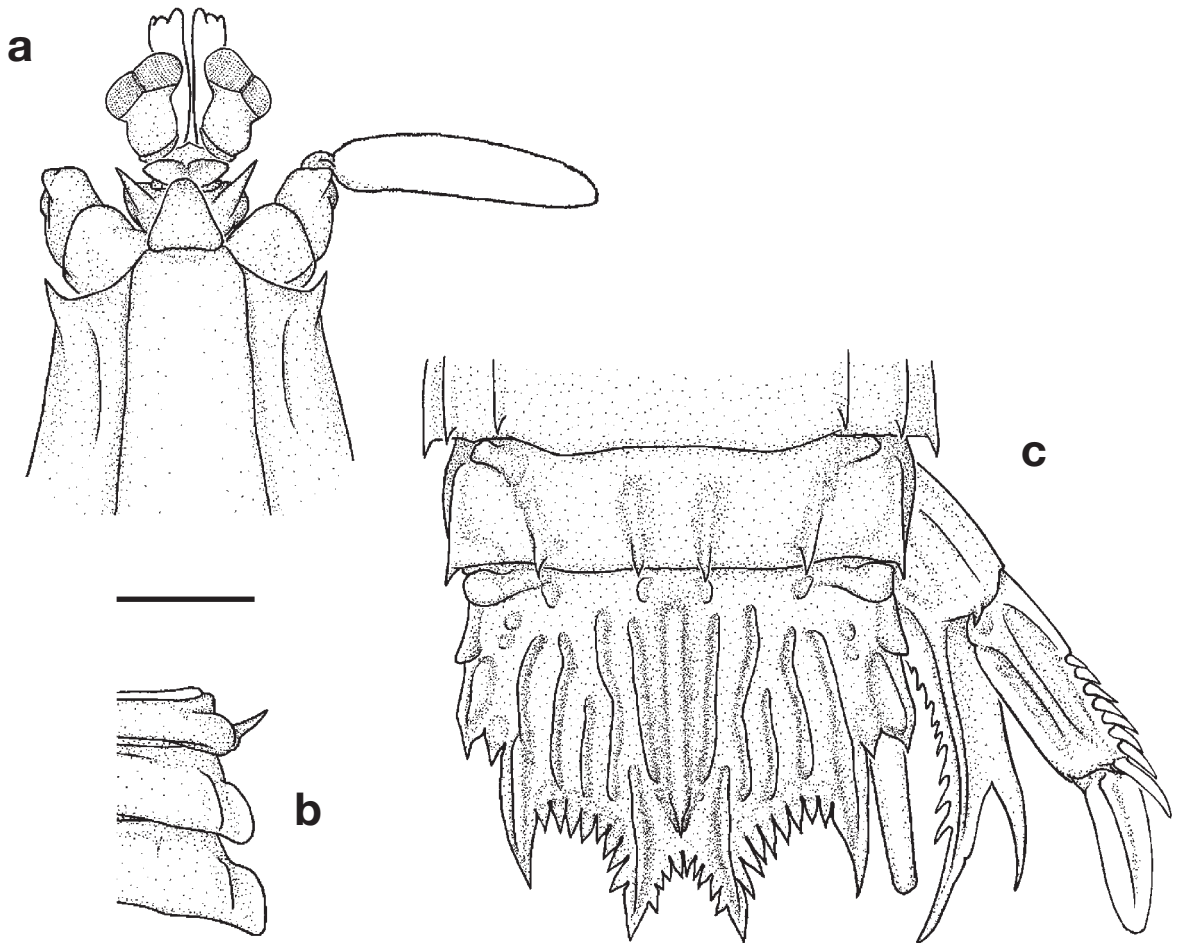


Fig. 49. Male, TL 50 mm, Dasi fishing port, Yilan County, 16 Nov 1995: **a**, anterior cephalothorax; **b**, TS5–7; **c**, AS5–6, telson and uropod. Scale = 5.0 mm.

Genus *Busquilla* Manning, 1978

Busquilla Manning, 1978b: 23. Type species *Busquilla plantei* Manning, 1978, by original designation. Gender feminine.

Diagnosis.— Dorsal integument smooth, appearing polished. Eye very large, cornea strongly bilobed, width at least 1/3 CL, distinctly broader than and set obliquely on stalk. Ophthalmic somite anterior margin triangular. Carapace anterior width exceeding half median length; anterolateral spines small, not extending to base of rostral plate; median carina indistinct or absent anterior to dorsal pit; posterolateral margin rounded. Raptorial claw dactylus with 5 teeth; carpus dorsal carina undivided; merus without outer inferodistal spine. Mandibular palp present. Maxillipeds 1–4 with epipod. TS5 lateral process obscurely bilobed; anterior lobe a small slender spine directed anteroventrally; posterior lobe minute, directed laterally. TS6–7 lateral process bilobed; anterior lobe much smaller than posterior lobe. AS1–6 with submedian carinae. Telson submedian teeth with fixed apices and prelateral lobe; dorsolateral surface without supplementary longitudinal carinae.

Remarks.— *Busquilla* includes two species, of which one is known from Taiwan.

Busquilla quadraticauda (Fukuda, 1911)

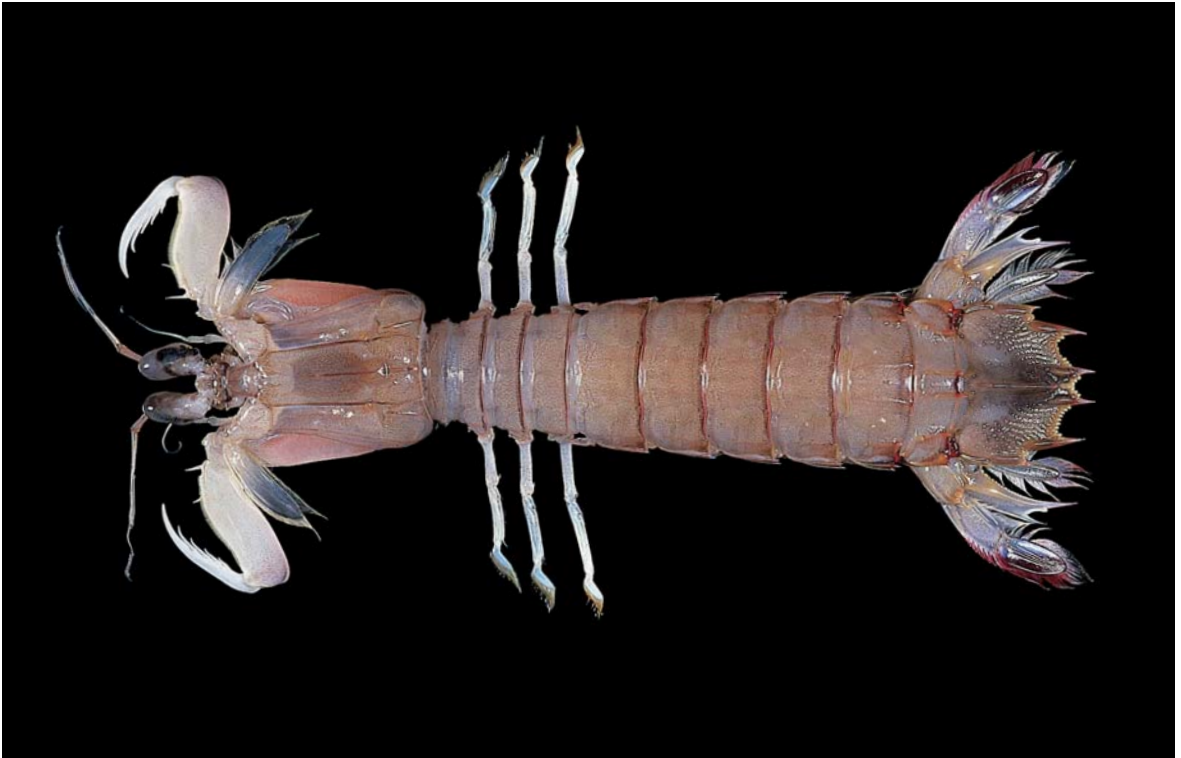


Fig. 50. Male neotype, TL 92 mm, Donggang fishing port, Pingtung County, 5 Aug 1996.

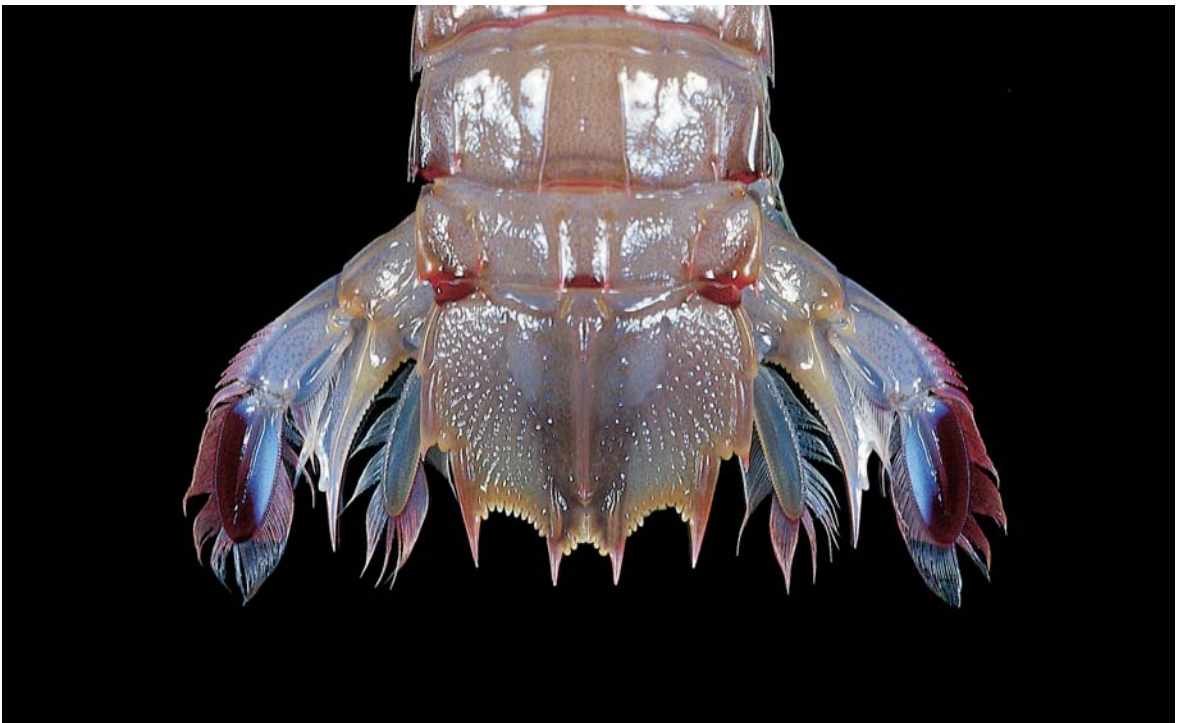


Fig. 51. Tail fan, dorsal view. Male neotype, TL 92 mm, Donggang fishing port, Pingtung County, 5 Aug 1996.

Squilla quadraticauda Fukuda, 1911a: 174, fig. 1 [published Apr 15] [type locality: Tungkang (= Donggang), Pingtung County, Taiwan, by neotype designation (Ahyong, 2001)]; 1911b: 287–289, fig. 3–5.

Squilla boopis Kemp, 1911: 97 [published May] [type locality: Gulf of Martaban, Burma, 14°26'N, 96°23'E].

Anchisquilla punctata Blumstein, 1970: 218, fig. 1 [type locality: Gulf of Tonkin, 17°48'N, 109°32'E, 102 m]; 1974: 115.

Alima guinotae Moosa, 1991: 186–188, fig. 9 [type locality: St. Vincent Bay, New Caledonia, 21°51'S, 165°45'E].

Busquilla quadraticauda.— Liu & Wang, 1999: 577.— Ahyong, 2001: 205–206, fig. 100.

Material examined.— Dasi fishing port, Yilan County, 28 Oct 2004: 1 female (TL 70 mm) (NTOU). Donggang fishing port, Pingtung County, 5 Aug 1996: 1 male (TL 84 mm), 1 female (TL 38 mm) (NTOU), male neotype (TL 92 mm) (AM P60114), 1 female (TL 94 mm) (AM P60115), 1 male (TL 92 mm) (NIWA).

Diagnosis.— Rostral plate with median carina. Distal segment of uropodal exopod entirely black.

Size.— To 94 mm.

Coloration.— Overall light gray-brown. Posterior margin of body somites orange-red. Telson with dark trinagular patch on posterior half of median carina. Uropodal exopod distal segment black.

Habitat.— Sandy or muddy substrates; 42–120 m.

Distribution.— Australia and New Caledonia to Indonesia, Vietnam, Philippines, Taiwan, Japan, and Hawaii.

Remarks.— *Busquilla quadraticauda* was originally described from Japan, but Ahyong (2001) designated a specimen from Taiwan as the neotype owing to the inavailability of a suitable Japanese specimen. The median carina on the rostral plate will distinguish *B. quadraticauda* from the only other known species of the genus, *B. plantei* Manning, 1978b.

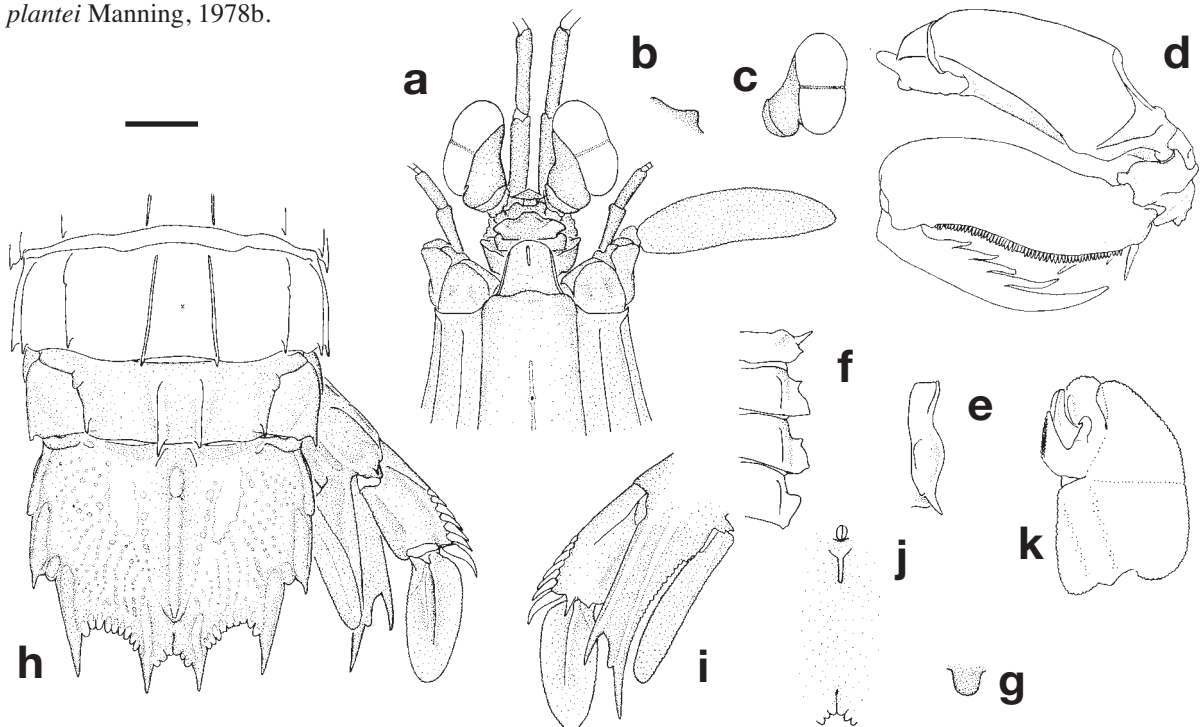


Fig. 52. Male neotype, TL 92 mm, Donggang fishing port, Pingtung County, 5 Aug 1996: **a**, anterior cephalothorax; **b**, right dorsal process of antennular somite, lateral; **c**, right eye; **d**, right raptorial claw; **e**, TS5, right lateral; **f**, TS5–8 lateral processes; **g**, TS8 sternal keel; **h**, AS5–6, telson and uropod; **i**, right uropod, ventral; **j**, postanal carina; **k**, right pleopod 1 endopod. Scale: a, c–f, h–j = 3.0 mm; b, g, k = 1.5 mm.

Genus *Carinosquilla* Manning, 1968

Carinosquilla Manning, 1968c: 121, 135. Type species *Squilla multicarinata* White, 1849, by original designation. Gender feminine.

Keijia Manning, 1995: 204–205. Type species *Squilla lirata* Kemp & Chopra, 1921, by original designation and monotypy. Gender feminine.

Diagnosis.— Cornea distinctly bilobed. Carapace thorax and abdomen covered with numerous, closely spaced, longitudinal carinae. Raptorial claw dactylus with 5–7 teeth; carpus dorsal carina undivided; merus without outer inferodistal spine. Mandibular palp absent or present. Maxillipeds 1–4 with epipod. TS5–7 lateral process bilobed. Telson submedian teeth with fixed apices; prelateral lobe present; dorsolateral surface with numerous closely spaced longitudinal carinae; ventral surface with long postanal carina and numerous supplementary carinae.

Remarks.— *Carinosquilla* includes ten species (Ahyong, 2006), all from the Indo-West Pacific, of which one is known from Taiwan. Species of *Carinosquilla* are recognized by the presence of numerous longitudinal carinae that densely cover the dorsal surface of the carapace, thorax and abdomen.

Carinosquilla multicarinata (White, 1849)

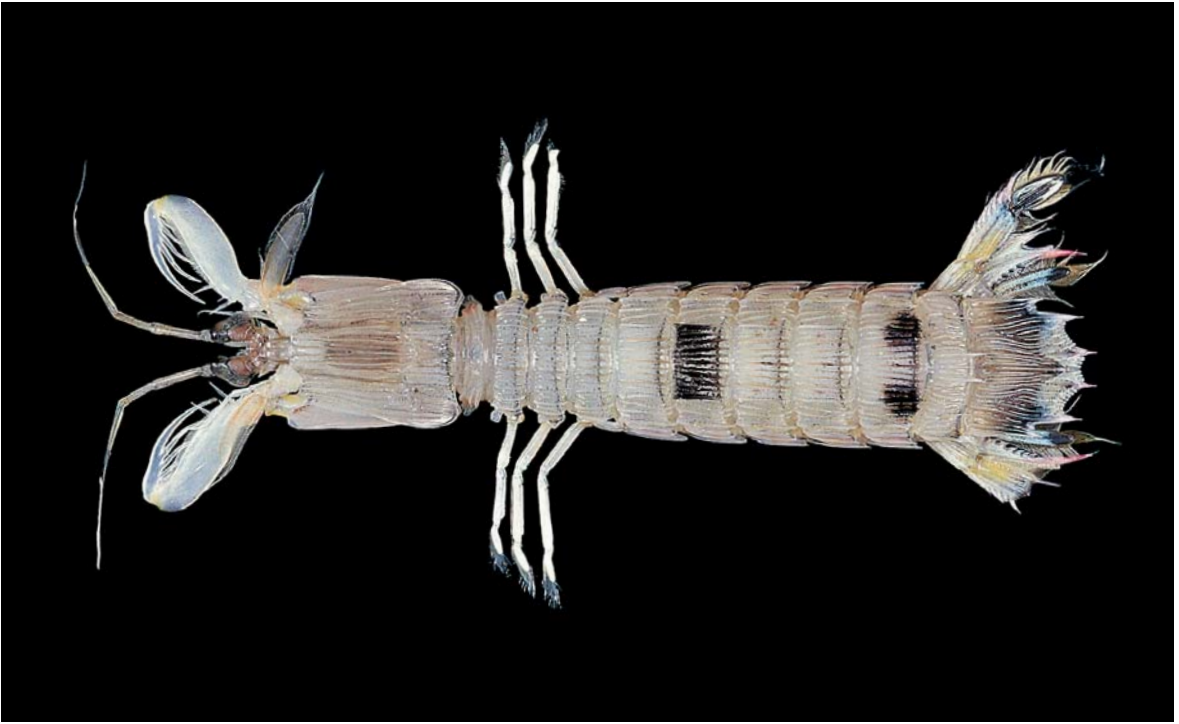


Fig. 53. Male, TL 57 mm, Donggang fishing port, Pingtung County, 5 Aug 1996.



Fig. 54. Female, TL 92 mm, Donggang fishing port, Pingtung County, 5 Aug 1996, black patches on abdomen indistinct.



Fig. 55. Tail fan, dorsal view. Female, TL 92 mm, Donggang fishing port, Pingtung County, 5 Aug 1996.

Squilla multicarinata White, 1849: 144, pl. 6, fig. 1 [type locality: the Philippines, fixed by lectotype designation (Ahyong & Moosa, 2004)].

Carinosquilla multicarinata.— Liu & Wang, 1999: 578.

Material examined.— Wuci fishing port, Taichung County, 29 Mar 1997: 1 male (TL 72 mm), 1 female (TL 80 mm) (NTOU). Gushan fishing port, Kaohsiung City, 3 Dec 1995: 3 males (TL 60–67 mm) (NIWA). Donggang fishing port, Pingtung County, 5 Aug 1996: 1 male (TL 57 mm), 1 female (TL 92 mm) (NTOU). Magong fishing port, Penghu County, Oct 1984: 1 male (TL 49 mm) (NTOU).— 23 Apr 1986: 1 male (TL 81 mm), 1 female (TL 80 mm) (TMCS-0039).— 16 Sep 1996: 1 female (TL 71 mm) (NTOU).— No specific locality: 2 females (TL 48–71 mm) (NTOU).

Diagnosis.— Eyestalk without carinae. TS5 with transverse dorsal carinae on either side of midline. Mandibular palp present. Telson prelateral lobe with short, spiniform apex.

Size.— To 92 mm TL (present study).

Coloration.— Overall pale gray-brown. AS2 generally with large, dark brown to black, rectangular median patch. AS5 usually with pair of dark brown to black submedian patches. Telson with diffuse black colouring midlaterally. Uropodal exopod distal segment black; proximal segment with diffuse yellow proximally and blue distolaterally. Uropodal endopod pale blue with black distal third. Raptorial claw white overall; merus diffusely brown dorsally and yellow distally; carpus with pale pink patch laterally; propodus yellow at articulation with dactylus.

Habitat.— Muddy, coralline and foraminiferal sand substrates to about 64 m depth (Moosa, 1973).

Distribution.— Southern India to Indonesia, Vietnam, the Philippines, China, Japan and now from Taiwan.

Remarks.— This is the first formal report of *Carinosquilla multicarinata* from Taiwan. The species differs

from all other Taiwanese stomatopods in the densely carinate dorsum of the carapace and abdomen. Ahyong & Moosa (2004) designated a lectotype for *C. multicastrinata* fixing the Philippines as the type locality. The 92 mm female from Tunggang (NTOU-1996-8-5) is the largest known specimen of *C. multicastrinata*. *Carinosquilla multicastrinata* most closely resembles *C. carita* Ahyong, 2001, from Australia — both species are almost identical morphologically, differing in the condition of the mandibular palp (absent in *C. carita*) and in the apex of the prelatral lobe of the telson (blunt in *C. carita*, spinular in *C. multicastrinata*).

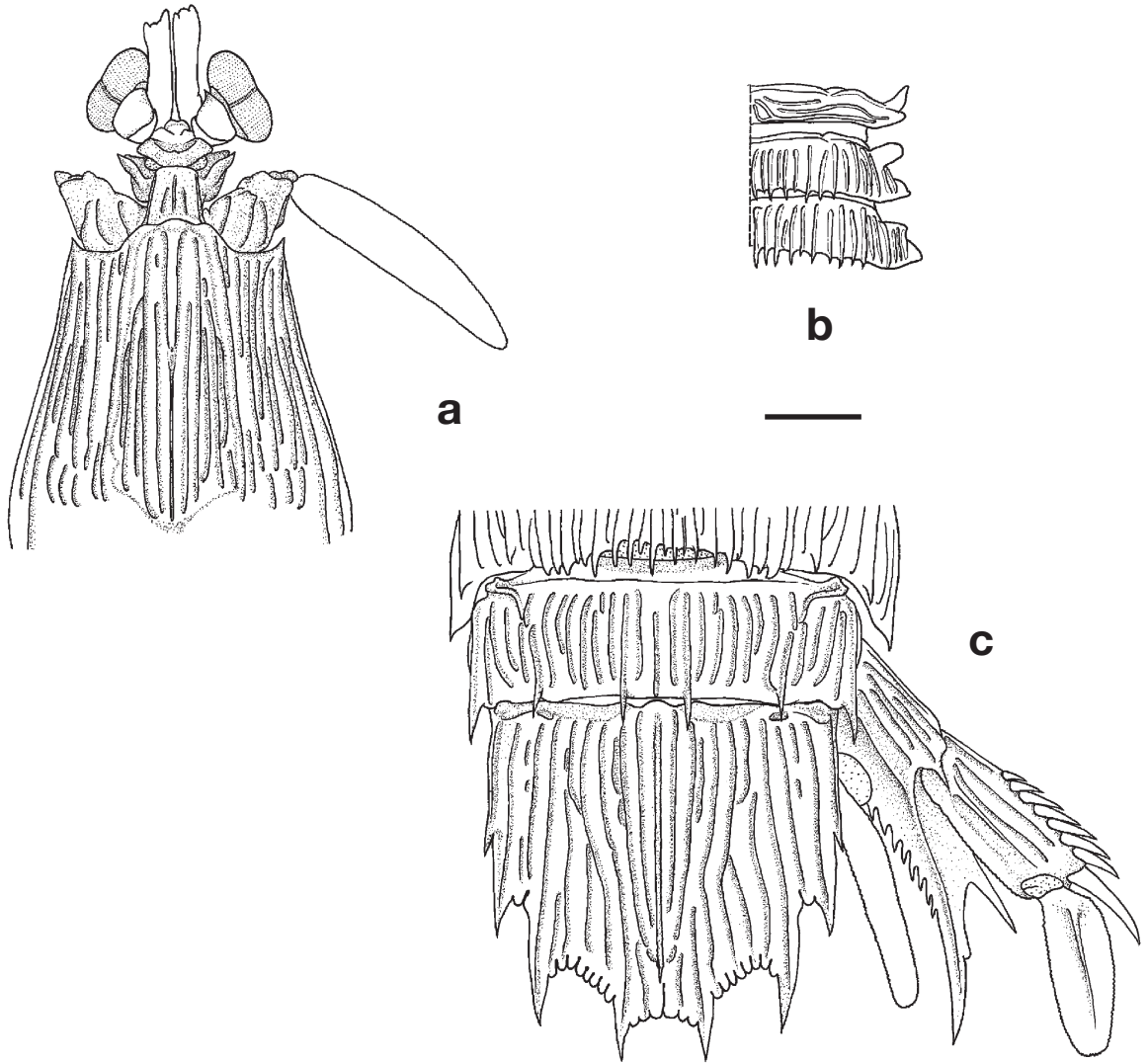


Fig. 56. Female, TL 92 mm. Donggang fishing port, Pingtung County, 5 Aug 1996: **a**, anterior cephalothorax; **b**, TS5–7; **c**, AS5–6, telson and uropod. Scale: a, c = 5.0 mm; b = 4.0 mm.

Genus *Clorida* Eydoux & Souleyet, 1842

Clorida Eydoux & Souleyet, 1842: 264. Type species *Clorida latreillei* Eydoux & Souleyet, 1842, by subsequent designation by Fowler (1912: 302). Gender feminine.

Diagnosis.— Eye small, pyriform, cornea bilobed, narrower than stalk; stalk short, strongly inflated laterally, mesially straight for at least proximal half with eyes in midline. Ocular scales fused. Rostral plate wider than long. Carapace with or without anterolateral spines; without median and intermediate carinae; with reflected marginal and reduced lateral carinae, distinct posteriorly only; posterolateral margin rounded. Raptorial claw dactylus with 4 or 5 teeth; carpus dorsal carina undivided; merus without outer inferodistal spine. Mandibular palp present or absent. Maxillipeds 1–4 with epipod. TS5–7 lateral processes single. AS1–5 with or without submedian carinae. Telson dorsolateral surface with supplementary tubercles; submedian teeth usually with articulated apices. Inner margin of uropodal protopod lined with spines.

Remarks.— *Clorida* presently includes 15 species, all from the Indo-West Pacific. The distinctions between *Clorida* and *Cloridina* Manning, 1995, require further consideration, and the two genera may need to be synonymized (Ahyong, 2001). Five species of *Clorida* are known from Taiwan.

Key to species of *Clorida* from Taiwan

1. Mandibular palp absent *C. denticauda*
- Mandibular palp present 2
2. Telson with postanal carina. TS5 lateral process with sharp apex, directed laterally or anterolaterally. A1 somite dorsal processes with sharp apices, triangular or spiniform 3
- Telson without postanal carina. TS5 lateral process a blunt lobe. A1 somite dorsal processes low, blunt
..... *C. rotundicauda*
3. Lateral processes of TS6–7 with posterolateral margin forming an acute point or spine
..... *C. bombayensis*
- Lateral processes of TS6–7 with posterolateral margin blunt, rounded 4
4. AS1–3 without submedian carinae. Dactylus of raptorial claw without basal notch on outer margin
..... *C. japonica*
- AS1–3 with submedian carinae. Dactylus of raptorial claw with basal notch on outer margin
..... *C. albolitura*

Clorida albolitura Ahyong & Naiyanetr, 2000



Fig. 57. Male, TL 74 mm, Donggang fishing port, Pingtung County, 5 Aug 1996.



Fig. 58. Tail fan, dorsal view. Male, TL 74 mm, Donggang fishing port, Pingtung County, 5 Aug 1996.

Clorida latreillei.— Liu & Wang, 1999: 578 [not *Clorida latreillei* Eydoux & Souleyet, 1842].

Clorida albolitura Ahyong & Naiyanetr, 2000: 317–320, fig. 2 [type locality: Ang Sila, Gulf of Thailand, Thailand].— Ahyong, 2001: 217–219, fig. 105.

Material examined.— Dasi fishing port, Yilan County, 3 Aug 1996: 1 female (TL 33 mm) (NTOU). Donggang fishing port, Pingtung County, 5 Aug 1996: 2 males (TL 71–72 mm), 2 females (TL 55–59 mm) (NTOU), 3 males (TL 60–74 mm) (AM P59109). No specific locality, 10 Feb 1965: 1 male (TL 36 mm) (USNM 113652).

Diagnosis.— Carapace with anterolateral spines. Mandibular palp present. TS5 lateral process forming a slender, laterally directed spine. Lateral processes of TS6–7 rounded posterolaterally. AS1–4 with submedian carinae. Telson median carina with large white patch in life; with long postanal carina, without carinae flanking postanal carina.

Size.— To 75 mm TL.

Coloration.— Overall light brown. Posterior margin of body somites dark brown. Telson with large white patch on median carina; posterior margin white. Pereopods, dactylus and propodus of raptorial claw, and primary spines of uropodal protod white. Uropodal exopod white with black on inner half of proximal segment and inner proximal half of distal segment.

Habitat.— Sand and mud substrates at depths of 31–110 m (Ahyong, 2001).

Distribution.— Eastern Mediterranean Sea, Red Sea to Australia, the Gulf of Thailand, Indonesia, Vietnam, and Taiwan.

Remarks.— Ahyong & Naiyanetr (2000) gave a full account of the species and were the first to record the species from Taiwan. *Clorida albolitura* was recently discovered in the eastern Mediterranean Sea, probably having migrated from the Red Sea via the Suez Canal (Ahyong & Galil, 2006). Of the Taiwanese species of *Clorida*, *C. albolitura* is most likely to be confused with *C. japonica* because of the spiniform lateral process on TS5 and unarmed lateral processes of TS6–7. The two species are readily distinguished, however, by the dorsal submedian carination of AS1–3: present in *C. albolitura*, absent in *C. japonica*.

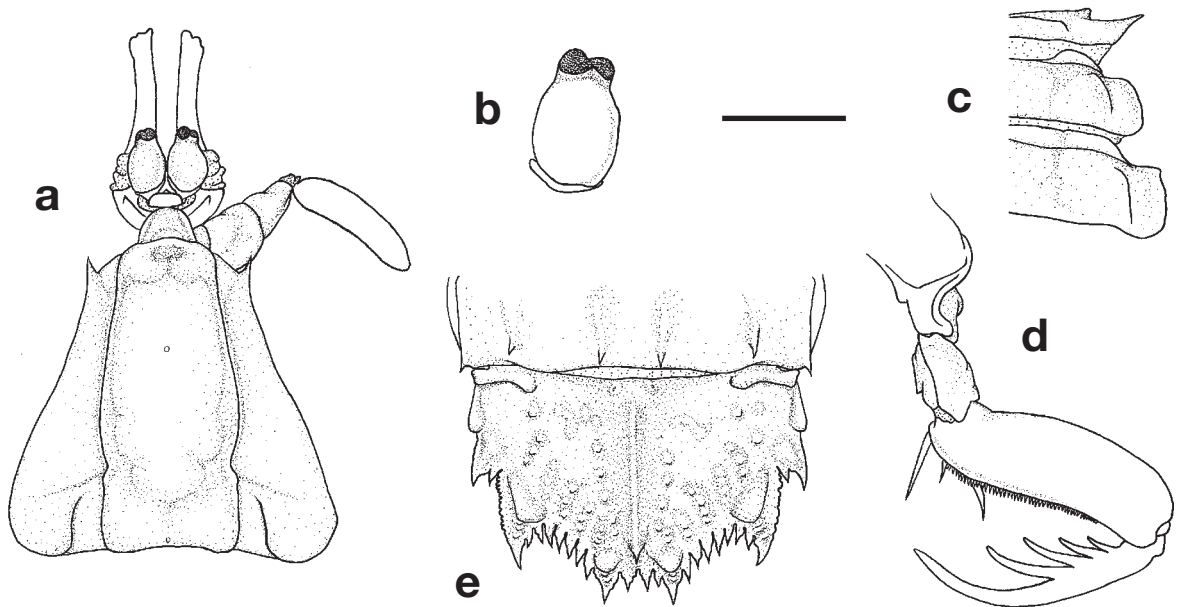


Fig. 59. Male, TL 74 mm, Donggang fishing port, Pingtung County, 5 Aug 1996: **a**, carapace; **b**, right eye; **c**, right TS5–7; **d**, left raptorial claw; **e**, AS6 and telson. Scale: a, b, e = 5.0 mm; d = 6.7 mm; b = 2.0 mm.

Clorida bombayensis (Chhapgar & Sane, 1967)



Fig. 60. Male, TL 84 mm, Donggang fishing port, Pingtung County, 5 Aug 1996.

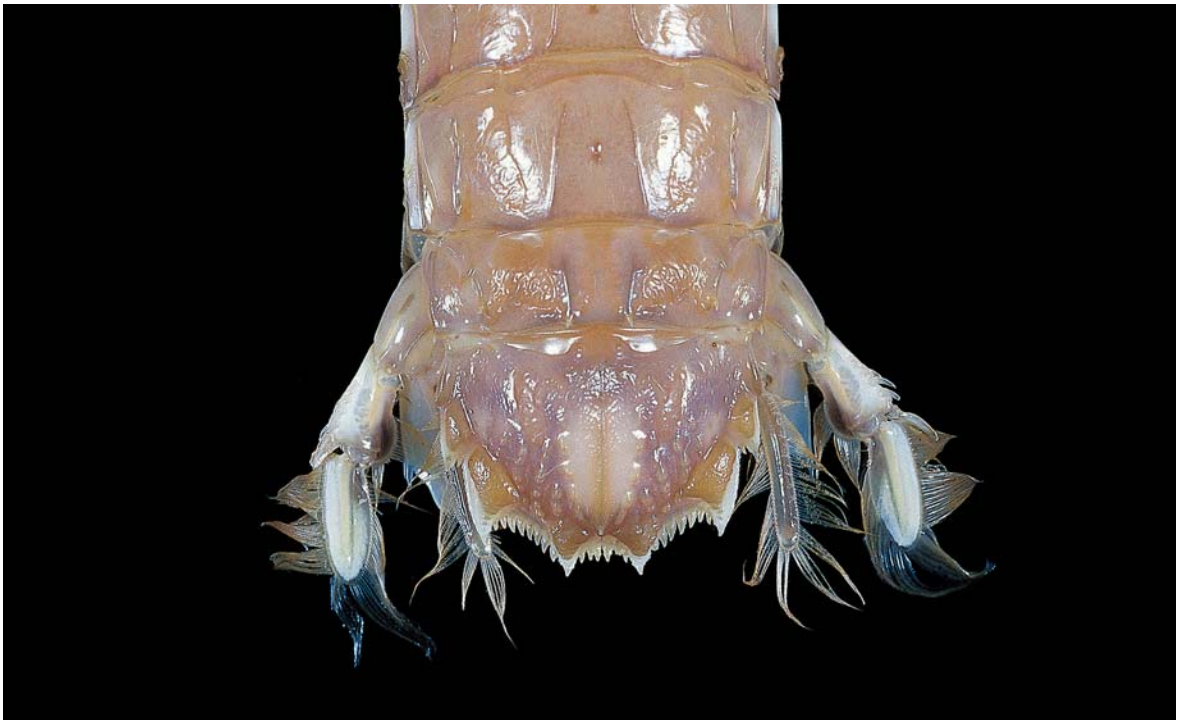


Fig. 61. Tail fan, dorsal view. Male, TL 84 mm, Donggang fishing port, Pingtung County, 5 Aug 1996.

Squilla bombayensis Chhapgar & Sane, 1967: 1, fig. 1 [type locality: Bombay, India (18°58'N, 72°50'E)].

Clorida latispina Manning, 1968a: 247–249, fig. 3 [type locality: Khota Bharu, Kelantan, Malaysia].

Clorida bombayensis.— Liu & Wang, 1999: 578.— Ahyong, 2001: 219, fig. 106.

Material examined.— Donggang fishing port, Pingtung County, 5 Aug 1996: 2 males (TL 36–84 mm), 5 females (TL 45–87 mm) (NTOU).

Diagnosis.— Carapace with anterolateral spines. Dorsal processes of A1 somite with sharp apices. Mandibular palp present. Lateral process of TS5 a broad, recurved spine. Lateral processes of TS6–7 with acute or spinular posterolateral angle. AS1–5 with submedian carinae.

Size.— To 100 mm TL (Ahyong, 2001).

Coloration.— Overall light red-brown. Pereopods, dactylus and propodus of raptorial claw, and uropodal exopod white.

Habitat.— Sand and mud substrates to at least 47 m (Ahyong, 2001).

Distribution.— India to Australia, Malaysia, Vietnam and now from Taiwan.

Remarks.— The Taiwanese specimens agree well with published accounts (Manning, 1995; Ahyong, 2001) and are the first known from Taiwan. *Clorida bombayensis* is readily distinguished from congeners by having the posterior spine on the lateral processes of TS6–7.

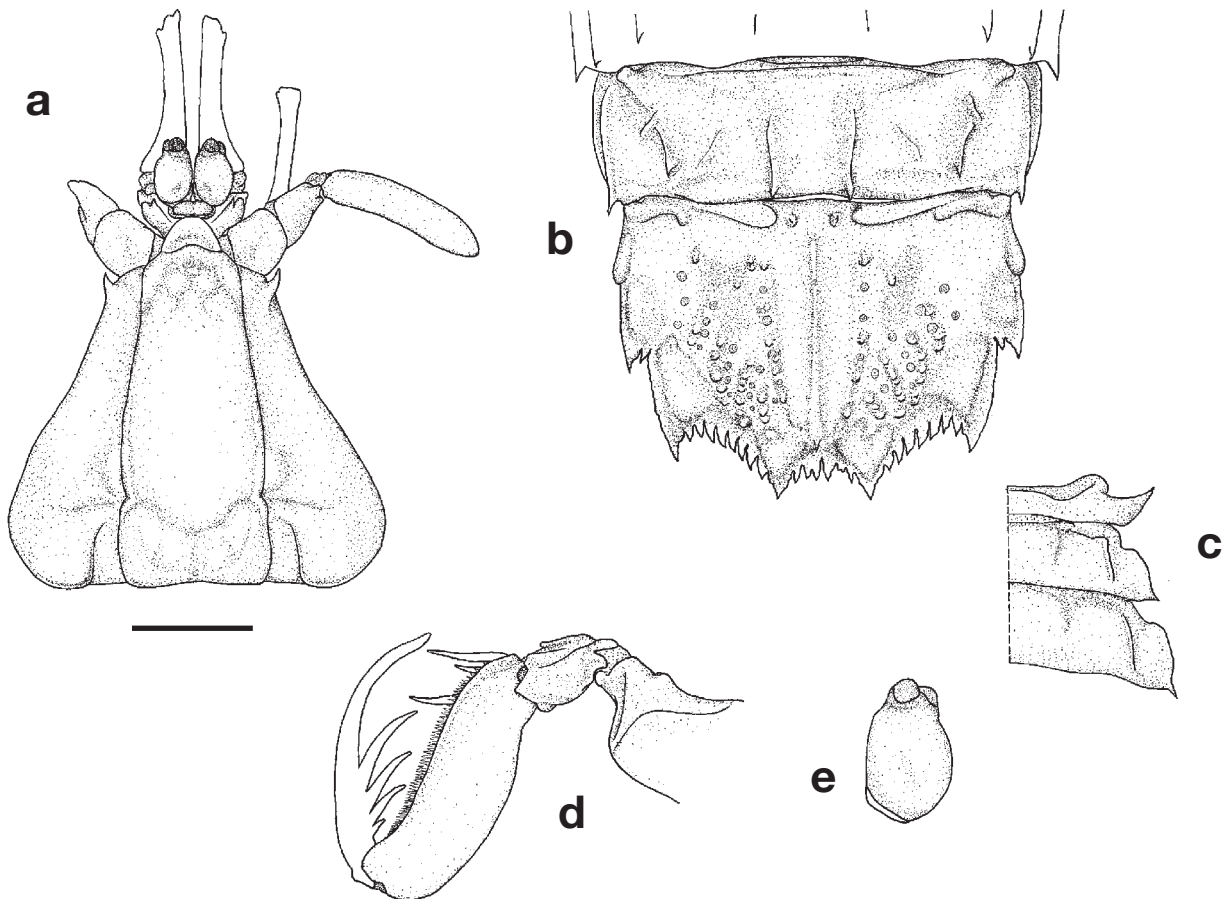


Fig. 62. Male, TL 84 mm, Donggang fishing port, Pingtung County, 5 Aug 1996: **a**, carapace; **b**, AS6 and telson; **c**, left TS5–7; **d**, left raptorial claw; **e**, left eye. Scale a–d = 5.0 mm; e = 1.7 mm.

Clorida denticauda (Chhapgar & Sane, 1967)



Fig. 63. Male, TL 48 mm, Donggang fishing port, Pingtung County, 5 Aug 1995.

Squilla denticauda Chhapgar & Sane, 1967: 4–8, fig. 2 [type locality: Bombay, India, intertidal].

Clorida nazasaensis Garcia & Manning, 1982: 538–540, fig. 2 [type locality: Nazasa Bay, Philippines, 17–37 m].

Clorida denticauda.— Liu & Wang, 1999: 578.— Ahyong, 2001: 228.

Material examined.— Donggang fishing port, Pingtung County, 5 Aug 1995: 1 male (TL 48 mm) (NTOU).— 5 Aug 1996: 1 male (TL 34 mm) (NTOU).

Diagnosis.— Carapace with anterolateral spines. Dorsal processes of A1 somite with sharp apices. Mandibular palp absent. Lateral process of TS5 a short, blunt lobe. Lateral processes of TS6–7 rounded, unarmed. AS1–5 without submedian carinae. Raptorial claw dactylus with 4 teeth, proximal tooth minute. Postanal carinae obsolete or absent.

Size.— To 48 mm TL (present study).

Coloration.— Overall pale tan. Carapace outline, gastric grooves, posterior margin of thoracic and abdominal somites, and distodorsal surface of merus of raptorial claw dark brown. Distal half of uropodal endopod, distal segment and distal end of proximal segment of uropodal exopod black.

Habitat.— Sandy mud substrates from the intertidal zone to 48 m depth (Moosa, 1991).

Distribution.— India to Vietnam, the Philippines, New Caledonia and now from Taiwan.

Remarks.— The Taiwanese specimens reported here agree well with published accounts (Chhapgar & Sane, 1967; Garcia & Manning, 1982) and unpublished figures of the holotype of *C. denticauda* by Lilly King Manning. *Clorida denticauda* differs from all other Taiwanese congeners by the absence of the mandibular palp. The two specimens reported here are the first known from Taiwan.

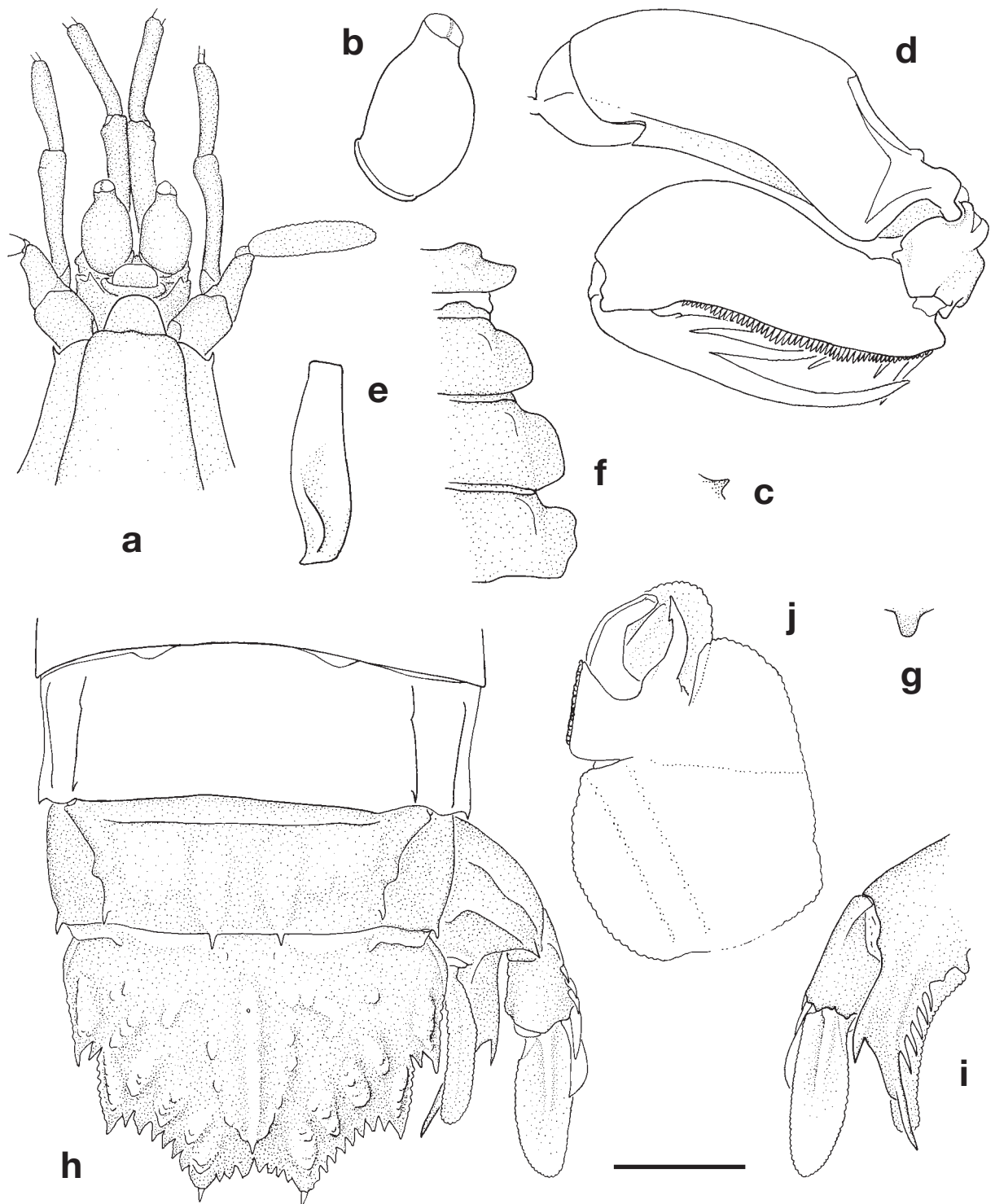


Fig. 64. Male, TL 48 mm, Donggang fishing port, Pingtung County, 5 Aug 1995: **a**, anterior cephalothorax; **b**, right eye; **c**, right dorsal process of antennular somite, lateral; **d**, right raptorial claw; **e**, TS5, right lateral; **f**, TS5–8 lateral processes; **g**, TS8 sternal keel; **h**, AS5–6, telson and uropod; **i**, right uropod, ventral; **j**, right pleopod 1 endopod, anterior view. Scale: a, d–f, h, i = 3.0 mm; b, c, g, j = 1.5 mm.

Clorida japonica Manning, 1978

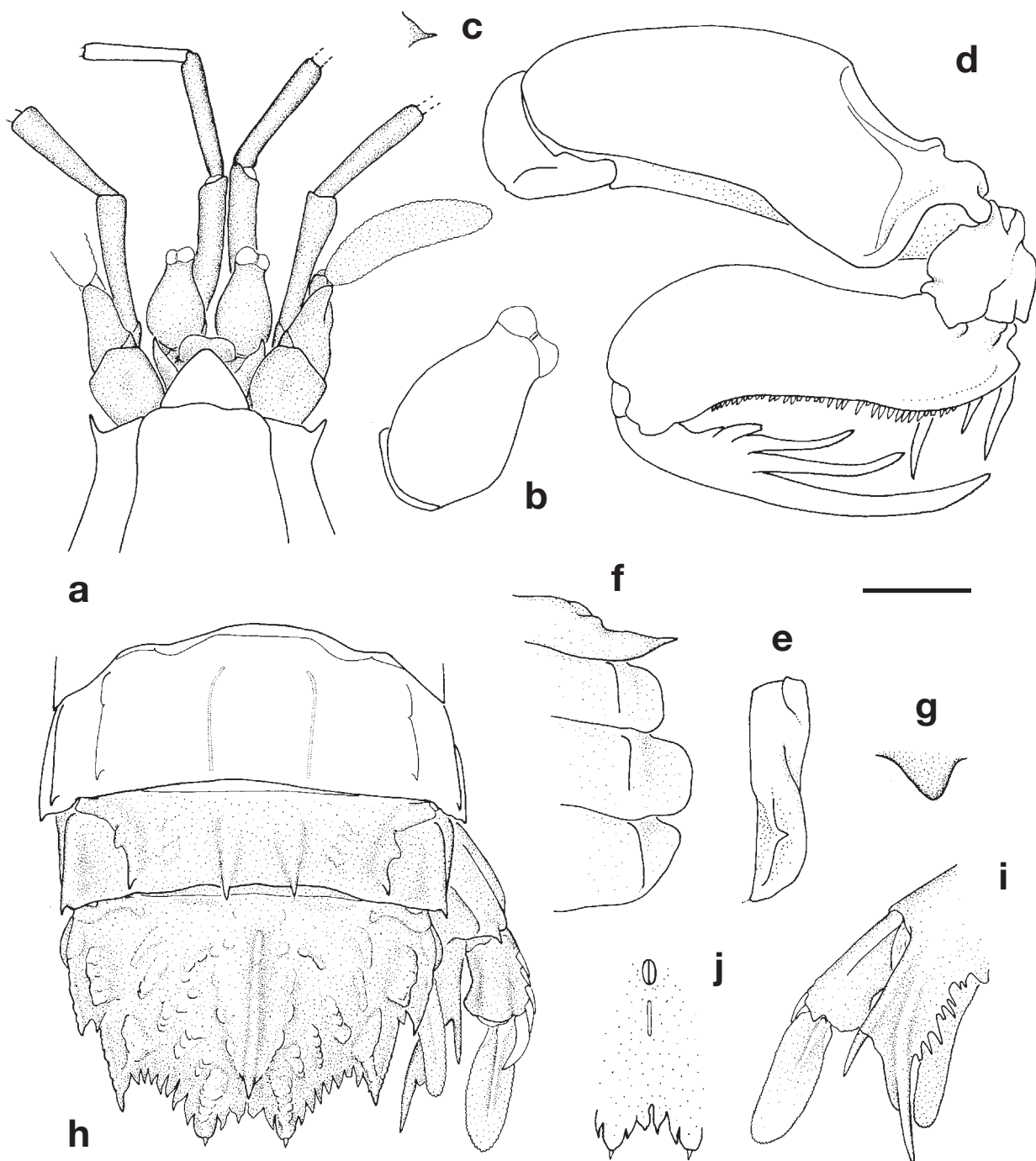


Fig. 65. Male, TL 41 mm, Siangshan, Hsinchu City, 10 Feb 1965: **a**, anterior cephalothorax; **b**, right eye; **c**, right dorsal process of antennular somite, lateral; **d**, right raptorial claw; **e**, TS5, right lateral; **f**, TS5-8 lateral processes; **g**, TS8 sternal keel; **h**, AS5-6, telson and uropod; **i**, right uropod, ventral; **j**, postanal carina. Scale: a, c-f, h-j = 3.0 mm; b, g = 1.5 mm.

Clorida microphthalma.— Lee & Wu, 1966: 44–45, fig. 3A–C.— Liu & Wang, 1999: 578.— Wang & Liu, 2004: 600 [Taiwan; not *C. microphthalma* H. Milne Edwards, 1837].

Clorida japonica Manning, 1978b: 25–26, fig. 12 [type locality: Sanuki, Shikoku, Japan].— Ahyong & Naiyanetr, 2000: 320–322, fig. 3.

Material examined.— Dasi fishing port, Yilan County, 22 Nov 1985: 1 female (TL 51 mm) (TMCS-0015). Siangshan, Hsinchu City, 10 Feb 1965: 1 male (41 mm) (ASIZ 53469).

Diagnosis.— Carapace with anterolateral spines. Mandibular palp present. Raptorial claw dactylus with 5 teeth, first tooth minute; dactylus outer margin without basal notch. TS5 lateral process forming a slender, laterally directed spine; without ventral spine. Lateral processes of TS6–7 rounded, unarmed. TS6–8 and AS1–3 without submedian carinae. AS4–5 with faint indication of submedian carinae. Telson with short postanal carina, without carinae flanking postanal carina.

Diagnosis.— Dorsal processes of antennular somite with acute apices. Rostral plate broader than or about as broad as long. TS5 lateral process a slender, laterally directed spine. Uropodal protopod with one rounded lobe on outer margin of inner spine.

Size.— To 51 mm TL (Ahyong, 2001).

Coloration.— Not known.

Habitat.— Sand and mud substrates.

Distribution.— Japan and now from Taiwan.

Remarks.— *Clorida japonica* was previously known only from the holotype from Japan, so the present specimens are the first to be recorded since the species was first described (Manning, 1978b). The Taiwanese specimens seemingly differ from holotype in having a more slender apex of the lateral process of TS5 — close inspection of the male holotype of *C. japonica* (ZMH 7353, TL 44 mm, Japan), however, revealed that the apices are slightly damaged.

Of the known Taiwanese stomatopods, *C. japonica* most closely resembles *C. albolitura* in the acute lateral process of TS5, presence of the mandibular palp, unarmed posterolateral margins of TS6–7. *Clorida japonica* is readily distinguished from *C. albolitura* by the absence of submedian carinae on AS1–3 and in lacking the basal notch on the outer margin of the dactylus of the raptorial claw. Previous records of *C. microphthalma* from Taiwan (Lee & Wu, 1966; Wang & Liu, 2004) appear to be based on *C. japonica*.

Clorida rotundicauda (Miers, 1880)



Fig. 66. Shengang, Changhua County, 1998.

Chloridella rotundicauda Miers, 1880: 3, 15, pl. 2: figs. 5, 6 [type locality: Formosa (= Taiwan)].—Schmitt, 1931: 130, pl. 16 figs 3–5.

Squilla rotundicauda.—Kemp, 1913: 33, 34.—Fukuda, 1913: 72.—Komai, 1927: 309.

Clorida rotundicauda.—Manning, 1979: 394–396, fig. 1.—Dong *et al.*, 1983: 84, pl. 1: fig. 1.—Liu & Wang, 1999: 578.—Moosa, 2000: 439.—Ahyong, 2001: 217.—Ahyong & Naiyanetr, 2002: 293.—Wang & Liu, 2004: 600.

Material examined.—No specific locality: female holotype (TL 70 mm, from Formosa) (NHM 1858.162).—15 Oct 1965: 1 female (TL 62 mm) (ASIZ 53820).

Diagnosis.—Carapace usually without anterolateral spines. Mandibular palp present. TS5 lateral process blunt. Lateral processes of TS6–7 rounded posterolaterally. Telson dorsal tubercles low, blunt, widely separated; apices on intermediate and lateral teeth blunt, obtuse; postanal carina absent. Uropodal exopod proximal segment with 3–5 movable spines on outer margin.

Size.—To 70 mm (Miers, 1880).

Coloration.—Body dull greenish-gray; posterior margins of somites blackish; telson carinae dark green.

Habitat.—Burrows in mud flats, often associated with mangroves; also in association with the thalassinidean shrimp, *Austinogebia edulis* (Ngoc-Ho & Chan, 1992).

Distribution.—Andaman Sea to Singapore, Peninsular Malaysia, China and Taiwan.

Remarks.—*Clorida rotundicauda* was described from Taiwan by Miers (1880), but poorly figured. The holotype is figured here. *Clorida rotundicauda* is the only species of the genus known to exhibit variation in the

anterolateral spination of the carapace (based on Singaporean and Thai specimens). The anterolateral carapace margin is usually unarmed, but when present, the anterolateral spines are minute.

Only two specimens of *C. rotundicauda* from Taiwan were available for study, both reported here. A third specimen, apparently a male (TL ca. 53 mm), known only from the photograph, is identifiable with *C. rotundicauda*, based on the eye, thorax and telson morphology. Notably, the photographed specimen was collected from Shengang, Changhua County, western Taiwan in 1998, from a mudflat burrow of the thalassinidean, *Austinogebia edulis* (Ngoc-Ho & Chan, 2002). Stomatopods are known to share their burrows with various other taxa (e.g., alpheid shrimp [Froggia & Atkinson, 1998; Hayashi, 2002], *Balanoglossus* and polynoid worms [Kemp, 1915], and lamellibranch molluscs [Popham, 1939]), but this record is the first known association of a stomatopod and thalassinidean. Very few specimens of *C. rotundicauda* are known from Taiwan, but additional specimens will probably be discovered when intertidal and shallow subtidal mudflat and mangrove habitats are studied more closely.

Clorida choprai (Tweedie, 1934), described from Singapore, is usually regarded as a synonym of *C. rotundicauda* (see Manning, 1979), although the Taiwanese specimens subtly differ from Singaporean and Thai specimens (Ahyong, unpublished). Further study may show the two nominal species to be distinct.

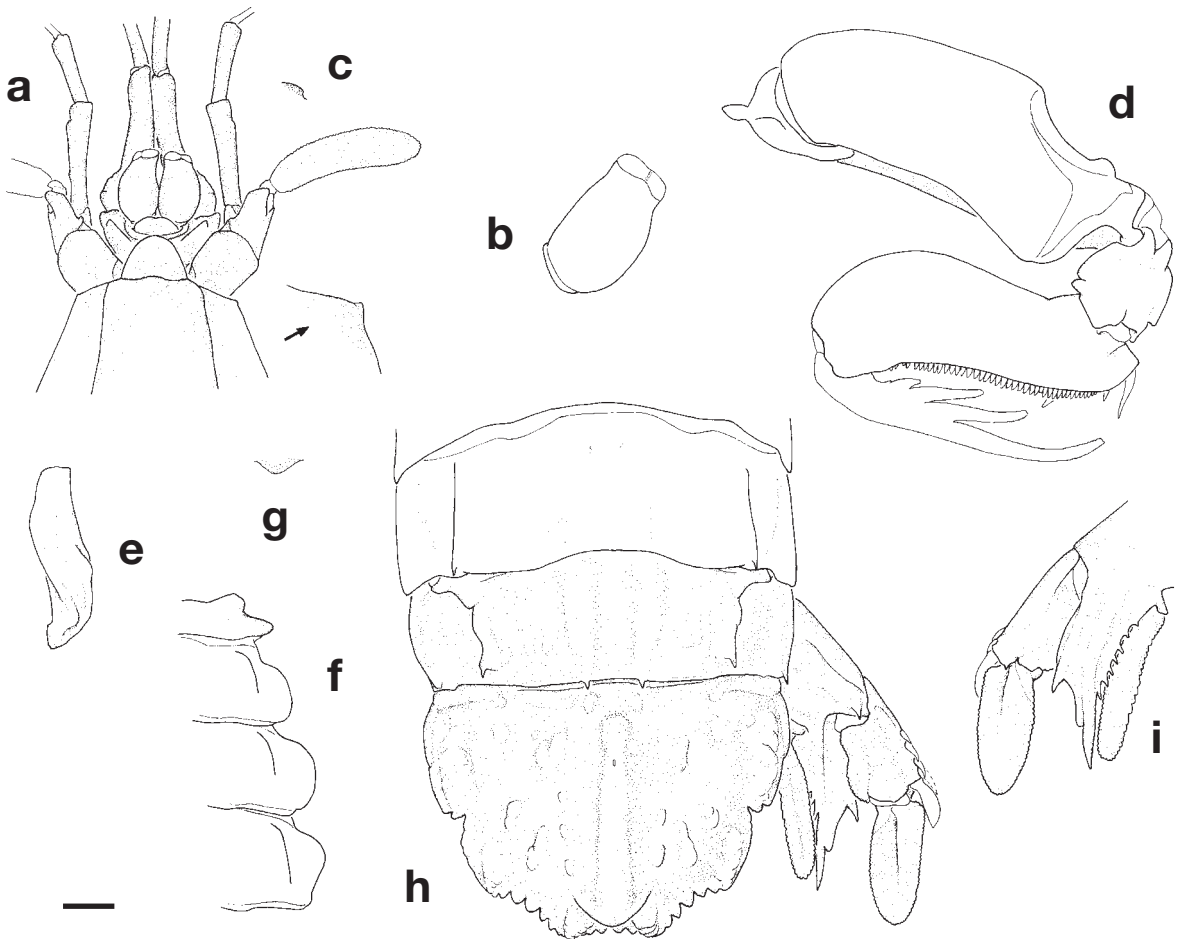


Fig. 67. Female holotype, TL 70 mm, Formosa, no specific locality: **a**, anterior cephalothorax; **b**, right eye; **c**, right dorsal process of antennular somite, lateral; **d**, right raptorial claw; **e**, TS5, right lateral; **f**, TS5–8 lateral processes; **g**, TS8 sternal keel; **h**, AS5–6, telson and uropod; **i** right uropod, ventral. Scale: a, c–i = 2.0 mm; b = 1.0 mm.

Genus *Cloridina* Manning, 1995

Cloridina Manning, 1995: 191. Type species *Squilla microphthalmia* H. Milne Edwards, 1837 (a junior subjective synonym of *Cloridina ichneumon* (Fabricius, 1798)), by original designation. Gender feminine.

Diagnosis. Eye small, pyriform, cornea bilobed, as wide as stalk; stalk short, inflated laterally, mesially curved. Ocular scales fused. Carapace with anterolateral spines; without median and intermediate carinae; with reflected marginal and reduced lateral carinae, distinct posteriorly only; posterolateral margin rounded. Raptorial claw dactylus with 4 or 5 teeth; carpus dorsal carina undivided; merus without outer inferodistal spine. Mandibular palp present. Maxillipeds 1–4 with epipod. TS5–7 lateral processes single. AS4–5 with or without submedian carinae. Telson dorsolateral surface with supplementary tubercles; submedian teeth usually with articulated apices. Inner margin of uropodal protopod lined with spines.

Remarks. Nine species of *Cloridina* are presently known (Ahyong, 2001, 2004), of which one species is known from Taiwan. This represents the first record of the genus from Taiwan.

Cloridina verrucosa (Hansen, 1926)



Fig. 68. Male, Donggang fishing port, Pingtung County, 15 Nov 1991.

Squilla verrucosa Hansen, 1926: 3, pl. 1: figs. 1a–d [type locality: Lesser Sunda Ids., Indonesia, 8°27'S, 122°54.5'E, by lectotype selection (Manning, 1976)].

Squilla merguiensis Tiwari & Biswas, 1952: 350, fig. 1a [type locality: 6.4 km N of Kabusa Id., Mergui Archipelago, Andaman Sea].

Clorida merguiensis.— Manning, 1976: 8–10, fig. 4.

Clorida verrucosa.— Manning, 1976: 10–13, fig. 5; 1991: 10, figs. 10, 11.

Cloridina verrucosa.— Manning, 1995: 195, figs. 24, 120.— Ahyong, 2001: 231, 239–241, fig. 118.

Material.— Donggang fishing port, Pingtung County, 15 Nov 1991: 1 male (from photograph with specimen not located).

Diagnosis.— Eyestalk with distinct constriction behind cornea. Ocular scales fused. Dorsal processes of A1 somite with spiniform apices, directed anteriorly. Rostral plate longer than wide. Raptorial claw dactylus with 5 teeth; outer margin with proximal notch. TS5 lateral process a short, anteriorly recurved spine; ventral spine short. TS6–7 lateral processes broadly rounded. AS1–2 without submedian carinae. AS3–5 submedian carinae indistinct or absent. Telson dorsolateral surface with accessory median carina composed of acute tubercles and curved rows of closely spaced acute tubercles; ventral surface with long postanal carina, not flanked by carinae or tubercles. Uropodal protopod with one rounded lobe between terminal spines. Uropodal exopod proximal segment unarmed dorsally.

Size.— To TL 45 mm (Ahyong, 2001).

Coloration.— Overall, evenly speckled with small brown-green chromatophores. Intermediate and lateral

carinae of abdomen light brown. Telson primary teeth light brown. Raptorial claw dactylus and propodus of white; merus mottled brown-green. Pereopods and uropods translucent white. Uropodal exopod with inner distal half of proximal segment, and inner half of distal segment diffuse black.

Habitat.— Muddy or shelly sand at depths of 23–123 m (Ahyong, 2001).

Distribution.— Andaman Sea to Australia, Indonesia, Malaysia, the Gulf of Thailand, Vietnam, the Philippines, Taiwan and New Caledonia.

Remarks.— *Cloridina verrucosa* is recorded for the first time from Taiwan. Although the photographed specimen could not be located at the time of writing, the image clearly depicts *C. verrucosa*. Taxonomic characters from an Australian specimen are illustrated to assist identification.

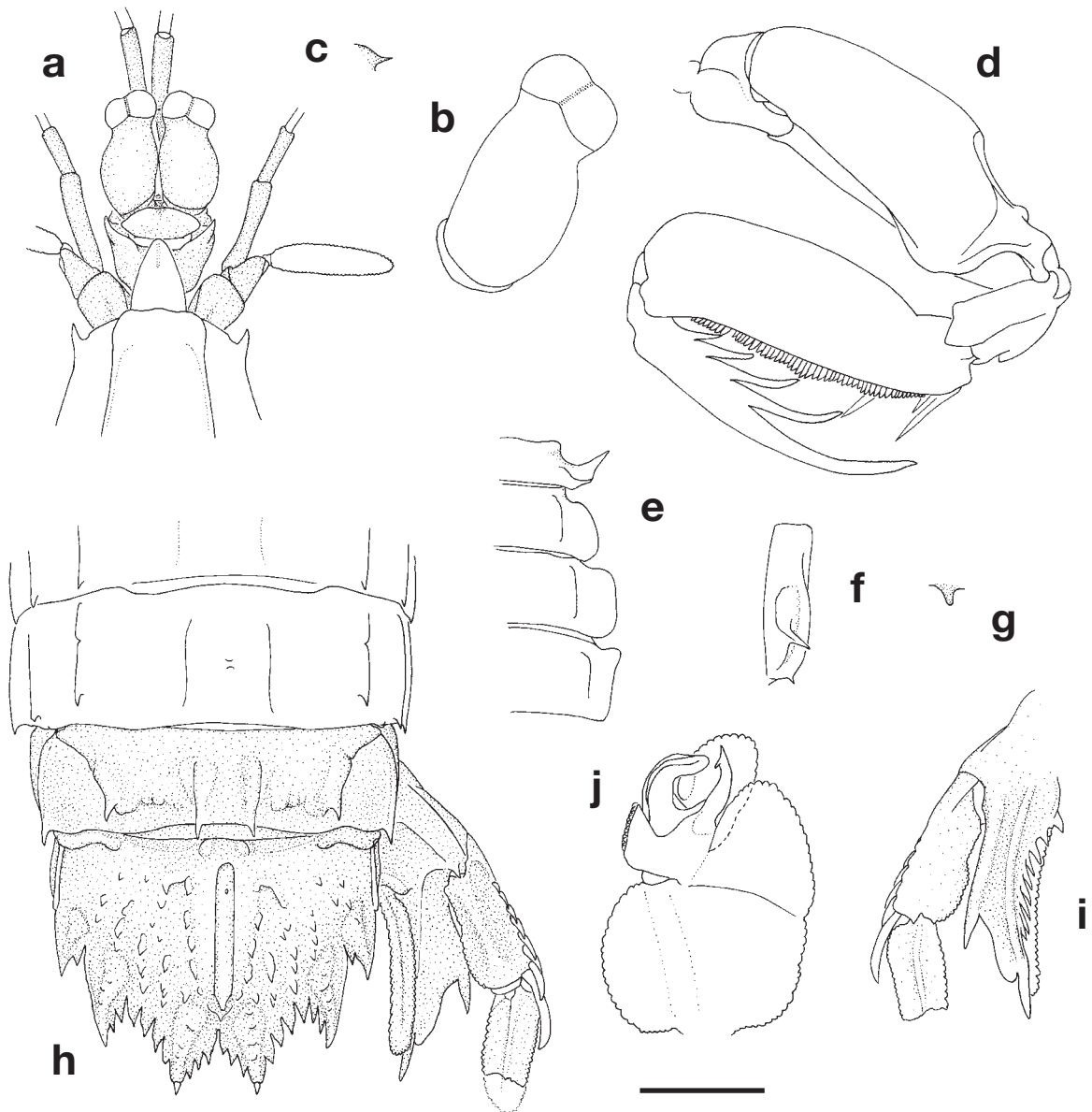


Fig. 69. Male, TL 29 mm, Arafura Sea, Australia, 15 Nov 1991: **a**, anterior cephalothorax; **b**, right eye; **c**, right dorsal process of antennular somite, lateral; **d**, right raptorial claw; **e**, TS5–8 lateral processes; **f**, TS5, right lateral; **g**, TS8 sternal keel; **h**, AS5–6, telson and uropod; **i**, right uropod, ventral; **j**, right pleopod 1 endopod, anterior view. Scale: a, c–i = 2.5 mm, j = 1.2 mm. (After Ahyong, 2001: fig. 118).

Genus *Cloridopsis* Manning, 1968c

Cloridopsis Manning, 1968c: 120, 128. Type species *Squilla scorpio* Latreille, 1828, by original designation.

Gender masculine.

Diagnosis.— Eye small, elongate, cornea bilobed, usually broader than and set slightly obliquely on stalk. Carapace with anterolateral spines; median carina with anterior bifurcation absent; posterolateral margin rounded. Raptorial claw dactylus with 5 or 6 teeth; carpus dorsal carina undivided; merus without outer inferodistal spine. Mandibular palp present or absent. Maxiilipeds 1–2 or 3 with epipod. TS6–8 with submedian carinae. TS5 lateral process a single broad spine recurved anteriorly or anterolaterally; ventral spine stout; directed ventrally. TS6–7 lateral process single, broadly rounded. AS1–6 with submedian carinae. Telson submedian teeth with minute, articulated apices; prelateral lobe present; dorsolateral surface without pits or supplementary longitudinal carinae; ventral surface without postanal carina. Uropodal protopod inner margin crenulate.

Remarks.— *Cloridopsis* includes six species, of which five occur in the Indo-West Pacific and one in the Western Atlantic and Eastern Pacific regions. One species of *Cloridopsis* is known from Taiwan. Species of *Cloridopsis* generally favour estuarine habitats, especially mudflats associated with mangroves.

Cloridopsis scorpio (Latreille, 1828)

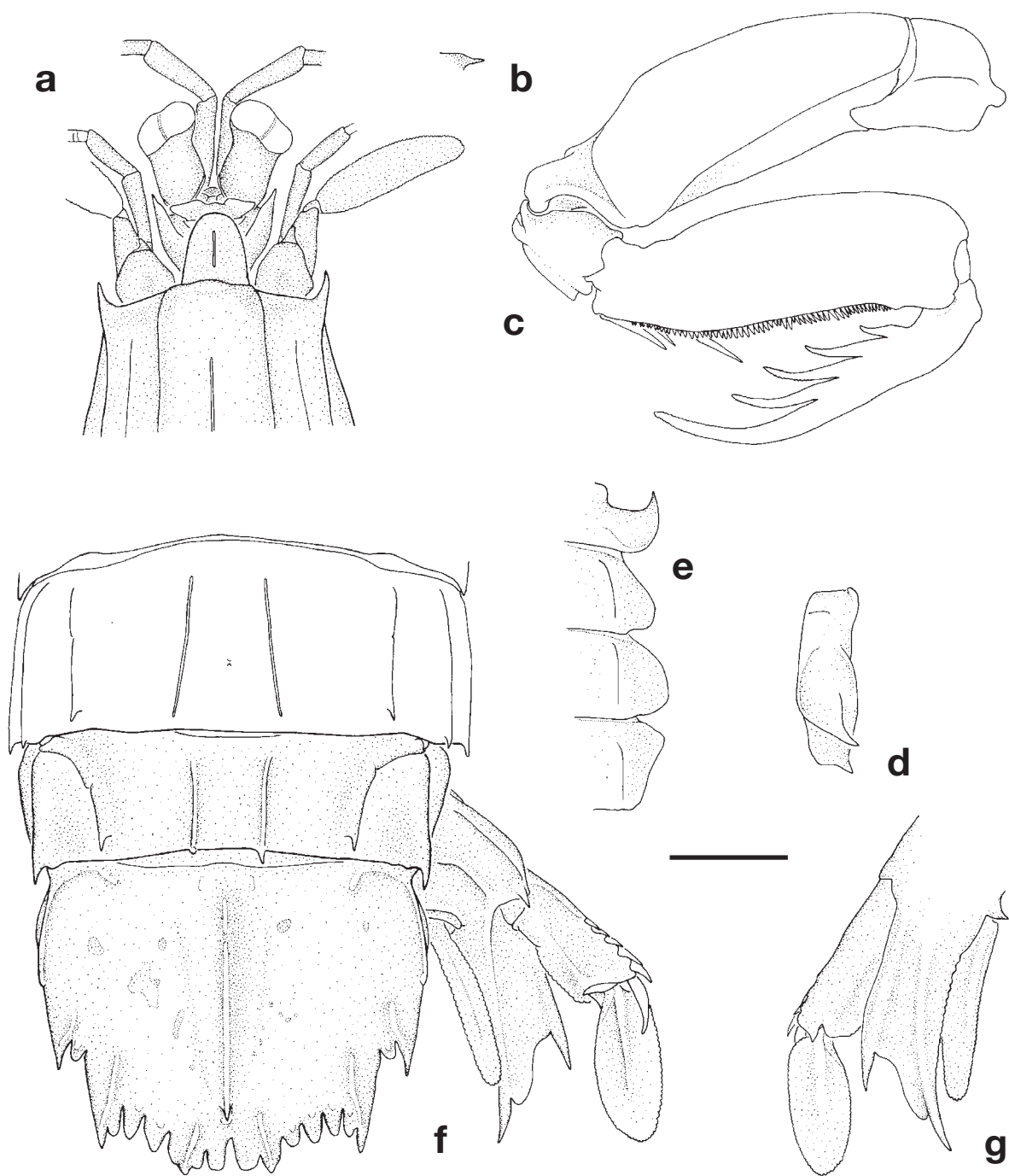


Fig. 70. Female, TL 52 mm, Jiangyun River, Tainan County, 1 Apr 1965: **a**, anterior cephalothorax; **b**, right dorsal process of antennular somite, lateral; **c**, right raptorial claw; **d**, TS5, right lateral; **e**, TS5–8 lateral processes; **f**, AS5–6, telson and uropod; **g**, right uropod, ventral. Scale = 3.0 mm.

Squilla scorpio Latreille, 1828: 472 [type locality: India].— Lee & Wu, 1966: 48.

Cloridopsis aquilonaris Manning, 1978b: 28–30, fig. 14 [type locality: Japan].— Liu & Wang, 1999: 578.

Cloridopsis scorpio.— Ahyong *et al.*, 1999: 42–46, fig. 4a–k.— Liu & Wang, 1999: 578.

Material examined.— Chiang-Chun River estuary (? = Jiangjyun River, Tainan County), 1 Apr 1965: 1 female (TL 52 mm) (ASIZ 53467). No specific locality: 1 male (TL 90 mm) (TMCS-0076).

Diagnosis.— Cornea broader than stalk. Dactylus of raptorial claw with 5 teeth. Mandibular palp absent. TS5 lateral process with black patch.

Size.— To 90 mm TL.

Coloration.— Overall light gray-brown; dorsal carinae orange-red. TS5 with black patch at base of lateral process.

Habitat.— Intertidal and shallow subtidal estuarine habitats.

Distribution.— Western Indian Ocean to Indonesia, Singapore, Malaysia, China, Taiwan and Japan.

Remarks.— *Cloridopsis scorpio* is readily recognized by the combination of five teeth on the dactylus of the raptorial claw, singular lateral process of TS5 with a black dorsal patch, and the absence of the mandibular palp. *Cloridopsis scorpio* was shown by Ahyong *et al.* (1999) to be a senior synonym of *C. aquilonaris* Manning, 1978.

Although *C. scorpio* is generally common throughout its range, only two specimens are known from Taiwan. Like *Clorida rotundicauda*, the paucity of records most likely represents limited sampling in shallow estuarine and mudflat habitats.

Genus *Erugosquilla* Manning, 1995

Erugosquilla Manning, 1995: 197. Type species *Squilla massavensis* Kossmann, 1880, by original designation.

Gender feminine.

Diagnosis.— Dorsal integument smooth, appearing polished. Eye large, cornea strongly bilobed, width less than 1/3 CL. Ophthalmic somite anterior margin usually with median spinule or point. Carapace anterior width exceeding half median length; with anterolateral spines; median carina low but distinct, interrupted at base of anterior bifurcation; branches of anterior bifurcation absent or faintly indicated, opening anterior to dorsal pit; posterolateral margin rounded. Raptorial claw dactylus with 6 or 7 teeth; carpus dorsal carina irregularly tuberculate. Mandibular palp present. Maxillipeds 1–4 with epipod. TS5–7 lateral process bilobed. AS1–6 with submedian carinae. Telson submedian teeth with fixed apices; prelateral lobe present; dorsolateral surface without supplementary longitudinal carinae. Uropodal protopod inner margin crenulate.

Remarks.— *Erugosquilla* Manning, 1995, includes six species, all from the Indo-West Pacific; three are known from Taiwan. Species of *Erugosquilla* have six teeth on the dactylus of the raptorial claw and live in shallow, near shore habitats, except for *E. septemdentata* Ahyong, 1994, which has seven teeth on the dactylus of the claw and is known only from depths exceeding 400 m (Ahyong, 1994).

Key to species of *Erugosquilla* from Taiwan

1. Merus of raptorial claw with outer inferodistal spine. Anterior margin of ophthalmic somite broadly rounded, usually with a median spinule *E. woodmasoni*
- Merus of raptorial claw without outer inferodistal spine. Anterior margin of ophthalmic somite trapezoidal usually with a median spinule 2
2. Telson prelateral lobe subequal to or longer than margin of lateral tooth in adults. AS1 with lateral carina unarmed posteriorly. Rostral plate broader than long. A1 peduncle banded with blue and yellow-orange in life *E. grahami*
- Telson prelateral lobe shorter than margin of lateral tooth in adults. AS1 with lateral carina armed posteriorly. Rostral plate as long as broad. A1 peduncle uniformly coloured in life *E. serenei*

Erugosquilla grabami Ah Yong & Manning, 1998



Fig. 71. Male, TL 82 mm, Donggang fishing port, Pingtung County, 1 Nov 1996.



Fig. 72. Tail fan, dorsal view. Male, TL 92 mm, Donggang fishing port, Pingtung County, 6 Jul 1996.

Erugosquilla grahmi Ah Yong & Manning 1998: 653–658, 660–661, figs 1, 2, 3A [type locality: off Patonga, New South Wales, Australia, 32°34'S, 151°17'E].— Ah Yong, 2001: 249–251, fig. 122.

Erugosquilla hesperia.— Liu & Wang, 1999: 578 [misspelling; not *E. hesperia* (Manning, 1968b)].

Material examined.— Wuci fishing port, Taichung County, 6 Jul 1996: 1 male (TL 92 mm) (NIWA). Donggang fishing port, Pingtung County, 1 Nov 1996: 2 males (TL 82–94 mm) (NTOU).

Diagnosis.— Ophthalmic somite anterior margin trapezoidal with median spinule. Rostral plate broader than long; trapezoid; lateral margins straight. Raptorial claw dactylus with 6 teeth; merus outer inferodistal angle at most a blunt angle. Lateral carina of AS1 without posterior spine. Telson with lateral margins of median carina flanked by pitted groove, with raised irregular margins; prelateral lobe subequal to (in smallest specimens) or longer than margin of lateral tooth.

Size.— To 177 mm (Ah Yong, 2001).

Coloration.— A1 peduncle with blue and yellow bands. Overall dorsal colour pale gray-green. Margin of rostral plate, dorsal carinae and gastric grooves of carapace, posterior margin of carapace and thoracic somites. Submedian carinae of abdomen and thorax red. AS2–5 with dark, rectangular median patch.

Habitat.— Sandy or sandy-mud substrates in shallow coastal embayments or protected waters to a depth of 66 m.

Distribution.— Australia, Philippines and Taiwan (Ah Yong, 2004).

Remarks.— *Erugosquilla grahmi* was fully treated by Ah Yong & Manning (1998) and Ah Yong (2001), with which the present specimens are in good agreement. The CI of Taiwanese specimens is 315–389, and the anterior lobe of the TS7 lateral process ranges round angular to blunt. Abdominal spination is as follows: submedian 5–6, intermediate 3–6, lateral (2)3–6, marginal 1–5.

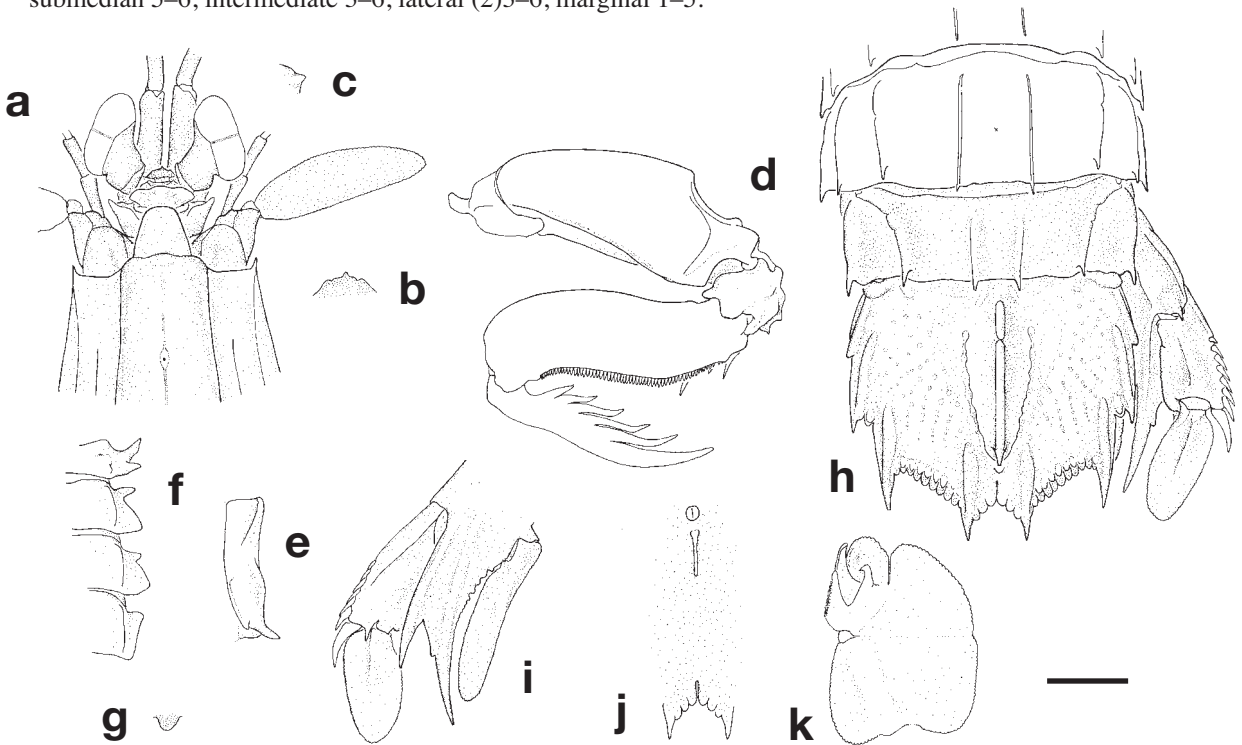


Fig. 73. Male, TL 92 mm, Wuci fishing port, Taichung County, 6 Jul 1996: **a**, anterior cephalothorax; **b**, anterior margin of ophthalmic somite; **c**, right dorsal process of antennular somite, lateral view; **d**, right raptorial claw; **e**, TS5, right lateral; **f**, right TS5–8 lateral processes; **g**, TS8 sternal keel; **h**, AS5–6, telson and uropod; **i**, right uropod, ventral; **j**, postanal carina; **k**, right pleopod 1 endopod, anterior view. Scale: a, c–j = 5.0 mm; b, k = 2.5 mm.

Erugosquilla serenei Ahyong & Manning, 1998

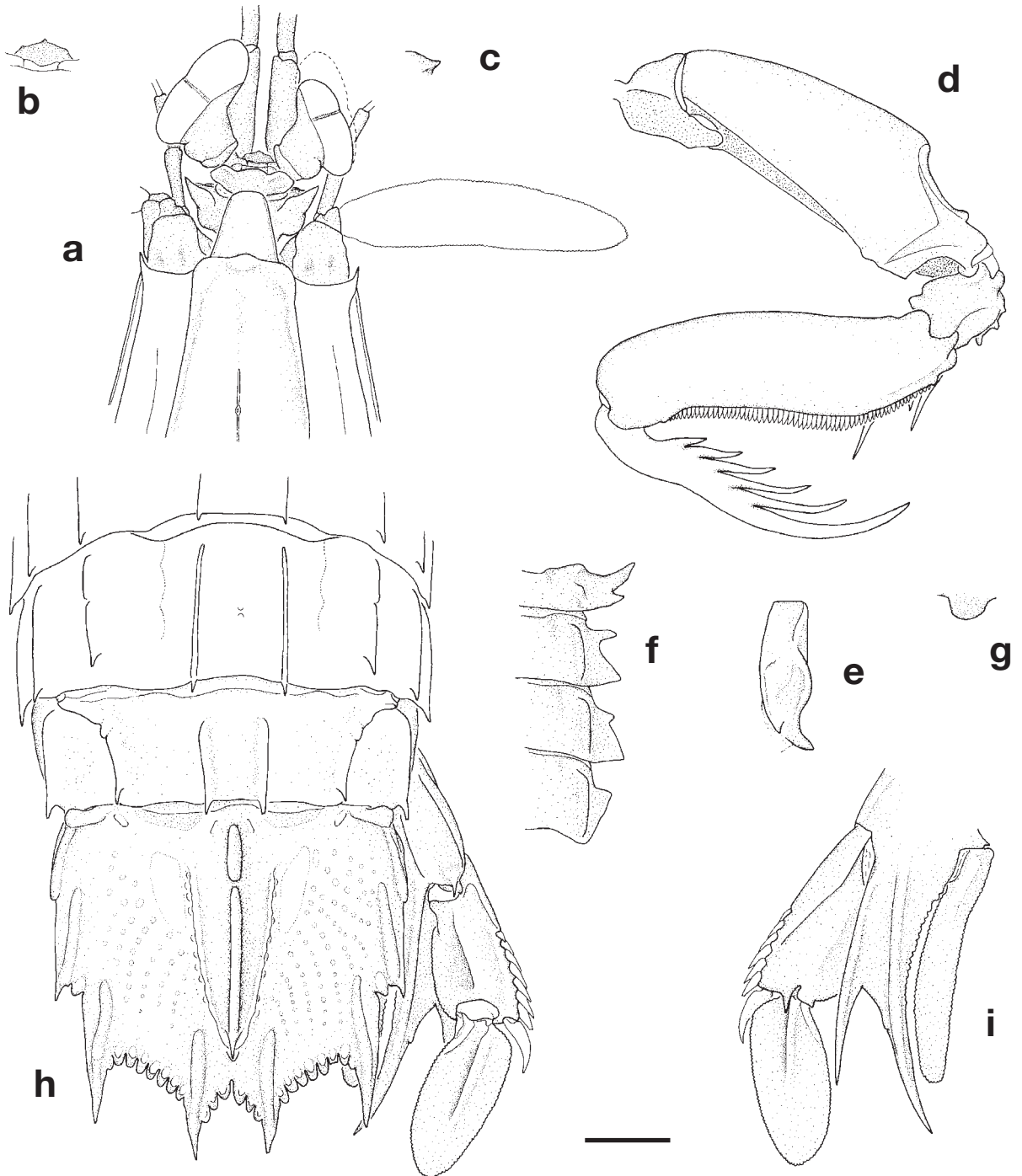


Fig. 74. Female, TL 118 mm, Nanfang-ao fishing port, Yilan County, no date: **a**, anterior cephalothorax; **b**, anterior margin of ophthalmic somite; **c**, right dorsal process of antennular somite, lateral view; **d**, right raptorial claw; **e**, TS5, right lateral; **f**, right TS5-8 lateral processes; **g**, TS8 sternal keel; **h**, AS5-6, telson and uropod; **i**, right uropod, ventral. Scale: a, c-i = 5.0 mm; b = 2.5 mm.

Squilla massavensis.— Serène, 1954: 6, 8, 54, 60–62, 87, pl. 3, figs. 5–8 [not *S. massavensis* Kossman, 1880].
Erugosquilla hesperia.— Manning, 1995: 198–200, figs. 121, 122, 123a, 136n, pl. 35.— Ďuriš, 2007: 127 [not *E. hesperia* (Manning, 1968b)].
Erugosquilla serenei Ahyong & Manning, 1998: 658–661, fig. 4 [type locality: Nhatrang Bay, Vietnam].— Ahyong, 2001: 249.

Material examined.— Nanfang-ao fishing port, Yilan County, no date: 1 female (TL 118 mm) (ZRC 1999.2098).

Diagnosis.— Ophthalmic somite anterior margin trapezoid. A1 peduncle uniformly coloured in life. Rostral plate as long as broad, trapezoidal; lateral margins straight. Raptorial claw dactylus with 6 teeth; merus outer inferodistal angle at most a blunt angle. Lateral carina of AS1 with posterior spine. Telson median carina lateral margins flanked by pitted groove, with raised irregular margins; prelateral lobe shorter than margin of lateral tooth.

Size.— To 142 mm (Ahyong & Manning, 1998).

Coloration.— A1 peduncle uniformly coloured. Overall light tan-brown. Thoracic and abdominal submedian carina red. Telson surface maroon; carinae redish. Uropodal exopod with blue central portion.

Habitat.— Soft substrates; shallow subtidal; 15–25 m.

Distribution.— Vietnam and now from Taiwan.

Remarks.— *Erugosquilla serenei* Ahyong & Manning, 1998, resembles *E. grahami* Ahyong & Manning, 1998, and differs from *E. woodmasoni* (Kemp, 1911) in having a trapezoid instead of rounded anterior margin of the ophthalmic somite, and an unarmed outer inferodistal margin of the raptorial claw. *Erugosquilla serenei* can be readily distinguished from *E. grahami* by the uniformly coloured instead of banded antennular peduncle, armed intermediate carina of AS1 and rostral plate length, being as long as wide rather than wider than long.

The single specimen known from Taiwan agrees well with the type material from Vietnam and is the first to be recorded outside of the type locality. Records of *Squilla massavensis* Kossman, 1880 (see Serène, 1954) and *Erugosquilla hesperia* (Manning, 1968) (see Manning, 1995; Ďuriš, 2007) from Vietnam are referable to *E. serenei*. Abdominal spination of the present specimen is as follows: submedian 4–6, intermediate 3–6, lateral 1–6, marginal 1–5; CI 315–389.

Erugosquilla woodmasoni (Kemp, 1911)

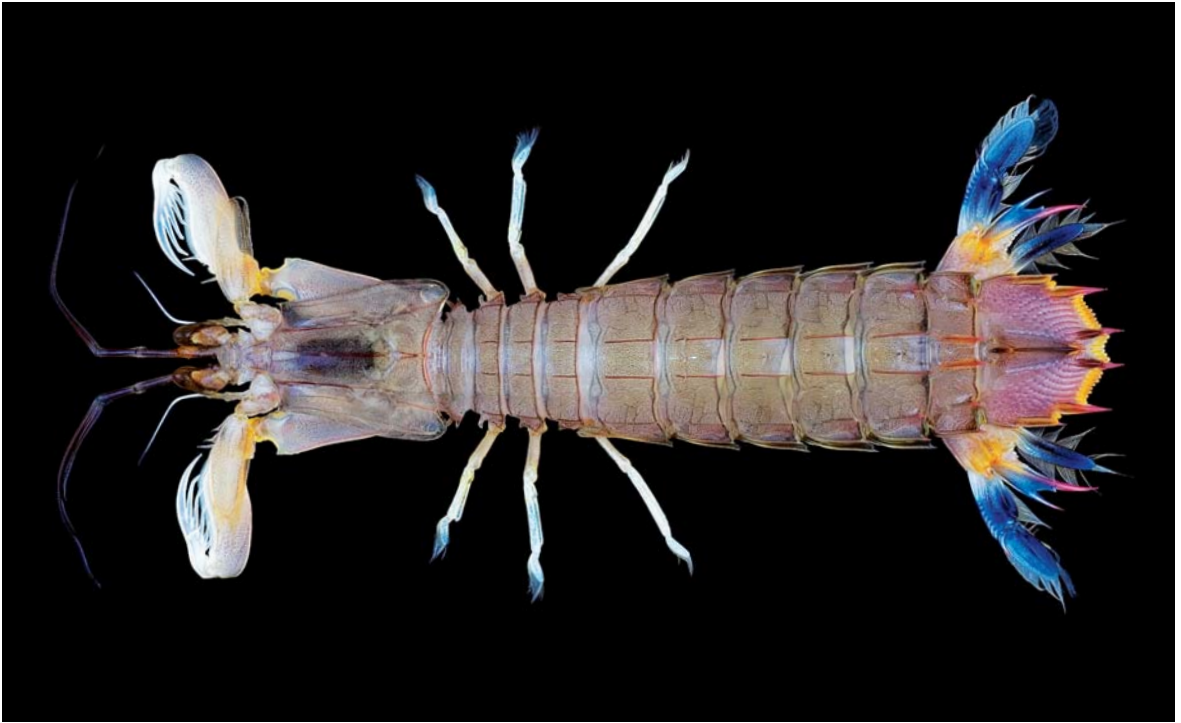


Fig. 75. Female, TL 97 mm, Dasi fishing port, Yilan County, 8 Jan 2008.



Fig. 76. Male, TL 89 mm, Donggang fishing port, Pingtung County, 1 Nov 1996, abdomen with black patches.

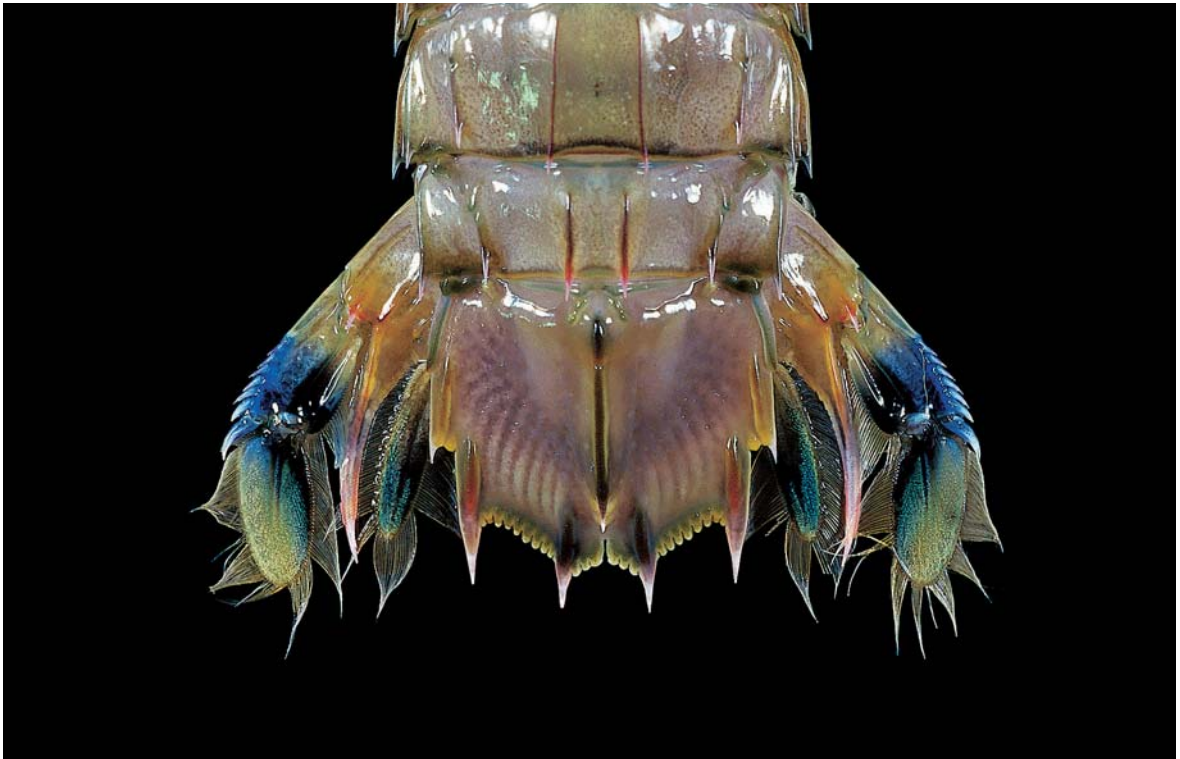


Fig. 77. Tail fan, dorsal view. Male, TL 117 mm, Jhongjhou, Kaohsiung 3 Dec 1995.

Squilla wood-masoni Kemp, 1911: 99; 1913: 74–76, pl. V: figs. 63–65 [type locality: Madras, India, by present lectotype designation].— Komai, 1914: 463, pl. 6: figs 5, 5a; 1927: 320, 344, 346.

Chloridella wood-masoni.— Schmitt, 1931: 147.

Oratosquilla tweediei Manning, 1971b: 11–14, fig. 4 [type locality: Singapore].

Oratosquilla jakartensis Moosa, 1975: 13–17, fig. 1 [type locality: Jakarta Bay, Indonesia].

Oratosquilla woodmasoni.— Dong *et al.*, 1983: 89, pl. 3: figs. 3–4.

Erugosquilla woodmasoni.— Manning, 1995: 203.— Liu & Wang, 1999: 578— Ahyong, 2001: 251–253, fig. 123.— Ahyong & Naiyanetr, 2002: 296.

Material examined.— Dasi fishing port, Yilan County, 3 Aug 1996: 1 female (TL 126 mm) (NTOU).— 4 Aug 1996: 1 male (TL 121 mm), 2 females (TL 122–128 mm) (NTOU).— 24 Sep 1996: 1 female (TL 69 mm) (NTOU), 2 males (TL 64–73 mm) (NIWA).— 5 Nov 1996: 2 females (TL 91 mm) (NTOU).— 3 Dec 1996: 10 males (TL 61–94 mm), 7 females (TL 67–90 mm) (NTOU).— 8 Jan 2008: 2 females (TL 80–97 mm) (NTOU).— 7 Mar 2008: 2 males (TL 85–96 mm), 5 females (TL 76–98 mm) (NIWA). Nanfang-ao fishing port, Yilan County, 5 Oct 1995: 1 male (TL 73 mm), 1 female (TL 105 mm) (NTOU). Wuci fishing port, Taichung County, 4 Nov 1995: 2 males (TL 108–133 mm), 2 females (TL 104–123 mm) (NTOU).— 16 Dec 1995: 4 males (TL 105–126 mm), 1 female (TL 108 mm) (NTOU).— 6 Jul 1996: 2 males (TL 123–140 mm) (NIWA).— 28 Jul 1996: 1 female (TL 75 mm) (NTOU).— 26 Nov 1996: 2 males (TL 93–117 mm) (NTOU). Jhongjhou, Kaohsiung City, Nov 1986: 1 female (TL 109 mm) (TMCS-0114).— 3 Dec 1995: 1 male (TL 117 mm), 1 female (TL 92 mm) (NTOU), 1 male (TL 110 mm), 2 females (TL 104–130 mm) (NIWA). Singda Harbor, Kaohsiung County, 9 Aug 1995: 1 male (TL 109 mm) (NIWA).— no date: 1 male (TL 109 mm) (NTOU). Donggang fishing port, Pingtung County, 21 Oct 1995: 1 female (TL 110 mm) (NTOU).— 5 Aug 1996: 1 male

(TL 102 mm) (NTOU).— 1 Nov 1996: 10 males (TL 72–112 mm), 6 females (TL 90–107 mm) (NTOU). Magong fishing port, Penghu County, Oct 1984: 1 male (TL 129 mm) (NTOU).— 16 Sep 1996: 2 males (TL 137–143 mm), 1 female (TL 135 mm) (NTOU). No specific locality: 1 male (TL 76 mm) (TMCS-0062).

Diagnosis.— Ophthalmic somite anterior margin broadly rounded, usually with median spinule. A1 somite dorsal processes with obtuse apices, directed anterolaterally. Rostral plate short, broader than long, subtrapezoid; lateral margins straight. Raptorial claw dactylus with 6 teeth; merus outer inferodistal angle produced into an acute point or spine. Telson median carina without rows of flanking tubercles; prelateral lobe length subequal to margin of lateral tooth.

Size.— To 153 mm TL (Ahyong, 2001).

Coloration.— Overall body colour is generally a uniform pale grey-green, but some specimens bear diffuse concentrations of chromatophores mid-dorsally on the abdominal somites giving a slightly mottled to somewhat banded appearance. Mid-lateral surface of telson maroon. Uropodal exopod blue; distal segment dark blue mesially, pale blue or clear laterally. A1 peduncle red-maroon.

Habitat.— Level sandy-mud substrates in shallow embayments or other sheltered coastal waters; intertidal to around 50 m.

Distribution.— Western Indian Ocean to Indonesia, Vietnam, the Philippines, Taiwan, Japan and Australia.

Remarks.— The specimens of *E. woodmasoni* agree well with recent accounts of the species, exhibiting the full range of variation reported by Manning (1978b) and Ahyong (2001). Abdominal spination in the present series is as follows: submedian (4)5–6, intermediate 3–6, lateral 2–6, marginal 1–5. The overall colour pattern of *E. woodmasoni* in Taiwan ranges from more or less evenly pigmented to having diffuse banding on the thoracic and abdominal somites. Differences in colour pattern correlate neither with morphological nor habitat differences. *Erugosquilla woodmasoni* was first reported from Taiwan by Komai (1914).

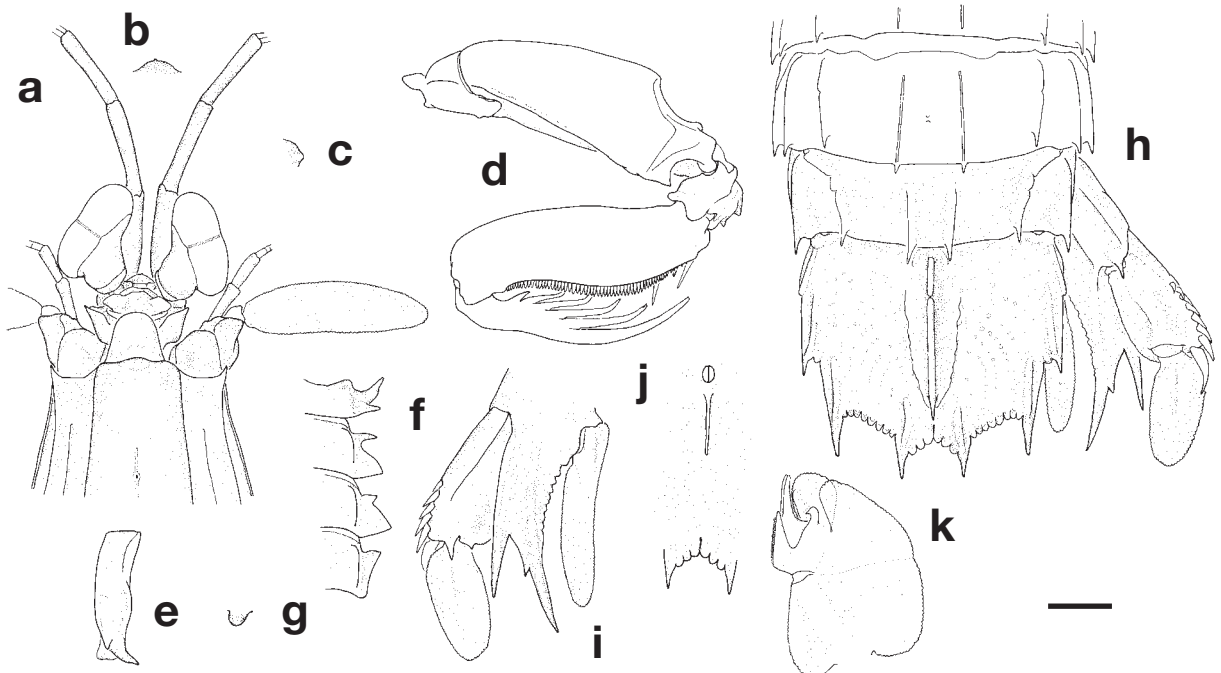


Fig. 78. Male, TL 71 mm, Dasi fishing port, Yilan County, 24 Sep 1996: **a**, anterior cephalothorax; **b**, anterior margin of ophthalmic somite; **c**, right dorsal process of antennular somite, lateral view; **d**, right raptorial claw; **e**, TS5, right lateral; **f**, right TS5–8 lateral processes; **g**, TS8 sternal keel; **h**, AS5–6, telson and uropod; **i**, right uropod, ventral; **j**, postanal carina. Male, TL 108 mm, Jhongjhou, Kaohsiung County (NIWA): **k**, right pleopod 1 endopod, anterior view. Scale = a, c–k = 3.0 mm; b = 1.5 mm.

Genus *Harpiosquilla* Holthuis, 1964

Harpiosquilla Holthuis, 1964: 140. Type species *Squilla harpax* de Haan, 1844, by original designation. Gender feminine.

Diagnosis.— Eye large, cornea width less than 1/3 CL, strongly bilobed, distinctly broader than and set transversely on stalk. Carapace with anterolateral spines; median carina interrupted, anterior bifurcation absent; posterolateral margin deeply excavate. Raptorial claw dactylus with 7–9 teeth; carpus dorsal carina absent; merus without outer inferodistal spine. Mandibular palp present. Maxillipeds 1–5 each with epipod. TS6–8 with intermediate and usually with submedian carinae. TS5 lateral process single; ventral process directed ventrally. TS6–7 lateral processes single or bilobed. AS1–5 usually with or without submedian carinae. Telson submedian teeth with fixed apices in adults; prelateral lobe present; dorsolateral surface without supplementary longitudinal carinae. Uropodal protopod inner margin crenulate.

Remarks.— Species of *Harpiosquilla* Holthuis, 1964, differ from all other squillids in bearing a series of fixed spines (rather than short pectinations) along the occlusal margin of the propodus of the raptorial claw and in having excavated rather than entire posterolateral margins of the carapace. On the basis of these features, Harpiosquillidae was recognized for *Harpiosquilla* by Manning (1980). Ahyong & Harling (2000) and Ahyong (2005b), however, showed that *Harpiosquilla* is deeply nested among other squillid genera, indicating that Harpiosquillidae is a synonym of Squillidae.

Hu & Tao (1996: plate 66, fig. 6) figured a fossil dactylus, apparently from the Miocene of Taiwan, identified as "*Squilla*?" The dactylus bears 8 teeth and conforms precisely to *Harpiosquilla*, possibly representing *H. harpax*, the most common species of the genus in the region. The known palaeontological record of *Harpiosquilla* was limited to a subfossil from Australia (Ahyong & Ebach, 1999), so the Taiwanese specimen, if correctly dated, is significant in extending the known fossil record of the genus into the Miocene.

Ahyong (2001) revised the majority of species of *Harpiosquilla*: four nominal species (*H. malagasiensis* Manning, 1978, *H. paradipa* Ghosh, 1987, *H. japonica* Manning, 1969, *H. intermedia* Manning & Michel, 1973) were synonymized with *H. harpax* (De Haan, 1844), and *H. philippina* Garcia, 1978, was suggested as a likely synonym of *H. indica* Manning, 1969 (Ahyong, 2001). In the present work, *H. japonica* is recognized as a valid species and *H. philippina* is synonymized with *H. indica*. Therefore, eight species are recognized in *Harpiosquilla* and six of them have been found in Taiwan.

Key to species of *Harpiosquilla*

1. Dactylus of raptorial claw with 7 teeth [Australia] *H. stephensoni*
- Dactylus of raptorial claw with 8 or 9 teeth 2
2. Carapace without median carina. Distal segment of uropodal exopod black *H. melanoura*
- Carapace with median carina. Distal segment of uropodal exopod at most black on inner half 3
3. TS7-8, usually 6-8, with intermediate carinae armed posteriorly 4
- TS6-8, with intermediate carinae unarmed posteriorly 6
4. Submedian carinae of AS5 armed posteriorly. Distal segment of uropodal exopod black with yellowish midline *H. annandalei*
- Submedian carinae of AS5 unarmed posteriorly. Distal segment of uropodal exopod black on inner half only or without black coloration 5
5. Rostral plate with sinuous lateral margins, forming slender apical projection. Distal segment of uropodal exopod dusky. Median carina of telson without pair of black 'ocelli' *H. raphidea*

- Rostral plate with convex, without slender apical projection. Distal segment of uropodal exopod black on inner half. Median carina of telson without pair of black 'ocelli' *H. sinensis*
- 6. Dactylus of raptorial claw with 8 teeth. TS6–8 with submedian carinae. 7
- Dactylus of raptorial claw with 9 teeth. TS6–8 without submedian carinae. *H. indica*
- 7. Rostral plate with convex margins, without slender apical projection. Antennal scale diffusely pigmented, without black anterior distal margin *H. japonica*
- Rostral plate with sinuous margin, usually with slender apical projection. Antennal scale with black anterior distal margin *H. harpax*

Harpiosquilla annandalei (Kemp, 1911)

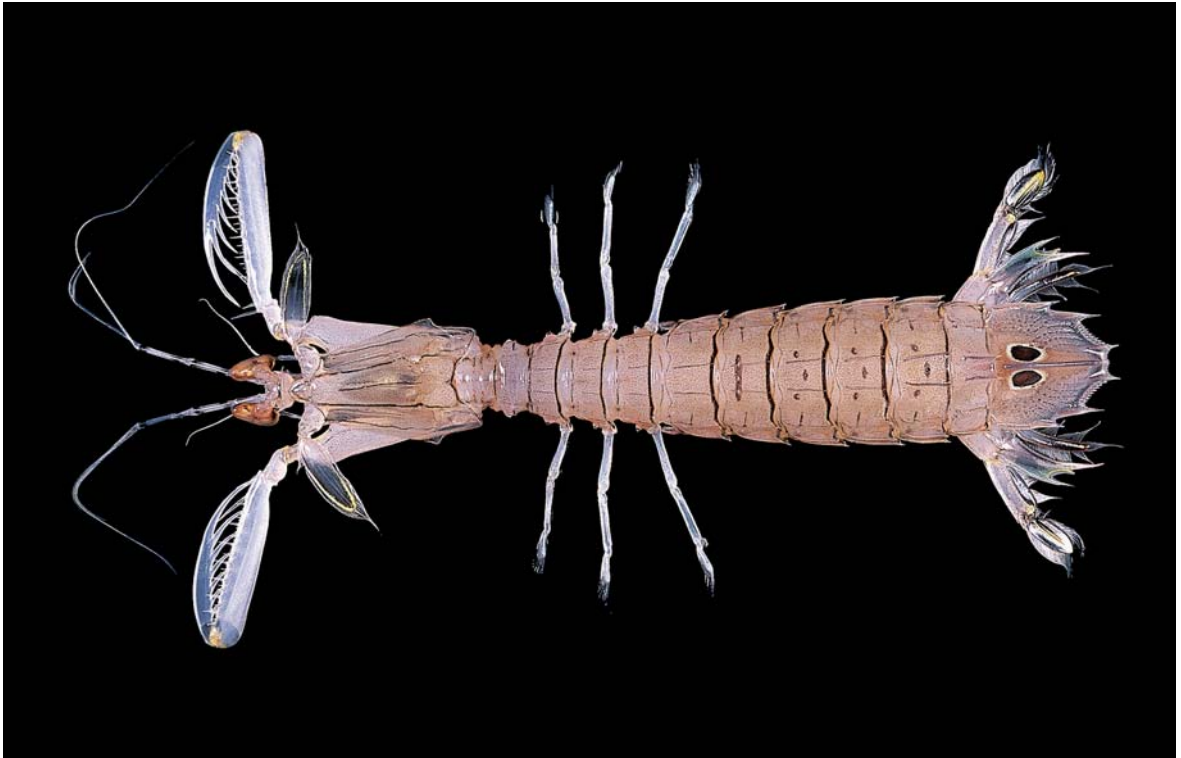


Fig. 79. Male, TL 115 mm, Nanfang-ao fishing port, Yilan County, 18 Nov 1997.



Fig. 80. Tail fan, dorsal view. Male, TL 115 mm, Nanfang-ao fishing port, Yilan County, 18 Nov 1997.

Squilla annandalei Kemp, 1911: 99 [type locality: Gulf of Martaban, Burma, 14°48'N, 95°52'E]; 1913: 3, 10, 24, 92, pl. 7, figs. 78–80.

Harpiosquilla annandalei.— Lee & Wu, 1966: 51, fig. 6A–B, tab. 2.— Manning, 1995: 153.— Ahyong *et al.*, 1998: 933–934, figs. 1h–j, 2c, d.— Liu & Wang, 1999: 577.— Ahyong, 2001: 257, fig. 125.— Ahyong & Naiyanetr, 2002: 297.

Material examined.— Dasi fishing port, Yilan County, 22 Nov 1985, 3 males (TL 80–120 mm) (TMCS-0009).— 28 Apr 1986: 2 males (TL 84–93 mm), 2 females (TL 105–120 mm) (TMCS-0047).— 16 Nov 1995: 2 males (TL 87–88 mm), 1 female (TL 97 mm) (NTOU).— 12 Dec 1995: 1 male (TL 85 mm), 1 female (TL 112 mm) (NTOU).— 3–4 Aug 1996: 2 males (TL 97–130 mm) (ZRC 1997.751).— 24 Sep 1996: 1 male (TL 70 mm) (NTOU).— 7 Oct 1996: 1 female (TL 88 mm) (NTOU).— 25 May 1998: 1 female (TL 91 mm) (NIWA).— May 1999: 1 male (TL 117 mm), 1 female (TL 114 mm) (ZRC 1999.0783).— 10 Apr 2000: 1 male (TL 114 mm) (ZRC 2002.0386). Nanfang-ao fishing port, Yilan County, 9 Nov 1995: 1 male (TL 115 mm) (NTOU).— 18 Nov 1997: 2 males (TL 105–109 mm) (NTOU). Wuci fishing port, Taichung County, 16 Dec 1995: 2 females (TL 124–133 mm) (NTOU). Jhongzhou fishing port, Kaohsiung City, 18 Mar 1988: 1 male (TL 105 mm) (TMCS-0101). Donggang fishing port, Pingtung County, 26 Jan 1994: 1 female (TL 70 mm) (NTOU).— 5 Aug 1995: 1 male (TL 108 mm), 1 female (TL 101 mm) (NTOU).— 21 Oct 1995: 5 males (TL 84–111 mm) (NTOU).— 6 Nov 2000: 1 male (TL 95 mm) (ZRC 2001.0120).— 2 Nov 2001: 1 female (TL 123 mm) (ZRC 2001.0269).

Diagnosis.— Rostral plate margins convex, apex rounded. Carapace with median carina. Raptorial claw dactylus with 8 teeth, without angular projection in adult males. TS6–8 with distinct submedian carinae; intermediate carinae armed posteriorly. TS5 intermediate carina produced to a short spine, directed laterally; ventral process triangular, apex acute. TS8 sternal keel produced posteriorly, apex usually sharp. AS1–5 with distinct submedian carinae. AS5 and 6 with posteriorly armed submedian carinae. Telson median carina proximally with distinct dark oval ‘eye-spot’ on either side, pale in outline. Uropodal exopod distal segment black with pale midline.

Size.— To 137 mm (Ahyong, 2001).

Coloration.— Overall dorsal colour pale grey, with scattered chromatophores over dorsal surface. Carapace grooves and carinae dark brown. Thoracic and abdominal somites with submedian carinae and posterior margin dark brown. AS2 with medial, black transverse bar. AS1 and 3–5 with traces of broken transverse bar. Telson with pair of dark brown eye-spots surrounded by white margin. Uropodal exopod with proximal segment black on inner half; distal segment black with yellow midline.

Habitat.— Silty sand; 15–206 m.

Distribution.— Western Indian Ocean to the Philippines, Japan, Taiwan, Vietnam and Australia.

Remarks.— *Harpiosquilla annandalei* resembles *H. sinensis* Liu & Wang, 1998, and differs from other species of *Harpiosquilla* by the combination of the short, rounded rostral plate and armed intermediate carinae on TS6–7 or 8. *Harpiosquilla raphidea* also bears armed intermediate carinae on TS6–8, but bears a slender apical projection on the rostral plate and is not known to occur north of Macau (Ahyong *et al.*, 1999). *Harpiosquilla annandalei* is readily distinguished from *H. sinensis* by the presence of armed submedian carinae on AS5 and the colour pattern of the distal segment of the uropodal exopod — black with a white or yellow median stripe as opposed to a black inner half and yellowish outer half. The margins of the large ‘ocelli’ on the telson are sharply defined in *H. annandalei*, but somewhat diffuse in *H. sinensis*.

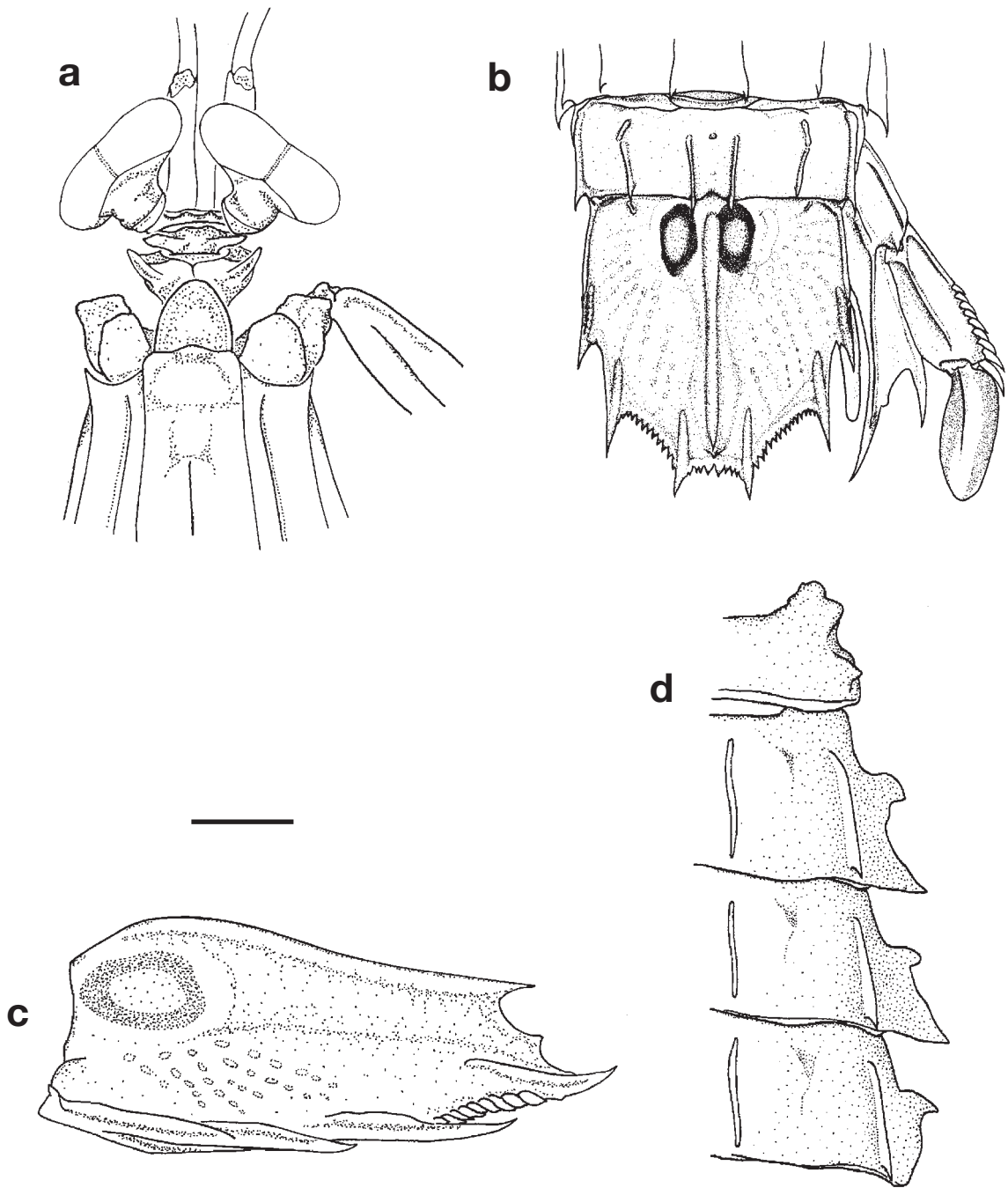


Fig. 81. (a–c) Male, TL 128 mm, no specific locality; (d) male, TL 111 mm, Donggang fishing port, Pingtung County, no date: **a**, anterior cephalothorax; **b**, AS5–6, telson and uropod; **c**, telson, left lateral view; **d**, right lateral processes of TS5–8. Scale: a = 4.0, b = 5.0 mm, c–d = 3.0 mm. (b, d, modified after Ahyong *et al.*, 1998).

Harpiosquilla harpax (de Haan, 1844)



Fig. 82. Female, TL 120 mm, Dasi fishing port, Yilan County, 13 Mar 1992.

Squilla harpax de Haan, 1844 (atlas): pl. 51, fig. 1 [type locality: Japan]; 1849: 222 (text).

Squilla raphidea.— Balss, 1910a: 8.— Kemp, 1913: 92 [Formosa record] [not *S. raphidea* Fabricius, 1798].

Chloridella raphidea.— Schmitt, 1931: 147 [not *C. raphidea* (Fabricius, 1798)]

Harpiosquilla malagasiensis Manning, 1978b: 30, fig. 15 [type locality: Tamatave, Madagascar]

Harpiosquilla paradipa Ghosh, 1987: 306–308, fig. 1 [type locality: Paradip, India].

Harpiosquilla harpax.— Manning, 1995: 158.— Liu & Wang, 1999: 577.— Ahyong, 2001: 257–261, fig. 126.

NOT *Harpiosquilla harpax*.— Lee & Wu, 1966: fig. 7B, C [= *H. indica* Manning, 1969].

Material examined.— Dasi fishing port, Yilan County, 29 Nov 1984: 1 male (TL 78 mm) (NTOU).— 8 Aug 1985: 1 female (TL 154 mm) (NTOU).— 22 Nov 1985: 1 male (TL 78 mm) (TMCS-0012), 1 female (TL 69 mm) (TMCS-0010).— 28 Apr 1986: 1 female (TL 96 mm) (TMCS-0046).— 18 May 1989: 1 male (TL 124 mm) (TMCS-0108).— 13 Mar 1992: 2 males (TL 120–125 mm), 2 females (TL 115–120 mm) (NTOU).— 13 Jun 1995: 1 male (TL 132 mm) (NTOU).— 16 Nov 1995: 4 males (TL 95–122 mm), 4 females (TL 64–89 mm) (NTOU).— 1995: 2 females (TL 95–153 mm) (NTOU).— 3 Aug 1996: 1 female (TL 148 mm) (TMCS-0006).— 4 Aug 1996: 3 males (TL 112–135 mm), 3 females (TL 96–117 mm) (NTOU).— 25 May 1998: 2 males (TL 83–85 mm) (NIWA). Nanfang-ao fishing port, Yilan County, 9 Nov 1995: 2 females (TL 114–130 mm) (NTOU). Nanliao fishing port, Hsinchu City, 4 Jul 1984: 1 male (TL 125 mm) (NTOU). Wuci fishing port, Taichung County, 16 Jan 1995: 1 male (TL 147 mm), 3 females (TL 169–227 mm) (NTOU).— 6 Jun 1995: 2 males (TL 148–186 mm), 5 females (TL 164–213 mm) (NTOU).— 16 Jun 1995: 1 male (TL 151 mm) (NTOU).— 9 Oct 1995: 1 male (TL 129 mm) (NTOU).— 4 Nov 1995: 1 male (TL 134 mm) (NTOU).— 26

Nov 1995: 1 female (TL 186 mm) (NTOU).— 31 Aug 1996: 1 female (TL 150 mm) (NTOU).— 22 Sep 1996: 2 males (TL 144–184 mm), 2 females (TL 151–169 mm) (NTOU). Budai fishing port, Chiayi County, 20 Jan 1995: 1 male (TL 149 mm), 2 females (TL 164–165 mm) (NTOU). Kaohsiung harbor, Kaohsiung city, 31 Jan 1994: 2 males (TL 145–146 mm) (NTOU). Jhongjhou fishing port, Kaohsiung City, 7 Jan 1986: 5 males (TL 144–187 mm) (TMCS-0023), 1 male (TL 145 mm) (TMCS-0024), 6 females (TL 148–158 mm) (TMCS-0022).— 1 Aug 1986: 1 female (TL 124 mm) (TMCS-0050).— 1 Nov 1996: 3 females (TL 85–163 mm) (NTOU).— 1996: 1 female (TL 171 mm) (NTOU).— Donggang fishing port, Pingtung County, 22 Nov 1992: 1 male (TL 171 mm) (NTOU).— 31 Oct 1993: 2 males (TL 101–104 mm) (NTOU).— 21 Oct 1995: 1 female (TL 43 mm) (NTOU).— 5 Aug 1996: 1 male (TL 146 mm), 2 females (TL 161–198 mm) (NTOU), 1 male (TL 124 mm), 1 female (TL 146 mm) (ZRC 1999.2340). SW Taiwan, 1985: 1 male (TL 199 mm) (NTOU).— 1992: 1 male (TL 186 mm) (NTOU). Magong fishing port, Penghu County, 23 Apr 1986: 1 female (TL 110 mm) (TMCS-0125), 2 females (TL 177–187 mm) (TMCS-0041).— 22 Sep 1986: 6 males (TL 117–166 mm), 7 females (TL 140–200 mm) (NTOU).— 16 Sep 1996: 3 males (TL 143–180 mm) (NTOU). No specific locality: 1 male (TL 171 mm) (NTOU).— 1 male (TL 137 mm) (NTOU).— 1 female (TL 145 mm) (NTOU).— 2 males (TL 116–124 mm), 2 females (TL 114–118 mm) (NTOU).— 1 female (TL 147 mm) (NTOU).— 1 female (TL 117 mm) (NTOU).— 1 female (TL 132 mm) (NTOU).— 1 female (TL 169 mm) (NTOU).— 1 female (broken. CL 37.2 mm) (TMCS-0102).— 1 male (TL 129 mm), 1 female (TL 154 mm) (TMCS-0127).

Diagnosis.— Rostral plate longer than broad; triangular to cordiform; usually with slender median projection; margins sinuous. Carapace with median carina. Raptorial claw dactylus with 8 teeth, outer margin strongly angular in adult males. TS8 sternal keel rounded, inclined posteriorly. AS1–5 with indistinct or near absent submedian carinae. Telson median carina proximally with diffuse dark patch on either side of midline; with marginal carina less than to greater than twice lateral carina length, usually exceeding twice lateral carina length. Uropodal exopod distal segment dark on inner half only.

Size.— To 262 mm TL (Ahyong, 2001).

Coloration.— Overall dorsal colour light grey-brown with slightly mottled appearance. Carinae and grooves of carapace, and posterior margins of body somites black-brown. AS6 with dark-green carinae. Telson with median carina and carinae of primary teeth green; median carina with proximal pair of dark spots. Uropodal endopod black-brown distally. Uropodal exopod with inner half black-brown, but with demarcation between inner and outer halves diffuse.

Habitat.— Sandy-mud substrates; intertidal to 70 m.

Distribution.— Western Indian Ocean to Australia, Indonesia, the South China Sea, Taiwan and Japan.

Remarks.— *Harpiosquilla harpax* is the most common species of the genus in Taiwan, though its presence has not been formally documented until now. The present series agrees well with published accounts (Manning, 1969a, 1995; Ahyong, 2001). Abdominal spination is as follows: submedian 6, intermediate (1)2–6, lateral 1–6, marginal 1–5; CI 251–388. Ahyong (2001) synonymized *H. malagasiensis* Manning, 1978, *H. japonica* Manning, 1969, *H. intermedia* Manning & Michel, 1973, and *H. paradipa* Ghosh, 1987, with *H. harpax* based on variability in diagnostic characters. The relative lengths of the marginal and lateral carinae of the telson were not found to be sufficiently constant in any species of the *Harpiosquilla* to constitute reliable diagnostic characters, and the distinctness of the apical projection of the rostral plate in *H. harpax* varies, approaching the form present in *H. japonica*. Prior to the present study, known specimens of the *H. japonica* form were few, and almost always collected together with large numbers of ‘typical’ *H. harpax*. The type series of *H. harpax* includes both typical *H. harpax* and *H. japonica*. On the basis of a good series of specimens corresponding to *H. japonica* available for this study, however, we believe that the species should be removed from the synonymy of *H. harpax*. The rostral plate in *H. harpax* is usually elongate with a distinct apical projection whereby the rostral

margins are distinctly sinuous. Where the apical projection of the rostral plate of *H. harpax* is indistinct, thus approaching *H. harpax*, the rostral margins nevertheless remain slightly sinuous. In contrast, the margins of the rostral plate in *H. japonica* are always convex. Other characters given by Manning (1969a) to distinguish *H. harpax* from *H. japonica*, namely the distinctness of the submedian carinae on the abdomen and relative lengths of the marginal and lateral carinae of the telson are variable within both species. The colour-in-life also appears to differ between *H. harpax* and *H. japonica*. In *H. harpax*, the anterior distal margin of the antennal scale is dense black and the uropods have an overall gray-green tone in contrast to the diffusely pigmented antennal scale and yellowish uropods in *H. japonica*. *Harpiosquilla intermedia* is indistinguishable from *H. japonica* and the two remain synonymous. Ah Yong (2001) reported and figured a 257 mm female as *H. harpax* from Moreton Bay, Queensland (Queensland Museum, W12234), bearing the 'short' rostral plate; it should be referred to *H. japonica*. As already concluded by Ah Yong (2001), *H. malagasiensis* and *H. paradipa* are junior synonyms of *H. harpax*, the former being based on a specimen with a damaged rostral plate, and the latter being 'typical' *H. harpax*.

Lee & Wu's (1966) record of *H. harpax* from Taiwan is attributed to *H. indica*, below, and thus, the present specimens appear to represent the first reliable records of *H. harpax* from Taiwan. *Harpiosquilla harpax* was recently used as an indicator of trace metal contamination of benthic sediments in Hong Kong (Ng et al., 2007).

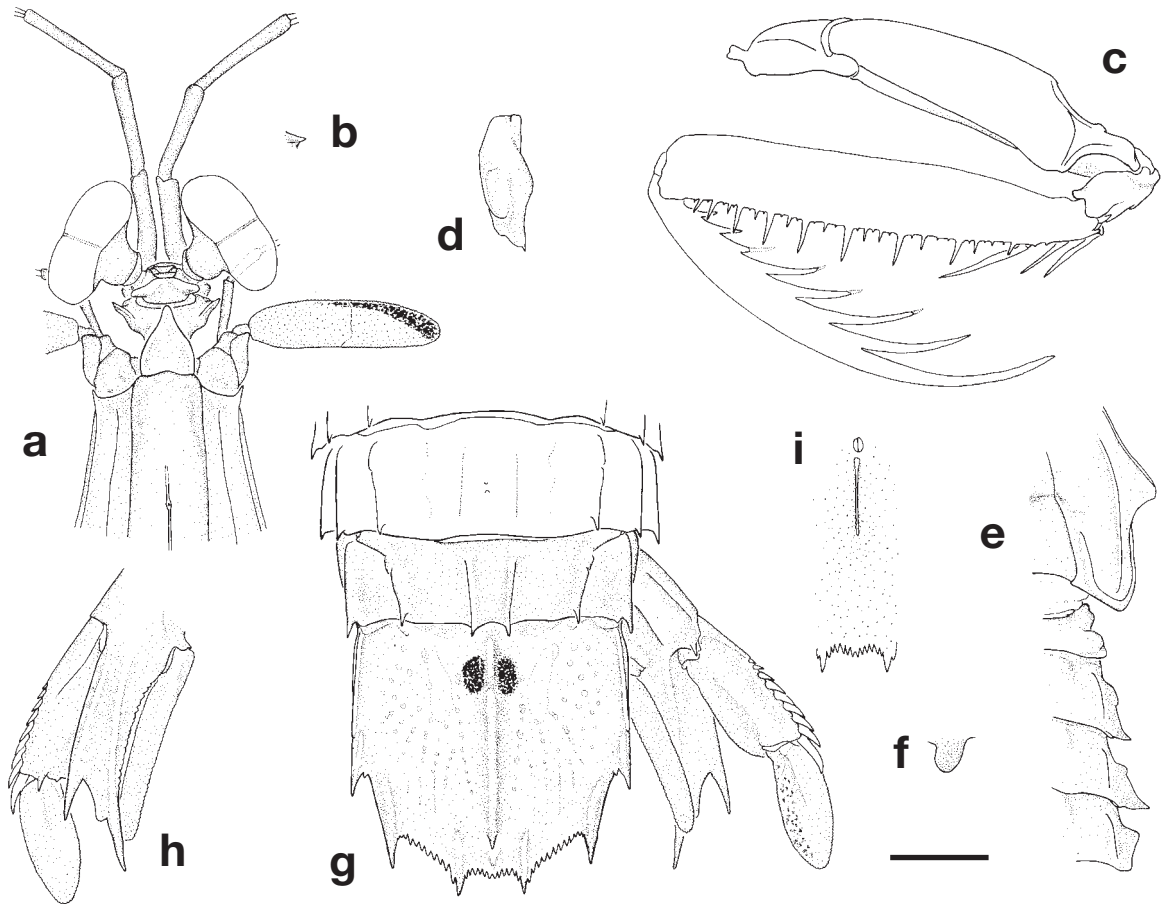


Fig. 83. Male, TL 83 mm, Dasi fishing port, Yilan County, 25 May 1998: **a**, anterior cephalothorax; **b**, right dorsal process of antennular somite, lateral view; **c**, right raptorial claw; **d**, TS5, right lateral; **e**, right posterolateral margin of carapace and TS5–8 lateral processes; **f**, TS8 sternal keel; **g**, AS5–6, telson and uropod; **h**, right uropod, ventral; **i**, postanal carina. Scale = 5.0 mm.

Harpiosquilla indica Manning, 1969



Fig. 84. Male, TL 178 mm, Wuci fishing port, Taichung County, 31 Aug 1996.



Fig. 85. Female, TL 156 mm, Wuci fishing port, Taichung County, 31 Aug 1996.



Fig. 86. Tail fan, dorsal view. Female, TL 156 mm, Wuci fishing port, Taichung County, 31 Aug 1996.

Harpiosquilla harpax.— Lee & Wu, 1966: fig. 7B, C [not *H. harpax* (de Haan, 1844)].

Harpiosquilla indica Manning, 1969a: 33–37, figs. 39–43 [type locality: Mandapan, southern India].— Liu & Wang, 1999: 577.— Ahyong, 2001: 256, 257.

Harpiosquilla philippina Garcia, 1978: 232–237, figs. 1–8 [type locality: Tayabas Bay, Philippines].

Material examined.— Wuci fishing port, Taichung County, 31 Aug 1996: 8 males (TL 125–178 mm), 1 female (TL 156 mm) (NTOU).— 22 Sep 1996: 1 male (TL 142 mm), 2 females (TL 147–150 mm) (NTOU), 1 male (TL 149 mm), 3 females (TL 136–189 mm) (AM), 1 male (TL 135 mm), 1 female (TL 154 mm) (NIWA). Jhongjhou fishing port, Kaohsiung City, 7 Jan 1986: 1 male (TL 109 mm) (TMCS-0091).— 1 Nov 1996: 2 males (TL 160–164 mm), 1 female (TL 158 mm) (NTOU). Donggang fishing port, Pingtung County, 21 Oct 1995: 1 female (TL 178 mm) (NTOU). Magong fishing port, Penghu County, 16 Sep 1996: 2 females (TL 152–161 mm) (NTOU).

Diagnosis.— Carapace with median carina; rostral plate with anterior projection, lateral margins sinuous or concave. TS6–8 with unarmed intermediate carinae. AS1–4 without submedian carinae. Dactylus of raptorial claw with 9 teeth.

Size.— To 189 mm TL.

Coloration.— Overall dorsal colour light grey-green with slightly mottled appearance. Carinae and grooves of carapace, and posterior margins of body somites greenish. Telson posterior margin yellow; median carina and carinae of primary teeth dark green; median carina with proximal pair of dark spots. Uropodal endopod black-brown distally. Uropodal exopod with inner half black-brown, outer half yellowish.

Habitat.— Sandy-mud substrates; shallow subtidal.

Distribution.— Southern India to Indonesia, the Philippines and now from Taiwan.

Remarks.— In newly describing *H. philippina*, Garcia (1978) distinguished his new species from *H. indica* Manning, 1969a based on differences in the spination of the intermediate carina of AS2 and different relative lengths of the marginal and lateral carinae of the telson. As with *H. harpax*, *H. japonica* and *H. melanoura*, however, the spination of the intermediate carina of AS2 and relative lengths of the marginal and lateral carinae of the telson in *H. indica* are variable. In the present specimens from Taiwan, the intermediate carina of AS2 may or may not be armed and the intermediate carina of the telson varies from half to less than half the length of the marginal carina. The abdominal spination of the present series of *H. indica* is as follows: submedian 6, intermediate (2)3–6, intermediate 1–6, lateral 1–5. Thus, the range of variation in the spination of the AS2 intermediate carina and relative length of the marginal and lateral carinae of the telson fully encompasses both *H. philippina* and *H. indica*. Consequently, no character is available to distinguish *H. indica* from *H. philippina* and the two species are herein synonymized. Garcia (1980, 1981) reported both *H. indica* and *H. philippina* from Tayabas Bay, Philippines, the type locality of the latter, and it is no surprise that the two nominal species are conspecific.

Lee & Wu (1966) reported *H. harpax* from Taiwan, but their figured specimens bear nine teeth on the raptorial claw, characteristic of *H. indica*. Although variation in dactylar tooth number in *Harpiosquilla* may rarely occur, Lee & Wu (1966) did not note variation in tooth number, suggesting a uniform dactylar armature. Therefore, we attribute Lee & Wu's (1966) records of *H. harpax* to *H. indica*. *Harpiosquilla indica* is formally reported for the first time from Taiwan.

Rostral plate morphology in *H. indica* exhibits similar variation to that observed in *H. harpax* and *H. melanoura* by (Ahyong, 2001). As in *H. harpax* and *H. melanoura*, the rostral plate margins of *H. indica* are sinuous with the apex tapering to a slender projection. Occasionally, however, the apical projection is relatively undeveloped approaching the condition in *H. japonica*.

Harpiosquilla indica is the only species of the genus bearing nine teeth on the dactylus of the raptorial claw. Other than *H. stephensoni* Manning, 1969 with seven dactylar teeth, other species of *Harpiosquilla* have eight teeth on the dactylus of the raptorial claw.

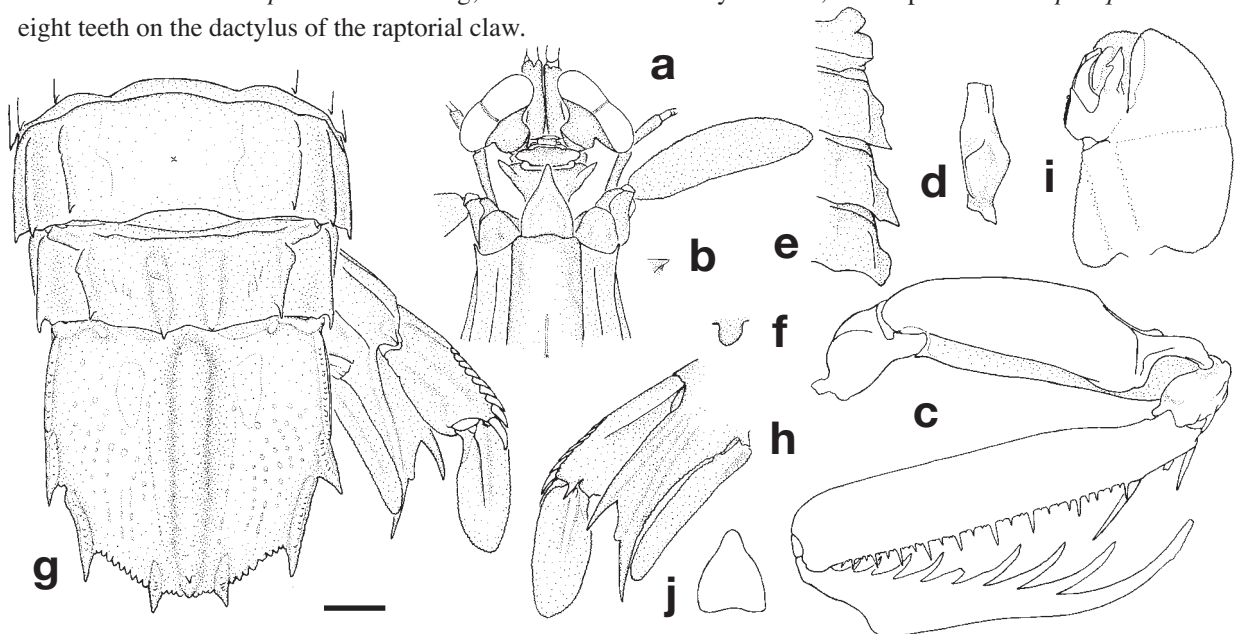


Fig. 87. Male, TL 142 mm, Wuci fishing port, Taichung County, 31 Aug 1996: **a**, anterior cephalothorax; **b**, right dorsal process of antennular somite, lateral view; **c**, right raptorial claw; **d**, TS5, right lateral; **e**, TS5–8 lateral processes; **f**, TS8 sternal keel; **g**, AS5–6, telson and uropod; **h**, right uropod, ventral; **i**, right pleopod 1 endopod. Female, TL 189 mm (AM); **j**, rostral plate. Scale: a–h, j = 5 mm; i = 2.5 mm.

Harpiosquilla japonica Manning, 1969

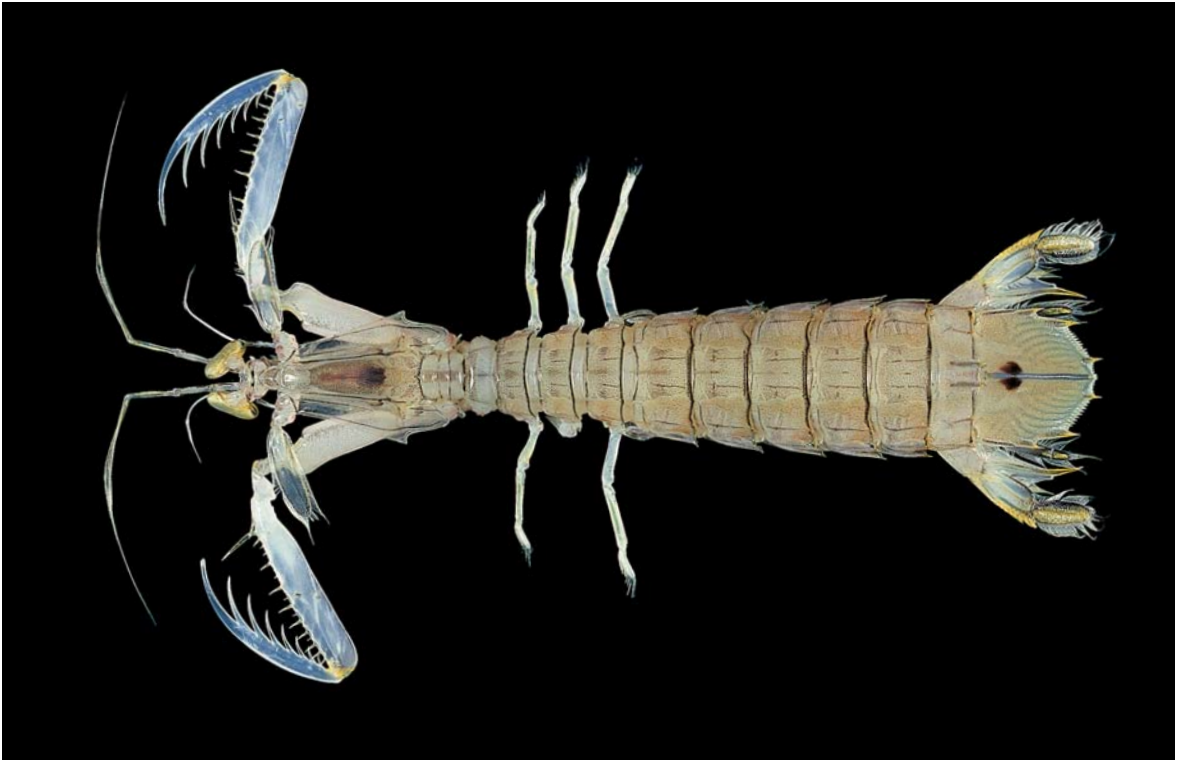


Fig. 88. Female, TL 145 mm, Dasi fishing port, Yilan County, 3 Aug 1996.



Fig. 89. Tail fan, dorsal view. No specific locality.

Squilla raphidea.— Fukuda, 1913: 70, 72, fig. on p. 71 [not *S. raphidea* Fabricius, 1798].

Harpiosquilla japonica Manning, 1969a: 15–17, figs. 10–11 [type locality: Wakanoura, Kii, Japan].— Liu & Wang, 1999: 577.

Harpiosquilla intermedia Manning & Michel, 1973: 113–116, figs 1, 2b [type locality: Baie de Ducos, New Caledonia].

Harpiosquilla harpax.— Ahyong, 2001: fig. 126J [part: types of *H. japonica* and *H. intermedia*, 257 mm female specimen; not *H. harpax* (de Haan, 1844)].

Material examined.— Keelung fishing port, Keelung City, Dec 1954: 1 male (TL 169 mm) (TMCS-0107). Dasi fishing port, Yilan County, 3 Aug 1996: 1 female (TL 145 mm) (NTOU).— Nanfang-ao fishing port, Yilan County, 9 Nov 1995: 1 female (TL 57 mm) (NTOU).— Wuci fishing port, Taichung County, 8 Mar 1996: 1 male (TL 175 mm), 2 females (TL 162–174 mm) (NIWA).— 24 Aug 1996: 9 females (TL 154–203 mm) (NTOU).— 31 Aug 1996: 1 male (TL 141 mm), 1 female (TL 184 mm) (NTOU), 2 males (TL 134–175 mm), 1 female (TL 158 mm) (AM).— 22 Sep 1996: 2 males (TL 148–160 mm), 7 females (TL 153–202 mm) (NTOU). Donggang fishing port, Pingtung County, 26 Jan 1994: 1 male (TL 160 mm) (NTOU). Magong fishing port, Penghu County, 16 Nov 1996: 3 males (TL 137–176 mm) (NTOU).

Diagnosis.— Rostral plate slightly longer than broad to slightly broader than long, without slender apical projection; margins convex. Carapace with median carina. Raptorial claw dactylus with 8 teeth, outer margin strongly angular in adult males. TS8 sternal keel rounded, inclined posteriorly. AS1–5 with indistinct or near absent submedian carinae. Telson median carina proximally with diffuse dark patch on either side of midline; with marginal carina less than to greater than twice lateral carina length, usually exceeding twice lateral carina length. Uropodal exopod distal segment dark on inner half only.

Size.— To 257 mm TL (Ahyong, 2001, as *H. harpax*).

Coloration.— Overall dorsal colour light yellow-gray with slightly mottled appearance. Carinae and grooves of carapace, and posterior margins of body somites black-brown. AS6 with dark-green carinae. Telson with median carina and carinae of primary teeth green; median carina with proximal pair of dark spots. Uropod with overall yellowish caste. Uropodal endopod black-brown distally. Uropodal exopod with inner half black-brown, but with demarcation between inner and outer halves diffuse. Antennal scale diffusely pigmented.

Habitat.— Sandy and muddy substrates in shallow water.

Distribution.— Gulf of Thailand, Vietnam, Philippines, eastern Australia, New Caledonia, Japan and now from Taiwan.

Remarks.— *Harpiosquilla japonica* resembles *H. harpax* in almost all respects, differing in rostral plate form. In *H. harpax*, the rostral plate margins are sinuous resulting in a slender apical projection. In *H. japonica*, however, the rostral plate margins are convex, not producing a slender apex.

As discussed under the account of *H. harpax*, *H. japonica* is removed from synonymy and recognized as distinct. *Harpiosquilla japonica* is readily distinguished from all other species of the genus by the combination of the convex margin of the rostral plate, 8 teeth of the dactylus of the raptorial claw, and unarmed intermediate carinae of the thoracic somites. Manning (1995) distinguished *H. japonica* from *H. intermedia* on the basis of rostral plate proportions, being slightly wider than long in the former, and slightly longer than wide in the latter. The rostral plate proportions, however, vary continuously in Taiwanese material, spanning the reported range of both *H. japonica* and *H. intermedia*. Moreover, the rostral plate proportions within the type series of *H. japonica* show similar variation: the rostral plate is slightly longer than wide in the holotype, slightly wider than long in the female paratype, and as long as wide in the male paratype. The rostral plates in the holotype and paratype of *H. intermedia* in the USNM are both elongate. Examination of the larger topotypic series of *H. intermedia* reported by Moosa (1991), however, revealed similar variation in rostral plate proportions present in *H.*

japonica. Manning & Michel (1973) also distinguished *H. intermedia* from *H. japonica* by the presence of a posterior spine on AS2 and a proportionally longer marginal carina on the telson, being about twice as long instead of less than twice as long as the lateral carina. The relative length of the marginal carina of the telson in the present series of *H. japonica* ranges from less than twice to more than twice the length of the lateral carina. Similarly, the lateral carina of AS2 may or may not be armed in the present series, as also found by Manning (1995) for *H. japonica* from Vietnam. The abdominal spination of the present series of *H. japonica* is as follows: submedian 6, intermediate (2)3–6, intermediate 1–6, lateral 1–5. *Harpiosquilla intermedia* must be considered a synonym of *H. japonica*.

As remarked under the account of *H. harpax*, the 257 mm female from Moreton Bay, Queensland (Queensland Museum, W12234) bearing the ‘short’ rostral plate and reported by Ahyong (2001) as *H. harpax*, should be referred to *H. japonica*. *Harpiosquilla japonica* appears to primarily occur along the margins of the western Pacific, between Japan and New Caledonia, and is now formally recorded from Taiwan. Although, *H. japonica* is known as far west as the Gulf of Thailand, it is apparently much less common there, with *H. harpax* being the dominant species of *Harpiosquilla* in the South China Sea and westwards.

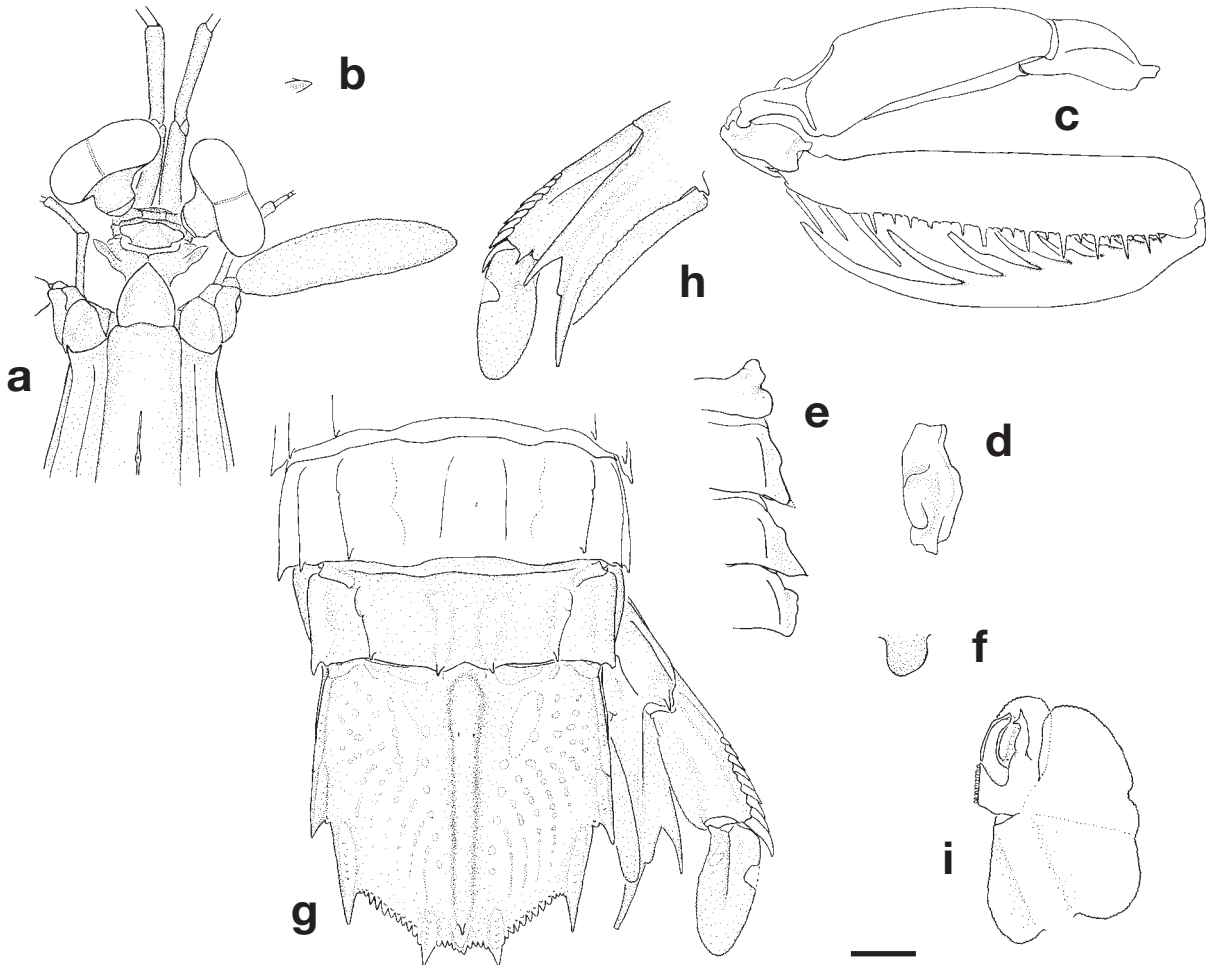


Fig. 90. Male, TL 141 mm, Wuci fishing port, Taichung County, 31 Aug 1996: **a**, anterior cephalothorax; **b**, right dorsal process of antennular somite, lateral view; **c**, right raptorial claw; **d**, TS5, right lateral; **e**, TS5–8 lateral processes; **f**, TS8 sternal keel; **g**, AS5–6, telson and uropod; **h**, right uropod, ventral; **i**, right pleopod 1 endopod. Scale: a–e, g, h = 5.0 mm; f, i = 2.5 mm.

Harpiosquilla melanoura Manning, 1968

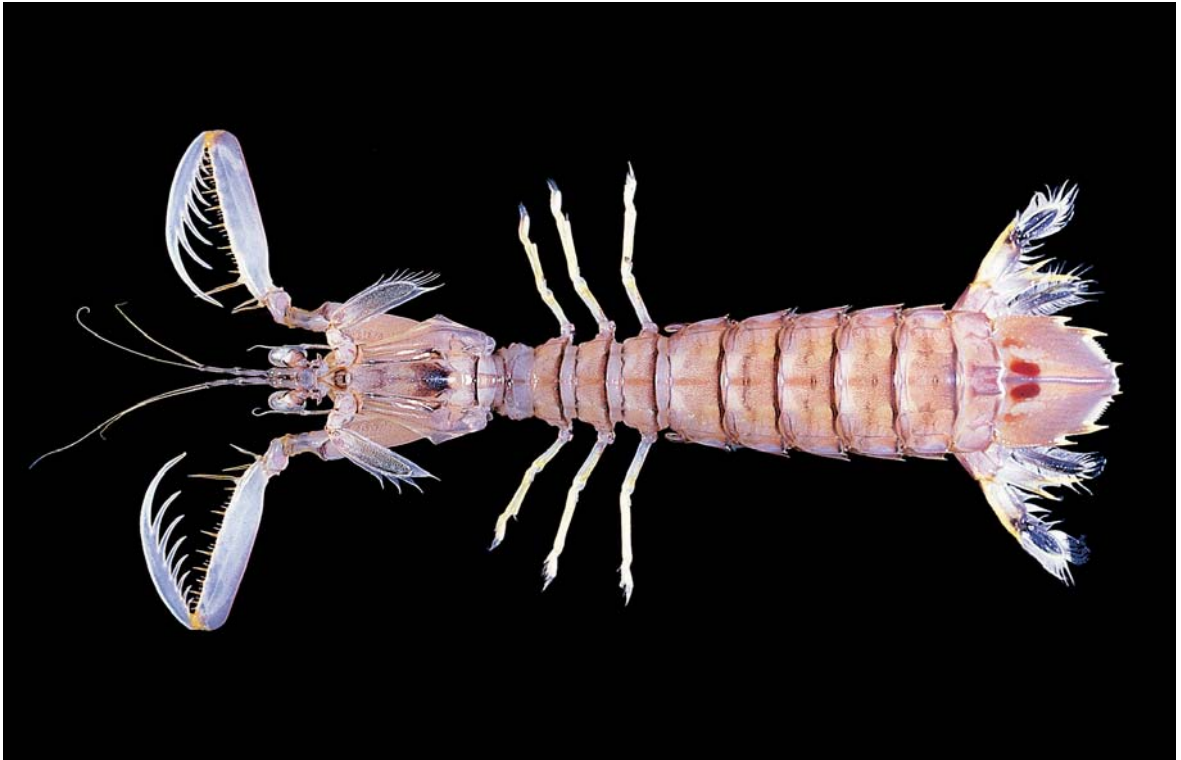


Fig. 91. Female, TL 148 mm, Dasi, fishing port, Yilan County, 28 May 1999.



Fig. 92. Tail fan, dorsal view. Female, TL 84 mm, Dasi fishing port, Yilan County, 16 Nov 1995.

Harpiosquilla melanoura Manning, 1968b: 14, 18–21, fig. 5 [type locality: Banc de Prancel, W coast of Madagascar, 17°00'S, 43°30'E].— Liu & Wang, 1999: 577.— Ahyong, 2001: 261–262, fig. 127.

Material examined.— Dasi fishing port, Yilan County, 22 Nov 1985: 1 female (TL 105 mm) (TMCS-0008).— 28 Apr 1986: 1 male (TL 93 mm) (TMCS-0094).— 16 Nov 1995: 1 female (TL 84 mm) (NTOU).— 1 Dec 1997: 1 male (TL 112 mm) (NTOU).— 28 May 1999: 1 female (TL 148 mm), (NTOU). Donggang fishing port, Pingtung County, 5 Aug 1996: 1 female (TL 140 mm) (NTOU). Magong fishing port, Penghu County, 23 Apr 1986: 1 female (TL 147 mm) (TMCS-0092).

Diagnosis.— Carapace without median carina. Thoracic and first five abdominal somites without submedian carinae. Dactylus of raptorial claw with 8 teeth; outer margin of dactylus in adult males moderately angular. Distal segment of uropodal exopod black.

Size.— To 168 mm TL (Ahyong, 2001).

Coloration.— Overall dull tan brown. Carapace grooves and carinae dark, with diffuse, dark brown patch mid-dorsally. Thoracic and abdominal somites with black-brown posterior margins. AS2 with narrow, diffuse transverse dark bar. Telson with primary teeth yellow; median carinae with pair of ovate red-maroon spots proximally. Uropodal protopod with terminal spines yellow; exopod proximal segment with yellow outer margin; exopod distal segment black; endopod black on distal half.

Habitat.— Muddy sand substrates; 10–80 m.

Distribution.— The western Indian Ocean to the Andaman Sea, Australia, Thailand, Vietnam, Philippines, Japan and now from Taiwan.

Remarks.— *Harpiosquilla melanoura* can be recognized by the combination of eight teeth on the dactylus of the raptorial claw, absence of a median carina on the carapace, absence of submedian carinae on AS1–5, and black distal segment of the uropodal exopod. The Taiwanese specimens agree well with published accounts (Manning, 1968a, 1969a; Ahyong, 2001) and constitute the first records of the species from Taiwan.

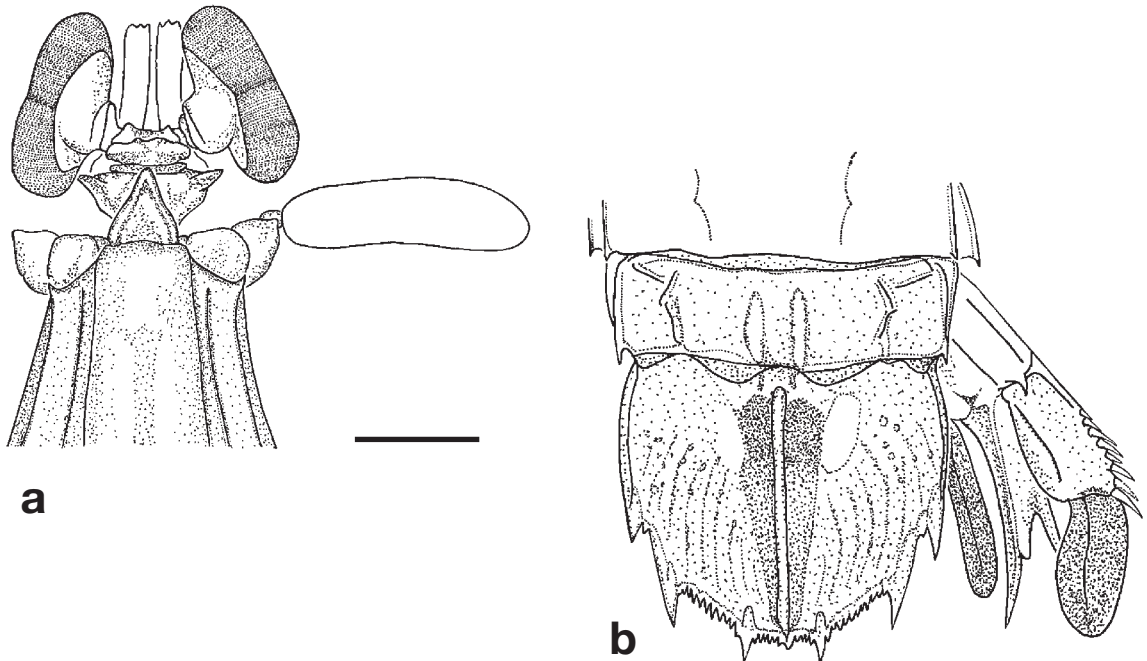


Fig. 93. Female, TL 84 mm, Dasi fishing port, Yilan County, 16 Nov 1995: **a**, anterior cephalothorax; **b**, AS5–6, telson and uropod. Scale = 5.0 mm.

Harpiosquilla sinensis Liu & Wang, 1998

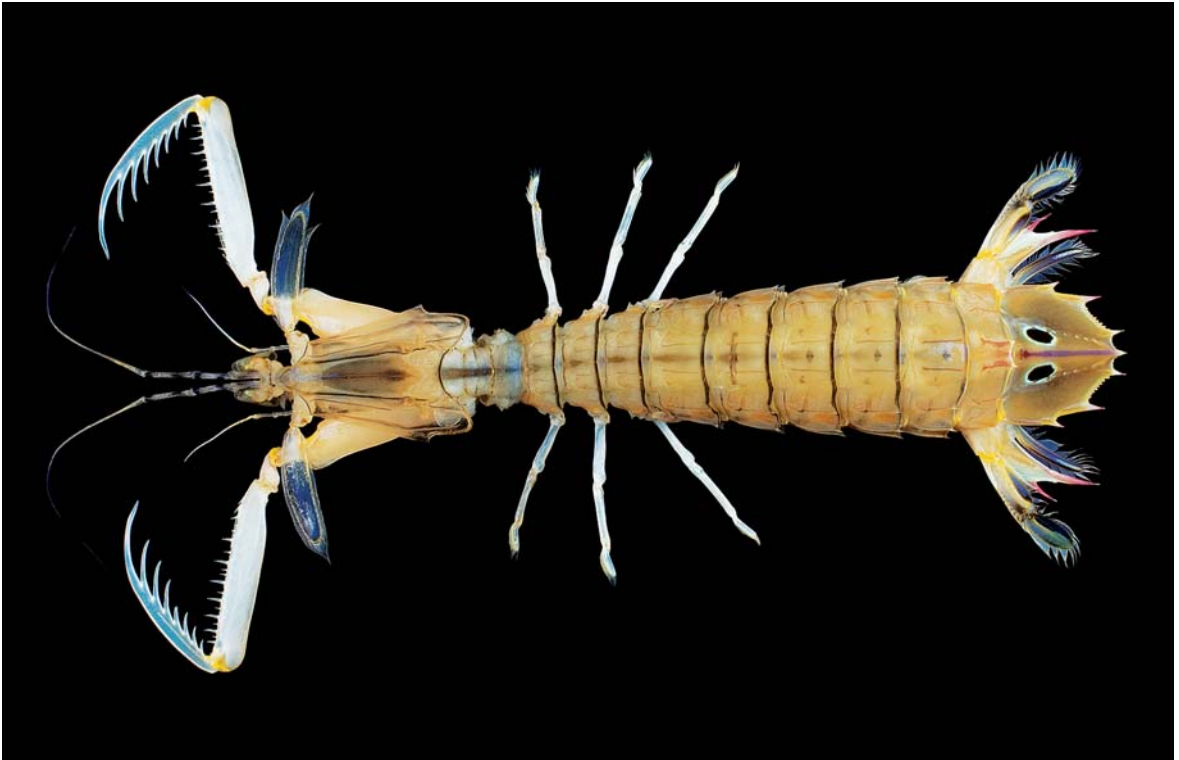


Fig. 94. Female, TL 235 mm, Dasi fishing port, Yilan County, 7 Mar 2008.



Fig. 95. Tail fan, dorsal view. Male, TL 197 mm, Donggang fishing port, Pingtung County, 5 Aug 1996. (From Ahyong *et al.*, 1998).

Harpiosquilla sinensis Liu & Wang, 1998: 590–592, 594–596, fig. 2. [type locality: Nansha Ids., South China Sea, 5°13.32'N, 108°53.06'S] [published Nov 1998].— Liu & Wang, 1999: 577.— Ah Yong, 2001: 263–264, fig. 128.

Harpiosquilla ocellata Ah Yong, Chan & Liao, 1998: 929–935, figs. 1a–g, 2a, b [type locality: Tung kang (=Donggang), Pintung County, SW Taiwan] [published Dec 1998].

Material examined.— Dasi fishing port, Yilan County, 7 Mar 2008: 1 female (TL 235 mm) (NTOU). Nanfang-ao fishing port, Yilan County, 16 May 1991: 1 female (TL 198 mm) (TMCS-0103, paratype of *H. ocellata*).— 9 Nov 1995: 1 male (TL 154 mm), 2 females (TL 195–198 mm) (NTOU, paratypes of *H. ocellata*), 1 male (TL 155 mm) (AM P51184, paratype of *H. ocellata*). Donggang fishing port, Pingtung County, 26 Jan 1994: 1 female (TL 232 mm) (NTOU, paratype of *H. ocellata*).— 2 Dec 1994: 2 males (TL 157–180 mm) (NTOU, paratypes of *H. ocellata*).— 12 Feb 1995: 1 male (TL 179 mm) (NTOU).— 2 Dec 1995: 1 male (TL 157 mm) (NTOU, holotype of *H. ocellata*), 1 male (TL 154 mm) (NTOU).— 5 Aug 1996: 1 male (TL 197 mm) (NTOU, paratype of *H. ocellata*), 1 male (TL 200 mm) (AM P51185, paratype of *H. ocellata*).— Nov 1998: 1 female (TL 199 mm) (NTOU).— 6 Nov 2000: 1 female (TL 90 mm) (NTOU).

Diagnosis.— Rostral plate margins convex, apex rounded. Carapace with median carina. Raptorial claw dactylus with 8 teeth; outer margin of dactylus in adult males moderately angular. TS6–8 with distinct submedian carinae; intermediate carinae armed posteriorly. TS5 intermediate carina produced to a short spine, directed laterally; ventral process triangular, apex acute. TS8 sternal keel produced posteriorly, apex blunt. AS1–5 with distinct submedian carinae. AS5 submedian carinae unarmed. Telson median carina proximally with distinct dark oval ‘eye-spot’ on either side, pale in outline. Uropodal exopod distal segment black on inner half only.

Size.— To 235 mm TL (this study).

Coloration.— Overall light golden-brown with dark dorsal carinae and somite margins. Telson median carina purplish; anteriorly with pair of large black-brown ‘ocelli’ with white outline. Uropodal exopod distal segment black on inner half.

Habitat.— Sandy-mud substrates; 63–250 m (Ah Yong, 2001).

Distribution.— Taiwan, the South China Sea and Australia.

Remarks.— Ah Yong (2001) showed that *H. sinensis* Liu & Wang, 1998, and *H. ocellata* Ah Yong, Chan & Liao, 1998, published a month apart, are synonymous. *Harpiosquilla sinensis* most closely resembles *H. raphidea* and *H. annandalei*. *Harpiosquilla sinensis* and *H. annandalei* both differ from *H. raphidea* in lacking the slender apical projection on the rostral plate. Additionally, *H. sinensis* and *H. annandalei* both occur in Taiwan, but *H. raphidea* is only known as far north as Macau (Ah Yong *et al.*, 1999). *Harpiosquilla sinensis* and *H. annandalei* both have similar overall colouration, with similarly patterned antennules and a pair of dark ‘ocelli’ on the median carina of the telson. The two species are readily distinguished by the spination of the submedian carinae of AS5 (armed in *H. annandalei*, unarmed in *H. sinensis*) and the colour pattern of the distal segment of the uropodal exopod — black with a white or yellow median stripe in *H. annandalei* as opposed to a black inner half with yellowish outer half in *H. sinensis*. Furthermore, the margins of the large ocelli on the telson are somewhat diffuse in *H. sinensis* but sharply defined in *H. annandalei*. *Harpiosquilla sinensis* attains a much larger size than *H. annandalei*, reaching 235 mm TL versus 137 mm TL.

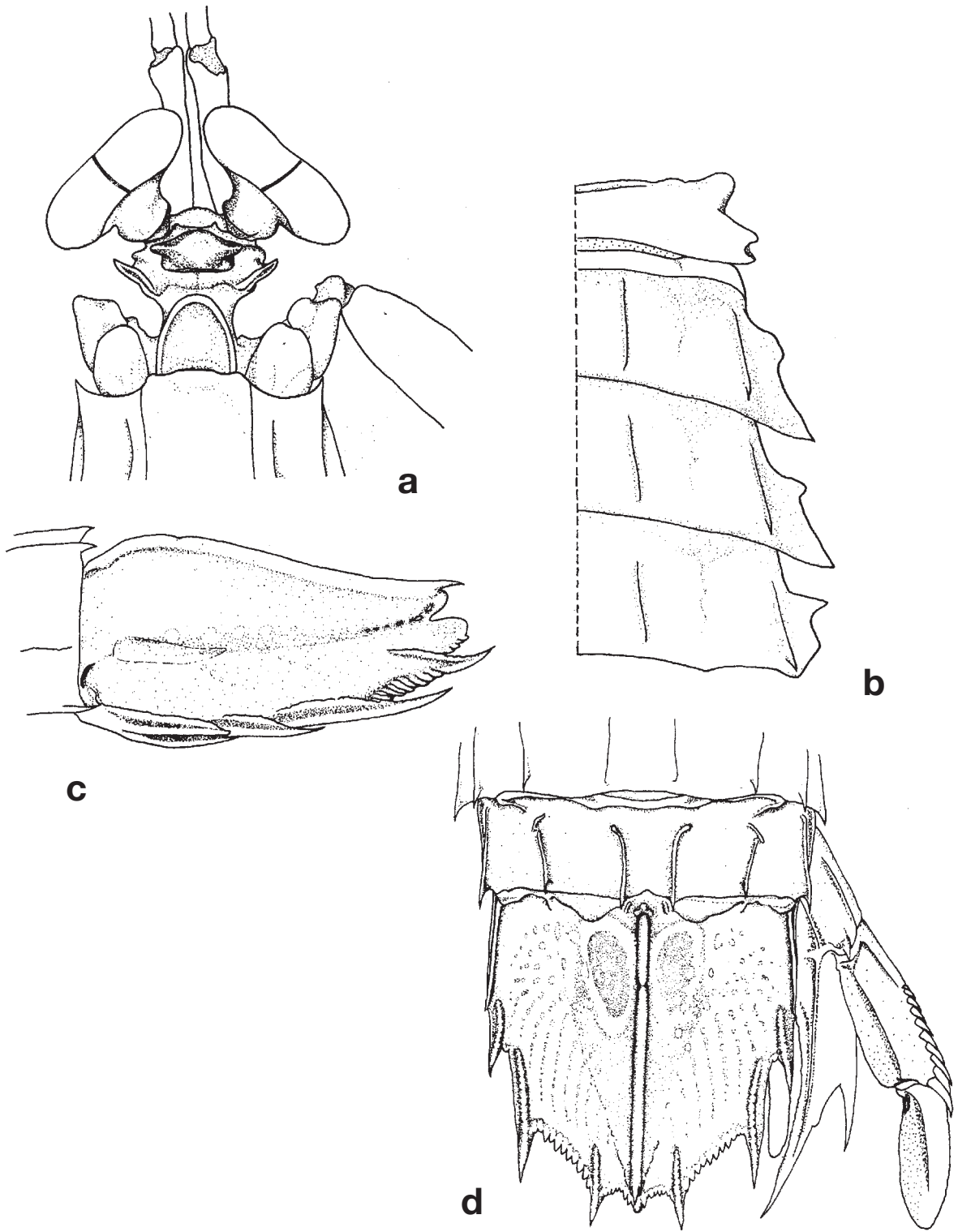


Fig. 96. Male, TL 157 mm, (holotype of *H. ocellata*), Donggang fishing port, Pingtung County, 2 Dec 1994: **a**, anterior cephalothorax; **b**, TS5–8 lateral processes; **c**, AS5–6, telson and uropod; **d**, telson left lateral view. (Modified after Ahyong *et al.*, 1998).

Genus *Kempina* Manning, 1978

Kempina Manning, 1978b: 39. Type species *Squilla mikado* Kemp & Chopra, 1921, by original designation.
Gender feminine.

Diagnosis.— Dorsal integument pitted, rugose. Eye small, cornea strongly bilobed, width less than 1/3 CL. Carapace with anterolateral spines; median carina distinct, uninterrupted at base of anterior bifurcation, branches of anterior bifurcation distinct, opening anterior to dorsal pit; posterolateral margin angular. Raptorial claw dactylus with 6 teeth; carpus dorsal carina undivided; merus without outer inferodistal spine. Mandibular palp present. Maxillipeds 1–4 with epipod. TS5 lateral process a single slender spine directed laterally; ventral spine slender, directed ventrolaterally. TS6–7 lateral processes distinctly bilobed. AS1–6 with submedian carinae. AS1–5 lateral carinae bicarinate. Telson submedian teeth with fixed apices; prelateral lobe present; dorsolateral surface without supplementary longitudinal carinae. Uropodal protopod inner margin crenulate.

Remarks.— Both known species of *Kempina* Manning, 1978, occur in Taiwan. *Kempina* is more closely allied to Eastern Pacific/Western Atlantic genera such as *Squilla* Fabricius, 1787, and *Fennerosquilla* Manning & Camp, 1983, than to Indo-West Pacific genera (Ahyong, 2005).

Key to species of *Kempina*

1. Rostral plate with median carina. AS5 with pair of large dark dorsal patches *K. mikado*
- Rostral plate without median carina. AS5 without pair of large dark dorsal patches *K. stridulans*

Kempina mikado (Kemp & Chopra, 1921)

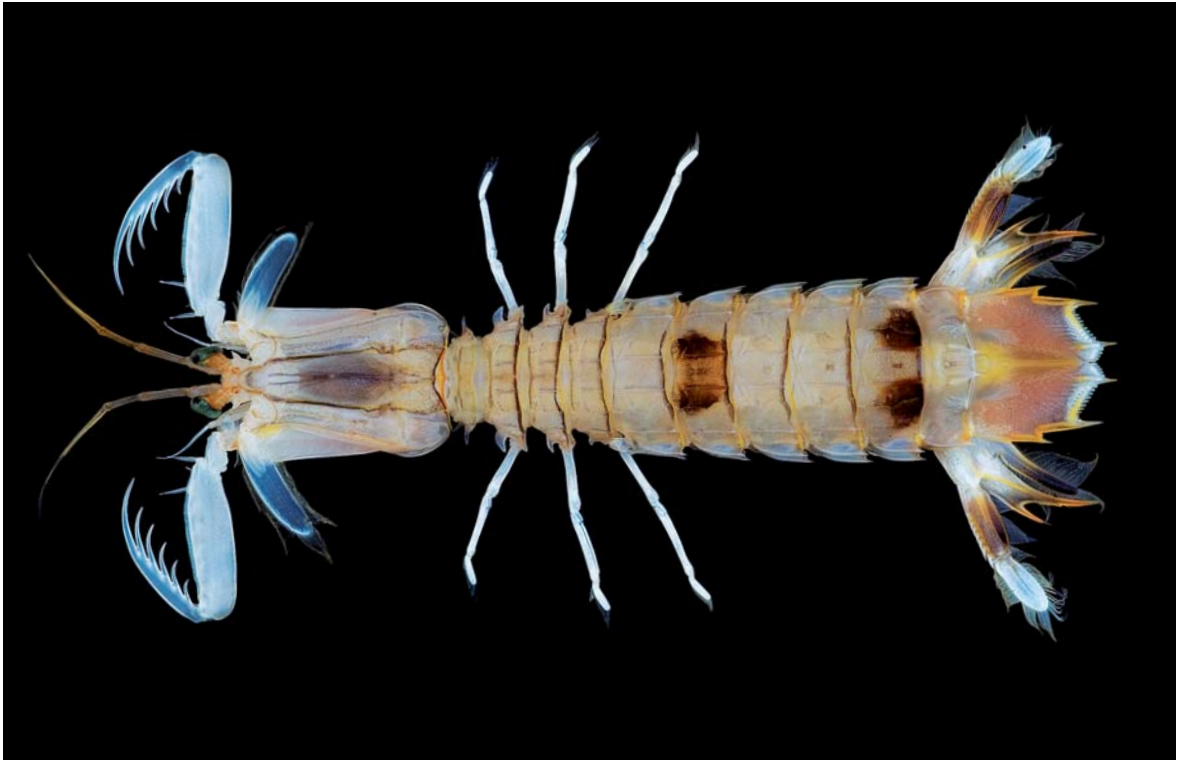


Fig. 97. Female, TL 118 mm, Dasi fishing port, Yilan County, 7 Mar 2008.

Squilla mikado Kemp & Chopra, 1921: 301, fig. 2 [type locality: Misaki, Japan].— Lee & Wu, 1966: 48–49.

Squilla zanzibarica Chopra, 1939: 143–148, figs. 2, 4 [type locality: off Zanzibar, 5°38'54"S, 39°15'42"E to 5°40'18"S, 39°17'36"E].

Kempina mikado.— Liu & Wang, 1999: 578.— Ahyong, 2001: 267–268, fig. 130.

Material examined.— Keelung fishing port, Keelung City, Dec 1954: 2 females (TL 138–175 mm) (TMCS-0109). Dasi fishing port, Yilan County, 6 May 1973: 1 male (TL 164 mm) (NTOU).— 6 May 1985: 1 male (TL 178 mm), 1 female (TL 185 mm) (TMCS-0004).— 16 Jun 1985: 1 male (broken; CL 30.0 mm), 1 female (broken. CL 32.0 mm) (TMCS-0030).— 22 Nov 1985: 1 female (broken; CL 35.0 mm) (TMCS-0088).— 7 Mar 1986: 2 males (TL 134–166 mm), 3 females (TL 68–150 mm) (TMCS-0031).— 22 Jan 1987: 1 female (TL 83 mm) (TMCS-0086).— 5 Jun 1987: 1 male (TL 170 mm), 1 female (TL 120 mm) (TMCS-0027).— 16 May 1988: 1 female (TL 175 mm) (TMCS-0116).— 25 Nov 1992: 1 male (TL 122 mm), 1 female (TL 79 mm) (NTOU).— 25 Nov 1994: 3 males (TL 94–160 mm), 3 females (TL 79 mm) (NTOU).— 16 Mar 1995: 1 male (TL 86 mm), 1 female (TL 123 mm) (NTOU).— 27 Apr 1995: 5 males (TL 106–152 mm), 2 females (TL 72–112 mm) (NTOU).— 28 Sep 1995: 2 males (TL 140–152 mm), 1 female (TL 148 mm) (NTOU).— 19 Oct 1995: 1 male (TL 78 mm) (NTOU).— 25 Nov 1996: 2 females (TL 38–39 mm) (NTOU).— 25 May 1998: 4 males (TL 107–154 mm), 3 females (TL 144–182 mm) (TMCS-0137), 2 males (TL 82–99 mm) (NIWA),— May 1999: 1 male (TL 170 mm) (ZRC 1999.2151).— 10 Apr 2000: 1 male (TL 112 mm) (ZRC 2002.0385).— 7 Mar 2008: 1 female (TL 118 mm) (NTOU), 6 males (TL 74–163 mm), 6 females (TL 75–115 mm) (NIWA 44719). Nanfang-ao fishing port, Yilan County, 17 Dec 1985: 1 female (TL 180 mm) (TMCS-0020).— 16 May 1991: 1 male (TL

118 mm) (TMCS-0104). NE Taiwan, no date: 3 females (TL 160–182 mm) (ZRC 1998.305). Donggang fishing port, Pingtung County, 26 Nov 1994: 1 female (TL 93 mm) (NTOU).— 5 Aug 1996: 2 females (TL 38–40 mm) (NTOU).— 23 Nov 2001: 1 male (TL 57 mm), 1 female (TL 70 mm) (ZRC 2001.0270).— 6–9 Dec 2001: 1 male (TL 72 mm) (ZRC 2001.0288). Magong fishing port, Penghu County, 29 Jan 1986: 1 male (TL 118 mm) (TMCS-0036). CP83, 24°51.4'N, 121°57.4'E, 75–110m, 8 May 2001: 1 male (TL 93 mm) (MNHN). No specific locality: 2 males (TL 132–147 mm) (TMCS-0102).— 1 female (TL 171 mm) (TMCS-0129).— 1 male (TL 150 mm) (TMCS-0133).

Diagnosis.— Rostral plate with median carina. AS5 with pair of dark brown patches.

Size.— To 182 mm TL (Ahyong, 2001).

Coloration.— Overall dorsal colour light brown. Carapace grooves and posterior margin on thoracic and abdominal somites dark brown. Carapace with orange posteromedian margin. AS2 with dark brown mid-dorsal patch. AS5 with pair of distinct tan to dark brown patches. Telson with carinae infused with pale orange. Uropodal protopod and exopod with orangish margins; exopod with dark brown proximal segment extending onto distal segment proximally.

Habitat.— Level, sandy or sandy-mud substrates from nearshore to the outer continental shelf and slope in depths of 30–804 m (Ahyong, 2001).

Distribution.— Western Indian Ocean to Vietnam, Japan, Taiwan, Philippines, New Caledonia, and Australia.

Remarks.— *Kempina mikado* was first reported from Taiwan by Lee & Wu (1966) and appears to be much more common in Taiwan than its congener, *K. stridulans* (Wood-Mason in Alcock, 1894). The most obvious features distinguishing *K. mikado* from *K. stridulans* are the pair of dark dorsal patches on AS5 and the median carina on the rostral plate, both features being absent in the latter.

Population structure and feeding biology of *K. mikado* in the East China Sea was studied by Hamano *et al.* (1996).

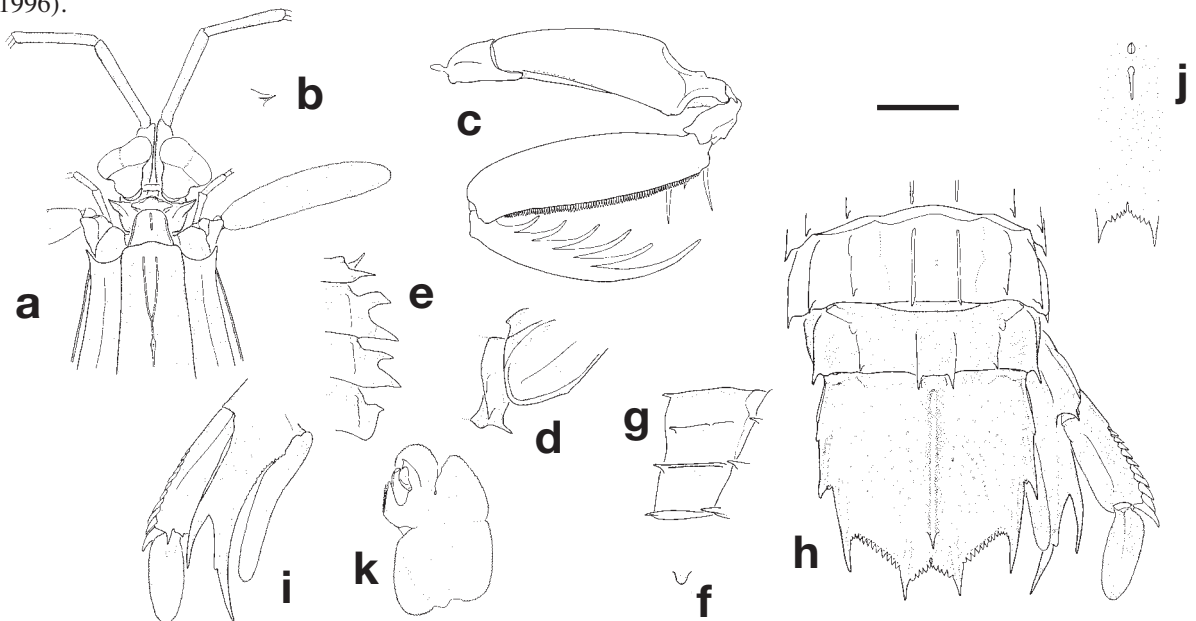


Fig. 98. Male, TL 74 mm, Dasi fishing port, Yilan County, 7 Mar 2008: **a**, anterior cephalothorax; **b**, right dorsal antennular process, lateral; **c**, right raptorial claw; **d**, posterolateral margin of carapace and TS5, right lateral; **e**, right TS5–8 lateral processes; **f**, TS8 sternal keel, right lateral view; **g**, AS5, right lateral view; **h**, AS5–6, telson and uropod; **i**, right uropod, ventral; **j**, postanal carina. Male, TL 91 mm: **k**, right pleopod 1 endopod, anterior view. Scale: a–j = 5.0 mm; k = 3.2 mm.

Kempina stridulans (Wood-Mason in Alcock, 1894)



Fig. 99. Female, TL 125 mm, Dasi fishing port, Yilan County, 7 Mar 2008.

Squilla stridulans Wood-Mason in Alcock, 1894: 409 [type locality: Orissa coast, India].

Kempina stridulans.— Ahyong, 2001: 266.

Material examined.— Dasi fishing port, Yilan County, 28 Feb 1989: 1 male (TL 102 mm) (TMCS-0079).— 25 May 1998: 1 female (TL 135 mm) (AM P67935).— 7 Mar 2008: 1 female (TL 125 mm) (NTOU). Donggang fishing port, Pingtung County, 6–9 Dec 2001: 1 female (TL 90 mm) (ZRC 2001.0287).

Diagnosis.— Rostral plate without median carina. AS2 and 5 without pair of dark brown patches.

Size.— To 135 mm TL.

Coloration.— Overall dorsal colour light brown. Carapace grooves and posterior margin on thoracic and abdominal somites dark brown. Carapace with orange posteromedian margin. Telson with carinae infused with pale orange. Uropodal protopod and exopod with orangish margins; exopod with dark brown proximal segment extending onto distal segment proximally.

Habitat.— Soft substrates; 122–432 m.

Distribution.— India, Philippines and now from Taiwan.

Remarks.— The specimens agree well with published accounts and are the first to be recorded from Taiwan. *Kempina stridulans* is readily distinguished from *K. mikado* by lacking a median carina on the rostral plate and the absence of the pair of large dark dorsal patches on AS5. The 135 mm female (AM P67935) is the largest known specimen of *K. stridulans*.

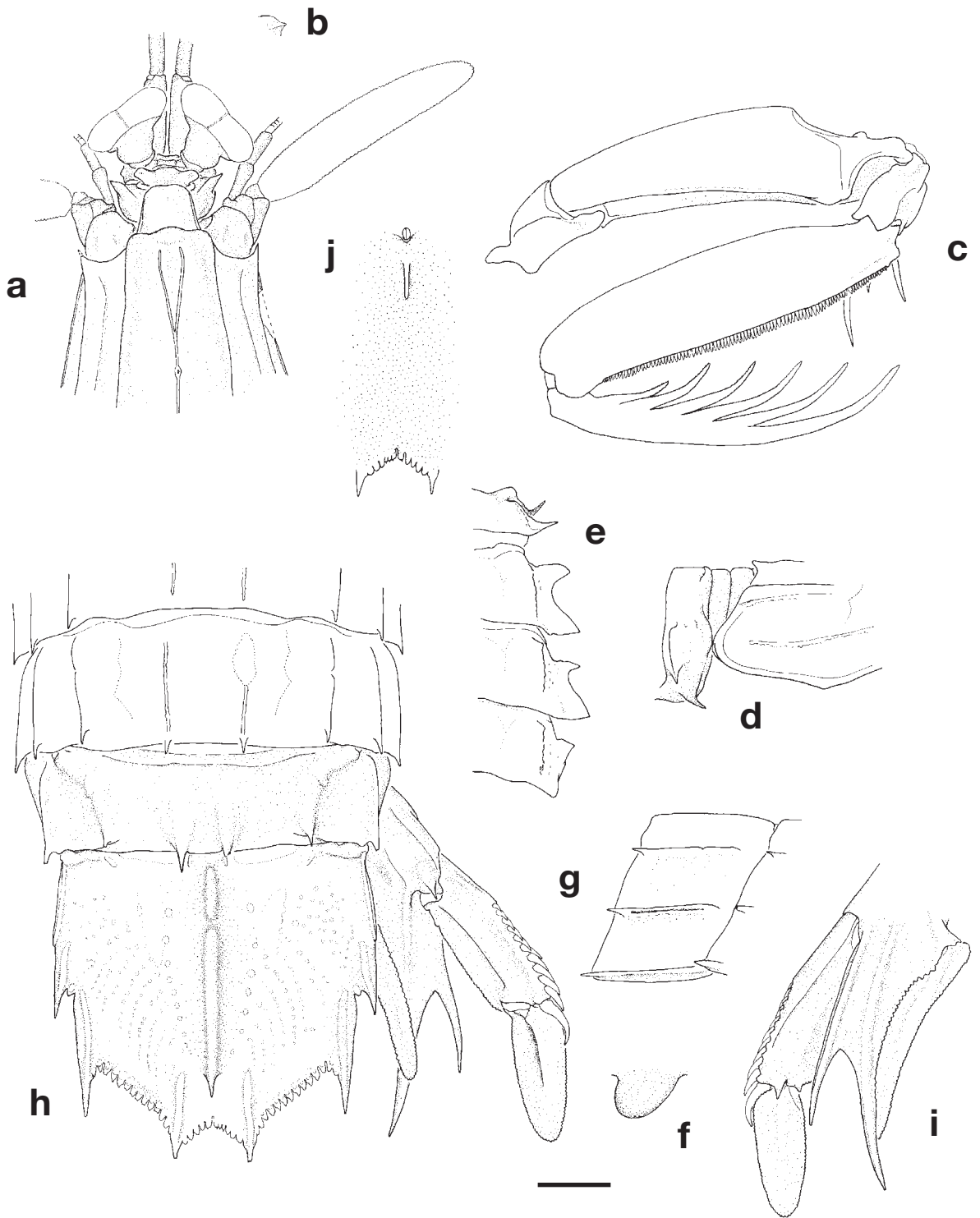


Fig. 100. Female, TL 135 mm, Dasi fishing port, Yilan County, 25 May 1998: **a**, anterior cephalothorax; **b**, right dorsal antennular process, lateral; **c**, right raptorial claw; **d**, posterolateral margin of carapace and TS5, right lateral; **e**, right TS5–8 lateral processes; **f**, TS8 sternal keel, right lateral view; **g**, AS4, right lateral view; **h**, AS5–6, telson and uropod; **i**, right uropod, ventral; **j**, postanal carina. Scale: a–e, h–i = 5.0 mm; f = 2.5 mm.

Genus *Lenisquilla* Manning, 1977

Lenisquilla Manning, 1977b: 422. Type species *Squilla lata* Brooks, 1886, by original designation. Gender feminine.

Diagnosis.— Eye elongate; cornea bilobed, broader than stalk, width less than 1/4 CL. Carapace with anterolateral spines; median carina absent; with intermediate, reflected marginal and reduced lateral carinae, distinct anteriorly and posteriorly only; posterolateral margin rounded. Raptorial claw dactylus with 5 or 6 teeth; carpus dorsal carina undivided; merus without outer inferodistal spine. Mandibular palp present. Maxillipeds 1–4 with epipod. TS5–7 lateral process a single slender spine directed anterolaterally, slightly inclined ventrally. AS1–5 submedian carinae present or absent. Telson submedian teeth with fixed apices; prelateral lobe indistinct; dorsolateral surface without supplementary longitudinal carinae. Telson with short postanal carina. Uropodal protopod inner margin with slender spines.

Remarks.— One of two known species of *Lenisquilla* occurs in Taiwan.

Lenisquilla lata (Brooks, 1886)

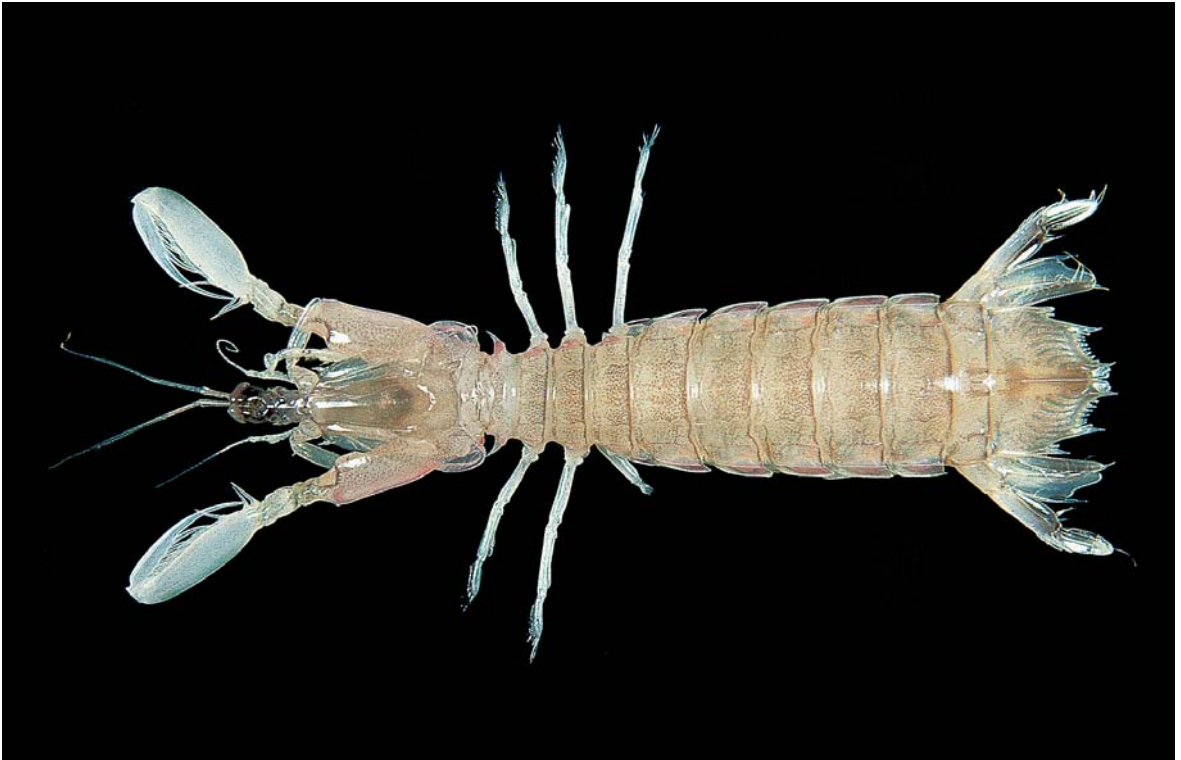


Fig. 101. Female, Donggang fishing port, Pingtung County, 15 Nov 1991.



Fig. 102. Tail fan, dorsal view. Female, TL 94 mm, Donggang fishing port, Pingtung County, 5 Aug 1996.

Squilla lata Brooks, 1886: 21, 34–37, pl. 1: figs. 1–3 [type locality: Arafura Sea, 08°56'S, 136°05'E].
Squilloides latus spinosus Blumstein, 1970: 223, figs. 4, 5 [type locality: Gulf of Tonkin, 17°48'N, 109°32'E].
Squilloides espinosus Blumstein, 1974: 121, fig. 7 [type locality: Gulf of Tonkin, 18°00'N, 109°32'E].
Lenisquilla pentadactyla Moosa, 1991: 205–207, fig. 14 [type locality: New Caledonia, 20°46.8'S, 165°17.3'E].
Lenisquilla lata.— Liu & Wang, 1999: 578.— Ahyong, 2001: 269, fig. 131.

Material examined.— Nanfang-ao fishing port, Yilan County, 9 Jan 1994: 1 female (TL 37 mm) (NTOU).
 Donggang fishing port, Pingtung County, 31 Oct 1984: 1 male (TL 65 mm) (NTOU).— 21 Oct 1995: 2 males (TL 90 mm, 1 damaged) (NIWA). — 5 Aug 1996: 2 females (TL 94–95 mm) (NTOU).

Diagnosis.— AS1–4 without submedian carinae. AS5 at most with faintly indicated submedian carinae.

Size.— To 88 mm TL (Ahyong, 2001).

Coloration.— Overall pale yellow-brown.

Habitat.— Sandy-mud substrates; 45–220 m.

Distribution.— Western Indian Ocean to the South China Sea, Japan, New Caledonia, Australia; a new record for Taiwan.

Remarks.— The Taiwanese specimens, the first to be recorded from Taiwan, agree well with the most recent accounts of the species (Manning, 1991; Ahyong, 2001).

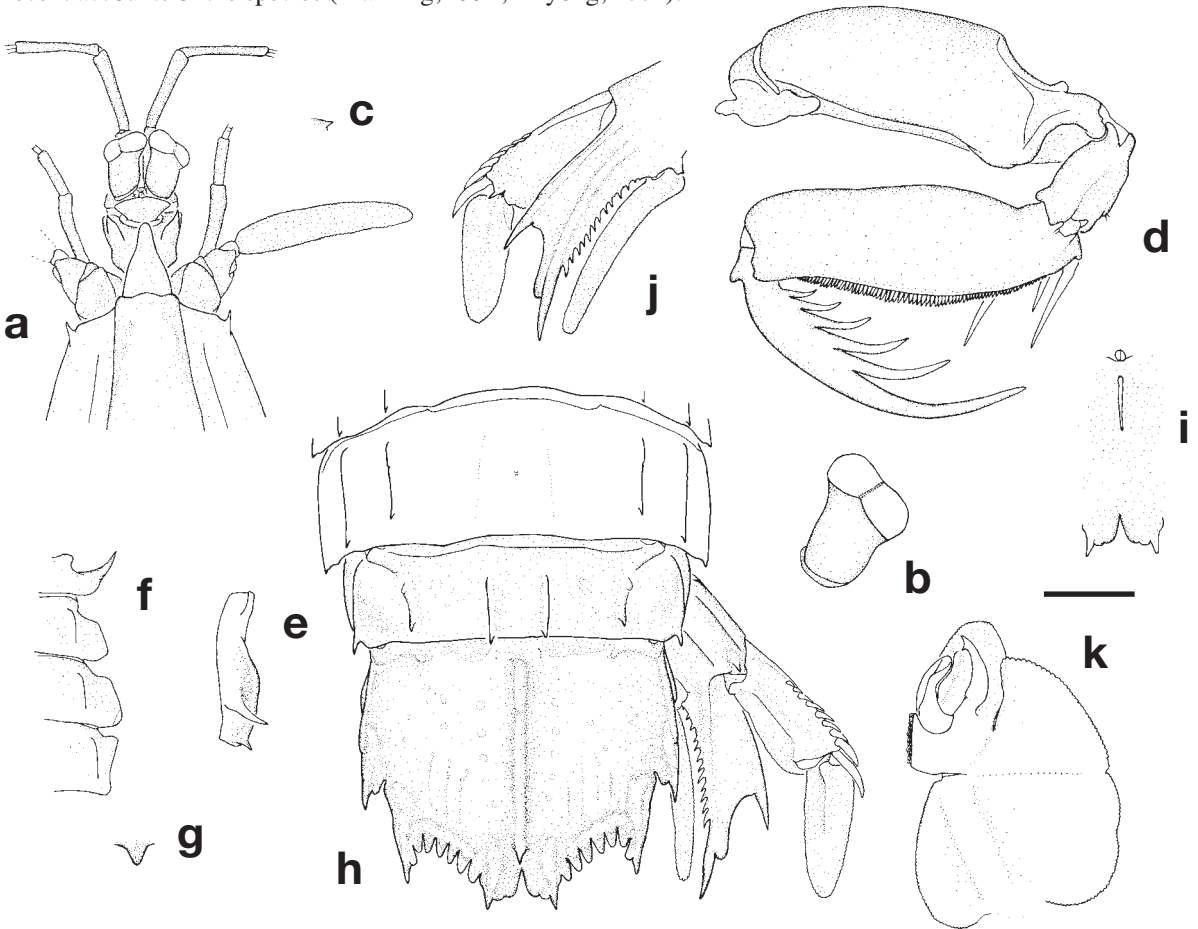


Fig. 103. Male, TL 90 mm, Donggang fishing port, Pingtung County, 21 Oct 1995: **a**, anterior cephalothorax; **b**, right eye; **c**, right dorsal process of antennular somite, lateral; **d**, right raptorial claw; **e**, TS5, right lateral; **f**, TS5–8 lateral processes; **g**, TS8 sternal keel; **h**, AS5–6, telson and uropod; **i**, postanal carina; **j**, right uropod, ventral; **k**, right pleopod 1 endopod. Scale: a, c–j = 5.0 mm; b, k = 2.5 mm.

Genus *Levisquilla* Manning, 1977

Levisquilla Manning, 1977b: 422. Type species *Squilla inermis* Manning, 1965, by original designation and monotypy. Gender feminine.

Diagnosis.— Eye small, elongate, cornea bilobed, broader than stalk. Carapace with anterolateral spines; median carina absent; with indistinct reflected marginal, reduced or absent lateral carinae, evident posteriorly only; posterolateral margin rounded. Raptorial claw dactylus with 6 teeth; carpus dorsal undivided; merus without outer inferodistal spine. Mandibular palp absent. Maxillipeds 1–4 with epipod. TS5 lateral process a short, anteriorly recurved spine basally. TS6–7 lateral process single. AS1–5 without submedian carinae. Telson submedian teeth with articulated apices; prelateral lobe present, but indistinct in juveniles. Uropodal protopod inner margin lined with slender spines; distalmost movable spines on outer margin of exopod proximal segment spatulate.

Remarks.— *Levisquilla* Manning, 1977b, comprises three species of which the type species, *L. inermis* (Manning, 1965) is known from Taiwan.

Levisquilla inermis (Manning, 1965)



Fig. 104. Male, TL 35 mm, Dasi fishing port, Yilan County, 7 Oct 1996.

Squilla inermis Manning, 1965: 255–257, fig. 2 [type locality: Enoshima, Sagami Bay, Japan].

Levisquilla inermis.— Liu & Wang, 1999: 578.— Ahyong, 2001: 271, fig. 132.

Material examined.— Dasi fishing port, Yilan County, 7 Oct 1996: 1 male (TL 35 mm) (NTOU).— 4 Dec 1996: 1 female (TL 38 mm) (NTOU). Nanfang-ao fishing port, Yilan County, 9 Jan 1994: 1 female (TL 33 mm) (NTOU).

Diagnosis.— Telson dorsolateral surface smooth, without supplementary carinae; ventral surface without postanal carina.

Size.— To 46 mm TL (Ahyong, 2001).

Coloration.— Overall light gray-brown. Carapace anterior margin, rostral plate and posterior margin, posterior margins of thoracic and abdominal somites dark brown. Mid-dorsal surfaces of thoracic and abdominal somites with diffuse dark brown rectangle. Thoracic and abdominal carinae light brown. Telson median carina with diffuse, dark brown speckling, carinae of primary teeth orange brown. Raptorial claw and pereopods translucent white with scattered, dark brown speckling. Uropodal exopod distal segment and distal end of proximal segment of black-brown.

Habitat.— Silty sand substrates at depths of 53–108 m.

Distribution.— Japan, Vietnam, northern Australia and now Taiwan.

Remarks.— *Levisquilla inermis* is unique in the genus for lacking longitudinal supplementary carinae on the dorsolateral surface of the telson. The Taiwanese specimens agree well with published accounts (Manning, 1965; Ahyong, 2001) and are the first to be reported from Taiwan.

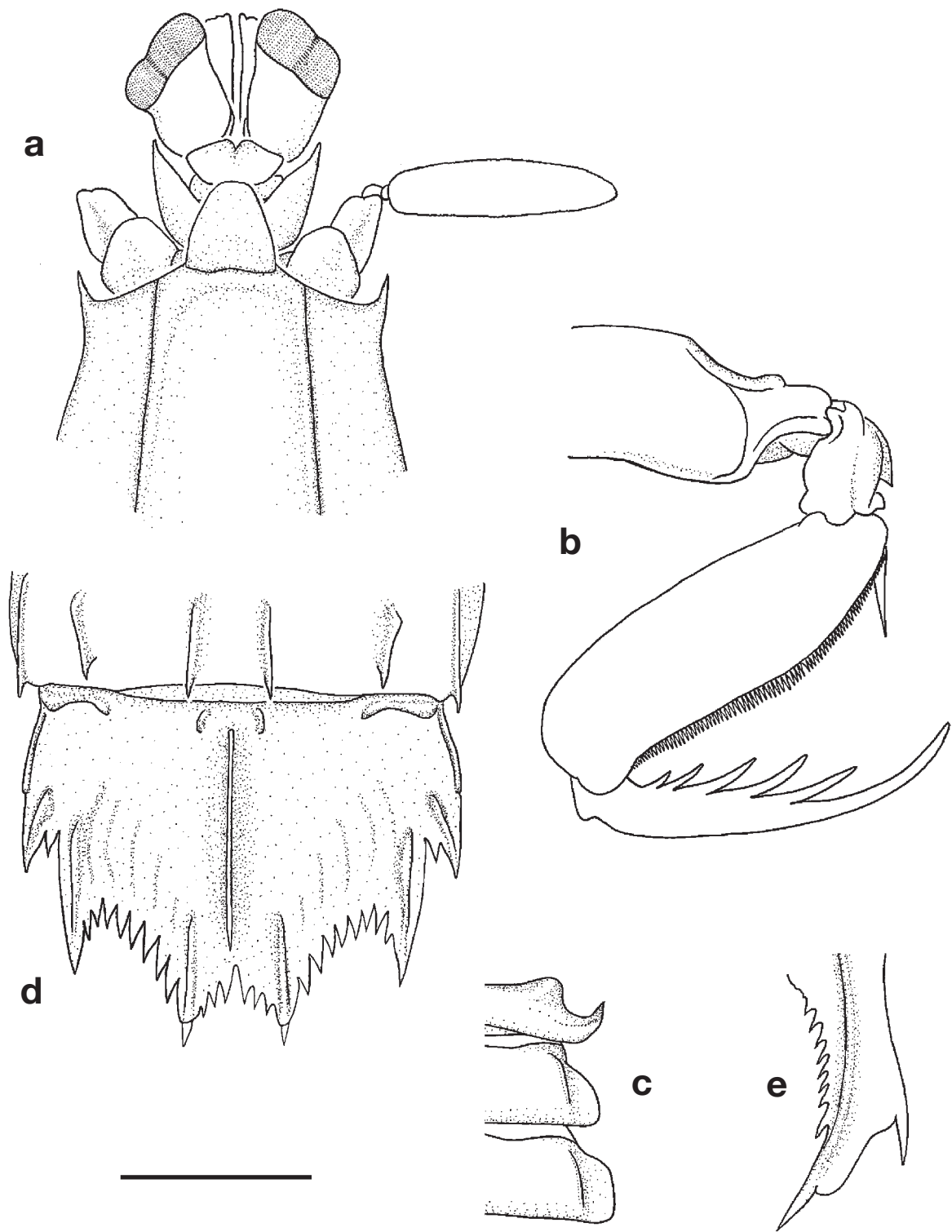


Fig. 105. Female, TL 38 mm, Dasi fishing port, Yilan County, 4 Dec 1996: **a**, anterior cephalothorax; **b**, right raptorial claw; **c**, TS5–7 right lateral processes; **d**, AS6 and telson; **e**, left uropodal protopod, ventral. Scale = 2.0 mm.

Genus *Lophosquilla* Manning, 1968

Lophosquilla Manning, 1968c: 121, 133. Type species *Squilla costata* de Haan, 1844, by original designation. Gender feminine.

Toshimitsu Manning, 1995: 234–235. Type species *Lophosquilla tiwarii* Blumstein, 1974, by original designation and monotypy. Gender masculine.

Diagnosis.— Eye with cornea bilobed, width less than $1/3$ CL. Carapace with anterolateral spines; with short carinae and/or tubercles adjacent to median carina; median carina distinct, interrupted at base of anterior bifurcation; branches of anterior bifurcation distinct; opening anterior to dorsal pit; posterolateral margin rounded. Raptorial claw dactylus with 6 teeth; carpus dorsal carina undivided; merus without outer inferodistal spine. Mandibular palp absent. Maxillipeds 1–4 each with epipod. TS6–8 with distinct submedian and intermediate carinae; with or without short supplementary carinae. TS5–7 lateral process bilobed. AS1–5 median and supplementary carinae concentrated around submedian and intermediate carinae. Telson submedian teeth with fixed apices; prelateral lobe present; dorsolateral surface with curved rows of shallow pits and supplementary longitudinal carinae.

Remarks.— *Lophosquilla* Manning, 1968, comprises two species, of which one is known from Taiwan.

Lophosquilla costata (de Haan, 1844)

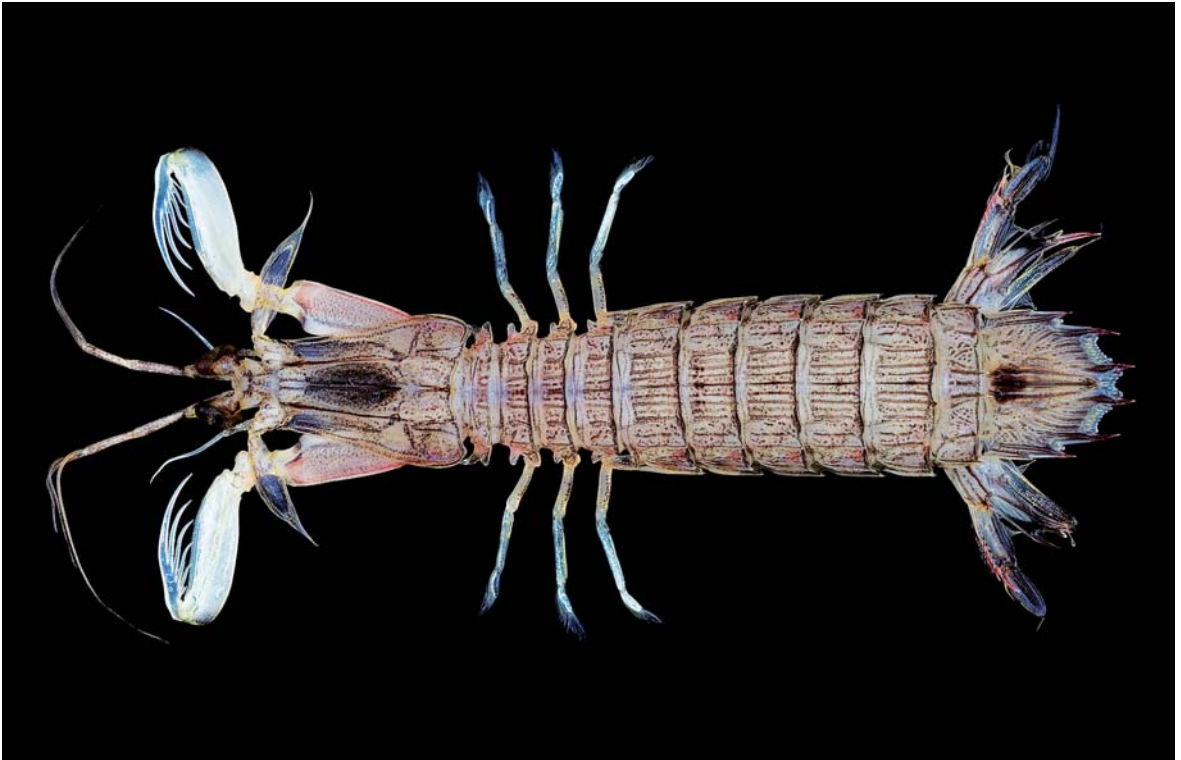


Fig. 106. Female, TL 61 mm, Dasi fishing port, Yilan County, 7 Mar 2008.



Fig. 107. Tail fan, dorsal view. Male, TL 85 mm, Donggang fishing port, Pingtung County, 5 Aug 1996.

Squilla costata de Haan, 1844 (atlas): pl. 51, fig. 5 [type locality: Japan].— Komai, 1927: 322.— Lee & Wu, 1966: 46.

Chloridella costata.— Schmitt, 1931: 147.

Lophosquilla costata.— Dong et al., 1983: 89, pl. 3: fig. 1.— Hu & Tao, 1996: 208, plate 67: 5.— Liu & Wang, 1999: 579.— Ahyong, 2001: 275, fig. 134.— Wang & Liu, 2004: 601.

Lophosquilla makarovi Manning, 1995: 211, fig. 129 [type locality: Vietnam].— Liu & Wang, 1999: 579 [new synonymy].

Material examined.— Keelung fishing port, Keelung City, 3 Jul 1978: 1 female (TL 45 mm) (USNM 304668). Dasi fishing port, Yilan County, 20 Jul 1981: 1 male (TL 73 mm) (NTOU).— 5 Aug 1981: 1 male (TL 64 mm) (NTOU).— 10 Dec 1983: 2 males (TL 46–59 mm), 1 female (TL 65 mm) (TMCS-0059).— 16 Jul 1985: 1 female (TL 66 mm) (TMCS-0029).— 22 Nov 1985: 1 female (broken. CL 17 mm) (TMCS-0016).— 7 Mar 1986: 1 male (TL 44 mm) (TMCS-0035).— 22 Jan 1987: 1 male (TL 48 mm), 1 female (TL 52 mm) (TMCS-0085).— 5 May 1987: 1 male (TL 76 mm) (TMCS-0066).— 18 May 1989: 1 male (TL 85 mm), 4 females (TL 72–90 mm) (TMCS-0110).— 25 Sep 1990: 1 female (TL 77 mm) (NTOU).— 8 Nov 1991: 1 male (TL 65 mm), 1 female (TL 82 mm) (NTOU).— 28 Sep 1995: 2 males (TL 72–78 mm), 5 females (TL 76–96 mm) (NTOU).— 19 Oct 1995: 2 female (TL 53–79 mm) (NTOU).— 2 Nov 1995: 2 males (TL 63–83 mm), 1 females (TL 67 mm) (NTOU).— 16 Nov 1995: 1 female (TL 63 mm) (NTOU).— 12 Dec 1995: 4 males (TL 53–69 mm), 6 females (TL 63–69 mm) (NTOU).— 4 Aug 1996: 2 males (TL 57–66 mm), 1 female (TL 62 mm) (NTOU).— 24 Sep 1996: 2 females (TL 67–76 mm) (NTOU).— 5 May 1998: 2 males (TL 68–74 mm), 10 females (TL 57–94 mm) (AM), 3 males (TL 49–75 mm), 2 females (TL 72–94 mm) (NIWA).— 25 May 1998: 10 males (TL 54–77 mm), 8 females (TL 59–90 mm) (TMCS-0136).— May 1999: 3 females (TL 70–95 mm) (ZRC 1999.2107).— 10 Apr 2000: 1 male (TL 58 mm) (ZRC 2002.0383).— 6 Nov 2000: 1 male (TL 65 mm), 2 females (TL 74–80 mm) (ZRC 2001.0122).— 7 Mar 2008: 1 female (TL 61 mm) (NTOU), 4 males (TL 50–59 mm), 1 female (TL 83 mm) (NIWA). Nanfang-ao fishing port, Yilan County, 16 May 1991: 1 female (TL 66 mm) (TMCS-0105).— 7 Nov 1991: 5 males (TL 47–60 mm), 7 females (TL 52–73 mm) (NTOU).— 5 Oct 1995: 2 females (TL 53–57 mm) (NTOU). Wuci fishing port, Taichung County, 4 Nov 1995: 6 males (TL 85–46 mm), 1 female (TL 73 mm) (NTOU).— 26 Nov 1995: 1 female (TL 79 mm) (NTOU). Budai fishing port, Chiayi County, 20 Jan 1995: 1 female (TL 79 mm) (NTOU). Gushan fishing port, Kaohsiung City, 3 Dec 1995: 4 males (TL 64–79 mm), 3 females (TL 58–74 mm) (NTOU). Kaohsiung harbor, Kaohsiung city, 31 Jan 1994: 1 female (TL 76 mm) (NTOU).— Singda Harbor, Kaohsiung County, 8 Aug 1990: 2 females (TL 81–87 mm) (NTOU). Donggang fishing port, Pingtung County, 5 Aug 1996: 3 males (TL 71–85 mm), 1 female (TL 66 mm) (NTOU), 1 male (TL 57 mm), 1 female (TL 74 mm) (ZRC 1999.2324). Magong fishing port, Penghu County, 6 Aug 1979: 1 male (TL 62 mm) (USNM 304667).— 29 Jan 1986: 1 male (TL 70 mm) (TMCS-0037).— 23 Apr 1986: 1 female (broken. CL 10.4 mm) (TMCS-0126).— 16 Sep 1996: 3 males (TL 51–76 mm) (NTOU). no specific locality: 1 male (TL 58 mm) (NTOU).

Diagnosis.— Telson with prelateral lobe. AS4 submedian carinae unarmed. Uropodal protopod with rounded lobe on outer margin of inner spine.

Size.— To 96 mm TL (this study).

Coloration.— Overall pale gray-brown with dark purple median patch on telson.

Habitat.— Muddy sand from the shore to about 30 m.

Distribution.— Japan, Taiwan, the Philippines, Hong Kong, Vietnam and Australia.

Remarks.— *Lophosquilla costata*, first reported from Taiwan by Lee & Wu (1966), is common around Taiwan and readily recognized by the carinate and tuberculate dorsum in combination with the dark purple patch on the median carina of the telson. Manning (1995) described *Lophosquilla makarovi* from two specimens: the

holotype from Vietnam (MNHN Sto 423, male, TL 45 mm) and a paratype from off Hong Kong (USNM 136307, female, TL 71 mm). According to Manning's (1995) account, *L. makarovi* differs from *L. costata* by the absence of a row of tubercles lateral to the median carina of the carapace, absence of median carinae on TS6–7, and the abdominal somites having at most one carina between the median and submedian carinae on AS1–5, rather than two or three. Re-examination of the type material of *L. makarovi* revealed several inaccuracies in the type description and figures of the species. Contrary to the type account, the holotype of *L. makarovi* bears median carinae on TS6–7 and a reduced row of tubercles is present lateral to the median carina of the carapace — features consistent with small specimens of *L. costata*. Moreover, the number of carinae between the median and submedian carinae on AS1–5 varies allometrically, with one carina present in juveniles increasing to two or three in adults. The holotype of *L. makarovi*, a 45 mm male is a small specimen of *L. costata* in which the overall dorsal carination and ventral telson carination is yet to be fully developed; it agrees in all respects with size-matched specimens of *L. costata*. Additionally, the paratype of *L. makarovi* is typical *L. costata* (fide Ahyong, 2001). Therefore, *L. makarovi* is synonymized with *L. costata*.

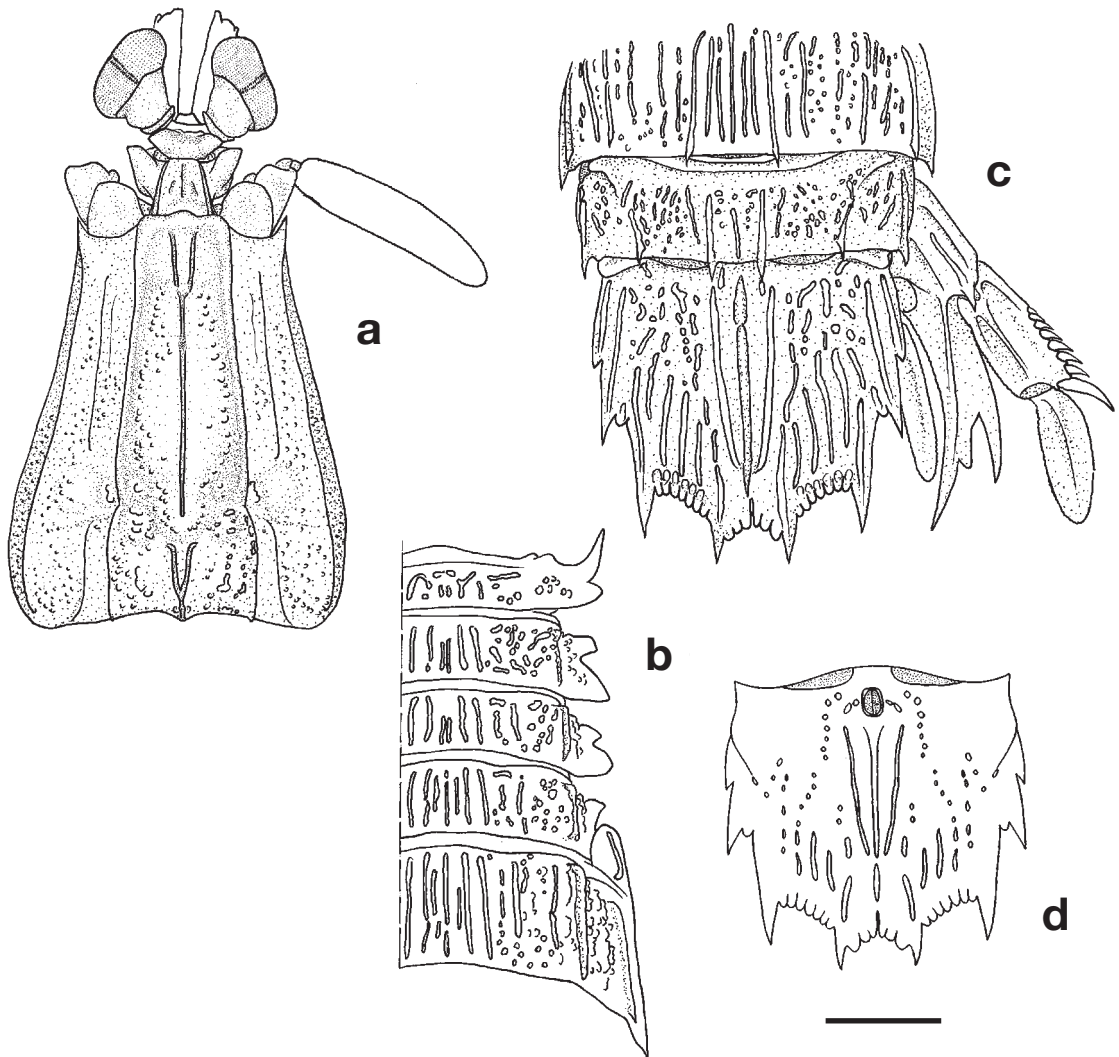


Fig. 108. Female, TL 76 mm, Dasi fishing port, Yilan County, 24 Sep 1996: **a**, carapace and anterior; **b**, left TS5–8 and AS1; **c**, AS5–6, telson and uropod; **d**, telson, ventral. Scale: a, b = 3.8 mm; c, d = 5.0 mm.

Genus *Miyakea* Manning, 1995

Miyakea Manning, 1995: 213. Type species *Squilla nepa* Latreille, 1828, by original designation. Gender feminine.

Diagnosis.— Dorsal integument pitted, rugose. Eye with bilobed cornea, width less than 1/3 CL. Carapace with anterolateral spines; median carina distinct, uninterrupted at base of anterior bifurcation; branches of anterior bifurcation distinct, opening posterior to dorsal pit; posterolateral margin rounded. Raptorial claw dactylus with 6 teeth; carpus dorsal carina irregularly tuberculate; merus outer surface with inferodistal spine. Mandibular palp present. Maxillipeds 1–4 with epipod. TS5–7 lateral processes bilobed. TS6–8 and AS1–6 with submedian carinae. Telson submedian teeth with fixed apices; prelateral lobe present; dorsolateral surface without supplementary longitudinal carinae.

Remarks.— Both known species of *Miyakea* occur in Taiwan.

Key to species of *Miyakea*

1. Carapace with portion of median carina between cervical groove and anterior bifurcation simple, not bicarinate. AS4 submedian carinae usually armed posteriorly *M. nepa*
- Carapace with portion of median carina between cervical groove finely bicarinate. AS4 submedian carinae unarmed *M. holoschista*

Miyakea holoschista (Kemp, 1911)

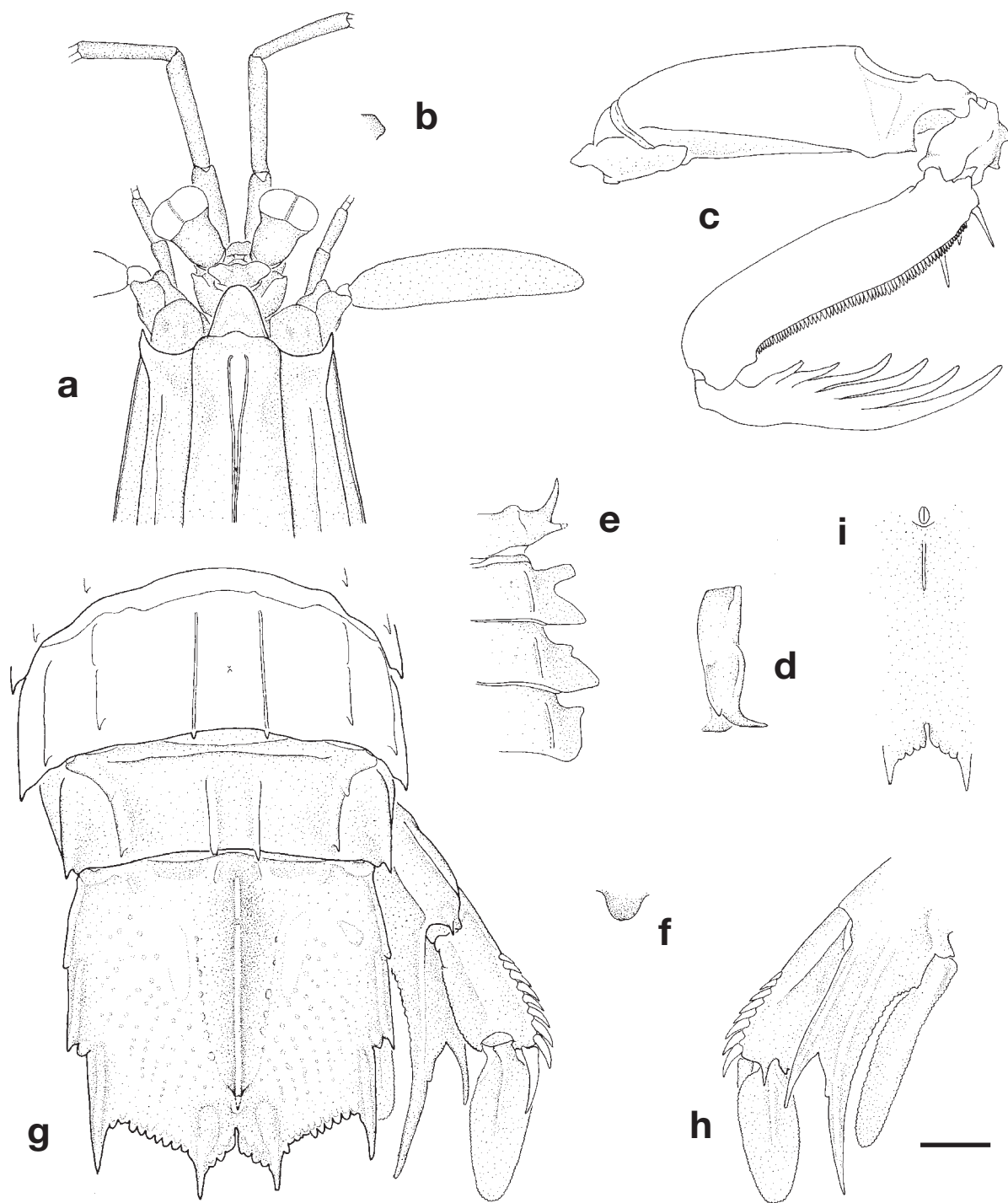


Fig. 109. Female, TL 85 mm, Dasi fishing port, Yilan County, 12 Dec 1995: **a**, anterior cephalothorax; **b**, right dorsal process of antennular somite, lateral; **c**, right raptorial claw; **d**, TS5, right lateral; **e**, right TS5–8 lateral processes; **f**, TS8 sternal keel; **g**, AS5–6, telson and uropod; **h**, right uropod, ventral; **i**, postanal carina. Scale = 3.0 mm.

Squilla holoschista Kemp, 1911: 97; 1913: 64–65, pl. 4, figs. 50–53 [type locality: Madras, India, by present lectotype designation].

Miyakea holoschista.— Liu & Wang, 1999: 579.— Ahyong, 2001: 279.

Material examined.— Dasi fishing port, Yilan County, 12 Dec 1995: 1 female (TL 85 mm) (NTOU).

Diagnosis.— Carapace with portion of median carina between cervical groove and anterior bifurcation finely bicarinate. AS4 with submedian carinae unarmed posteriorly.

Size.— To 85 mm TL.

Coloration.— Not known.

Distribution.— South Africa, India, Indonesia, Vietnam and now from Taiwan.

Remarks.— *Miyakea holoschista* is readily distinguished from its congener, *M. nepa*, by having the portion of the median carina of the carapace behind the anterior bifurcation finely bicarinate instead of single, and in lacking posterior spines on the submedian carinae of AS4. A male (TL 67 mm) and female (70 mm) from Kemp's (1911) original type series of *M. holoschista* from Madras, India, are deposited in the collections of the USNM (USNM 143571). The 67 mm male syntype is herein selected as the lectotype to fix the identity of the species. The 85 mm female (NTOU 1995-12-12) is the largest known specimen of *M. holoschista*, and the first formal record of the species from Taiwan.

Miyakea nepa (Latreille, 1828)

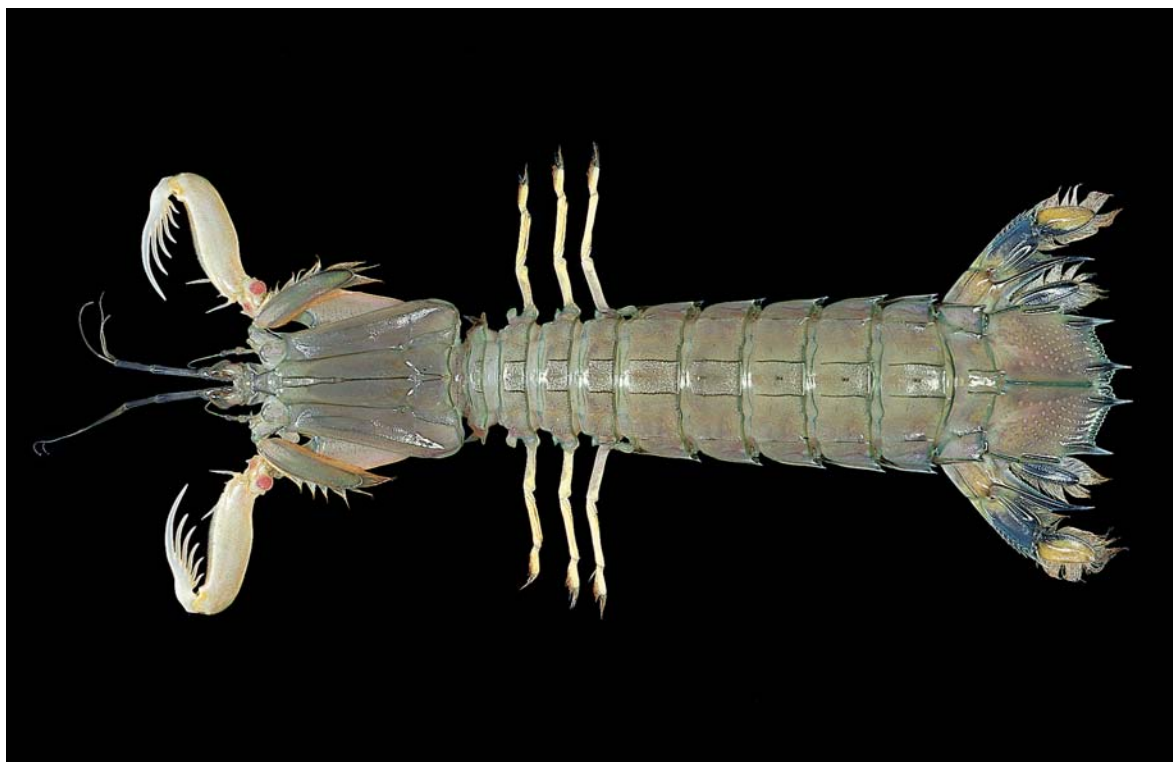


Fig. 110. Female, TL 148 mm, Wuci fishing port, Taichung County, 22 Sep 1996.

Squilla nepa Latreille, 1828: 471 [type localities: Xiamen, China, by neotype selection (Ahyong, 2001)].— Oshima, 1921: 227.— Komai, 1927: 314, 344, 346.

Squilla Edwardsi Giebel, 1861: 320 [type locality: Insel Banka, Indonesia, 2°15'S, 106°00'E].

Chloridella nepa.— Schmitt, 1931: 147.

Oratosquilla nepa.— Dong et al., 1983: 88, pl. 1: fig. 2.— Wang & Liu, 2004: 601.

Miyakea nepa.— Manning, 1995: 219.— Liu & Wang, 1999: 579.— Manning, 1998: 848.— Ahyong, 2001: 279, fig. 136.— Ahyong & Naiyanetr, 2002: 299.

Material examined.— Dasi fishing port, Yilan County, 8 Aug 1985: 1 male (TL 118 mm) (TMCS-0003).— 12 Dec 1995: 1 female (TL 125 mm) (NTOU). Nanfang-ao fishing port, Yilan County, 4–5 Nov 1985: 1 female (TL 74 mm) (NTOU). Wuci fishing port, Taichung County, 9 Oct 1995: 1 males (TL 95 mm), 1 females (TL 109 mm) (NTOU).— 22 Sep 1996: 2 males (TL 95–143 mm), 2 females (TL 110–148 mm) (NTOU). Budai fishing port, Chiayi County, 20 Jan 1995: 2 males (TL 127–137 mm), 1 females (TL 140 mm) (NTOU). Dongshih fishing port, Chiayi County, 8 Aug 1990: 1 male (TL 110 mm) (NTOU). Jhongjhou fishing port, Kaohsiung City, 7 Jan 1986: 1 male (TL 106 mm), 4 females (TL 94–125 mm) (TMCS-0021).— 1 Aug 1986: 5 females (TL 114–124 mm) (TMCS-0106).— Nov 1986: 2 males (TL 114–115 mm) (TMCS-0115).— 3 Dec 1995: 1 male (TL 107 mm) (NTOU). Kaohsiung harbor, Kaohsiung City, 31 Jan 1994: 1 female (TL 107 mm) (NTOU).— 5 Jun 1995: 2 males (TL 89 mm), 1 female (TL 85 mm) (NTOU). Singda Harbor, Kaohsiung County, 24 Jul 1990: 3 females (TL 115–138 mm) (NTOU).— 22 Oct 1995: 3 males (TL 121–127 mm), 1 female (TL 165 mm) (NTOU). Donggang fishing port, Pingtung County, 21 Oct 1995: 1 male (TL 86 mm)

(NTOU). No specific locality: 2 males (TL 115–119 mm), 2 females (TL 95–99 mm) (NTOU).— 1 male (TL 105 mm), 6 females (TL 97–119 mm) (NTOU).— 3 males (TL 91–105 mm), 3 females (TL 94–107 mm) (NTOU).— 1 male (TL 123 mm), 1 female (TL 114 mm) (NTOU).— 1 male (TL 98 mm), 4 females (TL 94–109 mm) (NTOU).

Diagnosis.— Carapace with portion of median carina between cervical groove and anterior bifurcation simple, not bicarinate. AS4 with submedian carinae usually armed posteriorly.

Size.— To 166 mm TL (Kemp, 1913).

Coloration.— Overall dorsal colour olive grey-green. Carinae and grooves of carapace, carinae and posterior margins of body somites dark green. Telson with median carina and carinae of primary teeth dark green; with dark transverse band medially. Uropodal protopod with terminal spines pink; exopod distal segment dark blue-green distally; exopod proximal segment yellow with dark inner proximal infusion.

Habitat.— Level sand and mud substrates; shallow sublittoral to less than 25 m.

Distribution.— Western Indian Ocean to Australia, New Caledonia and Taiwan; doubtfully from French Polynesia.

Remarks.— *Miyakea nepa* was first recorded from Taiwan by Oshima (1921). Characters distinguishing *M. nepa* from its only congener, *M. holoschista* are discussed under the account of the latter. *Miyakea nepa* has been attributed a wide distribution in the Indo-West Pacific, ranging from Madagascar to Tahiti, French Polynesia. Recent study of the French Polynesian Stomatopoda, however, revealed only a single species of ‘large’ squilloid, *Oratosquilla fabricii* [see Ah Yong, 2002a, as *O. calumnia* (Townsend, 1953)]. Apart from Heller’s (1865) record from Tahiti, *M. nepa* has been recorded only as far east as New Caledonia (Moosa, 1991). The specimens on which Heller’s record is based are correctly identified, however, so locality data for Heller’s specimens are probably erroneous.

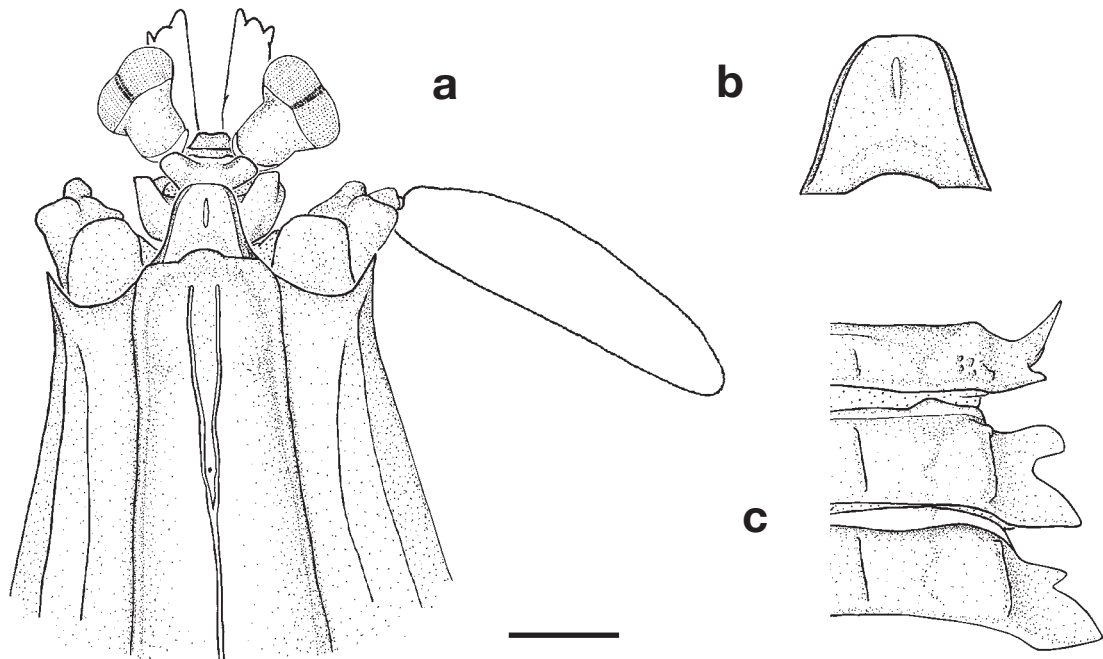


Fig. 111. Male, TL 143 mm, Wuci fishing port, Taichung County, 22 Sep 1996: **a**, carapace and anterior; **b**, TS5–7 lateral processes; **c**, rostral plate. Scale: a, b = 5.0 mm; c = 2.5 mm.

Genus *Oratosquilla* Manning, 1968

Oratosquilla Manning, 1968c: 120, 133. Type species *Squilla oratoria* de Haan, 1844, by original designation.

Gender feminine.

Diagnosis.— Dorsal integument variously pitted. Eye strongly bilobed, distinctly broader than and set obliquely on stalk, cornea width less than 1/3 CL. Carapace with anterolateral spines; median carina distinct, not interrupted at base of anterior bifurcation; branches of anterior bifurcation distinct, opening anterior to dorsal pit; posterolateral margin rounded. Raptorial claw dactylus with 6 teeth, outer margin without basal notch; carpus dorsal carina bi or tri tuberculate; merus outer inferodistal angle with or without spine. Mandibular palp present. Maxillipeds 1–4 with epipod. TS6–8 and AS1–6 with submedian carinae. TS5–7 lateral processes bilobed. Telson submedian teeth with fixed apices; prelateral lobe present; dorsolateral surface with curved rows of shallow pits; without supplementary longitudinal carinae. Uropodal protopod inner margin crenulate.

Remarks.— *Oratosquilla* presently includes four species, of which two are known from Taiwan.

Key to species of *Oratosquilla* from Taiwan

1. AS4 submedian carinae with posterior spine. AS5 with dark submedian patches *O. fabricii*
- AS4 submedian carinae unarmed. AS5 without dark submedian patches. *O. oratoria*

Oratosquilla fabricii (Holthuis, 1941)

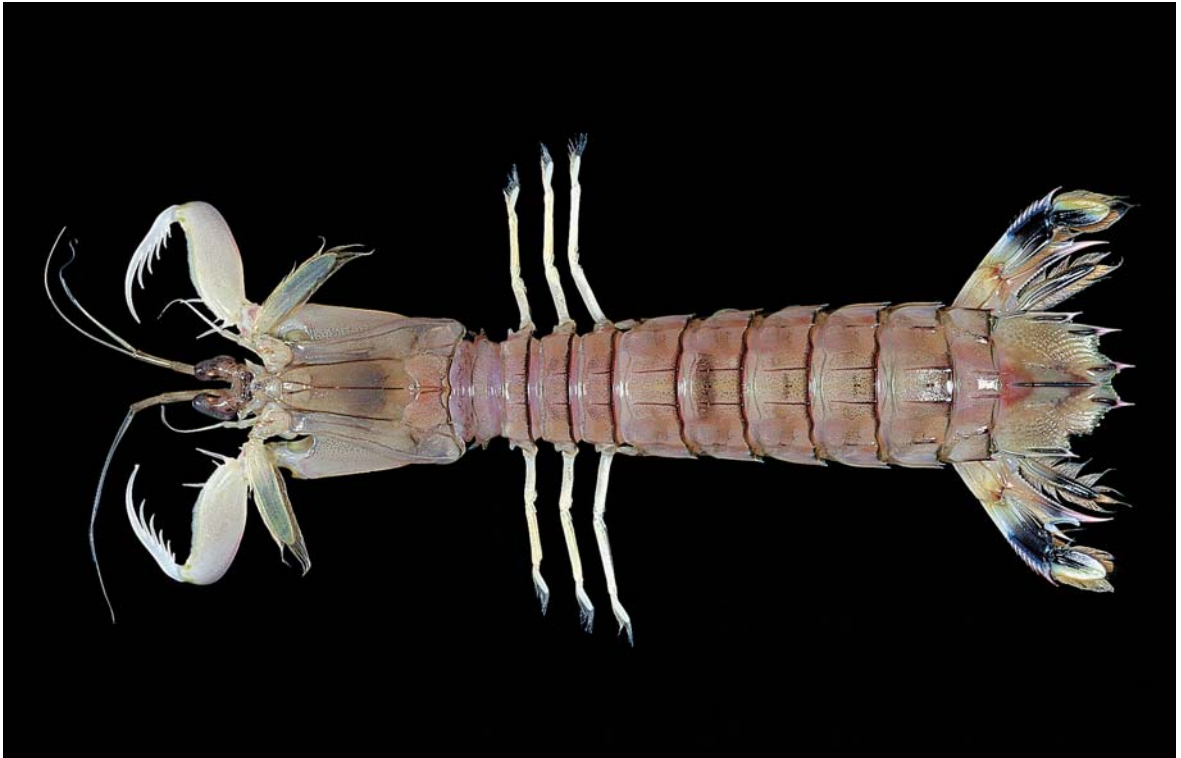


Fig. 112. Female, TL 108 mm, Donggang fishing port, Pingtung County, 5 Aug 1996.



Fig. 113. Tail fan, dorsal view. Female, TL 108 mm, Donggang fishing port, Pingtung County, 5 Aug 1996.

Squilla fabricii Holthuis, 1941: 249–253, fig. 1 [type locality: Telok Dalam, Nias, Indonesia].

Squilla calumnia Townsley, 1953: 410, figs. 8, 9 [type locality: Hilo, Hawaii].

Oratosquilla mauritania.— Liu & Wang, 1999: 579 [not *O. mauritania* (Kemp, 1913)].

Oratosquilla fabricii.— Ahyong, 2000: 926–930, fig. 1; 2001: 283.

Material examined.— Dasi fishing port, Yilan County, 24 Sep 1996: 1 female (TL 64 mm) (AM). Wuci fishing port, Taichung County, 4 Nov 1995: 1 female (TL 125 mm) (NTOU).— 26 Nov 1995: 1 male (TL 79 mm) (NTOU).— 6 Jul 1996: 1 female (TL 140 mm) (NTOU).— 22 Sep 1996: 1 female (TL 117 mm) (NTOU). Jhongjhou fishing port, Kaohsiung City, 1 Aug 1986: 1 male (TL 122 mm) (TMCS-0051).— Nov 1986: 1 female (TL 121 mm), (TMCS-0113). Donggang fishing port, Pingtung County, 5 Aug 1996: 1 female (TL 108 mm) (NTOU).— 1 Nov 1996: 1 male (TL 101 mm), 2 females (TL 132–146 mm) (NTOU). Magong fishing port, Penghu County, 16 Sep 1996: 1 male (TL 139 mm), 1 female (TL 149 mm) (NIWA).

Diagnosis.— Dorsal distinctly punctate. Rostral plate appearing elongate, apex broadly rounded. Anterior lobe of lateral process of TS7 angular or rounded. AS5 with dark submedian patches. Submedian carinae of AS4–6 each with posterior spine. Raptorial claw merus with outer inferodistal spine.

Size.— To 149 mm TL (this study).

Coloration.— Overall pale gray with diffuse, darker mottling; carinae of carapace submedian carinae of abdomen dark red. AS2 with dark transverse bar medially. Telson carinae dark blue-green. Uropodal exopod with distal half of proximal segment and inner two-thirds of distal segment blue.

Habitat.— Sand and mud substrates; 5–50 m.

Distribution.— Hawaii, French Polynesia, Guam, Fiji, New Caledonia, Indonesia, and the Philippines, and now from Taiwan.

Remarks.— The present specimens of *O. fabricii* are the first to be recorded from Taiwan, and correspond well with the recent redescription of the species (Ahyong, 2000). Ahyong (2002b) reported variation in the condition of the median carina of the carapace in Hawaiian specimens, with some having the median carina interrupted at the base of the anterior bifurcation. In all specimens of the present series, the median carina of the carapace is continuous with the anterior bifurcation. Manning (1968a, 1995) used the shape of the anterior lobe of TS7, whether rounded or angular, as a character distinguishing *O. mauritania* (Kemp, 1913) from *O. fabricii* (as *O. calumnia* (Townsley, 1853)). As discussed by Ahyong (2000), the anterior lobe of TS7 in *O. fabricii* varies from angular to rounded, and this variation is evident in the Taiwanese material. Abdominal spination in the present series is as follows: submedian (3)4–6, intermediate (1)2–6, lateral 1–6, marginal 1–5.

Oratosquilla fabricii is readily distinguished from *O. oratoria* by the presence of armed submedian carinae on AS4.

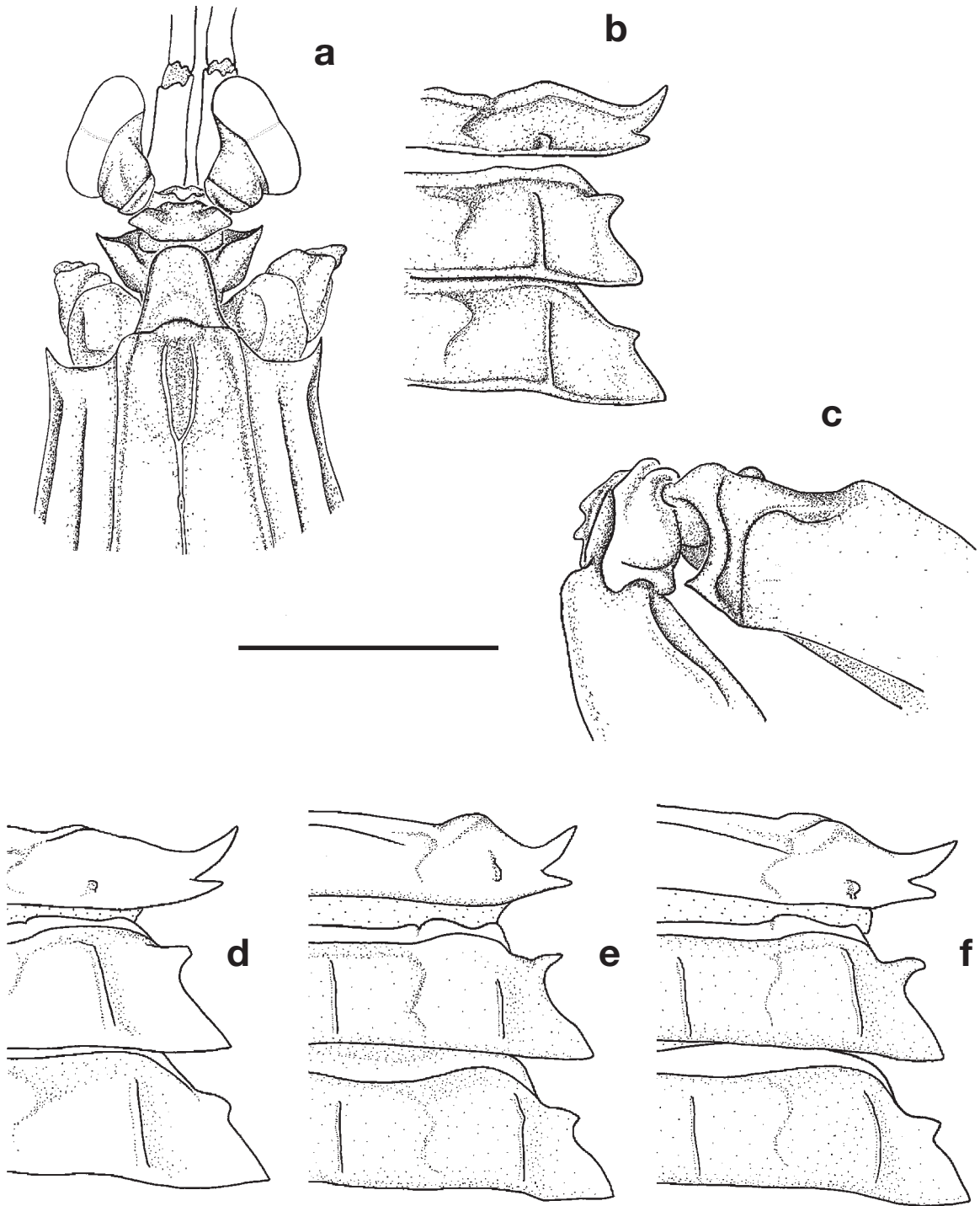


Fig. 114. Female, TL 125 mm, Wuci fishing port, Taichung County, 4 Nov 1995: **a**, anterior; **b**, carpus of left raptorial claw; **c-f**, TS5-7 lateral processes. Female, TL 140 mm, Makung fishing port, Penghu County, 16 Sep 1996: **d**, TS5-7 lateral processes. Male TL 139 mm, female TL 149, Makung fishing port, Penghu County, 16 Sep 1996: **e-f**, TS5-7 lateral processes. Scale = 10.0 mm.

Oratosquilla oratoria (de Haan, 1844)

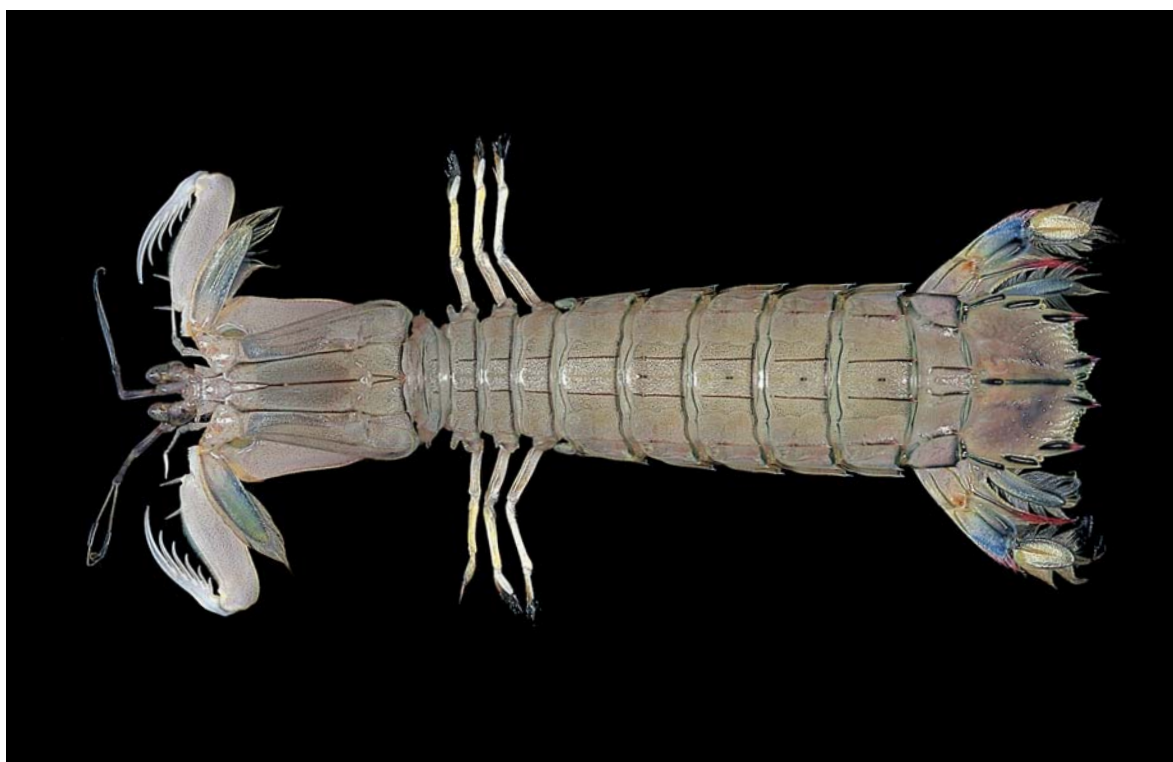


Fig. 115. Female, TL 117 mm, Wuci fishing port, Taichung County, 22 Sep 1996.



Fig. 116. Tail fan, dorsal view. No specific locality.

Squilla oratoria de Haan, 1844 (atlas): pl. 51, fig. 2 [type locality: Japan]; 1849 (text): 223.— Komai, 1927: 315, 344, 346.— Lee & Wu, 1966: 50–51, tab. 1.

Squilla affinis Berthold, 1845: 46 [type locality: China].— Fukuda, 1909: 169, pl. 4: fig 2; 1910, 150–151.— Balss, 1910a: 9; 1910b: 3.— Fukuda, 1913: 72.

Chloridella oratoria.— Schmitt, 1931: 147.

Oratosquilla oratoria.— Manning, 1971b: 6–8, fig. 2.— Hamano & Matsuura, 1987: 23.— Hamano et al., 1994: 5.— Hu & Tao, 1996: 207, plate 66: 4, 7.— Liu & Wang, 1999: 579.— Moosa, 2000: 447.— Ahyong, 2001: 283–285, fig. 138.

Material examined.— Keelung fishing port, Keelung City, 5 Aug 1996: 1 female (TL 116 mm) (NTOU). Dasi fishing port, Yilan County, 6 Nov 1989: 2 males (TL 72–77 mm) (NTOU). Nanfang-ao fishing port, Yilan County, 6 Nov 1995: 1 male (TL 136 mm) (NTOU). Wuci fishing port, Taichung County, 16 Jan 1995: 1 male (TL 146 mm) (NTOU).— 26 Nov 1995: 1 male (TL 118 mm), 1 female (TL 128 mm) (NTOU).— 28 Jul 1996: 5 males (TL 99–116 mm), 5 females (TL 82–108 mm) (NTOU).— 22 Sep 1996: 1 female (TL 117 mm) (NTOU). Donggang fishing port, Pingtung County, 21 Oct 1995: 1 male (TL 138 mm) (NTOU). Magong fishing port, Penghu County, 23 Apr 1986: 1 female (TL 145 mm) (TMCS-0042). No specific locality, 8 Jul 1978: 1 male (TL 130 mm), 1 female (TL 132 mm) (USNM 304669).

Diagnosis.— Dorsal integument finely pitted. Raptorial claw merus with outer inferodistal spine. Rostral plate trapezoid to square, appearing short. AS5 without dark submedian patches. Submedian carinae of AS4 unarmed.

Size.— To 185 mm TL (Ahyong, 2001).

Coloration.— Overall dorsal colour light grey or brown in large males. Carinae and grooves of carapace, submedian and intermediate carina of body dark red. Posterior margin of body somites dark green. Telson with median carina, tubercles and carinae of primary teeth dark brown-green; apices of primary teeth red. Uropodal protopod with red terminal spines. Uropodal exopod with proximal segment dark blue distally; distal segment yellow with dark inner margin.

Habitat.— U-shaped burrows in sandy-mud or silt-clay substrates from the shore to about 20 m.

Distribution.— Southern Russia, Japan, Taiwan, China, Vietnam and eastern Australia.

Remarks.— *Oratosquilla oratoria* differs from *O. fabricii* chiefly in having unarmed submedian carina of AS4 and in lacking the dark submedian patches on AS2 & 5. Abdominal spination in the present series is as follows: submedian 5–6, intermediate (2)3–6, lateral 2–6, marginal 1–5.

Oratosquilla oratoria is an abundant East Asian species that supports important fisheries, especially in Japan, where it is popularly known as Shako. Around 5000 tons of *O. oratoria* are harvested annually in Japan. As a result of its fishery importance, *O. oratoria* is one of the best studied stomatopods in the world, and most aspects of its fishery biology have been studied in detail (e.g., Komai, 1920, 1924; Hamano, 1988, 1990; Hamano et al., 1995; Hamano & Matsuura, 1984, 1986a, b, 1987a–c; Hamano, 2005). In Japanese populations of *O. oratoria*, mating typically takes place between April and September (peaking in June) (Hamano et al., 1987). As with other stomatopods, female *O. oratoria* incubate the embryos inside their burrows. Hatching time is temperature dependant, but is about 14 days at 25°C (Hamano & Matsuura, 1984). Larvae moult through 11 larval stages (over about 1–2 months under laboratory conditions), the first two of which are non-feeding propelagic stages that remain in the burrow with the female; subsequent feeding stages are planktonic (Hamano & Matsuura, 1987a). At settlement, postlarvae assume adult behaviours in terms of burrowing and feeding. Burrows are constructed in mud or sandy-mud, and U-shaped with an entrance at either end. Burrows of large adults reach about 1 m in length and 15 cm in depth (Hamano et al., 1994). Prey principally consists of caridean and penaeoid shrimps and thin-shelled bivalve molluscs (Hamano & Matsuura, 1986b). Estimated lifespan after

settlement is 3.0–3.5 years (Hamano *et al.*, 1987). The alpheid shrimp, *Athanas squilliphilus* Hayashi, 2002, was discovered to live commensally with *O. oratoria* in Japan (Hayashi, 2002).

In Taiwan, *O. oratoria* is more common in the southern region where it is frequently caught and sold. Ahyong (2001) recently reported *O. oratoria* from southeastern Australia as a probable human introduction.

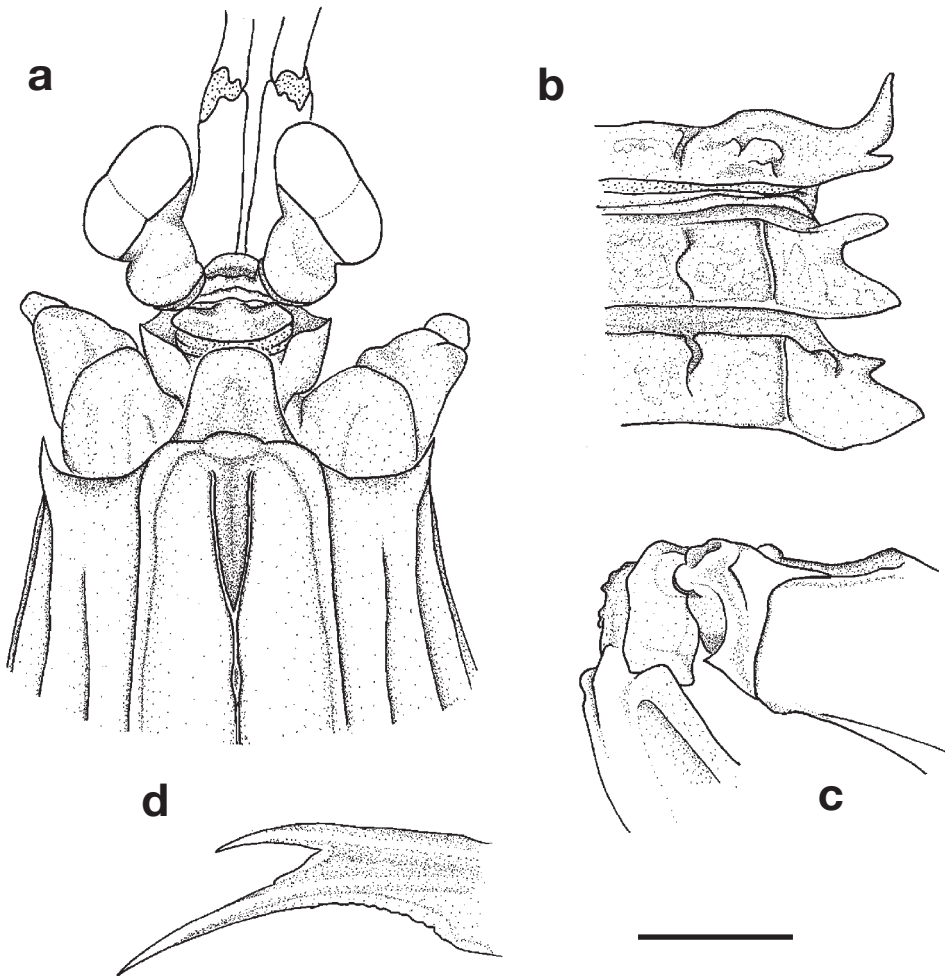


Fig. 117. Male, TL 138 mm, Donggang fishing port, Pingtung County, 21 Oct 1995: **a**, anterior; **b**, TS5–7 lateral processes; **c**, carpus of left raptorial claw; **d**, right uropodal protopod, ventral. Scale = 5.0 mm.

Genus *Oratosquillina* Manning, 1995

Oratosquillina Manning, 1995: 224. Type species *Squilla interrupta* Kemp, 1911, by original designation.

Gender feminine.

Diagnosis.— Dorsal integument smooth or variously pitted. Cornea width less than 1/3 CL, strongly bilobed. Carapace anterior width less than or slightly exceeding half median length; with anterolateral spines; median carina distinct, interrupted at base of anterior bifurcation; branches of anterior bifurcation distinct or absent, opening anterior to dorsal pit; posterolateral margin rounded. Raptorial claw dactylus with 5 or 6 teeth; carpus dorsal carina entire or divided; merus outer inferodistal angle armed. Mandibular palp present or absent. Maxillipeds 1–4 each with epipod. TS5–7 lateral process bilobed. TS6–8 and AS1–6 with submedian carinae. Telson submedian teeth with fixed apices; prelateral lobe present.

Remarks.— *Oratosquillina* Manning, 1995, includes 12 species, of which 7 are known from Taiwan. Ahyong (2001) indicated that *Oratosquillina megalops* (Manning, 1980b), described from Taiwan, was a probably synonym of the more widespread *O. inornata* (Tate, 1883) — the two species are synonymized below.

Key to species of *Oratosquillina* from Taiwan

1. Telson with rows of carinae on dorsolateral surface either side of median carina. Mandibular palp absent.
..... *O. manningi*
- Telson without rows of carinae on dorsolateral surface either side of median carina. Mandibular palp present
..... 2
2. Raptorial claw dactylus with 5 teeth *O. nordica*
- Raptorial claw dactylus with 6 teeth 3
3. Raptorial claw with dorsal carina of carpus entire, margin smooth 5
- Raptorial claw with dorsal carina of carpus divided or tuberculate 4
4. Submedian carinae of AS4 unarmed posteriorly. Lobe on outer margin of inner spine of uropodal protopod straight or convex. Rostral plate without median carina *O. interrupta*
- Submedian carinae of AS4 armed posteriorly. Lobe on outer margin of inner spine of uropodal protopod with concave margin. Rostral plate usually with short median carina *O. asiatica*
5. Dorsal processes of A1 somite with blunt, rounded apices (viewed laterally). Dorsum finely pitted, not distinctly rugose. TS6 lateral process with anterior lobe quadriform or slender, not triangular
..... *O. inornata*
- Dorsal processes of A1 somite usually with sharp or angular apices (viewed laterally). Dorsum distinctly rugose and pitted, often with eroded appearance. TS6 lateral process with anterior lobe trianguloid 6
6. Rostral plate squarish, appearing short *O. perpensa*
- Rostral plate rectangular, appearing elongate *O. gravieri*

Oratosquillina asiatica (Manning, 1978)



Fig. 118. Male, TL 80 mm, Donggang fishing port, Pingtung County, 1 Nov 1996.

Oratosquilla asiatica Manning, 1978c: 10–12, fig. 4 [type locality: Philippines].

Oratosquillina asiatica.— Liu & Wang, 1999: 579.— Ahyong, 2001: 286.

Material examined.— Nanfang-ao fishing port, Yilan County, 5 Oct 1995: 1 female (TL 90 mm) (NTOU). Budai fishing port, Chiayi County, 20 Jan 1995: 12 males (TL 91–114 mm), 8 females (TL 96–131 mm) (NTOU). Singda Harbor, Kaohsiung County, 2 Jun 1986: 1 female (TL 87 mm) (TMCS-0052).— no date: 1 male (TL 107 mm) (NTOU). Donggang fishing port, Pingtung County, 1 Nov 1996: 13 males (TL 73–86 mm) (NTOU), 8 females (TL 71–82 mm) (NIWA). No specific locality: 1 male (TL 105 mm) (TMCS-0130).— 1 male (TL 90 mm) (TMCS-0131).

Diagnosis.— Raptorial claw with dorsal carina of carpus divided or tuberculate; dactylus with 6 teeth. Mandibular palp present. Submedian carinae of AS4 armed posteriorly. Lobe on outer margin of inner spine of uropodal protopod with concave margin. Rostral plate usually with short median carina.

Size.— To 105 mm TL (present study).

Coloration.— Overall pale gray with diffuse, darker mottling; carinae of carapace submedian carinae of abdomen dark red. AS2 with dark transverse bar medially. Telson carinae dark blue-green. Uropodal exopod with distal half of proximal segment blue; distal segment yellow.

Habitat.— Sand and mud; shallow water.

Distribution.— Taiwan, Philippines and Indonesia.

Remarks.— The present series of *O. asiatica* agrees with the type description in most respects. The median carina on the rostral plate, however, may be indistinct, and the dorsal carina on the carpus of the raptorial claw

varies allometrically from irregularly divided to distinctly tuberculate, resembling allometric variation in *O. fabricii* (see Ah Yong, 2002a). Abdominal spination in the present series is as follows: submedian (3)4–6, intermediate (2)3–6, lateral 1–6, marginal 1–5; CI 360–390.

Oratosquillina asiatica, first reported from Taiwan by Manning (1978c) as part of the type series, can be distinguished from its Taiwanese congeners using the key above.

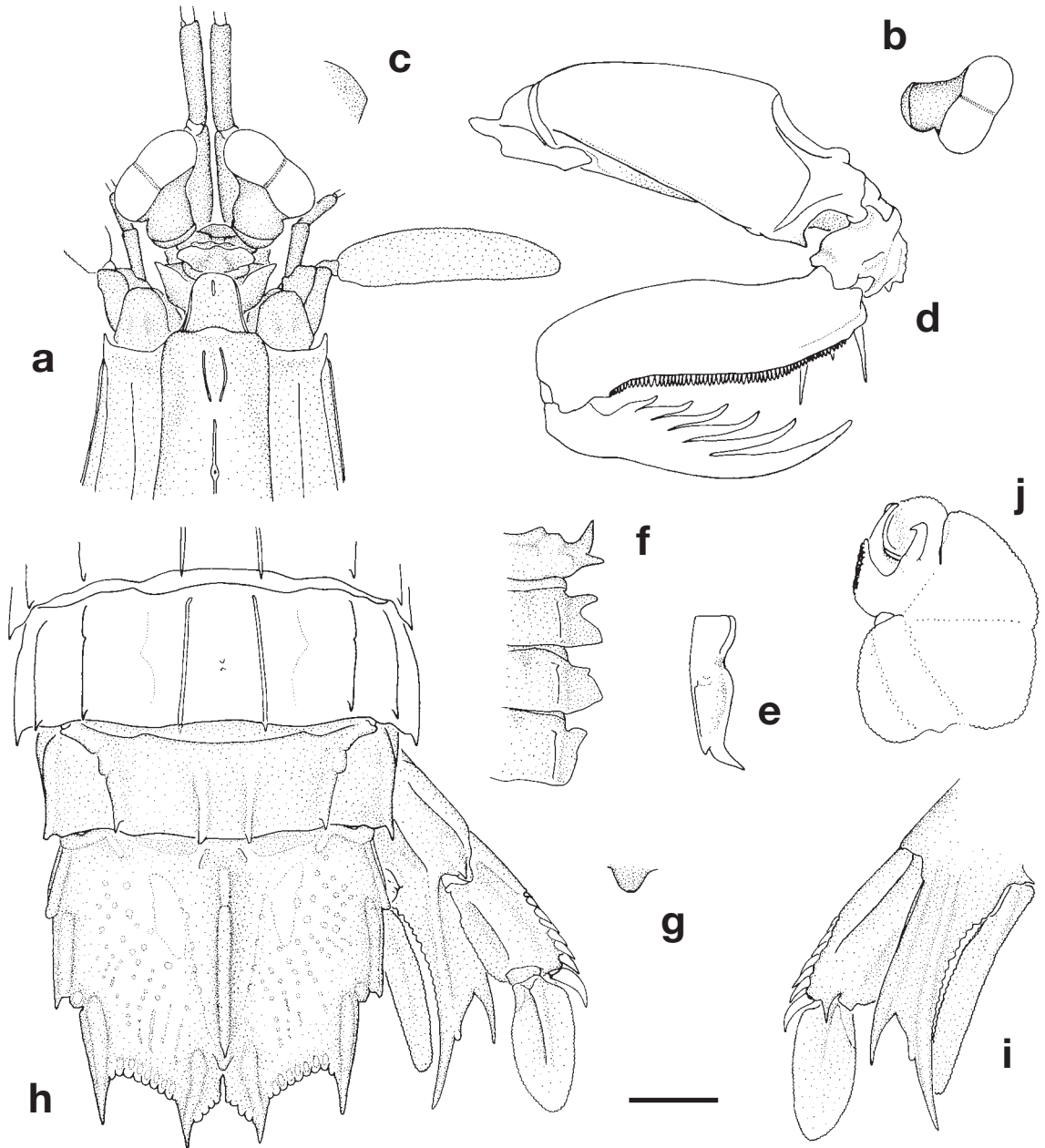


Fig. 119. Male, TL 72 mm, Donggang fishing port, Pingtung County, 1 Nov 1996: **a**, anterior cephalothorax; **b**, right eye; **c**, right dorsal process of antennular somite, lateral; **d**, right raptorial claw; **e**, TS5, right lateral; **f**, TS5–8 lateral processes; **g**, TS8 sternal keel; **h**, AS5–6, telson and uropod; **i**, right uropod, ventral; **j**, right pleopod 1 endopod. Scale: a, b, d–f, h–j = 3.0 mm; c, g, j = 1.5 mm.

Oratosquillina gravieri (Manning, 1978)

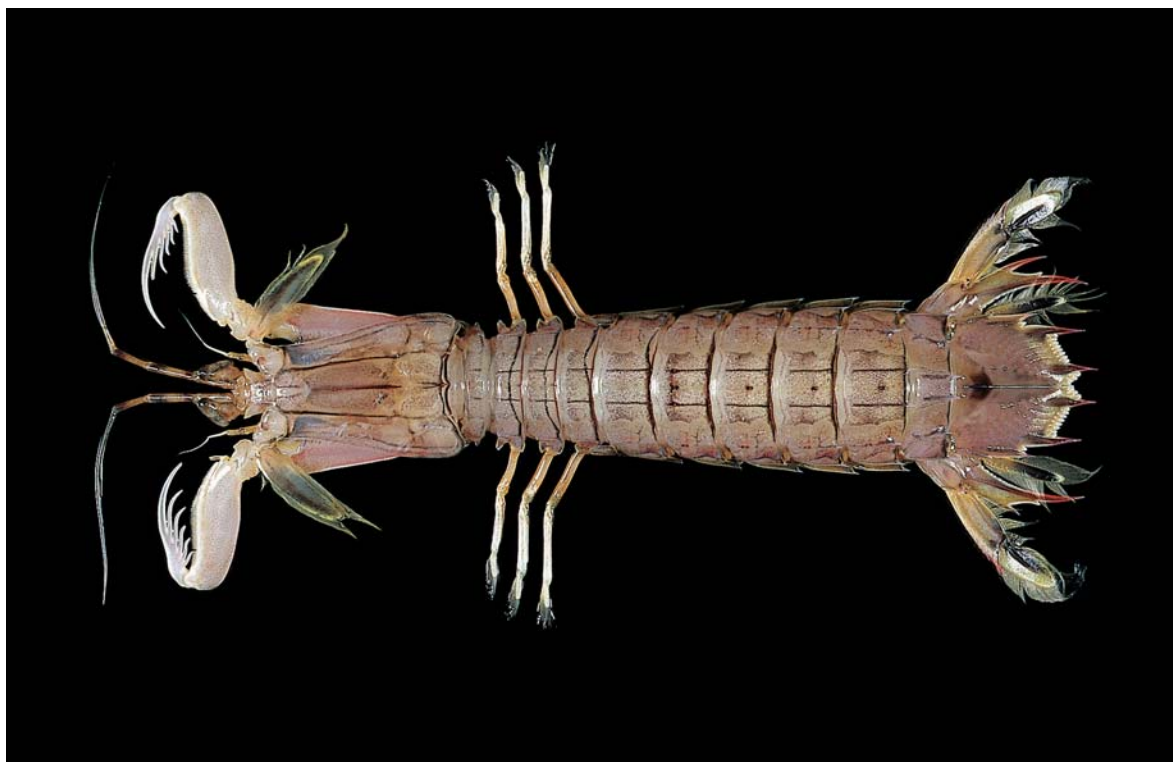


Fig. 120. Female, TL 102 mm, Donggang fishing port, Pingtung County, 1 Nov 1996.

Oratosquilla gravieri Manning, 1978c: 7, 14–15, fig. 6 [type locality: Hongay, Baie d'Along, Tonkin, Vietnam].
Oratosquillina gravieri.— Ahyong, 2001: 288–291, fig. 140.

Material examined.— Donggang fishing port, Pingtung County, 1 Nov 1996: 5 females (TL 97–108 mm) (NTOU).

Diagnosis.— Dorsal processes of A1 somite usually with sharp or angular apices (viewed laterally). Rostral plate rectangular, appearing elongate. Dorsum distinctly rugose and pitted, often with eroded appearance. TS6 lateral process with anterior lobe trianguloid. Telson without supplementary dorsolateral carinae on telson. Mandibular palp present. Raptorial claw with dorsal carina of carpus entire; dactylus with 6 teeth.

Size.— To TL 123 mm (Moosa, 1991, as *O. inornata*, non Tate, 1883).

Coloration.— Overall pale tan. Carinae and grooves marked with dark brown. A1 peduncle banded dark brown and tan. A2 scale dark proximally. AS2 with narrow transverse brown bar across submedian carinae. Telson median carina with dark red proximal patch; carinae of primary teeth green with reddish apices. Uropodal protopod yellow-brown proximally, terminal spines red; exopod black on inner half.

Habitat.— Sandy mud or muddy substrates; shallow subtidal to at least 59 m (Ahyong, 2001).

Distribution.— Vietnam, Philippines, Australia, New Caledonia, and now from Taiwan.

Remarks.— *Oratosquillina gravieri* resembles *O. perpensa* in almost all respects, differing in having a more elongate rostral plate, being rectangular rather than squarish. Abdominal spination in the present series is as follows: submedian 5–6, intermediate 4–6, lateral (2)3–6, marginal 1–5; CI 392–447. The present specimens are the first to be recorded from Taiwan.

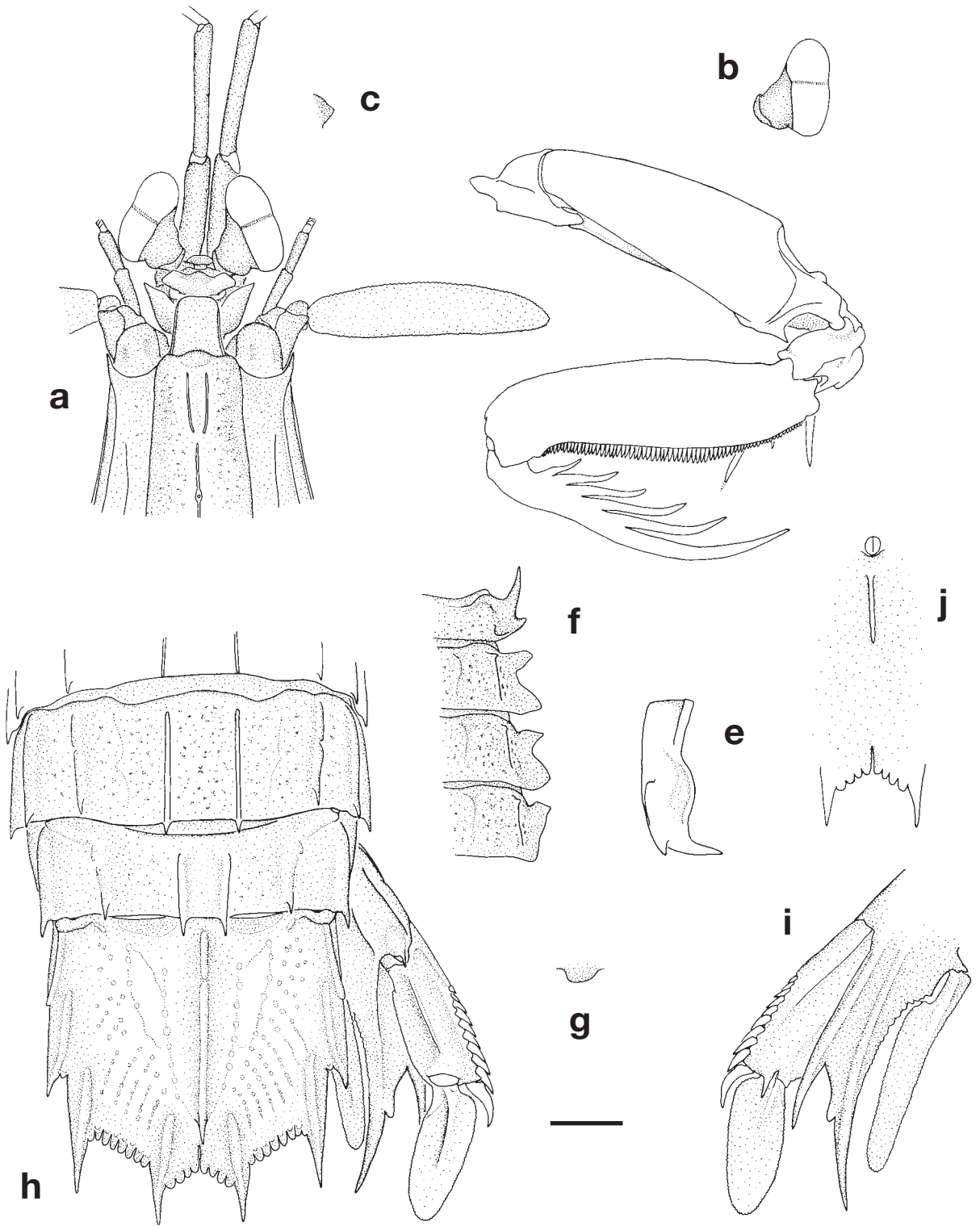


Fig. 121. Female, TL 103 mm, Donggang fishing port, Pingtung County, 1 Nov 1996: **a**, anterior cephalothorax; **b**, right eye; **c**, right dorsal process of antennular somite, lateral; **d**, right raptorial claw; **e**, TS5, right lateral; **f**, TS5–8 lateral processes; **g**, TS8 sternal keel; **h**, AS5–6, telson and uropod; **i**, right uropod, ventral; **j**, postanal carina. Scale = 4.0 mm.

Oratosquillina inornata (Tate, 1883)



Fig. 122. Male, TL 82 mm, Jhongihou fishing port, Kaohsiung City, 1 Nov 1996.

Squilla inornata Tate, 1883: 51, pl. 2 [type locality: Gulf of St. Vincent, South Australia, Australia].

Squilla oratoria var. *perpensa*.— Komai, 1927: 318, 344, 346 [not *Squilla oratoria* var. *perpensa* Kemp, 1911].

Oratosquilla hindustanica Manning, 1978c: 15–17, figs. 7, 15 [type locality: Tuticorin, Madras, Gulf of Manaar, India, 8°47'N, 78°08'E].

Oratosquilla sollicitans Manning, 1978c: 25–28, figs. 13, 14, 15 [type locality: Sandakan, Sabah, Malaysia, 5°50'N, 118°07'E].— Liu & Wang, 1999: 579.

Oratosquilla megalops Manning, 1980b: 523–524, fig. 1 [type locality: Anping, Taiwan].— Liu & Wang, 1999: 579. [new synonymy].

Oratosquillina sollicitans.— Manning, 1998: 848.— Moosa, 2000: 449.

Oratosquillina inornata.— Ahyong, 2001: 291–293, fig. 141.— Ahyong & Naiyanetr, 2002: 300.

Material examined.— Anping fishing port, Tainan City, Jun 1905: 1 male (TL 69 mm) (ZSM A20010122, holotype of *O. megalops*), 2 males (TL 63 mm. 1 broken, CL 12.3 mm) (ZSM A20010123, paratypes of *O. megalops*). Cijin, Kaohsiung City, 1 Aug 1986: 1 female, (TMCS-0089). Jhongjhou fishing port, Kaohsiung City, 7 Jan 1986: 1 male (TL 86 mm) (TMCS-0026).— 1 Nov 1996: 2 males (TL 82–89 mm) (NTOU), 3 males (TL 82–86 mm), 2 females (TL 91–97 mm) (NIWA).— no date: 1 male (TL 107 mm) (NTOU). Kaohsiung harbor, Kaohsiung city, no date: 1 female (TL 92 mm) (NTOU). Singda Harbor, Kaohsiung County, no date: 2 females (TL 90–96 mm) (NTOU). SW Taiwan, no date: 1 female (TL 87 mm) (NIWA). Magong fishing port, Penghu County, Oct 1984: 4 males (TL 71–74 mm), 4 females (TL 64–81 mm) (AM). No specific locality: 1 female (TL 92 mm) (NTOU).— 2 females (TL 92–94 mm) (USNM 266670).

Diagnosis.— Dorsal surface finely pitted. A1 somite dorsal processes with blunt apices. Rostral plate usually broader than long, appearing elongate; apex truncate to rounded; median carina absent. Carapace with branches of anterior bifurcation of median carina distinct. Raptorial claw dactylus with 6 teeth; carpus dorsal carina undivided. Mandibular palp present. TS6 lateral process anterior lobe large, broad, quadrate to trapezoid, apex truncate or slightly rounded. TS7 lateral process with emargination between lobes acute. Telson denticles dorsolateral surface pitted, without supplementary longitudinal carinae; ventral surface with short, postanal carina; without supplementary carinae ventral carinae. Uropod protopod terminal spines with lobe on outer margin of inner terminal spine rounded, narrower than or as broad as adjacent spine, proximal margin concave. Uropod exopod distal segment dark on inner half only.

Size.— To 112 mm TL (Ahyong, 2001).

Coloration.— Overall pale greenish-gray. Grooves and carinae of carapace, posterior margin of thoracic and first five abdominal somites black. AS2 with narrow transverse median bar. Telson with diffuse, elongate bar either side of median carina. Distal segment of uropodal exopod black on inner half.

Habitat.— Intertidal to shallow subtidal mud or sandy-mud flats.

Distribution.— Widely distributed throughout the Australian- Indo-Malaysian region from India, Vietnam, Thailand to Taiwan, Malaysia, Indonesia and Australia.

Remarks.— Ahyong (2001) showed that *O. hindustanica* (Manning, 1978) and *O. solicitans* (Manning, 1978) are synonyms of *O. inornata*, and suggested that further study would show that *O. megalops* (Manning, 1980), described from Taiwan, is also a synonym of Tate's species. Manning (1980b) distinguished *O. megalops* solely on the basis of its large eyes, apparently larger than those of *O. solicitans* (= *O. inornata*). We have since had the opportunity to study the type material of *O. megalops* and can find no characters to distinguish it from *O. inornata*. Although the eyes of the type specimens of *O. megalops* are somewhat larger than most specimens of *O. inornata*, eye size varies along a continuum, and those of *O. megalops* are simply at the higher end of the spectrum exhibited by *O. inornata* as measured by the CI. As noted by Ahyong (2001), the CI of the type series of *O. megalops* approaches or overlaps that of Australian *O. inornata*, and the same applies to the Taiwanese material. The CI of *O. megalops* is within the range of variation of *O. inornata* and the two species are synonymized. Abdominal spination of the Taiwanese specimens is as follows: submedian 5–6, intermediate (3)4–6, lateral (1–2)3–6, marginal 1–5; CI 308–392.

Oratosquillina inornata is a common shallow water species in Taiwan. It closely resembles *O. perpensa* in general facies, but is readily distinguished by the rectangular instead of triangular anterior lobe on TS6 and finely instead of coarsely pitted dorsal integument.

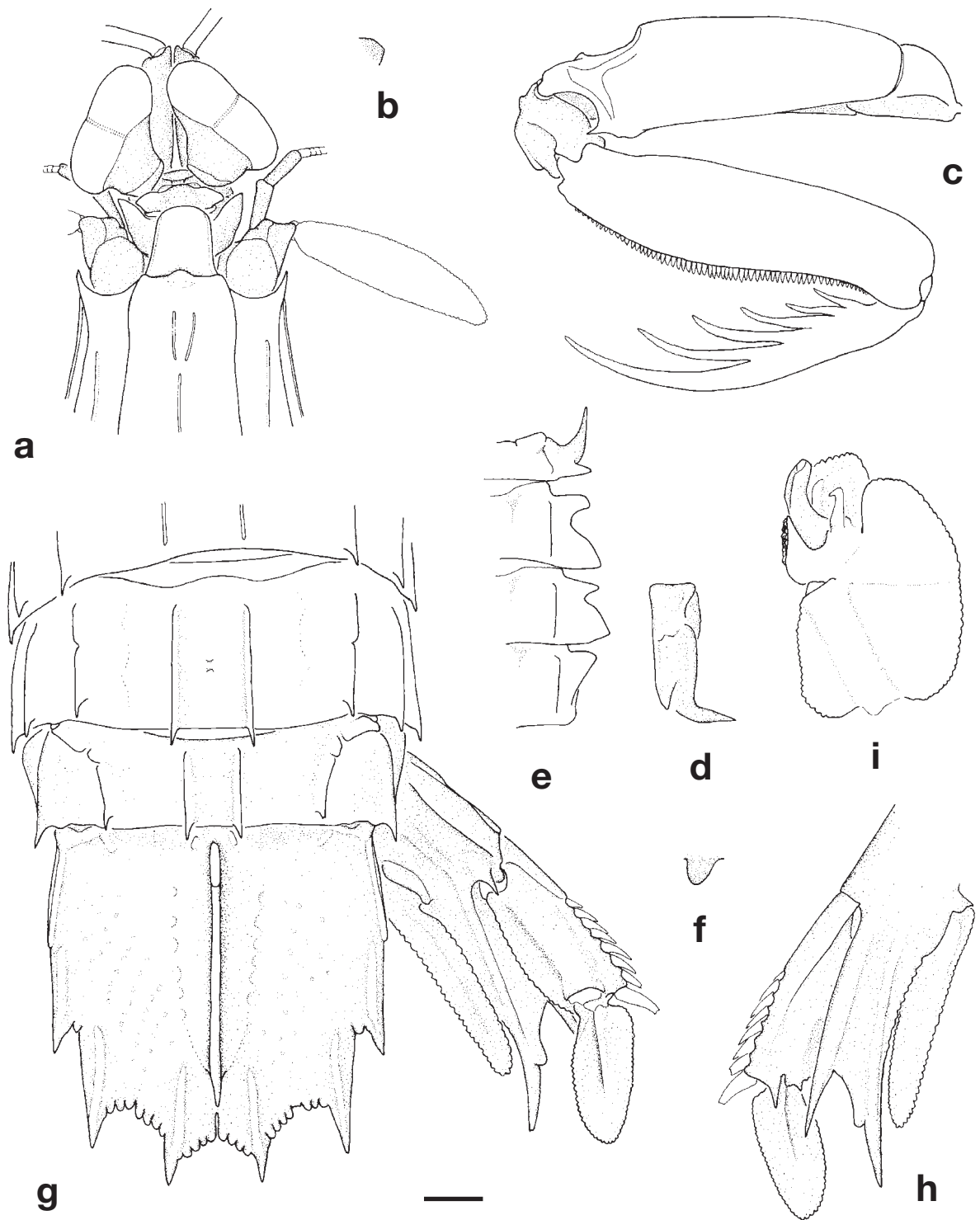


Fig. 123. Male, TL 63 mm, [paratype of *O. megalops* (Manning, 1980)], Anping fishing port, Tainan City, Jun 1905: **a**, anterior cephalothorax; **b**, right dorsal process of antennular somite, lateral; **c**, right raptorial claw; **d**, TS5, right lateral; **e**, TS5–8 lateral processes; **f**, TS8 sternal keel; **g**, AS5–6, telson and uropod; **h**, right uropod, ventral; **i**, right pleopod 1 endopod. Scale: a–h = 2.0 mm; i = 1.0 mm.

Oratosquillina interrupta (Kemp, 1911)



Fig. 124. Male, TL 120 mm, Budai fishing port, Chiayi County, 20 Jan 1995.

Squilla interrupta Kemp, 1911: 98 [type locality: Hong Kong, by lectotype designation (Ahyong, 2001)]; 1913: 72–74, pl. 5: figs. 60–62.— Komai, 1927: 319, 344, 346.— Lee & Wu, 1966: 49, tab. 1.

Chloridella interrupta.— Schmitt, 1931: 140, 147.

Oratosquilla interrupta.— Dong *et al.*, 1983: 88, pl. 2: figs. 5–7.

Oratosquillina interrupta.— Manning, 1995: 233.— Liu & Wang, 1999: 579.— Ahyong, 2001: 293–295, fig. 142.

Material examined.— Dasi fishing port, Yilan County, 16 Jan 1995: 5 males (TL 97–127 mm), 5 females (TL 101–127 mm) (NTOU).— 3 Dec 1996: 1 female (TL 67 mm) (NTOU). Wuci fishing port, Taichung County, 9 Oct 1995: 4 male (TL 97–116 mm), 1 female (TL 106 mm) (NTOU). Budai fishing port, Chiayi County, 17 Jul 1986: 1 male (TL 123 mm), 1 female (TL 90 mm) (NTOU).— 20 Jan 1995, 1 male (TL 120 mm) (NTOU). Tainan City, market, 15 Dec 1983: 1 female (TL 118 mm) (TMCS-0054). Dongshih fishing port, Chiayi County, 8 Aug 1990: 1 male (TL 103 mm), 2 females (TL 94–128 mm) (NTOU). Cijin fishing port, Kaohsiung City, 14 Oct 1989: 4 males (TL 80–105 mm), 4 females (TL 73–100 mm) (NTOU). Jhongjhou fishing port, Kaohsiung City, 7 Jan 1986: 2 males (TL 113–135 mm), 4 females (TL 120–137 mm) (TMCS-0025).— 1 Aug 1986: 2 males (TL 104–119 mm), 1 female (TL 113 mm) (TMCS-0069). Singda Harbor, Kaohsiung County, 2 Jun 1986: 2 males (TL 65–102 mm) (TMCS-0072).— 1 Jan 1987: 1 male (TL 103 mm) (TMCS-0070).— 24 Jul 1990: 2 males (TL 95–103 mm), 4 females (TL 101–104 mm) (NTOU).— 8 Aug 1990: 9 males (TL 84–111 mm), 14 females (TL 81–122 mm) (NTOU).— 22 Oct 1995: 1 male (TL 123 mm), 3 females (TL 113–127 mm) (NTOU). no date: 4 males (TL 84–108 mm), 1 female (TL 124 mm) (NTOU).— Donggang fishing port,

Pingtung County, 5 Aug 1996: 1 female (TL 107 mm) (NTOU), 3 males (TL 108–114 mm) (ZRC 1999.2327). SE Taiwan, 26 Sep 1989: 4 females (TL 77–94 mm) (NTOU). No specific locality: 1 male (TL 75 mm) (NTOU).— 3 males (TL 99–115 mm), 9 females (TL 73–101 mm) (NTOU).— 10 males (TL 96–117 mm), 1 females (TL 95 mm) (NTOU).— 1 male (TL 123 mm), 3 females (TL 98–127 mm) (NTOU).— 2 males (TL 96–105 mm), 2 females (TL 90–97 mm) (NTOU).— 2 males (TL 99–104 mm), 1 female (TL 106 mm) (NTOU).— 3 males (TL 93–99 mm), 5 females (TL 97–131 mm) (NTOU).— 3 males (TL 120–127 mm), 4 females (TL 99–116 mm) (NTOU).— 5 males (TL 71–107 mm), 4 females (TL 59–127 mm) (NTOU).— 1 male (TL 103 mm), 1 female (TL 100 mm) (NTOU).— 1 male (TL 119 mm) (NTOU).— 1 male (TL 120 mm) (NTOU).— 1 male (TL 113 mm) (NTOU).— 1 male (TL 100 mm) (TMCS-0111).

Diagnosis.— Carapace with branches of anterior bifurcation of median carina distinct. Raptorial claw dactylus with 6 teeth; carpus with dorsal carina divided into two triangular lobes. Mandibular palp present. Telson dorsolateral surface without supplementary longitudinal carinae. Uropodal protopod terminal spines with rounded lobe on outer margin of inner terminal spine, proximal margin straight or convex.

Size.— To 160 mm TL (Ahyong, 2001).

Coloration.— Overall dorsal colour pale olive green. Carapace grooves and posterior margin of body somites dark green. Carapace with median carina and submedian carinae of body somites dark red to green. AS2 with narrow, red-brown transverse bar. Telson with carinae of primary teeth dark green; apices of primary teeth red; median carina with single proximal dark maroon spot. Uropodal protopod with red terminal spines; exopod distal segment yellowish with dark infusion on proximal third.

Habitat.— Level sand and mud substrates in sheltered coastal waters and bays; intertidal to around 25 m.

Distribution.— Persian Gulf eastwards to Taiwan, Hong Kong, Vietnam and Australia.

Remarks.— *Oratosquillina interrupta* is readily recognized by the divided dorsal carina on the carpus of the raptorial claw and straight or convex margin of the lobe on the outer margin of the inner spine of the uropodal protopod. The species was reported from Taiwan by Kemp (1913) and Lee & Wu (1966). Abdominal spination in the present series is as follows: submedian 5–6, intermediate 4–6, lateral 3–6, marginal 1–5; CI 511–566.

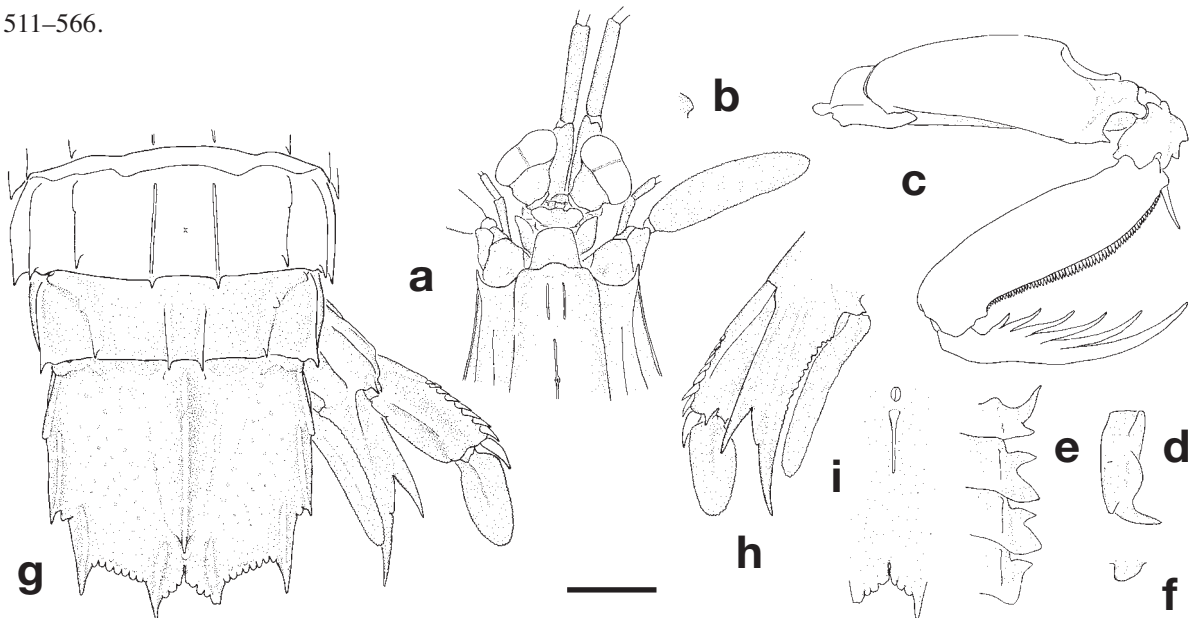


Fig. 125. Female, TL 67 mm, Dasi fishing port, Yilan County, 3 Dec 1996: **a**, anterior cephalothorax; **b**, right dorsal process of antennular somite, lateral; **c**, right raptorial claw; **d**, TS5, right lateral; **e**, TS5–8 lateral processes; **f**, TS8 sternal keel; **g**, AS5–6, telson and uropod; **h**, right uropod, ventral; **i**, postanal carina. Scale = 4.0 mm.

Oratosquillina manningi Ah Yong, Chan & Liao, 2000



Fig. 126. Male holotype, TL 87 mm, Dasi, fishing port, Yilan County, 4 Aug 1996.

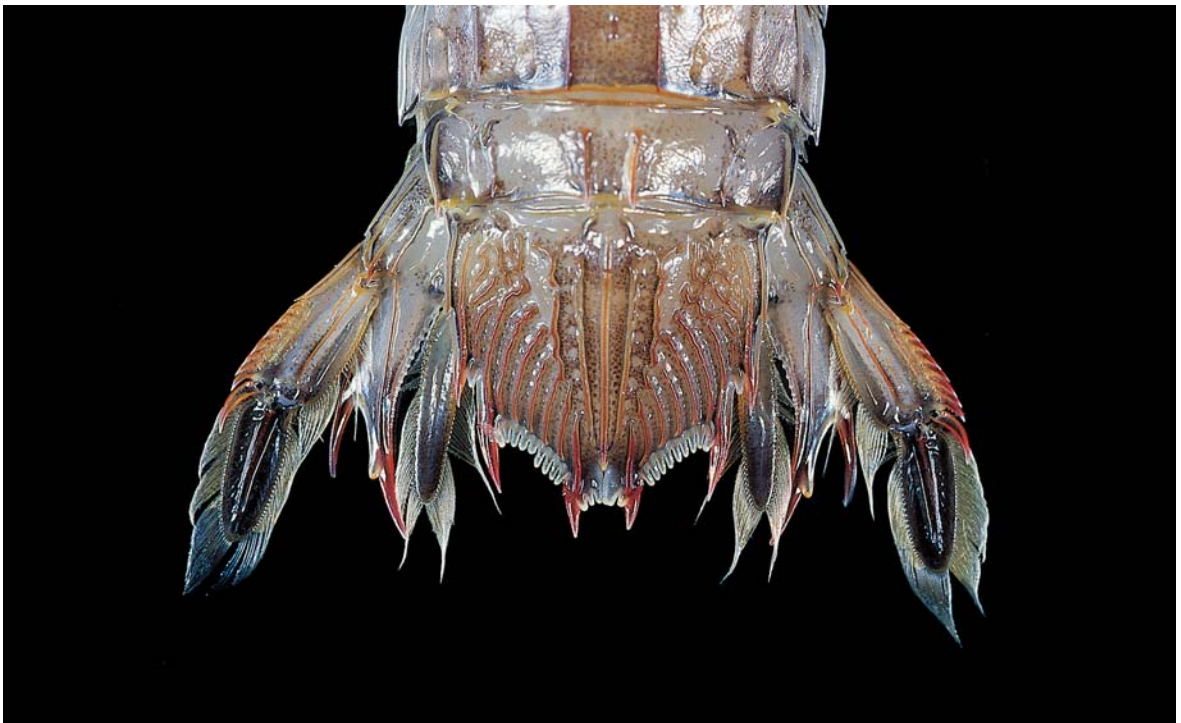


Fig. 127. Tail fan, dorsal view. Male holotype, TL 87 mm, Dasi, fishing port, Yilan County, 4 Aug 1996.

Paralimopsis carinata.— Liu & Wang, 1999: 580 [not *P. carinata* Moosa, 1991].

Oratosquillina manningi Ahyong, Chan, & Liao, 2000: 42–47, figs. 1, 2 [type locality: Tai-Shi (= Dasi), I-Lan County, NE Taiwan].— Ahyong, 2001: 295, fig. 143.— Ahyong & Naiyanetr, 2002: 301.

Material examined.— Dasi fishing port, Yilan County, 4 Aug 1996: male holotype (TL 87 mm) (NTOU).— 1 Dec 1997: female paratype (TL 79 mm) (NTOU), female paratype (TL 90 mm) (AM P53856).

Diagnosis.— Telson with bicarinate accessory median carina and supplementary dorsolateral carinae. Mandibular palp absent. Dactylus of raptorial claw with 5 teeth.

Size.— To 90 mm TL.

Coloration.— Overall pale tan. Carinae and grooves marked with orange-red. AS2 with narrow transverse brown bar across submedian carinae. Telson carinae orange proximally becoming red distally. Uropodal exopod black.

Habitat.— Sand and mud substrates in depths of 32–78 m.

Distribution.— Australia, Taiwan and the Andaman Sea, Thailand (Ahyong & Naiyanetr, 2002).

Remarks.— *Oratosquillina manningi* differs from all other Taiwanese congeners by the absence of the mandibular palp and presence of numerous dorsal carinae on the telson.

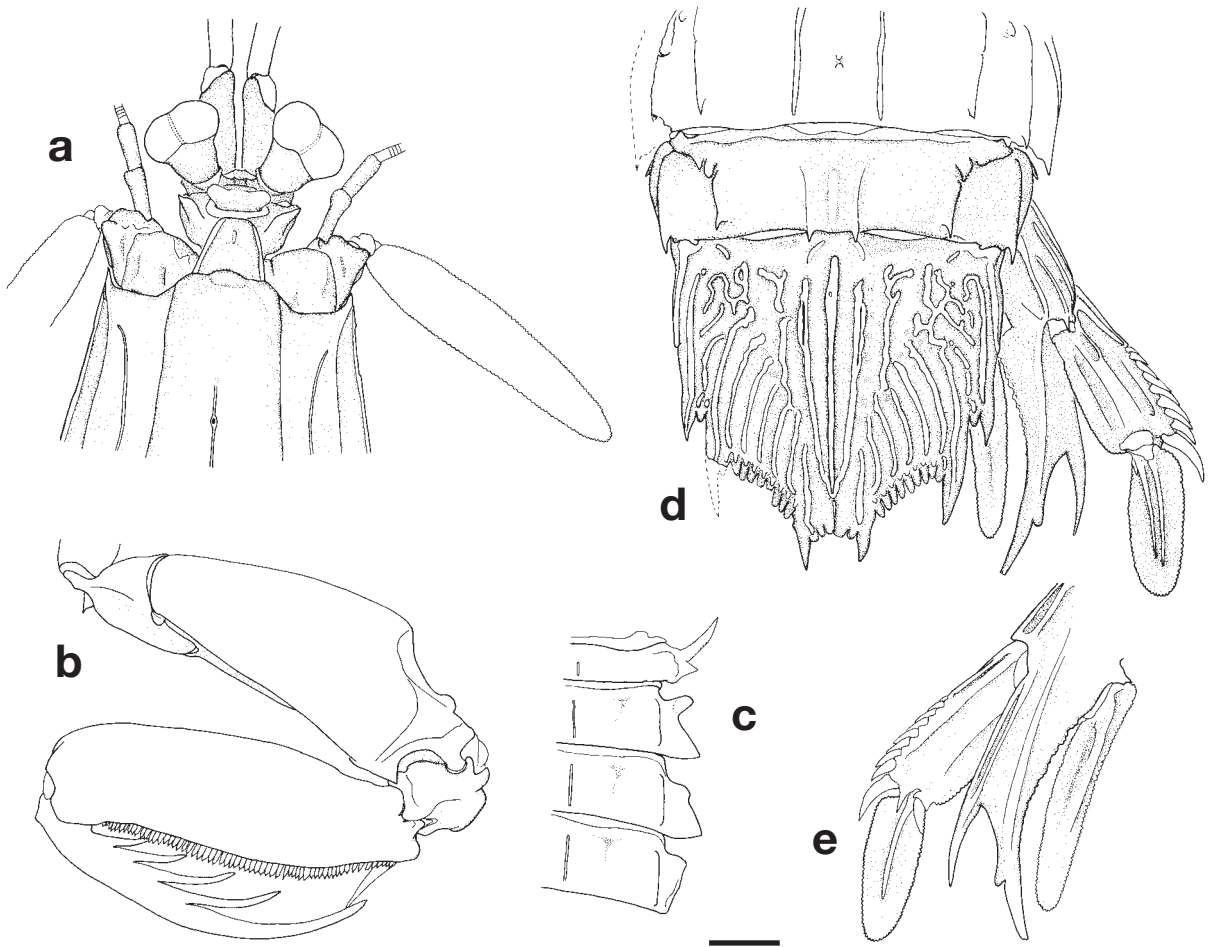


Fig. 128. Male holotype, TL 87 mm, Dasi fishing port, Yilan County, 4 Aug 1996: **a**, anterior cephalothorax; **b**, right raptorial claw; **c**, TS5–8 lateral processes; **d**, AS5–6, telson and uropod; **e**, right uropod, ventral. Scale = 3.0 mm. (From Ahyong *et al.*, 2000).

Oratosquillina nordica Ahyong & Chan, 2008



Fig. 129. Female paratype, TL 96 mm, Dasi fishing port, Yilan County, 7 Mar 2008.

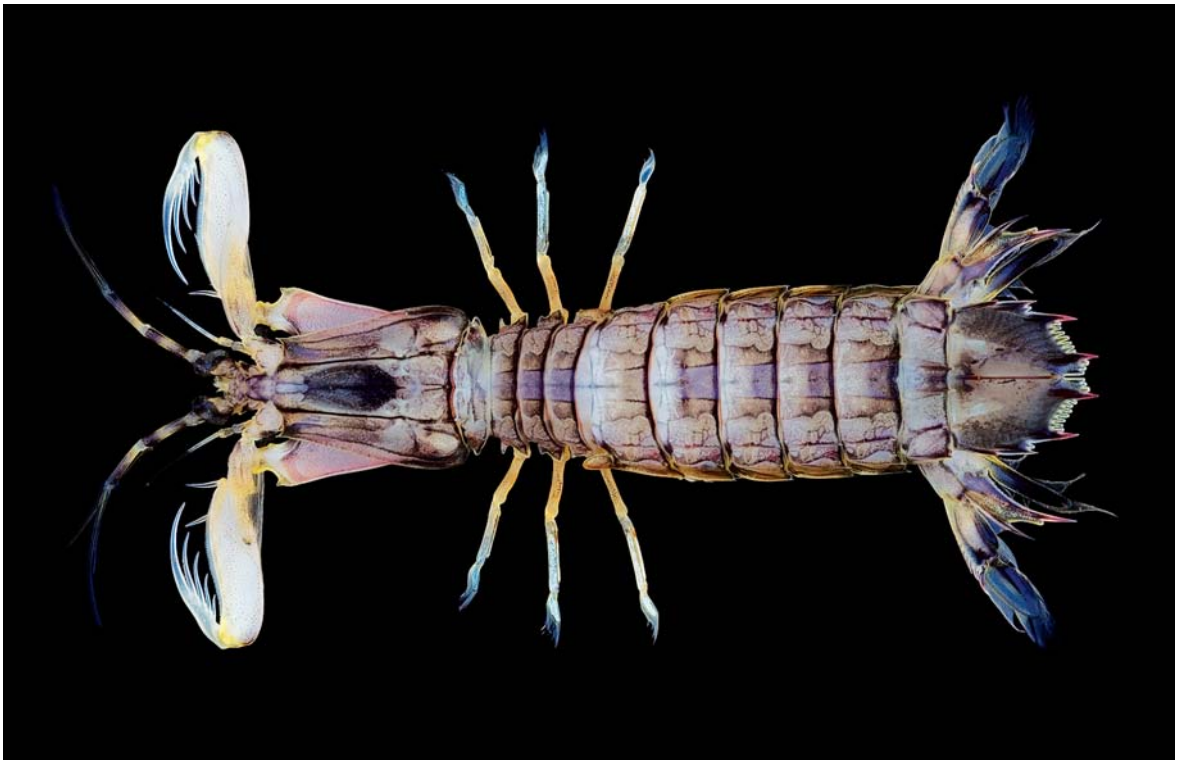


Fig. 130. Female paratype, TL 75 mm, Dasi fishing port, Yilan County, 8 Jan 2008, body and uropods darker.



Fig. 131. Tail fan, dorsal view. Female paratype, TL 94 mm, Dasi fishing port, Yilan County, 3 Aug 1996.

Oratosquillina quinquedentata.— Liu & Wang, 1999: 579.— Ahyong, 2001: 295–298, fig. 144 [not *O. quinquedentata* Brooks, 1886].

Oratosquillina nordica Ahyong & Chan, 2008: 61–68, figs. 1, 2 [type locality: Nanfangao, I-Lan County, Taiwan].

Material examined.— Dasi fishing port, Yilan County, 28 Feb 1989: female paratype (TL 68 mm) (TMCS-0065).— 12 Dec 1995: male paratype (TL 56 mm) (NTOU S-00031).— 3 Aug 1996: 2 female paratypes (TL 94–105 mm) (NTOU S-00029).— 4 Aug 1996: 3 males (TL 100–118 mm), 1 female paratype (TL 124 mm) (NTOU S-00030).— 24 Sep 1996: 9 male paratypes (TL 44–118 mm), 5 female paratypes (TL 52–98 mm) (NTOU S-00032).— 3 Dec 1996: 2 male paratypes (TL 48–59 mm), 3 female paratypes (TL 47–49 mm) (NTOU S-00033).— 25 May 1998: female paratype (TL 100 mm) (NIWA 44723).— 8 Jan 2008: female paratype (TL 75 mm) (NTOU S-00034).— 7 Mar 2008: female paratype (TL 96 mm) (NTOU S-00035), male paratype (TL 85 mm), 3 female paratypes (TL 71–80 mm) (NIWA 44724). Nanfang-ao fishing port, Yilan County, 5 Oct 1995: male holotype (TL 98 mm) (NTOU S-00028). Magong fishing port, Penghu County, 23 Apr 1986: 1 male (TL 85 mm), 1 female (TL 106 mm) (TMCS-0043).— 16 Sep 1996: 2 males (TL 44–57 mm), 1 female (TL 49 mm) (NTOU). No specific locality: 1 male (TL 71 mm) (NTOU), 1 male (TL 70 mm), 1 female (TL 58 mm) (TMCS-0074).

Diagnosis.— Raptorial claw dactylus with 5 teeth. Mandibular palp present. TS5 with posterior lobe of lateral process with blunt apex. TS6 with anterior lobe of lateral process slender, digitiform, about twice as long as wide. AS1–3 lateral carinae posteriorly unarmed. Telson dorsolateral surface without supplementary dorsolateral carinae.

Size.— To 131 mm TL (Ahyong & Chan, 2008).

Coloration.— Light gray-brown dorsally, darker mid-dorsally. Carinae and grooves of carapace, submedian carinae and posterior margins of body somites red. Telson with median carina and carinae of primary teeth red; median carina with narrow dark band across anterior and posterior third. Uropodal protopod with red terminal spines; endopod black on distal half; exopod with pink movable spines; exopod distal segment yellow with small black patch on inner proximal third.

Habitat.— Sandy-mud or muddy substrates including mud-flats; shore to about 70 m depth (Ahyong & Chan, 2008).

Distribution.— Andaman Sea, Singapore, Malaysia, Gulf of Thailand, China, and Taiwan; shore to 70 m (Ahyong & Chan, 2008).

Remarks.— *Oratosquillina nordica* is most similar to *O. quinqueidentata* (Brooks, 1886), described from the Arafura Sea (09°59'S, 139°42'E). *Oratosquillina quinqueidentata* is presently known only from northern Australia and the Arafura Sea to the Kai Islands Indonesia. Records of *O. quinqueidentata* between the Andaman Sea, Malaysia and the South China Sea are referable to *O. nordica* (see Ahyong & Chan, 2008).

The presence of five teeth on the dactylus of the raptorial claw will distinguish *O. nordica* from all other Taiwanese congeners except for *O. manningi*. *Oratosquillina manningi* differs from *O. nordica* by the absence of the mandibular palp and presence of numerous longitudinal dorsal telson carinae. *Oratosquillina nordica* might also be confused with the superficially similar *Quollastria gonypetes* (Kemp, 1911) and *Q. subtilis* (Manning, 1978) on the basis of the five-toothed dactylus of the raptorial claw, but species of *Quollastria* all lack the outer inferodistal spine on the merus of the raptorial claw, a feature of all species of *Oratosquillina*.

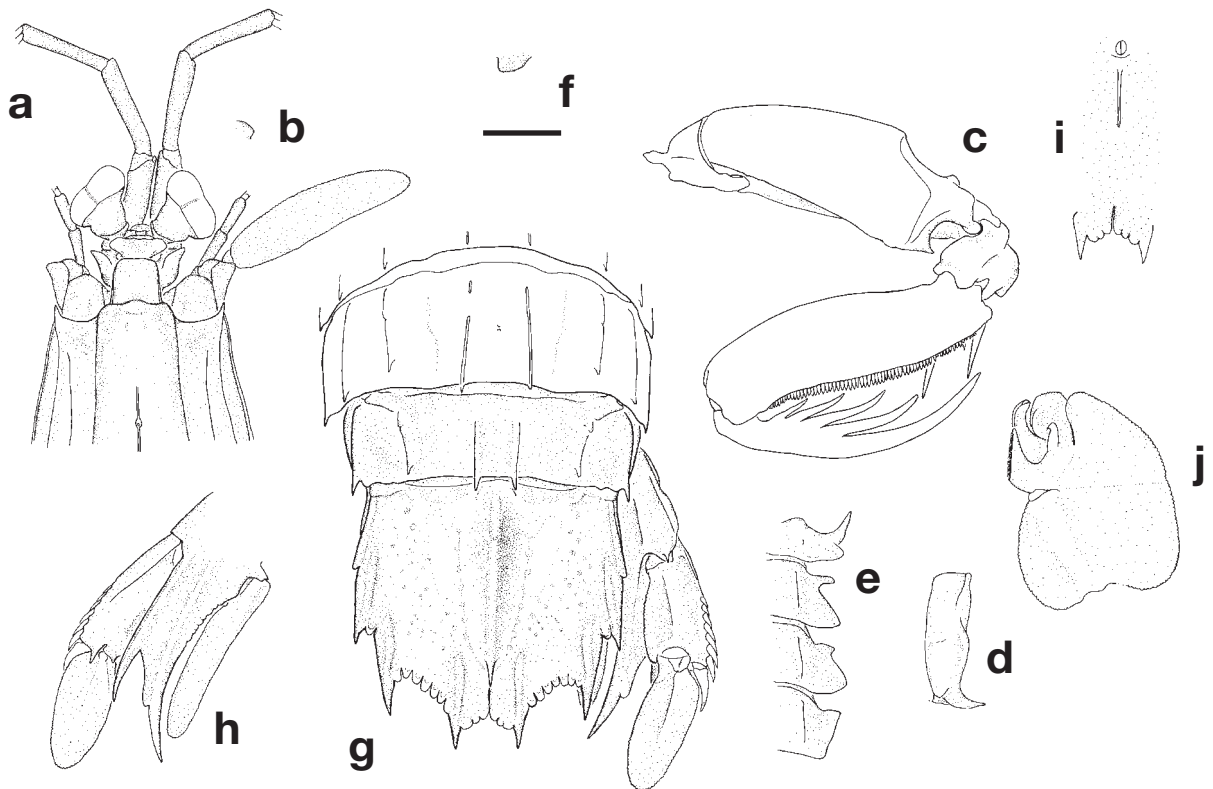


Fig. 132. Male holotype, TL 98 mm, Nanfang-ao fishing port, Yilan County, 5 Oct 1995: **a**, anterior cephalothorax; **b**, right dorsal process of antennular somite, lateral; **c**, right raptorial claw; **d**, TS5, right lateral; **e**, TS5–8 lateral processes; **f**, TS8 sternal keel; **g**, AS5–6, telson and uropod; **h**, right uropod, ventral; **i**, postanal carina; **j**, right pleopod 1 endopod, anterior view. Scale: a–j = 5.0 mm; j = 2.5 mm. (From Ahyong & Chan, 2008).

Oratosquillina perpensa (Kemp, 1911)

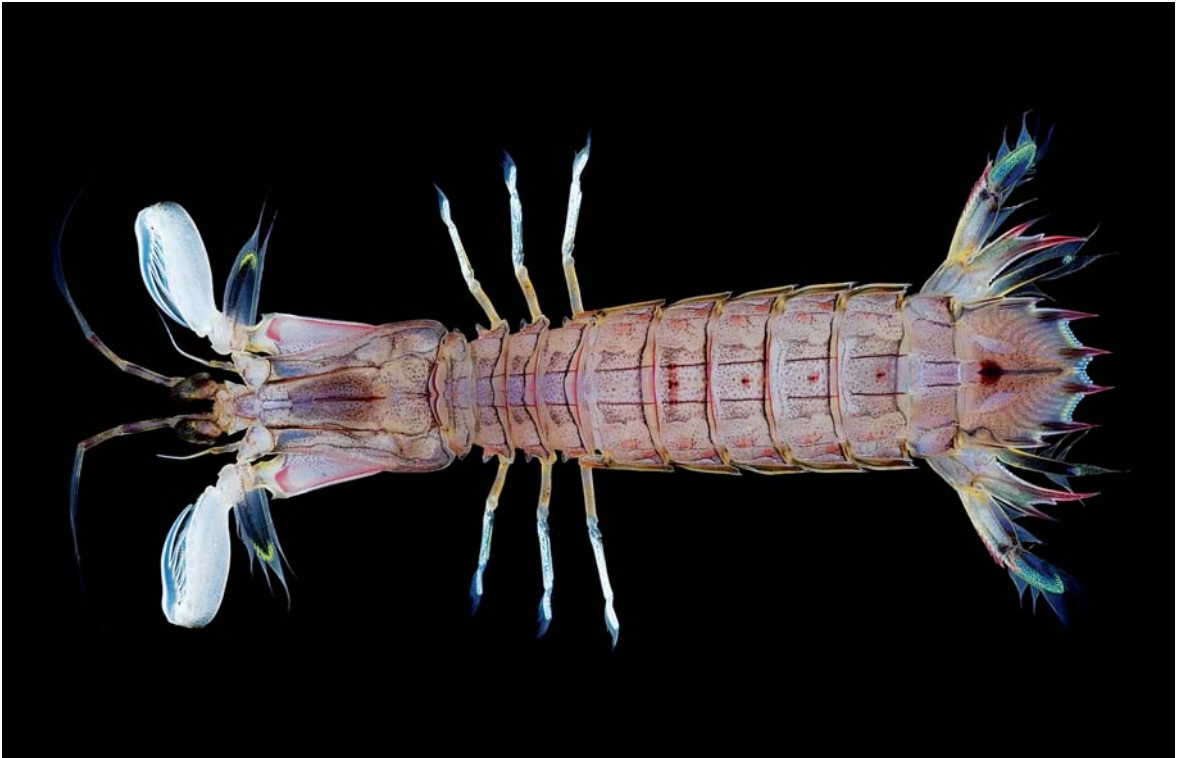


Fig. 133. Male, TL 76 mm, Dasi fishing port, Yilan County, 8 Jan 2008.

Squilla oratoria var. *perpensa* Kemp, 1911: 98 [part] [type locality: Hong Kong, by lectotype designation (Manning, 1978c)].

Chloridella oratoria var. *perpensa*.— Schmitt, 1931: 147.

Squilla perpensa.— Lee & Wu, 1966: 49, tab. 1.

Oratosquillina perpensa.— Manning, 1978c: 21–23, fig. 11.

Oratosquillina perpensa.— Manning, 1995: 234; 1998: 848.— Liu & Wang, 1999: 579.— Ahyong, 2001: 285, 286.

Material examined.— Yeliou, Taipei County, 11 Oct 1985: 1 male (TL 97 mm), 1 female (TL 77 mm) (NTOU). Dasi fishing port, Yilan County, Nov 22 1985: 3 males (TL 65–78 mm), 4 females (TL 54–73 mm) (TMCS-0014).— 7 Mar 1986: 1 male (TL 58 mm) (TMCS-0034).— 6 Nov 1989: 2 males (TL 89–99 mm), 1 female (TL 99 mm) (AM).— 13 Jun 1995: 1 male (TL 74 mm) (NTOU).— 16 Nov 1995: 4 females (TL 48–89 mm) (NTOU).— 12 Dec 1995: 1 male (TL 73 mm), 2 females (TL 68–75 mm) (NTOU).— 4 Aug 1996: 9 males (TL 70–91 mm), 9 females (TL 71–93 mm) (NTOU).— 24 Sep 1996: 1 male (TL 86 mm) (AM).— 25 May 1998: 1 male (TL 79 mm) (NIWA).— 3–4 Aug 1998: 2 males (TL 77–84 mm), 2 females (TL 88–92 mm) (ZRC 1998.319).— 8 Jan 2008: 1 male (TL 76 mm) (NTOU).— 7 Mar 2008: 3 males (TL 52–74 mm) (NIWA). Nanfang-ao fishing port, Yilan County, 4–5 Nov 1985: 1 female (TL 53 mm) (NTOU). Nanliao fishing port, Hsinchu City, 4 Jul 1984: 1 female (TL 119 mm) (NTOU). Wuci fishing port, Taichung County, 16 Jan 1995: 2 male (TL 91–96 mm), 1 females (TL 107 mm) (NTOU). 4 Nov 1995: 1 male (TL 84), 3 females (TL 77–97 mm) (NTOU). Singda Harbor, Kaohsiung County, 24 Jul 1990: 1 male (TL 95 mm), 4 females (TL 90–98 mm)

(NTOU). Jhongjhou fishing port, Kaohsiung City, 18 Mar 1988: 1 female (TL 103 mm) (TMCS-0100). Donggang fishing port, Pingtung County, 20 Sep 1990: 1 male (TL 107 mm) (NTOU).— 21 Oct 1995: 2 males (TL 79–81 mm), 4 females (TL 61–91 mm) (NTOU), 11 males (TL 65–106 mm), 9 females (TL 65–105 mm) (AM). Magong fishing port, Penghu County, 29 Jan 1986: 1 female (TL 57 mm) (TMCS-0038).— 23 Apr 1986: 1 male (TL 77 mm), 1 female (TL 61 mm) (TMCS-0049). SE Taiwan, 26 Sep 1989: 1 male (TL 81 mm) (NTOU). W Taiwan, no date: 1 males (TL 87 mm), 1 females (TL 100 mm) (NTOU). CP164, 22°15.57'N, 120°35.56'E, 60–90 m, 25 May 2002: 1 male (TL 30 mm), 2 females (TL 31–36 mm) (MNHN). CH177, 22°16.52'N, 120°29.90'E, 60 m, 28 May 2002: 2 females (TL 85–88 mm) (MNHN). No specific locality: 6 males (TL 60–80 mm), 2 females (TL 74–75 mm) (TMCS-0061).— 1 male (TL 112 mm) (USNM 252435).

Diagnosis.— Dorsal processes of A1 somite usually with sharp or angular apices (viewed laterally). Rostral plate squarish, appearing short. Dorsum distinctly rugose and pitted, often with eroded appearance. TS6 lateral process with anterior lobe trianguloid. Telson without supplementary dorsolateral carinae on telson. Mandibular palp present. Raptorial claw with dorsal carina of carpus entire; dactylus with 6 teeth.

Size.— To 119 mm TL (present study).

Coloration.— Overall pale tan. Carinae and grooves marked with dark red. AS2 with narrow transverse brown bar across submedian carinae. Telson median carina with dark red proximal patch; carinae of primary teeth green with reddish apices. Uropodal protopod white proximally, terminal spines red; exopod black on inner half, yellowish on outer half.

Habitat.— Sand and mud; shallow water.

Distribution.— India to Malaysia, Thailand, China, Taiwan and Japan.

Remarks.— *Oratosquillina perpensa* is a common species in Taiwanese waters and was first reported from the region by Lee & Wu (1966). *Oratosquillina perpensa* resembles *O. gravieri* in almost all respects, differing in the length and shape of the rostral plate: squarish, appearing short in *O. perpensa*, and rectangular, appearing elongate in *O. gravieri*. The present series agrees well with published accounts (Lee & Wu, 1966; Manning, 1978c) differing only in occasionally having the submedian carinae of AS4 posteriorly armed. Abdominal spination in the present series is as follows: submedian (4)5–6, intermediate (3)4–6, lateral 2–6, marginal 1–5. The 119 mm female from Nanliao (NTOU 1984-7-4) is the largest known specimen of the species.

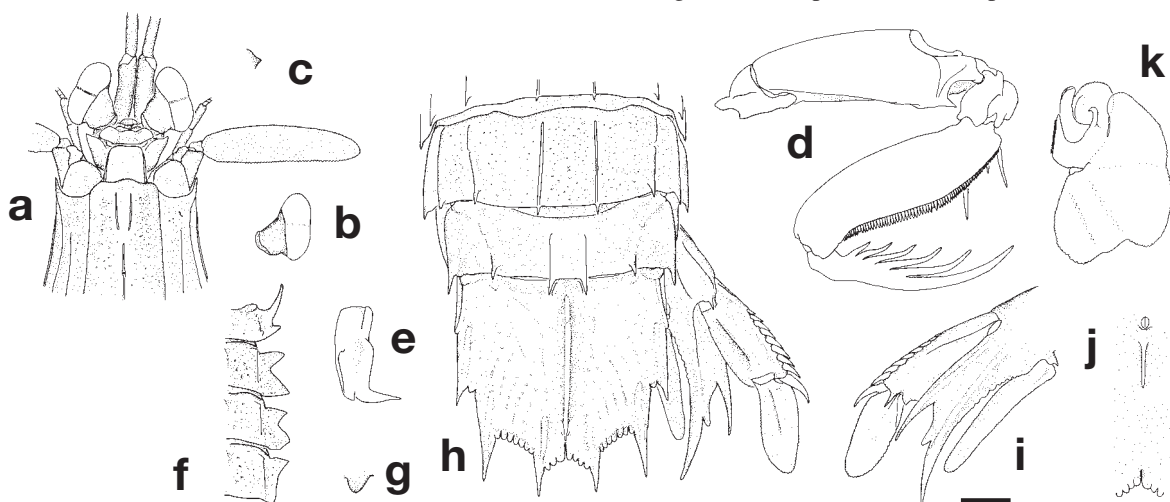


Fig. 134. Male, TL 81 mm, Donggang fishing port, Pingtung County, 21 Oct 1995: **a**, anterior cephalothorax; **b**, right eye; **c**, right dorsal process of antennular somite, lateral; **d**, right raptorial claw; **e**, TS5, right lateral; **f**, TS5–8 lateral processes; **g**, TS8 sternal keel; **h**, AS5–6, telson and uropod; **i**, right uropod, ventral; **j**, postanal carina; **k**, right pleopod 1 endopod. Scale: a–j = 3.0 mm; k = 1.5 mm.

Genus *Quollastria* Ahyong, 2001

Quollastria Ahyong, 2001: 300–301. Type species: *Quollastria capricornae* Ahyong, 2001, by original designation. Gender feminine.

Diagnosis.— Dorsal integument pitted. Cornea width less than 1/3 CL, strongly bilobed. A1 somite dorsal processes trianguloid, directed anterolaterally. Carapace anterior width less than or slightly exceeding half median length; with anterolateral spines; median carina distinct, interrupted at base of anterior bifurcation; branches of anterior bifurcation distinct, opening anterior to dorsal pit; posterolateral margin rounded. Raptorial claw dactylus with 5 or 6 teeth; carpus dorsal carina undivided; merus outer inferodistal angle unarmed. Mandibular palp present. TS5–7 lateral processes bilobed. AS1–6 with submedian carinae.

Remarks.— *Quollastria* Ahyong, 2001, presently comprises nine species of which four are known from Taiwan.

Key to species of *Quollastria* from Taiwan

1. Uropodal protopod with small upright spine on outer margin of inner spine *Q. ornata*
- Uropodal protopod with rounded lobe on outer margin of inner spine 2
2. Dactylus of raptorial claw with 6 teeth. Maxilliped 4 without epipod *Q. imperialis*
- Dactylus of raptorial claw with 5 (rarely 6) teeth. Maxilliped 4 with epipod 3
3. Distal segment of uropodal exopod distinctly longer than proximal segment. Dorsal processes of antennular somite rounded, blunt. Dorsal surface of AS5 with pair of dark triangles. *Q. subtilis*
- Distal segment of uropodal exopod as long as or shorter than proximal segment. Dorsal processes of antennular somite triangular to spiniform. Dorsal surface of AS5 with pair of dark squares
..... *Q. gonypetes*

Quollastria gonypetes (Kemp, 1911)



Fig. 135. Dasi fishing port, Yilan County, 16 Nov 1995.

Squilla gonypetes Kemp, 1911: 96 [type locality: restricted to vicinity of Cheduba Id., Burma, 18°48'N, 93°38'E, 13 m, by lectotype selection (Manning, 1978c)].

Oratosquillina gonypetes.— Liu & Wang, 1999: 579.

Quollastria gonypetes.— Ahyong, 2001: 304–306, fig. 147.

Material examined.— Dasi fishing port, Yilan County, 22 Sep 1984: 1 males (TL 64 mm) (NTOU).— 14 Oct 1984: 1 male (TL 82 mm) (NTOU).— 22 Nov 1985: 6 males (TL 82–94 mm) (TMCS-0017).— 7 Mar 1986: 11 males (TL 76–107 mm), 1 female (TL 79 mm) (TMCS-0032).— 28 Apr 1986: 4 males (TL 79–98 mm) (TMCS-0044).— 13 May 1991: 3 males (TL 80–92 mm) (NTOU).— 16 May 1995: 1 male (TL 104 mm) (NTOU).— 28 Sep 1995: 2 males (TL 53–70 mm), 2 females (TL 71–72 mm) (NTOU).— 19 Oct 1995: 2 females (TL 76–105 mm) (NTOU).— 2 Nov 1995: 2 males (TL 51–63 mm), 1 female (TL 85 mm) (NTOU).— 16 Nov 1995: 7 males (TL 50–71 mm), 11 females (TL 50–76 mm) (NTOU).— 12 Dec 1995: 2 females (TL 67–69 mm), (NTOU).— May 1999: 1 female (TL 95 mm) (ZRC 1999.2174).— 27 May 1997: 1 female (TL 74 mm) (ZRC 2001.0170).— 7 May 2008: 1 female (TL 78 mm) (NTOU). Nanfang-ao fishing port, Yilan County, 9 Jan 1994: 1 female (TL 46 mm) (NTOU).— 9 Nov 1995: 4 males (TL 74–93 mm), 4 females (TL 79–88 mm) (NTOU). Jhongjhou fishing port, Kaohsiung City, 12 May 1998: 1 male (TL 77 mm) (NIWA). Donggang fishing port, Pingtung County, 3 Mar 1991: 1 male (TL 60 mm), 7 females (TL 54–80 mm) (NTOU).— 26 Jan 1994: 1 male (TL 46 mm), 1 female (TL 79 mm) (NTOU).— 5 Aug 1995: 1 male (TL 106 mm) (NTOU).— 21 Oct 1995: 2 males (TL 56–76 mm), 1 female (TL 71 mm) (NTOU).— 2 Dec 1995: 3 males (TL 31–40 mm), 2 females (TL 41–43 mm) (NTOU).— 5 Aug 1996: 2 males (TL 36–70 mm), 2 females (TL 45–87 mm) (

NTOU).— May 1999: 1 male (TL 93 mm) (ZRC 1999.0725).— 6-9 Dec 2001: 4 males (TL 48-97 mm), 2 females (TL 88-89 mm) (ZRC 2001.0287).— 25 Jun 2002: 1 female (TL 84 mm) (ZRC 2002.0401). CP65, 24°54.1'N, 122°03.1'E, 440 m, 5 May 2001: 1 female (TL 53 mm) (MNHN). No specific locality: 1 male (TL 84 mm) (NTOU).— 1 female (TL 129 mm) (NTOU).— 1 female (TL 96 mm) (NTOU).

Diagnosis.— Raptorial claw dactylus usually with 5 teeth. A1 somite dorsal processes with acute apices. Maxillipeds 1-4 with epipod. TS8 with sternal keel usually near obsolete, usually at most a low swelling. AS5 with pair of large, dark, submedian squares. Uropodal exopod with proximal segment as long as or shorter than distal segment. Uropodal protopod with rounded lobe on outer margin of inner spine.

Size.— To 102 mm TL (Ahyong, 2001).

Coloration.— Overall dorsal colour light brown with scattered dark chromatophores over entire surface. Rostral plate with orange red margins. Carapace with dark carinae and grooves; median carina, gastric grooves and median posterior margin red. TS5-8 and AS1-5 with red median tubercles and submedian carinae. AS1-5 with intermediate carinae red medially. AS2 with diffuse black, transverse rectangular bar overlain by red. AS5 with black square lateral to each submedian carina. Telson with carinae of primary teeth red, that of lateral tooth red to level of apex of prelateral lobe; median carina with red posterior spine. Uropodal protopod with terminal spines and carinae red; endopod white/yellow with distal half black; exopod proximal segment black distally, outer spines red; exopod distal segment black on inner three quarters, remainder yellow.

Habitat.— Sandy-mud substrates; 13-110 m.

Distribution.— Western Indian Ocean to India, Australia, Indonesia, Philippines, Vietnam, Japan and now Taiwan.

Remarks.— The Taiwanese specimens agree well with published accounts (Kemp, 1911, 1913; Manning, 1978c; Ahyong, 2001). Most specimens bear the usual five teeth on the dactyli of the raptorial claws, though two specimens exhibit variation similar to that reported by Ahyong (2001) for Australian material. One specimen bears five and six teeth on the dactyli of the raptorial claws (male, 58 mm, NIWA, Donggang) and the other bears six teeth on the dactyli of both claws (female, 77 mm, ZRC, Dasi). The aberrant claw in the first specimen is possibly regenerating, but both claws in the second specimen appear to be normal apart from the higher number of dactylar teeth. This second specimen, bearing six dactylar teeth on both raptorial claws, is indistinguishable from *Q. simulans* (Holthuis, 1967) from the Red Sea. Further study of *Q. gonypetes* from the Western Indian Ocean is required to more accurately evaluate the status of *Q. simulans*. *Quollastria gonypetes* is formally recorded for the first time from Taiwan. Abdominal spination in the present series is as follows: submedian 5-6, intermediate 3-6, lateral 1-6, marginal 1-5; CI 449-518.

Quollastria gonypetes can be recognized by the presence of five teeth on the dactylus of the raptorial claw, sharp apices on the dorsal processes of the antennular somite, and pair of dark submedian squares on AS5.

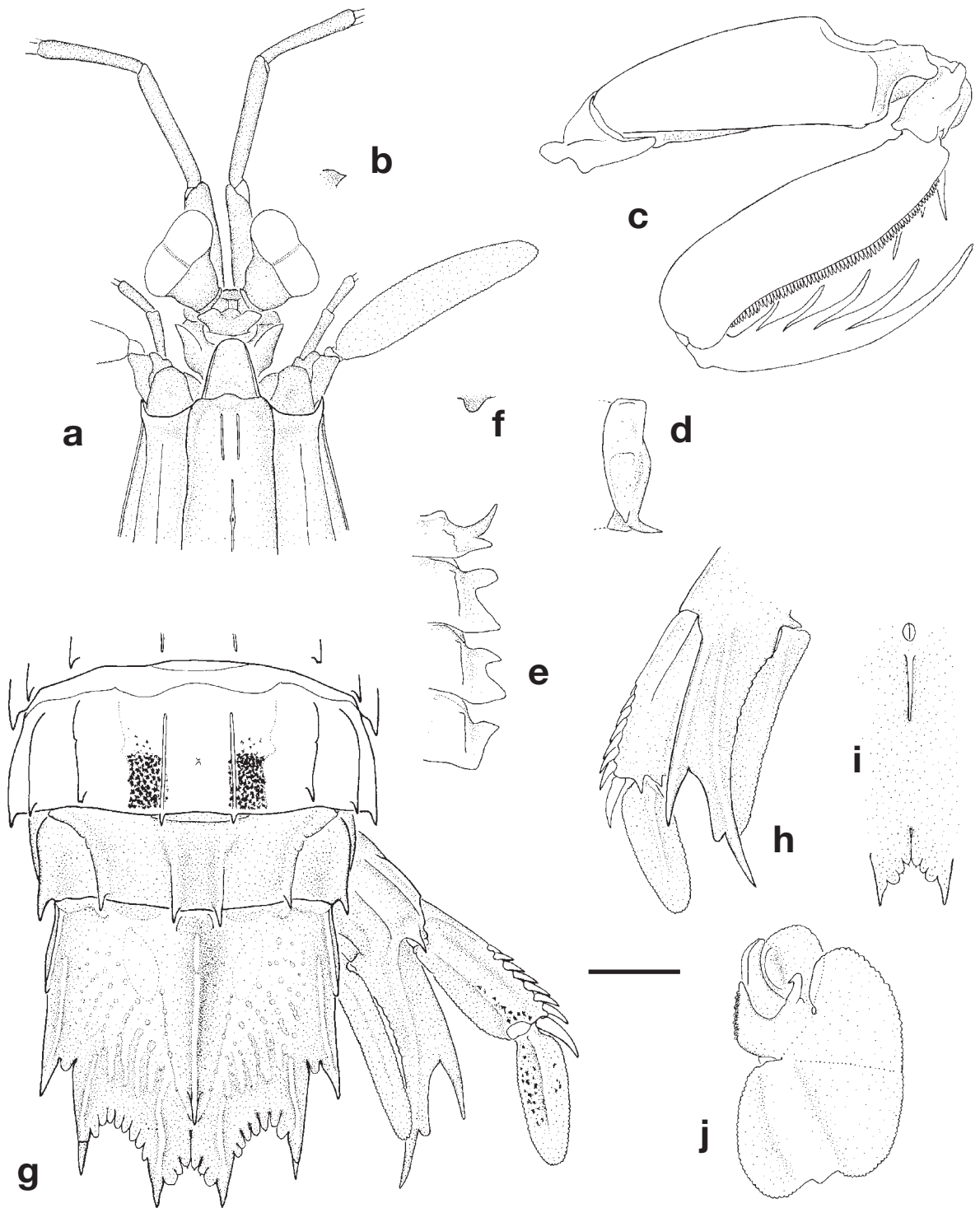


Fig. 136. Male, TL 61 mm, Dasi fishing port, Yilan County, 25 May 1998: **a**, anterior cephalothorax; **b**, right dorsal process of antennular somite, lateral; **c**, right raptorial claw; **d**, TS5, right lateral; **e**, TS5–8 lateral processes; **f**, TS8 sternal keel; **g**, AS5–6, telson and uropod; **h**, right uropod, ventral; **i**, postanal carina; **j**, right pleopod 1 endopod, anterior view. Scale: a–i = 3.0 mm, j = 1.5 mm.

Quollastria imperialis (Manning, 1965)



Fig. 137. Male, TL 75 mm, Dasi fishing port, Yilan County, 2 Nov 1995.

Squilla imperialis Manning, 1965: 253–255, fig. 1, pl. 13, fig. B [type locality: Sagami Bay].

Oratosquillina imperialis.— Liu & Wang, 1999: 579.

Quollastria imperialis.— Ahyong, 2001: 300, 301.

Material examined.— Dasi fishing port, Yilan County, 22 Sep 1984: 1 male (TL 67 mm), 1 female (TL 67 mm) (NTOU).— 14 Oct 1984: 2 females (TL 63–68 mm) (NTOU).— 22 Nov 1985: 3 males (TL 59–68 mm), 6 females (TL 62–70 mm) (TMCS-0013).— 28 Apr 1986: 1 female (TL 69 mm) (TMCS-0122).— 5 May 1987: 2 males (TL 62–69 mm), 1 female (TL 63 mm) (TMCS-0067).— 18 May 1989: 1 female (TMCS-0087).— 8 Nov 1991: 1 male (TL 63 mm) (NTOU).— 15 Jan 1995: 1 female (TL 80 mm) (NTOU).— 13 Jun 1995: 1 female (TL 82 mm) (NTOU).— 28 Sep 1995: 1 male (TL 77 mm), 2 females (TL 66–96 mm) (NTOU).— 19 Oct 1995: 1 male (TL 59 mm), 3 females (TL 66–79 mm) (NTOU).— 2 Nov 1995: 1 male (TL 75 mm) (NTOU).— 16 Nov 1995: 1 male (TL 77 mm), 5 females (TL 65–74 mm) (NTOU).— 3 Dec 1995: 2 males (TL 62–70 mm), 3 females (TL 67–85 mm) (NTOU).— 4 Dec 1995: 1 female (TL 80 mm) (NTOU).— 12 Dec 1995: 2 females (TL 62–65 mm) (NTOU).— 25 May 1998: 1 female (TL 86 mm) (TMCS-0132), 3 males (TL 57–76 mm), 6 females (TL 75–82 mm) (AM). Nanfang-ao fishing port, Yilan County, 9 Nov 1995: 1 male (TL 75 mm) (NTOU).— 18 Nov 1997: 1 female (TL 68 mm) (ZRC 1999.2342). Donggang fishing port, Pingtung County, 2 Dec 1995: 4 females (TL 60–75 mm) (NTOU).— 4 Dec 1995: 4 females (TL 60–74 mm) (NTOU).— 5 Aug 1996: 1 male (TL 61 mm), 3 females (TL 58–69 mm) (NTOU), 1 male (TL 60 mm), 1 female (TL 70 mm) (ZRC 1999.2341).— 1 Nov 1996: 1 male (TL 86 mm) (NTOU). CP83, 24°51.4'N, 121°57.4'E, 75–110 m, 8 May 2001: 1 female (TL 58 mm) (MNHN). CP158, 130 m, 24 May 2002: 1 male (TL 63 mm) (MNHN). No specific

locality: 3 females (TL 73–83 mm) (TMCS-0071).

Diagnosis.— Raptorial claw dactylus with 6 teeth. A1 somite dorsal processes with blunt, rounded apices. Maxillipeds 1–2 or 3 with epipod. TS8 sternal keel distinct, well-developed. Telson dorsolateral surface pitted, without rows of carinae on dorsolateral surface. Uropodal exopod with proximal segment as long as or shorter than distal segment. Uropodal protopod with rounded lobe on outer margin of inner spine.

Size.— To 96 mm TL.

Coloration.— Dorsal surface pale grey-brown, with darker, diffuse patches between submedian and lateral carinae. Carinae and grooves of carapace dark red-brown. Submedian carinae and posterior margins of thoracic and abdominal somites dark red. AS2 with narrow, dark red-brown band, medially diffuse. AS5 with dark red-brown band lateral to submedian carinae. AS6 dark below lateral carinae. Telson median carina with dark rectangle proximally and dark triangle distally, encompassing apical spine; carinae of primary teeth red. Uropodal exopod proximal segment with dark distal margin, distal segment dark on inner half; movable spines on outer margin of exopod proximal spines clear red.

Habitat.— Sandy-mud substrates.

Distribution.— Japan and now from Taiwan.

Remarks.— *Quollastria imperialis* is the only described species of the genus with epipods only on the first two or three maxillipeds. Taiwanese specimens agree well with the type account of *Q. imperialis*. Abdominal spination in the present series is as follows: submedian 5–6, intermediate (2)3–6, lateral 1–6, marginal 1–5; CI 457–583. Manning (1965) noted that variation in the number of epipods (two or three) in the type series of *O. imperialis*. Similar variation is evident in the present specimens, though in most cases, two epipods are present. One female (TL 73 mm, TMCS-0071) bears five teeth on the dactylus of a regenerating claw. *Quollastria imperialis* is known only from the northwestern Pacific Ocean where it has not been recorded outside of Japan until now. Ah Yong (2004) showed that records of the species from the Philippines and Indonesia were based on *Q. kapala* Ah Yong, 2001 and *Q. capricornae* Ah Yong, 2001.

Quollastria imperialis can be recognized by the presence of only two or three instead of four epipods and the rounded lobe on the outer margin of the inner spine of the uropodal protopod. The species is presently known only from the northwestern Pacific and is formally recorded for the first time from Taiwan.

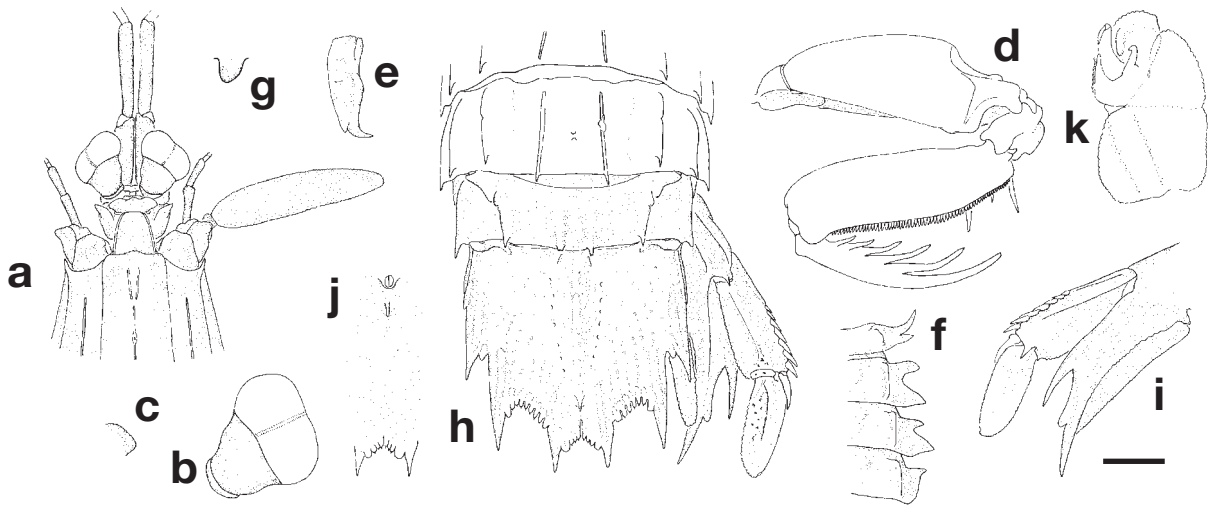


Fig. 138. Male, TL 63 mm, Dasi fishing port, Yilan County, 8 Nov 1991: **a**, anterior cephalothorax; **b**, right eye; **c**, right dorsal process of antennular somite, lateral; **d**, right raptorial claw, lateral; **e**, TS5, right lateral; **f**, TS5–8 lateral processes; **g**, TS8 sternal keel; **h**, AS5–6, telson and uropod; **i**, right uropod, ventral; **j**, postanal carina; **k**, right pleopod 1 endopod. Scale: a, d–j = 3.0 mm; b, c = 1.5 mm.

Quollastria ornata (Manning, 1971)

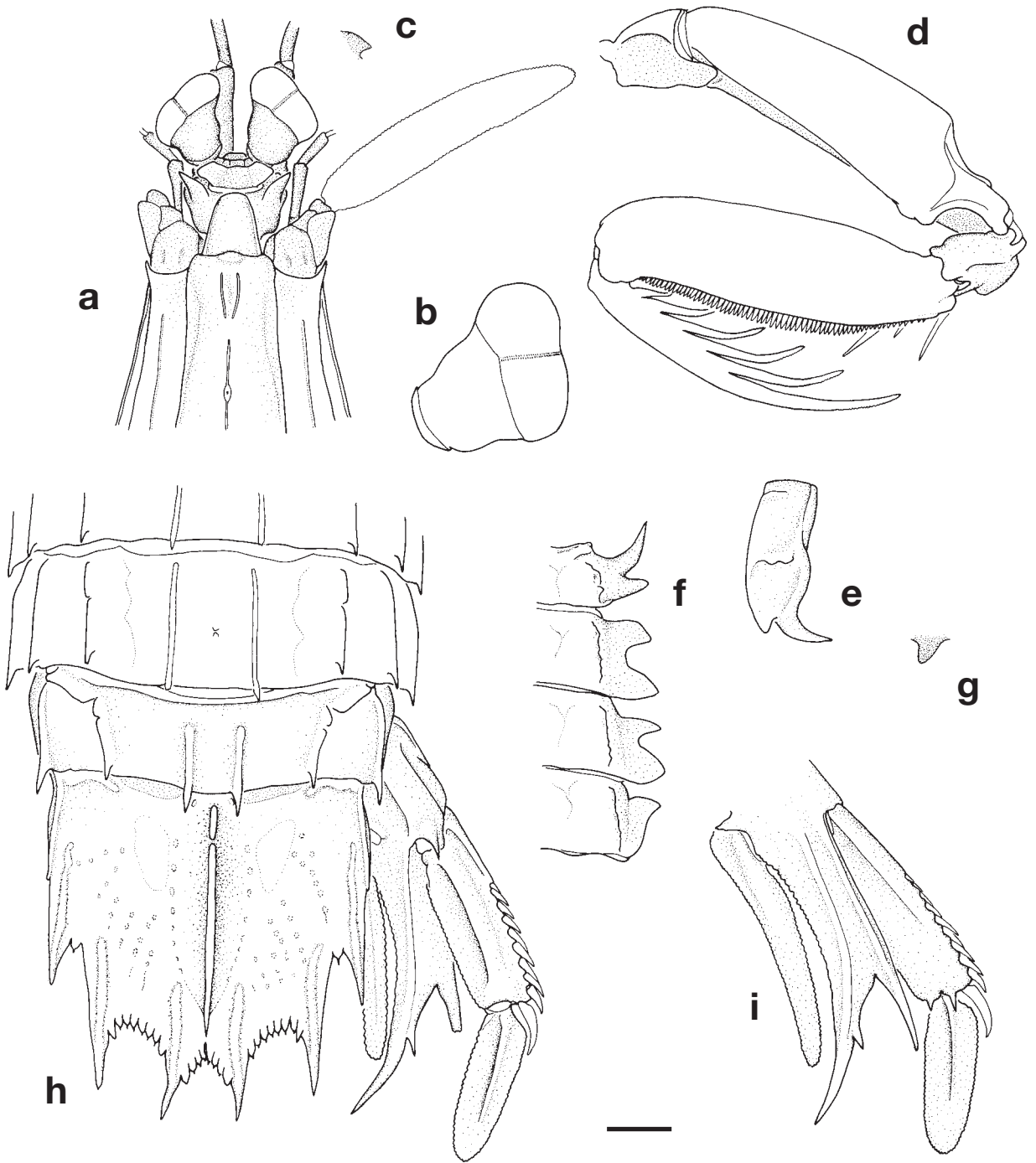


Fig. 139. Female, TL 62 mm, Donggang fishing port, Pingtung County, 5 Aug 1995: **a**, anterior cephalothorax; **b**, right eye; **c**, right dorsal process of antennular somite, lateral; **d**, right raptorial claw; **e**, TS5, right lateral; **f**, TS5-8 lateral processes; **g**, TS8 sternal keel; **h**, AS5-6, telson and uropod; **i**, left uropod, ventral. Scale: a, c-i = 2.0 mm; b = 1.0 mm.

Oratosquilla ornata Manning, 1971b: 9–11, fig. 3 [type locality: South China Sea off Hong Kong].

Quollastria ornata.— Ahyong, 2001: 301.

Material examined.— Donggang fishing port, Pingtung County, 5 Aug 1995: 1 female (TL 62 mm) (NTOU).

Diagnosis.— Raptorial claw dactylus with 6 teeth. A1 somite dorsal processes with acute apices. Maxillipeds 1–4 with epipod. Uropodal exopod proximal segment longer than distal segment. Uropodal protopod with small upright spine on outer margin of inner spine.

Size.— To 62 mm TL (present record).

Coloration.— Not known.

Habitat.— Muddy substrates; 76–113 m.

Distribution.— Taiwan and South China Sea off Vietnam and Hong Kong.

Remarks.— *Quollastria ornata* is recorded for the first time from Taiwan. It differs from all described species of the genus by bearing a spine instead of a rounded lobe on the outer margin of the inner spine of the uropodal protopod. The single Taiwanese specimen of *Q. ornata* agrees well with the holotype in the USNM, differing in having armed submedian carinae on AS4 and 10 instead of 9 movable spines on the outer margin of the proximal segment of the uropodal exopod. Both of the aforementioned differences are probably size related with the present specimen some 18.5 mm longer than the holotype. *Quollastria ornata* has been recorded from the South China Sea (type locality), Indonesia (Moosa & Cleva, 1984), and the Andaman Sea (Ahyong & Naiyanetr, 2002), but the latter two records are referable to an undescribed species presently under study.

Quollastria subtilis (Manning, 1978)

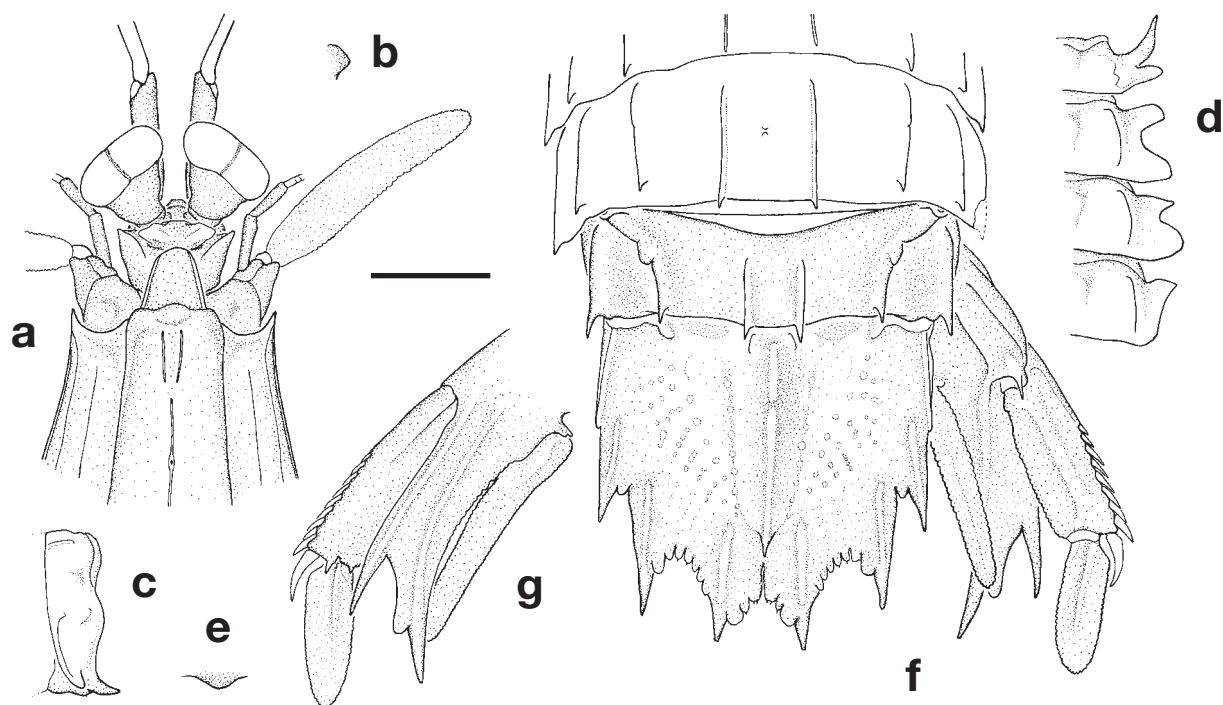


Fig. 140. Female, TL 52 mm, Dasi fishing port, Yilan County, 1 Dec 2003: **a**, anterior cephalothorax; **b**, right dorsal process of antennular somite, lateral view; **c**, TS5, right lateral; **d**, TS5–8 lateral processes; **e**, TS8 sternal keel, right lateral view; **f**, AS5–6, telson and uropod; **g**, right uropod, ventral view. Scale = 3.0 mm.

Oratosquilla subtilis Manning, 1978c: 33–34, fig. 19 [type locality: off Visakhapatnam coast, Madras, India].

Oratosquilla turbata Manning, 1978c: 35–36, fig. 20 [type locality: Banc de Pracel, W coast of Madagascar, 17°00'S, 43°30'E].

Quollastria subtilis.— Ahyong, 2001: 308–310, fig. 149.

Material examined.— Dasi fishing port, Yilan County, 1 Dec 2003: 1 female (TL 52 mm) (ZRC 2004.0639).

Diagnosis.— Raptorial claw dactylus usually with 5 teeth. A1 somite dorsal processes with blunt, rounded apices. Maxillipeds 1–4 with epipod. TS8 sternal keel at most a low swelling, usually near obsolete. AS5 with pair of large, dark, submedian triangles. Uropodal exopod proximal segment longer than distal segment.

Size.— To 53 mm TL (Ahyong, 2001).

Coloration.— Dorsal surface pale grey-brown, with darker, diffuse patches between submedian and lateral carinae. Carinae and grooves of carapace dark red-brown. Submedian carinae and posterior margins of thoracic and abdominal somites dark red. TS6–7 with dark patch between intermediate carinae and lateral processes. AS2 with narrow dark red-brown band, medially diffuse. AS5 with dark red-brown triangular patch lateral to submedian carinae. Telson median carina with dark rectangle proximally and dark triangle distally, encompassing apical spine; carinae of primary teeth red. Uropodal exopod proximal segment with dark distal margin, distal segment dark on inner half; movable spines on outer margin of exopod proximal spines clear red.

Habitat.— Sand or silty substrates between depths of 31–111 m (Ahyong, 2001).

Distribution.— Madagascar, India, Burma, Indonesia, Philippines, Taiwan, Australia, and New Caledonia.

Remarks.— The single known Taiwanese specimen of *Q. subtilis* accords well with published accounts (Manning, 1978c; Ahyong, 2001) and is the first recorded of the species from Taiwan. *Quollastria subtilis* closely resembles *Q. gonypetes* in almost all features, but is best distinguished by the presence of a pair of dark triangles instead of squares on AS5, and in having the proximal uropodal exopod segment distinctly longer than, instead of as long as the distal segment.

Genus *Squilloides* Manning, 1968

Squilloides Manning, 1968c: 131. Type species *Squilla leptosquilla* Brooks, 1886, by original designation.
Gender feminine.

Diagnosis.— Cornea bilobed. Carapace with anterolateral spines; median carina present. Mandibular palp absent. Dactylus of raptorial claw with 4 teeth. Maxillipeds 1–4 with epipods. TS5–7 lateral processes single, those of TS6–7 with posterolateral spine or point. AS1–6 with submedian carinae. Uropodal protopod with crenulate or smooth inner margin. Telson with fixed submedian teeth; without rows of dorsolateral carinae.

Remarks.— Two species of *Squilloides* are known, of which one occurs in Taiwan.

Squilloides leptosquilla (Brooks, 1886)



Fig. 141. Male, TL 104 mm, Dasi fishing port, Yilan County, 16 Mar 1995.



Fig. 142. Female, TL 78 mm, Dasi fishing port, Yilan County, 7 May 2008.

Squilla leptosquilla Brooks, 1886: 30–34, pl. 1: figs. 1–2 [type locality: Celebes Sea, Philippines, 12°46'N, 122°, 10'E].— Lee & Wu, 1966: 47–48, fig. 5A–B.

Squilla leptosquilla var *dentata* Jurich, 1904: 372, pl. 25(I): fig. 2.

Squilloides leptosquilla.— Liu & Wang, 1999: 580.— Ahyong, 2001: 310–312, fig. 150.

Material examined.— Dasi fishing port, Yilan County, 14 Oct 1984: 1 male (TL 82 mm) (NTOU).— 22 Nov 1985: 6 males (TL 82–94 mm) (TMCS-0017).— 7 Mar 1986: 11 males (TL 76–107 mm), 1 female (TL 79 mm) (TMCS-0032).— 28 Apr 1986: 4 males (TL 79–98 mm) (TMCS-0044).— 13 May 1991: 3 males (TL 80–92 mm) (NTOU).— 16 Mar 1995: 1 male (TL 104 mm) (NTOU).— 19 Oct 1995: 2 females (TL 76–105 mm) (NTOU).— May 1999: 1 female (TL 95 mm) (ZRC 1999.2174).— 27 May 1997: 1 female (TL 74 mm) (ZRC 2001.0170).— 7 May 2008: 1 female (TL 78 mm) (NTOU). Nanfang-ao fishing port, Yilan County, 9 Nov 1995: 4 males (TL 74–93 mm), 4 females (TL 79–88 mm) (NTOU). Kaohsiung County, 12 May 1998: 1 male (TL 77 mm) (NIWA). Donggang fishing port, Pingtung County, 3 Mar 1991: 1 male (TL 60 mm), 7 females (TL 54–80 mm) (NTOU).— 26 Jan 1994: 1 female (TL 79 mm) (NTOU).— 5 Aug 1995: 1 male (TL 106 mm) (NTOU).— 21 Oct 1995: 2 males (TL 56–76 mm), 1 female (TL 71 mm) (NTOU).— May 1999: 1 male (TL 93 mm) (ZRC 1999.0725).— 6–9 Dec 2001: 4 males (TL 48–97 mm), 2 females (TL 88–89 mm) (ZRC 2001.0287).— 25 Jun 2002: 1 female (TL 84 mm) (ZRC 2002.0401). CP65, 24°54.1'N, 122°03.1'E, 440 m, 5 May 2001: 1 female (TL 53 mm) (MNHN). No specific locality: 1 male (TL 80 mm) (NTOU), 1 male (TL 84 mm) (NTOU).— 1 female (TL 96 mm) (NTOU).

Diagnosis.— Carapace with intermediate carinae.

Size. — To 118 mm TL (Moosa, 1986).

Coloration.— Overall dorsal pale orange dorsally; carinae brown-orange or reddish-orange; ventral surface translucent white. Median carina of telson with pair of red-maroon patches. Raptorial claw merus pale orange; carpus, propodus and dactylus white; distal margin of propodus yellow-orange. Pereopods with pale orange proximal half; white distal half. Uropods pale orange.

Habitat.— Soft substrates; 170–754 m.

Distribution. — Andaman Sea, Australia, Indonesia, the Philippines, Japan and Taiwan.

Remarks.— Taiwanese specimens of *S. leptosquilla* exhibit similar variation to that reported for Australian specimens (Ahyong, 2001). The most important variation is in the orientation of the lateral process of TS5 ranging from being directed laterally to anterolaterally, a feature used by Kemp (1911) to distinguish *S. leptosquilla* from *S. tenuispinis* (Wood-Mason, 1875). Sexual dimorphism in the size of the intermediate teeth of the telson is present in Taiwanese material as also reported for Philippine (Moosa, 1986) and Australian specimens (Ahyong, 2001). Abdominal spination in the present series is as follows: submedian 6, intermediate 1–6, lateral 1–6, marginal 1–5; CI 509–605.

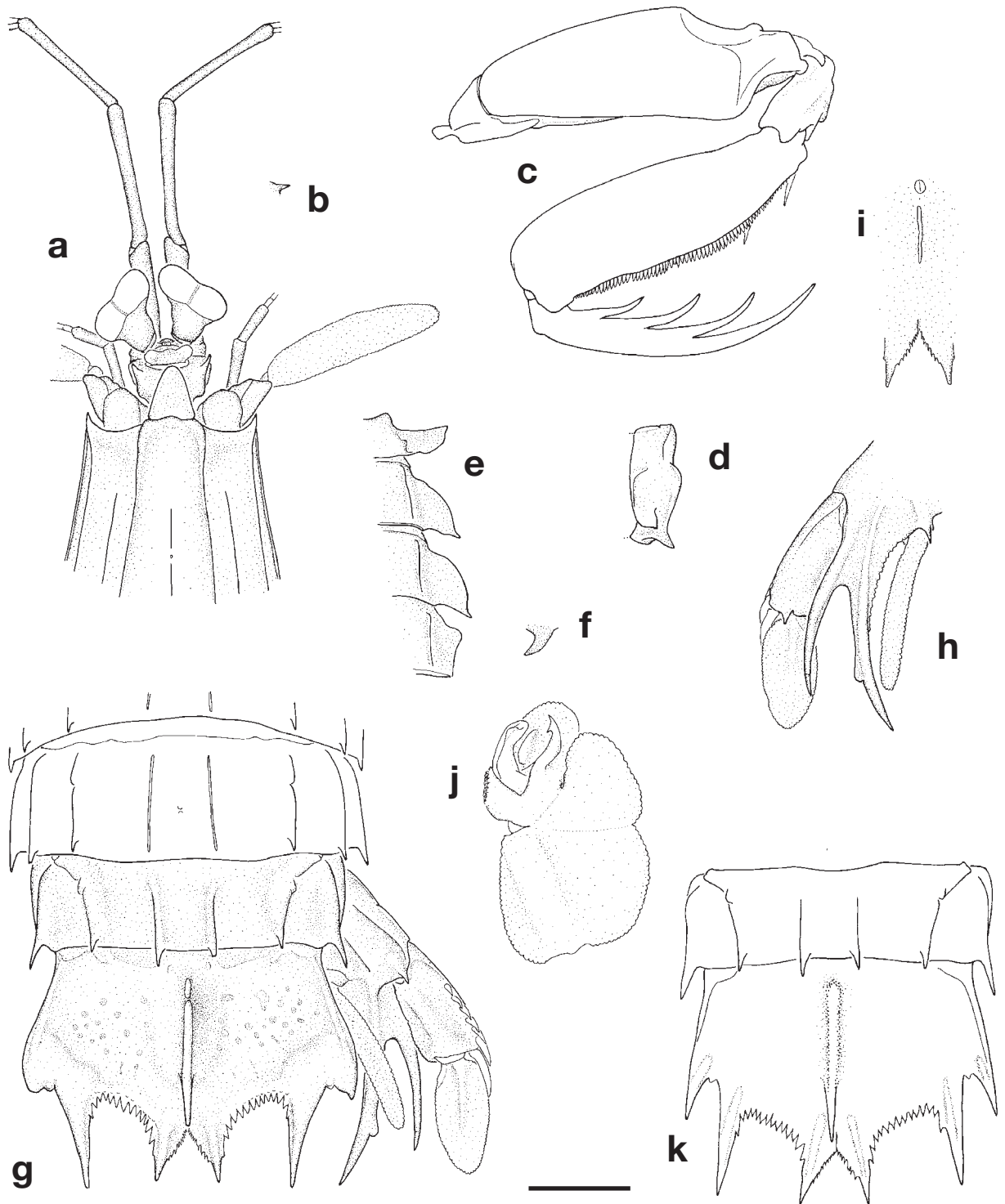


Fig. 143. Male, TL 77 mm, Jhongihou fishing port, Kaohsiung City, 12 May 1998: **a**, anterior cephalothorax; **b**, right dorsal process of antennular somite, lateral view; **c**, right raptorial claw; **d**, right lateral processes of TS5–8, dorsal view; **e**, TS5, right lateral view; **f**, TS8 sternal keel, right lateral; **g**, AS5–6, telson and right uropod; **h**, right uropod, ventral view; **i**, postanal carina; **j**, right pleopod 1 endopod, anterior view. Female, TL 84 mm, Nanfang-ao fishing port, Yilan County, 9 Nov 1995: **k**, AS6 and telson. Scale: a–i, k = 5.0 mm; j = 2.5 mm.

Taxonomic and Nomenclatural Decisions Made in This Work

Revised status:

Harpiosquilla japonica Manning, 1969 removed from synonymy of *H. harpax* (de Haan, 1844)

New synonyms:

Harpiosquilla philippina Garcia, 1983 as *H. indica* Manning, 1969

Lophosquilla makarovi Manning, 1995 as *L. costata* (de Haan, 1844)

Oratosquillina megalops (Manning, 1980) as *O. inornata* (Tate, 1883)

Lectotype designation:

Miyakea holoschista (Kemp, 1911)

Literature Cited

- Ahyong, S. T. 1994. *Oratosquilla septemdentata* n.sp. (Crustacea: Stomatopoda: Squillidae), a new species of deep water stomatopod from Halmahera, Indonesia. *Records of the Australian Museum*, 46: 1–4.0
- Ahyong, S. T. 1997. A phylogenetic analysis of the Stomatopoda (Crustacea: Malacostraca). *Journal of Crustacean Biology*, 17(4): 695–715.
- Ahyong, S. T. 2000. Redescription of *Squilla fabricii* Holthuis, 1941 (Crustacea: Stomatopoda), and its transfer to *Oratosquilla* Manning, 1968. *Proceedings of the Biological Society of Washington*, 113(4): 926–930.
- Ahyong, S. T. 2001. Revision of the Australian Stomatopod Crustacea. *Records of the Australian Museum*, 26: 1–326.
- Ahyong, S. T. 2002a. Stomatopod Crustacea from the Marquesas Islands: results of MUSORSTOM 9. *Zoosystema*, 24(2): 347–372.
- Ahyong, S. T. 2002b. A new species and new records of Stomatopoda from Hawaii. *Crustaceana*, 75: 827–840.
- Ahyong, S.T. 2004. New species and new records of stomatopod Crustacea from the Philippines. *Zootaxa*, 793: 1–28.
- Ahyong, S. T. 2005a. Coral reef mantis shrimps from the vicinity of Sodwana Bay, South Africa (Crustacea: Stomatopoda). *Proceedings of the Biological Society of Washington*, 118(1): 158–164.
- Ahyong, S. T. 2005b. Phylogenetic analysis of the Squilloidea (Crustacea: Stomatopoda). *Invertebrate Systematics*, 19(3): 189–208.
- Ahyong, S. T. 2006. A new species of *Carinosquilla* (Crustacea: Stomatopoda: Squillidae) from the Seychelles with a cladistic analysis of the genus. *Zoosystema*, 28(2): 307–314.
- Ahyong, S. T. (in press) Stomatopod Crustacea of the Dampier Archipelago, Western Australia. *Records of the Western Australian Museum*, 72.
- Ahyong, S. T., & Chan, T. Y. 2008. A new species of *Oratosquillina* Manning, 1995 (Crustacea: Stomatopoda: Squillidae) from the Indo-West Pacific region with a key to the genus. *Zootaxa*, 1775: 61–68.
- Ahyong, S. T., Chan, T. Y. & Liao, Y. J. 1998. A new stomatopod (Crustacea: Malacostraca) of the genus *Harpiosquilla* Holthuis, 1964, from Taiwan and Australia. *Proceedings of the Biological Society of Washington*, 111(4): 929–935, figs 1, 2.
- Ahyong, S. T., Chan, T. Y. & Liao, Y. J. 2000. *Oratosquillina manningi*, a new species of stomatopod from Taiwan and Australia. *Journal of Crustacean Biology*, 20 (special issue 2): 42–47.
- Ahyong, S. T., Chu, K. H., Chan, T.-Y. & Chen, Q. C. 1999. Stomatopoda of the Zhujiang estuary between Hong Kong and Macau. *Crustaceana*, 72(1): 37–54.
- Ahyong, S. T., & M. C. Ebach. 1999. First occurrence of a subfossil stomatopod crustacean from Australia. *Alcheringa*, 3/4: 227–228.
- Ahyong, S. T., & Erdmann, M. V. 2007. Two new species of *Gonodactylellus* from Indonesia. *Raffles Bulletin of Zoology*, 55: 89–95.
- Ahyong, S. T., & Galil, B. S. 2006. First Mediterranean record of the Indo-West Pacific mantis shrimp, *Clorida albolitura* Ahyong & Naiyanetr, 2000 (Stomatopoda, Squillidae). *Aquatic Invasions*, 1: 191–193.
- Ahyong, S. T. & Harling, C. 2000. The phylogeny of the stomatopod Crustacea. *Australian Journal of Zoology*, 48(6): 607–642.
- Ahyong, S. T. & Manning, R. B. 1998. Two new species of *Erugosquilla* from the Indo-West Pacific (Crustacea: Stomatopoda: Squillidae). *Proceedings of the Biological Society of Washington*, 111(3): 653–662.
- Ahyong, S. T. & Moosa, M. K. 2004. Stomatopod Crustacea from Anambas and Natuna Islands, South China Sea, Indonesia. *Raffles Bulletin of Zoology*, Supplement 11: 61–66.
- Ahyong, S. T. & Naiyanetr, P. 2000. Revision of the *Clorida latreillei* species complex with description of a new species (Squillidae: Stomatopoda). *Raffles Bulletin of Zoology*, 48(2): 313–325.
- Ahyong, S. T. & Naiyanetr, P. 2002. Stomatopod Crustaceans from Phuket and the Andaman Sea. *Phuket Marine Biological Centre Special Publication*, 23(2): 281–312.
- Alcock, A. 1894. On the results of the deepsea dredging during the season 1890-91 (concluded). Natural history notes from H. M. Marine Survey Steamer 'Investigator,' Commander R. F. Hoskyn, R.N., late commanding, series 2, no. 1. *The Annals and Magazine of Natural History*, series 6, 13: 400–411.

- Balss, H. 1910a. Ostasiatische Stomatopoden. Beiträge zur Naturgeschichte Ostasiens. Herausgegeben von Dr. F. Doflein. *Abhandlungen der Wissenschaften, Mathematisch-Naturwissenschaftliche Klasse, Munich*, supplement 2, 2: 1–11.
- Balss, H. 1910b. Über Stomatopoden des Roten Meeres. Expeditionen S.M. Schiff "Pola" in das Rote Meer: nördliche und südliche Hälfte 1895/96–1897/98. *Zoologische Ergebnisse*, 28: 11–14.
- Barber, P. H. & Erdmann, M. V. 2000. Molecular systematics of the Gonodactylidae (Stomatopoda) using mitochondrial cytochrome oxidase C (subunit 1) DNA sequence data. *Journal of Crustacean Biology*, 20 (special issue 2): 20–36.
- Berthold, A. A. 1827. *Latreille's Natürliche Familien des Thierreichs, aus dem Französischen mit Anmerkungen und Zusätzen*. 606 pp. Weimer.
- Berthold, A. A. 1845. Ueber verschiedene neue oder seltene Reptilien aus Neue-Granada und Crustaceen aus China. *Gesellschaft der Wissenschaften zu Göttingen, Nachrichten*, 1845: 37–48.
- Bigelow, R. P. 1893. Preliminary notes on the Stomatopoda of the Albatross collections and on other specimens in the National Museum. *Johns Hopkins University Circulars*, 12 (106): 100–102.
- Bigelow, R. P. 1931. Stomatopoda of the southern and eastern Pacific Ocean and the Hawaiian Islands. *Bulletin of the Museum of Comparative Zoölogy, Harvard University*, 72(4): 105–191, pls. 1, 2.
- Blumstein, R. 1970. New stomatopod crustaceans from the Gulf of Tonkin, South China Sea. *Crustaceana*, 18 (2): 218–224.
- Blumstein, R. 1974. Stomatopod crustaceans from the Gulf of Tonkin with the description of new species. *Crustaceana*, 26 (2): 112–126.
- Borradaile, L. A. 1900. On the Stomatopoda and Macrura brought by Dr Willey from the South Seas In: A. Willey (Ed.), *Zoological Results based on the material from New Britain, New Guinea, Loyalty Islands and elsewhere, collected during the years 1895, 1896, and 1897*, 4: 395–428, pls. 36–39. Cambridge University Press.
- Brooks, W. K. 1886. Report on the Stomatopoda collected by H.M.S. Challenger during the years 1873–76. *The Voyage of the H.M.S. Challenger, Zoology*, 16: 1–116, pls. 1–16.
- Burnett, B. R. & Hessler, R. R. 1973. Thoracic epipodites in the Stomatopoda (Crustacea): a phylogenetic consideration. *Journal of Zoology*, 169: 381–392.
- Caldwell, R. L. & Dingle, H. 1976. Stomatopods. *Scientific American*, 234: 80–89.
- Calman, W. T. 1909. Crustacea. In: R. Kankester (Ed.), *A Treatise on Zoology*, Part 7. Adam & Charles Black, London.
- Chhapgar, B. F. & Sane, S. R. 1967. Two new species of *Squilla* (Stomatopoda) from Bombay. *Crustaceana*, 12(1): 1–8.
- Chopra, B. 1939. Stomatopoda. *John Murray Expedition Scientific Reports*, 6(3): 137–181, figs. 1–13.
- Claus, C. 1871. Die Metamorphose der Squilliden. *Abhandlungen der königlichen Gessellschaft der Wissenschaften zu Göttingen*, 16: 111–163, pls. 1–8.
- Dana, J. D. 1852–1855. Crustacea, Part 1. *United States Exploring Expedition during the years 1838, 1839, 1840, 1841, 1842, under the command of Charles Wilkes, U.S.N.*, 13: 1–685 [1852]. Atlas: 1–27, pls. 1–96 [1855]. C. Sherman, Philadelphia.
- Dong, Y. M., Chen, Y. S. & Huang, L. Q. 1983. Report on the stomatopods of the East China Sea. *Donghai Marine Science*, 1: 82–98.
- Đuriš, Z. 2007. Mantis Shrimps (Crustacea: Stomatopoda) of Nhatrang Bay. In: À. N. Sysoev, & Y. I. Kantor (Eds.), *Benthic Fauna of the Bay of Nhatrang, Southern Vietnam*. KMK Scientific Press, Moscow. Pp. 124–159.
- Eydoux, F., & L. F. A. Souleyet 1842. Crustacés. *Voyage autour du Monde exécuté pendant les années 1836 et 1837 sur la Corvette La Bonite Commandée par M. Vaillant, Capitaine de Vaisseau, Zoologie*, 1: 219–272, pl. 5. Arthus Bertrand, Paris.
- Fabricius, J.C. 1781. *Species Insectorum Exhibentes Eorum Differentias Specificas, Synonyma Auctorum, Loca Natalia, Metamorphosin Adiectis, Observationibus, Descriptionibus*, 1: vii + 552 pp. Hamburgii et Kilonii.
- Fabricius, J. C. 1787. *Mantissa insectorum sistens eorum species nuper detectas: adiectis characteribus genericis, differentiis specificis, emendationibus, observationibus*. Proft Hafniae, 1: 1–348.
- Fabricius, J. C. 1793. *Entomologia Systematica Emendata et Aucta. Secundum Classes, Ordines, Genera, Species. Adiectis Synonymis, Locis, Observationibus, Descriptionibus*, 2: vii + 519 pp. Hafniae.
- Fabricius, J. C. 1798. *Supplementum Entomologiae Systematicae*, ii + 572 pp. Hafniae.
- Fowler, H. W. 1912. The Crustacea of New Jersey. *Annual Report of the New Jersey State Museum*, Part II, 1911: 29–650.

- Frogliola, C. & Atkinson, R. J. A. 1998. Association between *Athanas amazone* (Decapoda: Alpheidae) and *Squilla mantis* (Stomatopoda: Squillidae). *Journal of Crustacean Biology*, 18: 529–632.
- Fukuda, T. 1909. Japanese Stomatopoda. *Dobutsugaku Zasshi*, 21: 54–62, 167–174, 5 pls. [In Japanese; published in English, 1910].
- Fukuda, T. 1910. Report on the Japanese Stomatopoda with descriptions of two new species. *Annotationes Zoologicae Japonenses*, 7(3): 139–152, pl. 4.
- Fukuda, T. 1911a. Supplement to Japanese Stomatopoda. *Dobutsugaku Zasshi*, 23: 173–175, pl. 1. [In Japanese; published in English, 1911b].
- Fukuda, T. 1911b. Further report on Japanese Stomatopoda with descriptions of two new species. *Annotationes Zoologicae Japonenses*, 7(5): 285–290, pl. 11.
- Fukuda, T. 1913. On two species of stomatopods, with a list of Stomatopoda found in Japanese Seas. *Dobutsugaku Zasshi*, 25(2): 69–72, 2 figs. [In Japanese].
- Garcia, R. G. 1978. *Harpisquilla philippina*, a new stomatopod crustacean from the Philippines. *Kalikasan, Philippine Journal Biology*, 7(3): 231–237.
- Garcia, R. G. 1980. Occurrence of three species of Stomatopoda (Crustacea) in the Philippines. *Fisheries Research Journal of the Philippines*, 5 (1): 24–32.
- Garcia, R. G. 1981. Inventory of the littoral fauna of Tayabas Bay — Crustacea: Stomatopoda. *National Museum Manila, Philippines, Zoological Papers*, 6: 1–33.
- Garcia, R. G. & Manning, R. B. 1982. Four new species of stomatopod crustaceans from the Philippines. *Proceedings of the Biological Society of Washington*, 95 (3): 537–544.
- Ghosh, H. C. 1987. Stomatopoda: Crustacea. Fauna of Orissa. *State Fauna Series*, 1: 305–318.
- Ghosh, H. C. 1990. Stomatopoda: Crustacea. Fauna of Lakshadweep. *State Fauna Series*, 2: 199–212.
- Giebel, C. 1861. Neue *Squilla* von der Insel Banka. *Zeitschrift für Gesammten Naturwissenschaften*, 18: 319–320.
- Giesbrecht, W. 1910. Stomatopoden, Erster Theil. *Fauna und Flora des Golfes von Neapel Monographie*, 33: i–vii, 1–239, pls. 1–11.
- Ghosh, H. C. & Manning, R. B. 1988. Types of Stomatopod Crustaceans in the Zoological Survey of India. *Proceedings of the Biological Society of Washington*, 101(3): 653–661.
- Haan, W. de 1833–1850. Crustacea. In: von Siebold, Ph. F., *Fauna Japonica sive descriptio animalium, quae in itinere per Japoniam, jussu et auspiciis superiorum, qui summum in India Batavia Imperium tenent, suscepto, annis 1823–1830 collegit, notis observationibus et adumbrationibus illustravit*. Lugdunum Batavorum: A. Arnz. Pp. 1–243.
- Hamano, T. 1988. Mating behaviour of *Oratosquilla oratoria* (De Haan, 1844) (Crustacea: Stomatopoda). *Journal of Crustacean Biology*, 8(2): 239–244.
- Hamano, T. 1990. Growth of the stomatopod crustacean *Oratosquilla oratoria* in Hakata Bay. *Bulletin of the Japanese Society of Scientific Fisheries (Nippon Suisan Gakkaishi)*, 56(9): 1529.
- Hamano, T. 2005. Biology of stomatopod crustaceans and stock management of the Japanese mantis shrimp *Oratosquilla oratoria*. *Japan Fisheries Resource Conservation Association, Tokyo*. 210 pp. [In Japanese].
- Hamano, T., Hayashi, K.-I., Kubota, K., Matsushita, H. & Tabuchi, K. 1996. Population structure and feeding behaviour of the stomatopod crustacean *Kempina mikado* (Kemp & Chopra, 1921) in the East China Sea. *Fisheries Science*, 62(3): 397–399.
- Hamano, T., Kikkawa, T., Ueno, S., & Hayashi, K.-I. 1995. Use of larval size, instead of larval stage, to study the ecology of a stomatopod crustacean *Oratosquilla oratoria*. *Fisheries Science*, 61(1): 165–166.
- Hamano, T., Torisawa, M., Mitsihashi, M., & Hayashi, K.-I. 1994. Burrow of a stomatopod crustacean *Oratosquilla oratoria* (De Haan, 1844) in Iishikari Bay, Japan. *Crustacean Research*, 23: 5–11.
- Hamano, T. & Matsuura, S. 1984. Egg laying and egg mass nursing behaviour in the Japanese mantis shrimp. *Bulletin of the Japanese Society of Scientific Fisheries (Nippon Suisan Gakkaishi)*, 50(12): 1969–1973.
- Hamano, T. & Matsuura, S. 1986a. Optimal prey size for the Japanese mantis shrimp from structure of the raptorial claw. *Bulletin of the Japanese Society of Scientific Fisheries (Nippon Suisan Gakkaishi)*, 52(1): 1–10.
- Hamano, T. & Matsuura, S. 1986b. Food habits of the Japanese mantis shrimp in the benthic community of Hakata Bay. *Bulletin of the Japanese Society of Scientific Fisheries (Nippon Suisan Gakkaishi)*, 52(2): 787–798.

- Hamano, T. & Matsuura, S. 1987a. Egg size, duration of incubation, and larval development of the Japanese mantis shrimp in the laboratory. *Bulletin of the Japanese Society of Scientific Fisheries (Nippon Suisan Gakkaishi)*, 53(1): 23–39.
- Hamano, T. & Matsuura, S. 1987b. Delayed metamorphosis of the Japanese mantis shrimp in nature. *Bulletin of the Japanese Society of Scientific Fisheries (Nippon Suisan Gakkaishi)*, 53(5): 889.
- Hamano, T. & Matsuura, S. 1987c. Sex ratio of the Japanese mantis shrimp in Hakata Bay. *Bulletin of the Japanese Society of Scientific Fisheries (Nippon Suisan Gakkaishi)*, 53(12): 2279.
- Hamano, T., Morrissy, N. M., & Matsuura, S. 1987. Ecological information on *Oratosquilla oratoria* (Stomatopoda, Crustacea) with an attempt to estimate the annual settlement date from growth parameters. *Journal of Shimonoseki University of Fisheries*, 36(1): 9–27.
- Hansen, H. J. 1926. The Stomatopoda of the Siboga Expedition. *Siboga-Expeditie, monographe*, 35: 1–48, pls. 1–2.
- Hayashi, K.-I. 2002. A new species of the genus *Athanas* (Decapoda, Caridea, Alpheidae) living in the burrows of a mantis shrimp. *Crustaceana*, 75(3–4): 396–403.
- 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): 1–280, pl. 1–25.
- Hessler, R. R. 1983. A defense of the caridoid facies: wherein the early evolution of the Eumalacostraca is discussed. *Crustacean Issues*, 1: 145–164.
- Hof, C. H. J. 1998a. Late Cretaceous stomatopods (Crustacea: Malacostraca) from Israel and Jordan. *Contributions to Zoology*, 67: 257–266.
- Hof, C. H. J. 1998b. Fossil stomatopods (Crustacea: Malacostraca) and their phylogenetic impact. *Journal of Natural History*, 32(10/11): 1567–1576.
- Holthuis, L. B. 1941. The Stomatopoda of the Snellius Expedition. Biological Results of the Snellius Expedition XII. *Temminckia*, 6: 241–294.
- Holthuis, L. B. 1959. Stomatopod Crustacea of Suriname. *Studies on the Fauna of Suriname and other Guyanas*, 10: 173–191.
- Holthuis, L. B. 1964. Preliminary note on two new genera of Stomatopoda. *Crustaceana*, 7(2): 140–141.
- Holthuis, L. B. 1967. The stomatopod Crustacea collected by the 1962 and 1965 Israel South Sea Expeditions. The Second Israel South Red Sea Expedition, 1965, Report No.1. *Israel Journal of Zoology*, 16: 1–45.
- Holthuis, L. B. 2000. Nomenclatural notes on eighteenth century Stomatopoda (Hoplocarida). *Journal of Crustacean Biology*, 20 (special number 2): 12–19.
- Hu, C.-H. & Tao, H.-J. 1996. *Crustacean Fossils of Taiwan*. Ta-Jen Printers, Taipei. Pp. 1–228.
- Huang, J.-F. & Hsueh, P.-W. 2006. A new record of *Haptosquilla glyptocercus* (Wood-Mason, 1875) (Stomatopoda: Protosquillidae) from Taiwan. *Endemic Species Research*, 8(2): 97–101.
- Hwang, J.-J., & H.-P. Yu. 1980. A fauna-list of the Crustacea from Lan-Yu Island. *Annual of Taiwan Museum*, 23: 151–180. (In Chinese).
- Ingle, R. W. & Merrett, N. 1971. A stomatopod Crustacean from the Indian Ocean, *Indosquilla manihinei* gen. et. sp. nov. (Family Bathysquillidae) with remarks on *Bathysquilla crassispinosa* (Fukuda, 1910). *Crustaceana*, 20 (2): 192–198.
- Jeng, M.-S. 1998. *The Prawns and Crabs of Kenting National Park*. Kenting National Park Hand Guides, No.14. 133 pp. (in Chinese).
- Jenner, R. A., Hof, C. H. J., & Schram, F. 1998. Palaeo- and archaeostomatopods (Hoplocarida: Crustacea) from the Bear Gulch Limestone, Mississippian (Namurian), of Central Montana. *Contributions to Zoology*, 67: 155–185.
- Jurich, B. 1904. Die Stomatopoden der Deutsche Tiefsee-Expedition. *Wissenschaftliche Ergebnisse der Deutschen Tiefsee-Expedition auf dem Dampfer "Valdivia" 1898–1899*, 7: 361–408, pl. 25–30. [Pp 1–51, pl. 1–6 on separate].
- Kemp, S. 1911. Preliminary descriptions of new species and varieties of Crustacea Stomatopoda in the Indian Museum. *Records of the Indian Museum*, 6(2): 93–100.
- Kemp, S. 1913. An account of the Crustacea Stomatopoda of the Indo-Pacific region, based on the collection in the Indian Museum. *Memoirs of the Indian Museum*, 4: 1–217, figs. 1–10, pls. 1–10.
- Kemp, S. 1915. On a collection of stomatopod Crustacea from the Philippine Islands. *The Philippine Journal of Science*, 10(3D): 169–186, pl. 1.
- Kemp, S. & Chopra, B. 1921. Notes on Stomatopoda. *Records of the Indian Museum*, 22: 297–311.

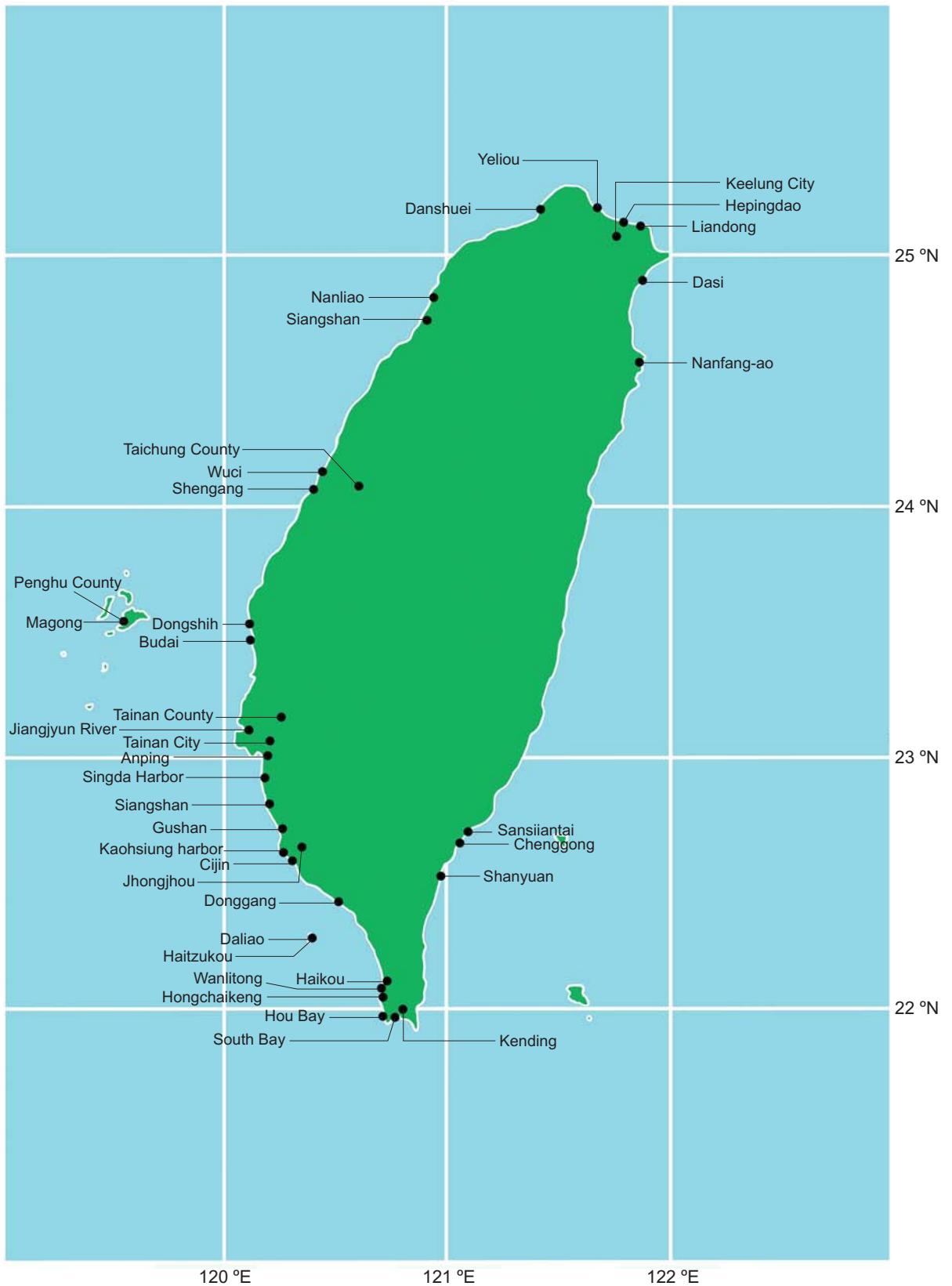
- Komai, T. 1914. On some species of Japanese Stomatopoda. *Dobutsugaku Zasshi*, 26: 459–468, pl. 6. [In Japanese].
- Komai, T. 1920. Spermatogenesis of *Squilla oratoria* De Haan. *Journal of Morphology*, 34(2): 307–333.
- Komai, T. 1924. Development of *Squilla oratoria* de Haan. I. Change in external form. *Memoirs of the College of Science, Kyoto Imperial University*, (B) 1(3): 273–283, pl. 1.
- Komai, T. 1927. Stomatopoda of Japan and adjacent localities. *Memoirs of the College of Science, Kyoto Imperial University*, (B) 3(3): 307–354, figs. 1–2, pls. 13–14.
- Kossmann, R., 1880. Malacostraca. *Zoologische Ergebnisse einerin Aufrage der königlichen Academie der Wissenschaften zu Berlin ausgeführten Reise in die Küstengebiete des Rothen Meeres*, 2(1): 1–140, pls. 1–15.
- Kunze, J. C. 1981. The functional morphology of stomatopod Crustacea. *Philosophical Transactions of the Royal Society of London B*, 292: 255–328.
- Kunze, J. C. 1983. Stomatopoda and the evolution of the Hoplocarida. *Crustacean Issues*, 1: 165–188.
- Lamarck, J. B. P. A. de. 1818. *Histoire naturelle des animaux sans vertèbres presentant les caractères généraux et particuliers de ces animaux, leur distribution, leur classes, leurs familles, leurs genres, et la citation des principales espèces qui s’y rapportent; précédée d’une introduction offrant la détermination des caractères essentiels, de l’animal, sa distinction du végétal et des autres corps naturelles, enfin, l’exposition des principes fondamentaux de la zoologie*, 5: 1–612. Deterville, Paris.
- Lanchester, W. F. 1903. Stomatopoda, with an account of the varieties of *Gonodactylus chiragra*. Marine Crustaceans VIII. In: J. S. Gardiner (Ed.), *The fauna and geography of the Maldive and Laccadive Archipelagoes: being the account of the work carried on and of the collections made by an expedition during the years 1899 and 1900*, 1: 444–459.
- Latreille, P. A. 1802. *Histoire naturelle, générale et particulière, des Crustacés et des Insectes*, 3: 467 pp. F. Dufart, Paris.
- Latreille, P. A. 1828. *Squille*, Squilla. Encyclopédie Méthodique. *Entomologie ou Histoire naturelle des Crustacés, des Arachnides et des Insectes*, 10: 467–475. Agasse, Paris.
- Leach, W. E. 1818. A general notice of the animals taken by Mr John Cranch, during the expedition to explore the source of the River Zaire. Appendix 4. Pp. 407–419, 1 unnumbered plate. In: J. K. Tuckey (Ed.), *Narrative of an expeditio to explore the River Zaire, usually called the Congo, in South Africa, in 1816, under the direction of Captain J. K. Tuckey, R.N., to which is added the journal of Professor Smith, some general observations on the country and its inhabitants, and an appendix, containing the natural history of that part of the Kingdom of Congo through which the Zaire flows*. John Murray, London.
- Lee, S.-C., and Wu, S.-K. 1966. The stomatopod Crustacea of Taiwan. *Bulletin of the Institute of Zoology, Academia Sinica*. 5: 41–58.
- Linnaeus, C. 1758. *Systema Naturae per Regna Tria Naturae, Secundum Classes, Ordines, Genera, Species, cum Characteribus, Differentiis, Synonymis Locis*. Edition 10, volume 1: iii + 824 pp. Holmiae.
- Linnaeus, C. 1768. *Systema Naturae per Regna Tria Naturae, Secundum Classes, Ordines, Genera, Species, cum Characteribus, Differentiis, Synonymis Locis*. Edition 12. Stockholm, 3: 1–236.
- Liu, J.-Y. & Wang, Y. 1998. On two new species of the Squillidae and Harpiosquillidae (Crustacea Stomatopoda) from the South China Sea. *Oceanologia et Limnologia Sinica*, 29(6): 588–592 [Chinese text], 592–596 [English text], figs. 1, 2.
- Liu, J.-Y. & Wang, Y. 1999. The stomatopod fauna of the China Seas. In: F. R. Schram, & J.C. von Vaupel Klein (Eds.), *Crustaceans and the Biodiversity Crisis: Proceedings of the Fourth International Crustacean Congress, Amsterdam, The Netherlands, July 20–24, 1998*, 1: 569–582
- Makarov, R. R. 1978. New data on crustaceans of the families Lysiosquillidae and Gonodactylidae (Crustacea, Stomatopoda) from Tonkin Bay (Vietnam). *Zoologicheskij zhurnal, Moscow*, 57:176–189 [in Russian].
- Man, J. G. de. 1902. Die von Herrn Professor Kükenthal im Indischen Archipel gesammelten Dekapoden und Stomatopoden. In: W. Kükenthal, (Ed.), *Ergebnisse einer zoologischen Forschungsreise in den Molukken und Borneo. Abhandlungen der Senckenbergischen naturforschenden Gesellschaft*, 25: 467–929, pls. 19–27.
- Manning, R. B. 1961. A new deepwater species of *Lysiosquilla* (Crustacea: Stomatopoda) from the Gulf of Mexico. *Annals and Magazine of Natural History*, series 13, 3: 693–697, pls. 10, 11.
- Manning, R. B. 1963a. A new species of *Lysiosquilla* (Crustacea, Stomatopoda) from the northern Straits of Florida. *Bulletin of Marine Science of the Gulf and Caribbean*, 13(1): 54–57.
- Manning, R. B. 1963b. Preliminary revision of the genera *Pseudosquilla* and *Lysiosquilla* with descriptions of six new

- genera. *Bulletin of Marine Science of the Gulf and Caribbean*, 13(2): 308–328.
- Manning, R. B. 1965. Stomatopoda from the collection of His Majesty The Emperor of Japan. *Crustaceana* 9(3): 249–262, pls. 11, 12.
- Manning, R. B. 1967a. Preliminary account of a new genus and a new family of Stomatopoda. *Crustaceana*, 13(2): 238–239.
- Manning, R. B. 1967b. Review of the genus *Odontodactylus* (Crustacea: Stomatopoda). *Proceedings of the United States National Museum*, 123: 1–35.
- Manning, R. B. 1968a. Three new stomatopod crustaceans from the Indo-Malayan area. *Proceedings of the Biological Society of Washington*, 81: 241–250.
- Manning, R. B. 1968b. Stomatopod Crustacea from Madagascar. *Proceedings of the United States National Museum*, 124: 1–61.
- Manning, R. B. 1968c. A revision of the family Squillidae (Crustacea, Stomatopoda), with the description of eight new genera. *Bulletin of Marine Science*, 18(1): 105–142.
- Manning, R. B. 1969a. A revision of the genus *Harpisquilla* (Crustacea, Stomatopoda), with descriptions of three new species. *Smithsonian Contributions to Zoology*, 36: 1–41.
- Manning, R. B. 1969b. Stomatopod Crustacea of the western Atlantic. *Studies in Tropical Oceanography, Miami*, 8: viii + 380pp.
- Manning, R. B. 1969c. Notes on the *Gonodactylus* section of the family Gonodactylidae (Crustacea, Stomatopoda), with descriptions of four new genera and a new species. *Proceedings of the Biological Society of Washington*, 82: 143–166.
- Manning, R. B. 1970. Some stomatopod crustaceans from Tuléar, Madagascar. *Bulletin du Muséum National d'Histoire Naturelle, Paris*, series 2, 41(6): 1429–1441. [Dated 1969, published 1970].
- Manning, R. B. 1971a. Two new species of *Gonodactylus* (Crustacea, Stomatopoda) from Eniwetok Atoll, Pacific Ocean. *Proceedings of the Biological Society of Washington*, 84: 73–80.
- Manning, R. B. 1971b. Keys to the species of *Oratosquilla* (Crustacea: Stomatopoda), with descriptions of two new species. *Smithsonian Contributions to Zoology*, 71: 1–16.
- Manning, R. B. 1976. Redescriptions of *Oratosquilla indica* (Hansen), with accounts of a new genus and two new species (Crustacea, Stomatopoda). *Beaufortia*, 25(318): 1–13.
- Manning, R. B. 1977a. A monograph of the West African stomatopod Crustacea. *Atlantide Report*, 12: 25–181.
- Manning, R. B. 1977b. Preliminary accounts of five new genera of stomatopod crustaceans. *Proceedings of the Biological Society of Washington*, 90(2): 420–423.
- Manning, R. B. 1978a. Synopses of the Indo-West Pacific species of *Lysiosquilla* Dana, 1852 (Crustacea: Stomatopoda: Lysiosquillidae). *Smithsonian Contributions to Zoology*, 259: 1–16.
- Manning, R. B. 1978b. New and rare stomatopod Crustacea from the Indo-West Pacific region. *Smithsonian Contributions to Zoology*, 264: 1–36.
- Manning, R. B. 1978c. Further observations on *Oratosquilla*, with accounts of two new genera and nine new species (Crustacea: Stomatopoda: Squillidae). *Smithsonian Contributions to Zoology*, 272: 1–44.
- Manning, R. B. 1979. Notes on two species of stomatopod Crustacea from Phuket Island, Thailand. *Proceedings of the Biological Society of Washington*, 92(2): 394–398.
- Manning, R. B. 1980a. The superfamilies, families, and genera of Recent Stomatopod Crustacea, with diagnoses of six new families. *Proceedings of the Biological Society of Washington*, 93(2): 362–372.
- Manning, R. B. 1980b. *Oratosquilla megalops*, a new stomatopod crustacean from Taiwan. *Proceedings of the Biological Society of Washington*, 93(3): 523–524.
- Manning, R. B. 1991. Stomatopod Crustacea collected by the *Galathea* Expedition, 1950–1952, with a list of Stomatopoda known from depths below 400 meters. *Smithsonian Contributions to Zoology*, 521: 1–18.
- Manning, R. B. 1995. Stomatopod Crustacea of Vietnam: the legacy of Raoul Serène. *Crustacean Research*, Special No. 4: 1–339.
- Manning, R. B. 1998. Stomatopods. In: K. E. Carpenter & V. H. Niem (Eds.), *FAO species identification guide for fishery purposes. The living marine resources of the Western Central Pacific. Vol. 2. Cephalopods, crustaceans, holothurians and sharks*. FAO, Rome. Pp. 827–849.

- Manning, R. B. & Camp, D. K. 1983. *Fennerosquilla*, a new genus of stomatopod crustacean from the northwestern Atlantic. *Proceedings of the Biological Society of Washington*, 96 (2): 317–322.
- Manning, R. B. & Chan, T.-Y. 1997. The genus *Faughnia* from Taiwan, with the description of a new species (Stomatopoda: Parasquillidae). *Journal of Crustacean Biology*, 17 (3): 546–554.
- Manning, R. B. & Michel, A. 1973. *Harpiosquilla intermedia*, a new stomatopod Crustacean from New Caledonia. *Proceedings of the Biological Society of Washington*, 86(9): 113–116.
- Martin, J. W., & Davis, G. E. 2001. An updated classification of the Recent Crustacea. *Natural History Museum of Los Angeles County Science Series*, 39:1–124.
- Miers, E. J. 1880. On the Squillidae. *Annals and Magazine of Natural History*, 5: 1–30, 108–127.
- 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," 1881–2*, pp.178–322, 513–575, pls. 18–35, 46–52.
- Milne Edwards, H. 1837. *Histoire naturelle de Crustacés, comprenant l'anatomie, la physiologie et la classification de ces animaux*, 2: 1–532. Atlas: 32 pp, pls. 1–14, 14 bis, 15–25 bis, 26–42. Roret, Paris.
- Milne Edwards, A. 1868. Observations sur la faune carcinologique des Iles du Cap Vert. *Nouvelles Archives du Muséum d'Histoire Naturelle, Paris*, 4: 49–69, pls. 16–18.
- Moosa, M. K. 1973. The stomatopod Crustacea collected by the Mariel King memorial expedition in Malaku waters. *Marine Research in Indonesia*, 13: 1–30.
- Moosa, M. K. 1975. Notes on stomatopod Crustacea from Seribu Islands and adjacent waters with a description of a new species. *Marine Research in Indonesia (Penelitian Laut di Indonesia)*, 15: 1–20.
- Moosa, M. K. 1982. *Faughnia serenei*, new species, a stomatopod from the South China Sea. *Journal of Crustacean Biology*, 2(4): 600–604.
- Moosa, M. K. 1986. Stomatopod Crustacea. In: A. Crosnier (Ed.), *Résultats du Campagnes MUSORSTOM I & II Philippines*, 2. Mémoires du Muséum National d'Histoire Naturelle, Paris, series A, Zoologie 133: 367–414. [Dated 1985, published 1986].
- Moosa, M. K. 1991. The Stomatopoda of New Caledonia and Chesterfield Islands In: B. Richer de Forges (Ed.), *Le benthos de fonds meubles des lagons de Nouvelle-Calédonie*, 1: 149–219. Editions de l'ORSTOM, Paris.
- Moosa, M. K. 2000. Marine biodiversity of the South China Sea: a checklist of Stomatopod Crustacea. *Raffles Bulletin of Zoology*, supplement 8: 405–457.
- Moosa, M. K. & Cleva, R. 1984. Stomatopod Crustacea collected by the mission Corindon II in the Makassar Strait, Indonesia. *Marine Research in Indonesia*, 24: 73–82.
- Müller, F. 1886. Zur Crustaceenfauna von Trincomali. *Verhandlungen der Naturforschenden Gesellschaft in Basel*, 8(1): 470–479, pl. 4.
- Naiyanetr, P. 1995. *Acanthosquilla sirindhorn* n.sp., a new mantis shrimp from Thailand (Stomatopoda, Nannosquillidae). *Crustaceana*, 68(4): 409–417.
- Naiyanetr, P., Ahyong, S. T., & Ng, P. K. L. 2000. Reinstatement of *Carinosquilla thailandensis* Naiyanetr, with a first record of *Alima orientalis* Manning from the Gulf of Thailand, and notes on *Cloridina pelamidae* (Blumstein) (Stomatopoda: Squillidae). *Crustaceana*, 73(10): 1291–1296.
- Ng, J. S. S., Lui, K. K. Y., Lai, C.-H., Leung, K. M. Y. 2007. *Harpiosquilla harpax* (Crustacea, Stomatopoda) as a biomonitor of trace metal concentration in benthic sediments in Hong Kong waters. *Marine Pollution Bulletin*, 54: 1523–1558.
- Ngoc-Ho, N. & Chan, T.-Y. 1992. *Upogebia edulis*, new species, a mud-shrimp (Crustacea: Thalassinidea: Upogebiidae) from Taiwan and Vietnam, with a note on polymorphism in the male first pereopod. *Raffles Bulletin of Zoology*, 40(1): 33–34.
- Oshima, M. 1921. Supplement to the species list of the crabs and shrimps from Formosa. *Zoological Magazine*, 33: 122–124.
- Osawa, M., Mitsuhashi, M., & Takeda, M. 2004. Discovery of the type specimen of *Lysiosquilla crassispinosa* Fukuda, 1909 (Crustacea: Stomatopoda) and Fukuda's stomatopod specimens. *Benthos Research*, 59(1): 1–10.
- Pocock, R. I. 1893. Report upon the stomatopod crustaceans obtained by P. W. Bassett-Smith, Esq., Surgeon R. N., during the cruise, in the Australian and China seas, of H.M.S. "Penguin," Commander W. U. Moore. *Annals and Magazine of*

- Natural History*, series 6, 11: 473–479, pl. 20B.
- Popham, M. 1939. On *Phyctaenachlamys lysiosquillina* gen. nnd sp. nov., a lamellibranch commensal in the burrows of *Lysiosquilla maculata*. *Scientific Reports of the Great Barrier Reef Expedition*, 6(2): 61–84.
- Richter, S., & Scholtz, G. 2001. Phylogenetic analysis of the Malacostraca (Crustacea). *Journal of Zoological Systematics and Evolutionary Research*, 39: 113–136.
- Roxas, H. A. & Estampador, E. 1930. Stomatopoda of the Philippines. *Natural and Applied Science Bulletin, University of the Philippines*, 1(1): 93–131.
- Schmitt, W. L. 1931 [for 1929] Chinese Stomatopoda collected by S.F. Light. *Lingnan Science Journal*, 8: 127–155.
- Schmitt, W. 1940. The stomatopods of the west coast of America, based on collections made by the Allan Hancock Expedition, 1933–38. *Allan Hancock Pacific Expeditions*, 5(4): 129–225.
- Schotte, M. & Manning, R. B. 1993. Stomatopod Crustacea from Tobago, West Indies. *Proceedings of the Biological Society of Washington*, 106(3): 566–581.
- Schram, F. R. 1969. Some middle Pennsylvanian Hoplocarida (Crustacea) and their phylogenetic significance. *Fieldiana: Geology*, 12: 235–289.
- Schram, F. R. 1986. *Crustacea*. Oxford University Press, Oxford.
- Schram, F. R. 2007. Paleozoic mantis proto-mantis shrimp revisited. *Journal of Paleontology*, 81(5): 895–916.
- Schram, F. R. 2008. An adjustment to the higher taxonomy of the fossil Stomatopoda. *Crustaceana*, 81(6): 751–754.
- Schram, F. R. & Müller, H.-G. 2004. *Catalog and Bibliography of the Fossil and Recent Stomatopoda*. Backhuys Publishers, Leiden. 264 pp.
- Serène, R. 1954. Observations biologiques sur les stomatopodes. *Mémoires de l'Institut Océanographique de Nhatrang*, 8: 1–93, pls. 1–10.
- Serène, R. 1962. Révision du genre *Pseudosquilla* (Stomatopoda) et définition de genres nouveaux. *Bulletin de l'Institut océanographique, Monaco*, 1241: 1–27.
- Shanbogue, S. L. 1986. Studies on stomatopod Crustacea from the seas around India. In: P. S. B. R. James (Ed.), *Recent Advances in Marine Biology* (Dr. S. Jones 70th Birthday Commemoration Volume): 515–567. Today & Tomorrow's Printers & Publishers, New Delhi.
- Suzuki, H. 1985. A list of the macro-crustaceans collected from Formosa. Report on the Ocean *Environment of the southern Ryukyu Islands*, 2: 49–59.
- Tate, R. 1883. Descriptions of some new species of *Squilla* from South Australia. *Transactions and Proceedings of the Royal Society of South Australia*, 6: 48–53, pl. 2.
- Tiwari, K.K. & Biswas, S. 1952. On two new species of the genus *Squilla* Fabr., with notes on other stomatopods in the collections of the Zoological Survey of India. *Records of the Indian Museum*, 49(3–4): 349–363, figs. 1–5.
- Townsley, S. J. 1953. Adult and larval stomatopod crustaceans occurring in Hawaiian waters. *Pacific Science*, 7(4): 399–437.
- Wang, Y. & Liu, J.-Y. 1998. Stomatopod fauna of the northern South China Sea and the Nansha Islands. *Studies on Marine Fauna and Flora and Biogeography of the Nansha Islands and Neighbouring Waters*, 3: 131–141.
- Wang, Y. & Liu, J.-Y. 2004. Stomatopoda. In: Huang, Z.-G. (Ed.), *Marine species and their distribution's in China's seas*. China Ocean Press, Beijing. Pp. 600–603.
- White, A. 1847. *List of the species of Crustacea in the collection of the British Museum, London*, British Museum, London. viii + 143 pp.
- White, A. 1849. Description of two new species of Crustacea. *Proceedings of the Zoological Society of London*, 15: 144, pl. 6 [also published in *The Annals and Magazine of Natural History*, series 2, 4: 381–382, 1849].
- White, A. 1851. Descriptions of two species of Crustacea in the British Museum. *Proceedings of the Zoological Society of London*, 18: 95–97, pls. 15, 16.
- Wood-Mason, J. 1875. [On some new species of stomatopod Crustacea]. *Proceedings of the Asiatic Society of Bengal*, 1875: 231–232 [untitled].
- Wood-Mason, J. 1895. *Figures and descriptions of nine species of Squillidae from the collection in the Indian Museum*. Calcutta. Pp. 1–11.

Map of Taiwan



List of Localities in English and Chinese

Anping, Tainan City	安平, 台南市
Budai, Chiayi County	布袋, 嘉義縣
Chenggong, Taitung County	成功, 台東縣
Cijin, Kaohsiung City	旗津, 高雄市
Daliao, SiaoLiouciou, Pingtung County	大寮, 小琉球, 屏東縣
Danshuei, Taipei County	淡水, 台北縣
Dasi, Yilan County	大溪, 宜蘭縣
Donggang, Pingtung County	東港, 屏東縣
Dongshih, Chiayi County	嘉義, 東石
Gushan, Kaohsiung City	鼓山, 高雄市
Haikou, Pingtung County	海口, 屏東縣
Haitzukou, SiaoLiouciou, Pingtung County	海仔口, 小琉球, 屏東縣
Hepingdao, Keelung City	和平島, 基隆市
Hongchaikeng, Pingtung County	紅柴坑, 屏東縣
Hou Bay, Pingtung County	後灣, 屏東縣
Jiangjyun River, Tainan County	將軍溪, 台南縣
Jhongjhou, Kaohsiung City	高雄市, 中洲
Kaohsiung harbor, Kaohsiung city	高雄港, 高雄市
Keelung City	基隆市
Kending, Pingtung County	墾丁, 屏東縣
Liandong, Taipei County	濂洞, 台北縣
Magong, Penghu County	馬公, 澎湖縣
Nanfang-ao, Yilan County	南方澳, 宜蘭縣
Nanliao, Hsinchu City	南寮, 新竹市
Penghu County	澎湖縣
Sansiantai, Taitung County	三仙台, 台東縣
Shanyuan, Taitung County	杉原, 台東縣
Shengang, Changhua County	伸港, 彰化縣
Shihmen, Taipei County	石門, 台北縣
Siangshan, Hsinchu City	香山, 新竹市
Singda Harbor, Kaohsiung County	興達港, 高雄縣
South Bay, Pingtung County	南灣, 屏東縣
Taichung County	台中縣
Tainan City	台南市
Tainan County	台南縣
Wanlitong, Pingtung County	萬里桐, 屏東縣
Wuci, Taichung County	梧棲, 台中縣
Yeliou, Taipei County	野柳, 台北縣

A CATALOG OF THE MANTIS SHRIMPS (STOMATOPODA) OF TAIWAN

Authors: S.T. Ahyong, T.Y. Chan and Y.C. Liao

Published by:

National Taiwan Ocean University

2 Pei Ning Road, Keelung 20224 Taiwan

Tel No.: +886-2-24622192

<http://www.ntou.edu.tw>

ISBN 978-986-01-5060-5

GPN 1009702133

© 2008 National Taiwan Ocean University, Keelung.

No part of this book may be reproduced in any form, by print, photoprint, microfilm, or any other means without permission from the publishers.

Art Design Yeh May

Printing Suhai Design and Production

35-B, Guang Fu S. Road, Taipei, Taiwan

Tel: 886-2-2761-8117

1st Edition, September 2008

Printed in Taiwan

