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STUDIES ON THE CRUSTACEA BRACHYURA OF THE PALAU
ISLANDS, III. XANTHIDAE (1)

パラオ諸島産十脚短尾類の研究, III. オウギガニ科 (1)

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Masatsune TAKEDA

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STUDIES ON THE CRUSTACEA BRACHYURA OF THE PALAU
ISLANDS, III. XANTHIDAE (1)¹⁾,

With 3 Plates

by

Masatsune TAKEDA

(*Department of Zoology, National Science Museum, Tokyo*)

パラオ諸島産十脚短尾類の研究, III. オウギガニ科 (1)

図版 3

武 田 正 倫

(国立科学博物館動物研究部)

Family XANTHIDAE MCLEAY, 1838

In the present well known, large family there are actual difficulties in the way of arriving at the natural subdivisions. Most of the features strongly intergrade, and it seems even to be no exact boundaries. ALCOCK (1898) divided the present family into two sections, Heperolissa and Hyperomerista, according to the character of the palate emphasized by DANA (1852). The Hyperolissa, in which the ridges defining the efferent branchial channels are either altogether absent or present only on the posterior part of the palate, is divided into three subfamilies Xanthinae, Actaeinae and Chlorodinae which are again subdivided into many alliances. On the other hand, the Hyperomerista, in which the efferent branchial channel on either side is well defined by a ridge on either side of the palate, is divided into four subfamilies Menippinae, Oziinae, Pilumninae and Eriphiinae which are also subdivided into many alliances. Although the Hyperolissa and Hyperomerista are not adopted at present, ALCOCK's subdivisions are generally accepted. The subdivisions of the Hyperolissa into the subfamilies seem to be apparently artificial and still highly unsatisfactory, while the Hyperomerista is emended by BALSS (1932) who admitted three subfamilies Menippinae, Pilumninae and Trapeziinae.

In the present paper the following subfamilies are recognized chiefly as a matter of convenience. ACTAEINAE ALCOCK, 1898; CARPILIINAE ORTMANN, 1893;

1) First two parts appeared in the *Bulletin of the Liberal Arts & Science Course, Nihon University School of Medicine*, 1: 75-122, pls. 2, 3 (1973), 2: 41-79, pls. 1-4 (1974).

CHLORODIINAE DANA, 1852; CYMOINAE ALCOCK, 1898; ERIPHIINAE MCLEAY, 1838; ETISINAE ORTMANN, 1893; EUXANTHINAE ALCOCK, 1898; GALENINAE ALCOCK, 1898; PILUMNINAE SAMOUELLE, 1819; POLYDECTINAE DANA, 1851; PSEUDOZINAE ALCOCK, 1898; TRAPEZIINAE MIERS, 1886; XANTHINAE DANA, 1851; ZOSIMINAE ALCOCK, 1898.

The subfamilies Actaeinae, Carpiliinae, Chlorodiinae, Cymoinae, Etisinae, Euxanthinae, Galeninae, Xanthinae and Zosiminae are characterized by the features of the Hyperolissa, and the others are referred to those of the Hyperomerista.

In the formation of the palate the Hyperolissa without the efferent branchial channels is without doubt primitive than the Hyperomerista, but in most of the species the male abdomen is five-segmented with the fused third to fifth segments. Only in the Galeninae, to which the genus *Halimede* DE HAAN is additionally referred with question, the male abdomen is seven-segmented, and in the Carpiliinae the male abdomen is six-segmented. It is therefore pronounced that the present family is composed of two different lines of developments, so that the concept of the Pilumnidae distinct from the present family may arise. The Galeninae and Carpiliinae are placed at the primitive position, and the latter which is superficially similar to some genera of the Xanthinae is close to the Eriphiinae through the Pseudoziinae. The Actaeinae, Euxanthinae, Zosiminae, Xanthinae and Etisinae are in reality very close to each other through some intervening genera. It is otherwise mentioned that the present family intergrades towards the Zalasiinae and Parthenopinae of the Parthenopidae of the section Oxyrhyncha through the Actaeinae, and towards the Carcinoplacinae of the Goneplacidae through the Pilumninae.

As shortly noted above, it is very difficult to arrange the subfamilies in a line, but they are provisionally arranged as follows. The Galeninae is not dealt herewith. GALENINAE—CARPILIINAE—XANTHINAE—ACTAEINAE—ZOSIMINAE—EUXANTHINAE—CHLORODIINAE—ETISINAE—CYMOINAE—PSEUDOZIINAE—ERIPHIINAE—PILUMNINAE—POLYDECTINAE—TRAPEZIINAE.

Subfamily CARPILIINAE ORTMANN, 1893

The present subfamily is emended to include only the genus *Carpilius* LEACH in DESMAREST, 1825, since the genera *Euryozius* MIERS, 1886, and *Gardineria* RATHBUN, 1911, are to be transferred to the Pseudoziinae. The present subfamily is therefore characterized most remarkably by the features that the male abdomen is six-segmented and the second male pleopod is filiform and longer than the first.

Genus *Carpilius* LEACH, 1825

Carpilius LEACH, 1825, in DESMAREST, *Consid. Gén. Crust.*, p. 104 footnote; DANA, 1852, p. 159; A. MILNE EDWARDS, 1865, p. 212; HASWELL, 1882c, p. 40; MIERS, 1886, p. 110; ORTMANN,

1892, p. 464 (in key); ALCOCK, 1898, pp. 72 (in key), 78; KLUNZINGER, 1913, p. 123; BALSS, 1922b, p. 129; RATHBUN, 1930, p. 239; SAKAI, 1939, p. 440 (in key); BARNARD, 1950, pp. 201 (in key), 203; EDMONDSON, 1962a, p. 219 (in key); GUINOT, 1968, p. 321.

The present well known genus having the male abdomen six-sigmented and the filiform male second pleopod is composed of only three large species. Two Indo-West Pacific species are the type species, *C. maculatus* (LINNAEUS, 1758) and *C. convexus* (FORSKÅL, 1775), the latter of which extends its geographical distribution as far east as Clipperton Island in the East Pacific.

Carpilius convexus (FORSKÅL, 1775)

Carpilius convexus: RÜPPELL, 1830, p. 13, pl. 3 fig. 2, pl. 6 fig. 6; ALCOCK, 1898, pp. 79 (in key), 80 (lit.); BORRADAILE, 1900, p. 585; 1902, p. 261; CALMAN, 1900, p. 4; LENZ, 1905, p. 347; NOBILI, 1906a, p. 214; RATHBUN, 1906, p. 342; 1907, p. 37; 1911, p. 211; KLUNZINGER, 1913, p. 125, pl. 1 fig. 1, pl. 5 fig. 1; LAURIE, 1915, p. 442; BOUVIER, 1915, p. 295; BALSS, 1922b, p. 130; 1924, p. 5; EDMONDSON, 1923, p. 11; 1925, p. 54; 1962a, p. 223, fig. 1 (b); SENDLER, 1923, p. 37; McNEILL, 1926, p. 312; WARD, 1932, p. 239; 1939, p. 4; 1942, p. 82; SAKAI, 1934, p. 310; 1936a, p. 146, fig. 70; 1939, pp. 445 (in key), 446, pl. 87 fig. 3; 1954, p. 74; RAMADAN, 1936, p. 30; MIYAKE, 1936, p. 30; STEPHENSEN, 1945, p. 156, fig. 40; TWEEDIE, 1950a, p. 110, fig. 1 (b); BARNARD, 1950, p. 205; HOLTHUIS, 1953, p. 12; BUITENDIJK, 1960, p. 263; FOREST and GUINOT, 1961, p. 37; GUINOT, 1962b, p. 11; 1968, figs. 1, 7, pl. 1 fig. 1.

Material examined. Ngadarák Reef, 1 ♂, ZLKU 2209, 1 ♂, in the National Science Museum, Tokyo, May 23, 1939, S. MIYAKE leg.

Remarks. The male first pleopod is represented by STEPHENSEN (1945), and TWEEDIE (1950a), and the second pleopod also by STEPHENSEN.

Distribution. This species is a common inhabitant of the coral flat reefs of the whole Indo-West Pacific waters.

Carpilius maculatus (LINNAEUS, 1758)

Cancer maculatus LINNAEUS, 1758, p. 626.

Carpilius maculatus: H. MILNE EDWARDS, 1844, *CUVIER'S Rég. Anim., Crust.*, pl. 11 fig. 2; ALCOCK, 1898, p. 79 (lit.); BORRADAILE, 1900, p. 585; 1902, p. 261; LENZ, 1901, p. 464; SCHENKEL, 1902, p. 576; RATHBUN, 1906, p. 812; 1907, p. 37; NOBILI, 1907, p. 386; STIMPSON, 1907, p. 37; PESTA, 1913, p. 39, pl. 3 fig. 4; BOUVIER, 1915, p. 294; EDMONDSON, 1923, p. 11; 1946, p. 284; 1962a, p. 223, fig. 1 (a); McCULLOCH and McNEILL, 1923, p. 54; URITA, 1926, p. 13; McNEILL, 1926, p. 312, pl. 41; WARD, 1932, p. 239; 1942b, p. 82; BOONE, 1934, p. 86, pls. 39-42; SAKAI, 1934, p. 310; 1936a, p. 145, fig. 69; 1936b, p. 163; 1939, p. 445, pl. 55 fig. 1; MIYAKE, 1936, p. 507; 1939, p. 206 (in list); TWEEDIE, 1950a, p. 110, fig. 1 (a); BARNARD, 1950, p. 203, fig. 37 (e), 38 (a, b); HOLTHUIS, 1953, p. 12; FOREST and GUINOT, 1961, p. 37; GUINOT, 1967d, p. 378, fig. 7.

Remarks. The present large, beautiful species with eleven red blotches on the dorsal surface of the carapace called "Akamon-gani" is sold in the Ryukyu Islands as ornaments.

The present species is included in the crab fauna of the Palau Islands by SAKAI (1936b) without examination of the material, and there is also no specimen from the Palau Islands in the Zoological Laboratory, Kyushu University. The male first pleopod is represented by TWEEDIE (1950a) and BARNARD (1950), and the second pleopod also by BARNARD.

Distribution. This species is common in the Indo-West Pacific waters but the Red Sea.

Subfamily XANTHINAE DANA, 1851

The present subfamily accomodating the typical xanthid crabs is composed of many genera, and may be more subdivided after the clarification of the interrelation of the genera. On one hand, the present subfamily is rather difficult to be separated from the Zosiminae through some genera in which the ambulatory legs are rather depressed, and on the other hand, includes some unusual genera such as *Calmania* LAURIE and *Ralumia* BALSS which seem to be somewhat related to the Parthenopidae of the section Oxyrhyncha. The inclusion of such genera as *Liagore* DE HAAN, *Liomera* DANA and *Neoliomera* ODHNER hitherto referred to the Carpiliinae is also questionable.

The following genera may be enumerated from the Indo-West Pacific waters. *Calmania* LAURIE, 1906; *Camptoplax* MIERS, 1886; *Carpoporus* STIMPSON, 1871; *Cycloxanthops* RATHBUN, 1897; *Demania* LAURIE, 1906; *Hapalonotus* RATHBUN, 1897; *Lachnopus* STIMPSON, 1858; *Leptodius* A. MILNE EDWARDS, 1863; *Lioxanthodes* CALMAN, 1909; *Macromedaeus* WARD, 1942; *Medaeops* GUINOT, 1967; *Medaeus* DANA, 1851; *Megametope* FILHOL, 1875; *Microcassiope* GUINOT, 1967; *Micropanope* STIMPSON, 1871; *Miersiella* GUINOT, 1967; *Monodaeus* GUINOT, 1967; *Nanocassiope* GUINOT, 1967; *Nectopanope* WOOD-MASON, 1891; *Neoxanthias* WARD, 1932; *Panopeus* H. MILNE EDWARDS, 1834; *Paramedaeus* GUINOT, 1967; *Parapanope* DE MAN, 1895; *Paraxanthias* ODHNER, 1925; *Paraxanthodes* GUINOT, 1968; *Pseudactumnus* BALSS, 1933; *Ralumia* BALSS, 1933; *Xanthias* RATHBUN, 1897.

The genera *Carpoporus*, *Cycloxanthops*, *Microcassiope*, *Micropanope*, *Monodaeus*, *Nanocassiope*, *Paraxanthias*, *Panopeus* and *Xanthias* are also known from the Atlantic. In this Indo-West Pacific waters *Carpoporus*, *Cycloxanthops*, *Microcassiope*, *Micropanope* and *Monodaeus* are represented each by a single representative, *C. orientalis* SAKAI from Japan, *C. truncatus* (DE HAAN) from Japan, *M. orientalis* TAKEDA et MIYAKE from Japan, *M. sexlobata* RATHBUN from Hawaii and *M. tuberculidens* (RATHBUN) from the Western Indian Ocean.

The genera *Camptoplax*, *Hapalonotus*, *Miersiella*, *Nectopanope* and *Pseudactumnus* are monotypically represented each by *C. coppingeri* MIERS, *M. reticulatus* (DE MAN), *M. haswelli* (MIERS), *N. rhodobaphes* WOODMASON and *P. pestae* BALSS.

In the present paper *Lachnopus*, *Leptodius*, *Liomera*, *Macromedaeus*, *Nanocasiope*, *Neoliomera*, *Paramedaeus*, *Paraxanthias* and *Xanthias* are dealt with.

Genus *Lachnopus* STIMPSON, 1858

Lachnopus STIMPSON, 1858, p. 32; 1907, p. 40; A. MILNE EDWARDS, 1865, p. 233; ORTMANN, 1893, p. 452; ALCOCK, 1898, pp. 73 (in key), 89; ODHNER, 1925, p. 82; SAKAI, 1939, p. 442 (in key); BARNARD, 1950, pp. 202 (in key), 236; EDMONDSON, 1962a, p. 221 (in key); GUINOT, 1967c, pp. 716-720.

The dorsal surface of the carapace is not well marked and the last two lobes of the anterolateral border are usually tooth-like. The anterior borders of the meri of the ambulatory legs are spiny and hairy.

As GUINOT (1967c) well discussed, some species are unexpectedly close to the genus *Paraxanthias* ODHNER and included in that genus *s. lato*. The present genus is exclusively Indo-West Pacific and accomodates six species. Among them, the type species, *L. rodgersii* STIMPSON, 1858, *L. tahitensis* DE MAN and *L. gibsonhilli* (TWEEDIE) are the species of the present genus *s. restr.*

Lachnopus subacutus (STIMPSON, 1858)

(Pl. XI, fig. D)

Liomera subacuta STIMPSON, 1858, p. 32; 1907, p. 39, pl. 5 fig. 1; A. MILNE EDWARDS, 1865b, p. 221.

Lioxantho tumidus ALCOCK, 1898, p. 91; Illust. Zool. Invest., Crust., 1899, pl. 36 fig. 3; BORRA DAILE, 1902, p. 253; NOBILI, 1906a, p. 227; KLUNZINGER, 1913, p. 146; BOUVIER, 1915, p. 155, fig. 33.

Xantho subacutus: DE MAN, 1902, p. 595, pl. 21 fig. 21.

Carpilodes tristis: LENZ, 1910, p. 545.

Xantho bidentatus: KLUNZINGER, 1913, p. 206, pl. 5 fig. 15.

Lachnopus subacutus: ODHNER, 1925, p. 82; BALSS, 1934a, p. 509; 1938a, p. 36 (pt.); 1938b, p. 52; MIYAKE, 1939, p. 207 (in list); SAKAI, 1939, p. 480; BARNARD, 1950, p. 236; TWEEDIE, 1950b, p. 113; FOREST and GUINOT, 1961, p. 43, figs. 31, 32, 34, pl. 9.

Xantho demani ODHNER, 1925, p. 83; WARD, 1932, p. 224; BUITENDIJK, 1960, pp. 327, 338 (in key), fig. 9 (j).

Lioxantho subacuta: WARD, 1934, p. 13, pl. 2 fig. 1.

Material examined. Ngadarák Reef, 7 ♂♂, 4 ovig. ♀♀, ZLKU 1336, May 23, June 1, 16, 17, 1939, S. MIYAKE leg.

Remarks. The present species is extremely close to *L. bidentatus* (A. MILNE EDWARDS) from which it is well distinguished by FOREST and GUINOT (1961). In the present species, the carapace is wider, the posterior two anterolateral teeth are obtuse in the adult, the shallow oblique furrow between the posterolateral regions is absent, and the male first pleopod bears no long hairs. The male first pleopod is represented

by BUITENDIJK (1960) as *Xantho demani*, and by FOREST and GUINOT.

Distribution. The type locality is the Ryukyu Islands, and this species ranges southwards to Samoa, and then westwards to the Red Sea and Mozambique in the east coast of Africa.

Genus *Leptodius* A. MILNE EDWARDS, 1863

Leptodius A. MILNE EDWARDS, 1863, p. 283; 1873a, p. 221; HASWELL, 1882c, p. 59; MIERS, 1886, p. 136; KLUNZINGER, 1913, p. 208; BALSS, 1922b, p. 126; EDMONDSON, 1962a, p. 220 (in key); SERÈNE, 1962b, pp. 255-257; GUINOT, 1968, p. 704.

Xantho: ORTMANN, 1893, p. 443 (pt.); ODHNER, 1925, p. 79 (pt.).

Xantho (Leptodius): ALCOCK, 1898, pp. 74 (in key), 117; SAKAI, 1939, pp. 442 (in key), 463; BARNARD, 1950, pp. 201 (in key), 220.

The present genus emended by GUINOT (1968) is most characterized by having the male first pleopod fringed with somewhat mushroom-like outgrowths along the beak. The type species is *Chlorodius exaratus* H. MILNE EDWARDS, 1834, and seven species are enumerated exclusively from the Indo-West Pacific waters.

Leptodius exaratus (H. MILNE EDWARDS, 1834)

Chlorodius exaratus H. MILNE EDWARDS, 1834, p. 402.

Leptodius exaratus: A. MILNE EDWARDS, 1868, p. 71; 1873a, p. 222; RICHTERS, 1880, p. 118; HASWELL, 1882c, p. 60; MIERS, 1884a, pp. 214, 530; DE MAN, 1887, p. 33; 1888, p. 285; 1895, p. 521; HENDERSON, 1893, p. 362; WHITELEGGE, 1897, p. 137; LANCHESTER, 1900, p. 738; 1901, p. 550; RATHBUN, 1906, p. 847; 1910a, p. 350; 1911, p. 215; NOBILI, 1906a, p. 240; 1906c, p. 131; 1907, p. 389; GRANT and MCCULLOCH, 1906, p. 10; LENZ, 1912, p. 3; KLUNZINGER, 1913, p. 209, pl. 3 fig. 6, pl. 5 fig. 16; BOUVIER, 1915, p. 284; PARISI, 1916, p. 180; BALSS, 1922b, p. 127; 1924, p. 10; SENDLER, 1923, p. 37; EDMONDSON, 1925, p. 51; 1962a, pp. 237 (in key), 242, fig. 7 (b); SHEN, 1932, p. 100, figs. 57, 58 (c, d); BOONE, 1934, p. 110, pl. 58; SAKAI, 1934, p. 309; 1965b, p. 140, pl. 70 fig. 6; MACCAGNO, 1936, p. 174; MIYAKE, 1936, p. 508; 1937, p. 28; CHOPRA and DAS, 1937, p. 398; FOREST and GUINOT, 1961, fig. 54; GUINOT, 1964c, p. 25; 1968, figs. 19, 21, 28.

Chlorodius (Leptodius) exaratus: HILGENDORF, 1878, p. 790.

Xantho (Leptodius) exaratus var. *typica*: ORTMANN, 1893, p. 445; 1894, p. 50.

Xantho (Leptodius) exaratus: ALCOCK, 1898, p. 118; CALMAN, 1900, p. 6; SCHENKEL, 1902, p. 575; LAURIE, 1906, p. 402; URITA, 1926, p. 10; GRAVELY, 1927, p. 146; BALSS, 1935d, p. 133; 1938a, p. 41; YOKOYA, 1933, p. 189; SAKAI, 1936a, p. 151, fig. 73, pl. 45 fig. 3; 1939, pp. 463 (in key), 465, pl. 58 fig. 3, pl. 91 fig. 1; MIYAKE, 1939, p. 209; 1940a, p. 152; STEPHENSEN, 1945, p. 149, fig. 37 (C); EDMONDSON, 1946, p. 289; GUINOT, 1958, p. 92; MCNEILL, 1968, p. 58.

Xantho hydrophylus: LAURIE, 1915, p. 444; MONTGOMERY, 1931, p. 435.

Xantho exaratus: GORDON, 1931, pp. 543-545, figs. 20, 22 (B); ? MONOD, 1938, p. 125, fig. 17 (B); HOLTHUIS, 1953, p. 27; BUITENDIJK, 1960, pp. 331, 338 (in key), fig. 9 (k-m); MIYAKE, 1961a, p. 19.

Xantho (Leptodius) hydrophilus: BARNARD, 1950, pp. 220 (in key), 223, figs. 41 (c), 42 (c-e); 1955, p. 3.

Material examined. S. W. Madalâi, Goréor I., 2 ♂♂, ZLKU 2806, April 15, 1939,

S. MIYAKE leg. Malagál Harbour, Ngurkdápel I., 2 ♂♂, 1 ♀, ZLKU 2808, May 6, 1939, S. MIYAKE leg.

Remarks. The male first pleopod is represented by GORDON (1931), SHEN (1932), SAKAI (1936a), MONOD (1938), STEPHENSEN (1945), BARNARD (1950), BUITENDIJK (1960), FOREST and GUINOT (1961) and GUINOT (1968), but the figure given by MONOD seems to be that of *L. sanguineus* (H. MILNE EDWARDS).

Distribution. This species is one of the commonest crabs in the whole Indo-West Pacific waters.

Leptodius gracilis (DANA, 1852)

Chlorodius gracilis DANA, 1852, *Proc. Acad. nat. Sci. Philad.*, 6, p. 79; 1852, p. 210.

Leptodius exaratus var. *gracilis*: MIERS, 1884a, pp. 214, 530; ORTMANN, 1893, p. 447; LENZ, 1905, p. 353.

Leptodius gracilis: DE MAN, 1888, p. 287, pl. 11 fig. 2; 1890, p. 54; NOBILI, 1906a, p. 240; 1907, p. 389; RATHBUN, 1906, p. 818, pl. 9 fig. 2; 1907, p. 39; 1911, p. 215; KLUNZINGER, 1913, p. 211; BOUVIER, 1915, p. 283, fig. 32, pl. 5 fig. 7; BALSS, 1938a, p. 42; WARD, 1939, p. 7; FOREST and GUINOT, 1961, p. 64, figs. 57, 58, pl. 2 fig. 4; GUINOT, 1962a, p. 235; EDMONDSON, 1962a, pp. 237 (in key), 240, fig. 7 (a); TAKEDA and HAYASHI, 1973, p. 71.

Leptodius exaratus gracilis: LANCHESTER, 1900, p. 738.

Xantho gracilis: ODHNER, 1925, p. 80; TWEEDIE, 1950b, p. 115; HOLTHUIS, 1953, p. 27; BUITENDIJK, 1960, pp. 335, 338 (in key).

Xantho (= *Leptodius*) *exaratus* var.: GORDON, 1931, p. 29, fig. 16 (c).

Leptodius planus WARD, 1931, p. 14, pl. 3 fig. 6.

Xantho (*Leptodius*) *gracilis*: BALSS, 1938a, p. 52; MIYAKE, 1939, p. 210; SAKAI, 1939, pp. 463 (in key), 465, pl. 91 fig. 2.

Material examined. Ngaiánges I., 1 ovig. ♀, ZLKU 2984, March 7, 1938, S. MURAKAMI leg. Songél a Lise, Goréor I., 1 ovig. ♀, ZLKU 2988, April 15, 1939, S. MIYAKE leg. Ngarekobasáng I., 1 ♀, ZLKU 1842, April 20, 1939, S. MIYAKE leg. Ngerekamâis, Goréor I., 1 juv. ♂, ZLKU 1778, May 17, 1939, S. MIYAKE leg.

Remarks. The male first pleopod is represented by GORDON (1931) and FOREST and GUINOT (1961).

Distribution. This species is widely distributed in the Indo-West Pacific waters, ranging from the Red Sea and the east African coast to the Tuamotu and Hawaiian Islands, and also to Japan.

Leptodius leptodon FOREST et GUINOT, 1961

? *Chlorodius exaratus* var. *acutidens* and *cuplifer* STIMPSON, 1907, p. 55, pl. 6 figs. 7, 8.

Leptodius exaratus: NOBILI, 1907, p. 389.

Leptodius leptodon FOREST and GUINOT, 1961, p. 65, figs. 55, 56, 59, pl. 2 fig. 3; MIYAKE and TAKEDA, 1967, p. 294; TAKEDA and HAYASHI, 1973, p. 71.

Material examined. Ngarekeklaui I., 1 ♂, ZLKU 2987, March 14, 1938, S. MURAKAMI leg.

Remarks. The general appearance of the carapace closely resembles that of *L.*

exaratus (H. MILNE EDWARDS). The carapace is, however, more strongly convex, and the anterolateral teeth are apparently sharper with more or less tuberculated tips. In *L. exaratus* the anterolateral teeth are distinctly depressed and rather lobular in the dorsal view. The male first pleopods of both species are markedly different from each other. That of the present species bears the long, apically truncated beak as represented by FOREST and GUINOT (1961).

Through the courtesy of Dr. M. IMAJIMA of the National Science Museum, Tokyo, the present author examined a collection of crabs from the Ogasawara Islands. In the collection several specimens, all the specimens referable to the present genus, are identified as the present species. Though STIMPSON's varieties are at present known to be the typical species or only the synonym of *L. exaratus*, it is therefore highly probable that the variety *cuplifer* may be identical with the present species. It is otherwise noted that the present species is a common inhabitant of the Ryukyu Islands, so that the variety *acutidens* is also referable to the present species. The present specific name is, however, valid, even if the hypothesis is acceptable.

Distribution. This species is restricted to the West Pacific from the Tahiti and Tuamotu Islands through Vanikoro Island in the Santa Cruz Islands and the Carolines to the Ryukyu and Ogasawara Islands.

***Leptodius nudipes* (DANA, 1852)**

(Pl. X, fig. A)

Chlorodius nudipes DANA, 1852, *Proc. Acad. nat. Sci. Philad.*, 6, p. 79; 1852, p. 209.

Leptodius nudipes: A. MILNE EDWARDS, 1873a, p. 225; DE MAN, 1887, p. 33; 1895, p. 523; BORRADAILE, 1902, p. 252; RATHBUN, 1906, p. 848, pl. 9 fig. 3; 1911, p. 215; BOUVIER, 1915, p. 282; WARD, 1934, p. 14; FOREST and GUINOT, 1961, fig. 52; SANKARANKUTTY, 1962, p. 128, figs. 12, 13; GUINOT, 1962a, p. 235; TAKEDA and HAYASHI, 1973, p. 72.

Leptodius exaratus var. *nudipes*: ORTMANN, 1893, p. 448.

Xantho (Leptodius) nudipes: ALCOCK, 1898, pp. 118 (in key), 121; MIYAKE, 1939, pp. 178, 209, pl. 14 fig. 4.

Xantho danae ODHNER, 1925, p. 80; BALSS, 1935d, p. 133; 1938a, p. 41; BUITENDIJK, 1960, pp. 312, 338 (in key), fig. 9 (a); EDMONDSON, 1962a, pp. 236 (in key), 237, fig. 6 (b).

Material examined. Ngadarák Reef, 8 ♂♂, 11 ovig. ♀♀, 2 ♀♀, ZLKU 2830, April 21-June 1, 1939, 1 ♂, 1 ♀, in the National Science Museum, Tokyo, April 21, 1939, 1 juv. ♀, ZLKU 1791, June 1, 1939, S. MIYAKE leg.

Remarks. In the Zoological Laboratory, Kyushu University are two males and one female from Okinawa-jima Island which agree well with the present materials. In the convexity of the carapace and of its regions and subregions the present species is closely related to *L. sanguineus* (H. MILNE EDWARDS), but the first three anterolateral teeth have one or two small additional cusps. In the male the fingers of the larger chela are very widely gaped unlike in the case of the female. The male first

pleoped is figured by BUITENDIJK (1960) as *Xantho danae*, and by FOREST and GUINOT (1961) and SANKARANKUTTY (1962), having the distal end narrowed abruptly.

Distribution. This species ranges from Madagascar, Mauritius and the Seychelles in the Western Indian Ocean to New Caledonia, and northwards to the Hawaiian Islands and the Ryukyu Islands. It is noted that it has been unrecorded from the Japanese waters.

Leptodius sanguineus (H. MILNE EDWARDS, 1834)

Chlorodius sanguineus H. MILNE EDWARDS, 1834, p. 402; DANA, 1852, p. 207.

Leptodius sanguineus: A. MILNE EDWARDS, 1873a, p. 224; RICHTERS, 1880, p. 147; HASWELL, 1882c, p. 60; DE MAN, 1895, p. 521; 1902, p. 602; WHITELEGGE, 1897, p. 137; BORRADAILE, 1902, p. 252; LENZ, 1905, p. 352; GRANT and McCULLOCH, 1906, p. 10; NOBILI, 1906a, p. 240; 1907, p. 389; RATHBUN, 1906, p. 847; 1907, p. 39; 1910a, p. 350; 1911, p. 215; BOUVIER, 1915, p. 284; PARISI, 1916, p. 181; BALSS, 1922b, p. 217; 1938a, p. 35; SENDLER, 1923, p. 37; EDMONDSON, 1925, p. 51; 1946, p. 288, fig. 177 (a); 1962a, pp. 237 (in key), 240, fig. 6 (e); McNEILL, 1926, p. 313; WARD, 1932, p. 244; 1934, p. 14; 1942b, p. 89; SAKAI, 1934, p. 309; 1965b, p. 141, pl. 70 fig. 4; MIYAKE, 1936, p. 508; FOREST and GUINOT, 1961, p. 63, fig. 50; GUINOT, 1962a, p. 235; 1962b, p. 7; SANKARANKUTTY, 1962, p. 128, figs. 10, 11; TAKEDA and HAYASHI, 1973, p. 72.

Leptodius exaratus var. *sanguinea*: ORTMANN, 1893, p. 447; DOFLEIN, 1904, p. 101.

Xantho (Leptodius) sanguineus: ALCOCK, 1898, pp. 118 (in key), 119; PESTA, 1913, p. 43; URITA, 1926, p. 10; MIYAKE, 1939, pp. 180, 210, fig. 7, pl. 14 fig. 5; SAKAI, 1939, pp. 463 (in key), 464, pl. 90 fig. 3.

Xantho sanguineus: ODHNER, 1925, p. 80; TWEEDIE, 1950b, p. 117; HOLTHUIS, 1953, p. 27; BUITENDIJK, 1960, pp. 323, 338 (in key).

Material examined. S. W. Madalâi, Goréor I., 1 ♂, 1 ♀, somewhat damaged, ZLKU 2811, April 15, 1939, S. MIYAKE leg.

Remarks. The male first pleopod is represented by MIYAKE (1939), FOREST and GUINOT (1961), and SANKARANKUTTY (1962).

Distribution. This species is a common inhabitant of the whole Indo-West Pacific waters.

Genus *Liomera* DANA, 1851

Liomera DANA, 1851, *Amer. J. Sci. and Arts*, (2), 12, p. 124; 1852, p. 73; A. MILNE EDWARDS, 1865b, p. 218; 1873a, p. 176; HASWELL, 1882c, p. 46; ORTMANN, 1893, p. 46; ALCOCK, 1898, pp. 72 (in key), 87; KLUNZINGER, 1913, p. 129; BARNARD, 1950, pp. 202 (in key), 237.

Carpilodes DANA, 1851, *Amer. J. Sci. and Arts*, (2), 12, p. 126; 1852, p. 192; A. MILNE EDWARDS, 1865b, p. 224; 1873a, p. 178; HASWELL, 1882c, p. 56; MIERS, 1886, p. 133; ALCOCK, 1898, pp. 72 (in key), 81; KLUNZINGER, 1913, p. 135; ODHNER, 1925, p. 8; RATHBUN, 1930, pp. 235 (in key), 241; SAKAI, 1939, p. 412 (in key); BUITENDIJK, 1941, p. 296; EDMONDSON, 1962a, p. 296.

Carpiloxanthus A. MILNE EDWARDS, 1862, *Faune l'île Réunion*, p. 3.

Actaeopsis LANCHESTER, 1900, p. 741.

The species of the present genus is many in number, but form a rather natural

group, having the carapace transversely ovate and fairly well areolated without hairs. The anterolateral border is divided into four rounded or rather convex lobes, and the chelipeds are equal and not much strong in both sexes. The present genus is Indo-West Pacific with one exception, *L. cinctimanus* (WHITE), the type species, which extends its geographical range as far east as the Pacific coast of America. Thirty species and one subspecies are referable to the present genus.

***Liomera bella* (DANA, 1852)**

Actaeodes bellus DANA, 1852, *Proc. Acad. nat. Sci. Philad.*, 6, p. 78; 1852 p. 196.

Actaea bella: A. MILNE EDWARDS, 1865b, p. 261.

Carpilodes vaillantianus A. MILNE EDWARDS, 1865b, p. 231, pl. 11 fig. 3; ALCOCK, 1898, p. 85 (lit.); BORRADAILE, 1900, p. 585; 1902, p. 260; DE MAN, 1902, p. 579; LENZ, 1905, p. 348; NOBILI, 1906a, p. 220; 1907, p. 387; RATHBUN, 1906, p. 342; 1911, p. 212; BOUVIER, 1915, p. 293; EDMONDSON, 1925, p. 53.

Carpiloxanthus rugipes: HELLER, 1865, p. 17.

Carpilodes bellus: MIERS, 1886, p. 134; ODHNER, 1925, pp. 10 (in key), 16 pl. 1 fig. 9; WARD, 1932, p. 240; 1934, p. 11; 1939, p. 4; GORDON, 1934, p. 24; MIYAKE, 1939, pp. 174, 206, fig. 3, pl. 13 fig. 9; SAKAI, 1939, pp. 471 (in key), 476; TWEEDIE, 1950b, p. 112; HOLTHUIS, 1953, p. 12; BUITENDIJK, 1960, p. 257, fig. 2 (b); EDMONDSON, 1962a, pp. 247 (in key), 249, fig. 8 (f).

Carpilodes rugatus: ALCOCK, 1898, pp. 82 (in key), 84; NOBILI, 1907, p. 387; RATHBUN, 1907, p. 37.

Liomera bella: MONTGOMERY, 1931, p. 434; FOREST and GUINOT, 1961, p. 38, fig. 26; GUINOT, 1964c, p. 10; TAKEDA and HAYASHI, 1973, p. 72.

Liomera bellus: BARNARD, 1950, pp. 237 (in key), 238, figs. 37 (b), 44 (a, b).

Material examined. aUgulpelú Reef, aUgulupelú I., 2 ♀♀, ZLKU 2788, May 5, 1939, S. MIYAKE leg. Ngadarák Reef, 29 ♂♂, 2 ovig. ♀♀, 9 ♀♀, ZLKU 2727, June 1, 17, 1939, S. MIYAKE leg.

Remarks. The male first pleopod is represented by MIYAKE (1939), BARNARD (1950), BUITENDIJK (1960) and FOREST and GUINOT (1961).

Distribution. This species is an inhabitant of the coral reefs of the whole Indo-West Pacific waters.

***Liomera caelata* (ODHNER, 1925)**

(Pl. IX, fig. B)

Carpilodes sp.: CALMAN, 1900, p. 4.

Carpilodes caelatus ODHNER, 1925, pp. 11 (in key), 21, pl. 1 fig. 19; SAKAI, 1939, pp. 471 (in key), 475; TWEEDIE, 1950b, p. 113; GUINOT, 1958, p. 86; BUITENDIJK, 1960, p. 255.

Material examined. Ngadarák Reef, 1 ♂, 2 ♀♀, ZLKU 2766, June 14, 1939, 1 ♀, ZLKU 1787, June 16, 1939, S. MIYAKE leg.

Remarks. The present small, distinctive crabs are well agreeable with the figure given by the original author. In the formation of the protogastric region, the present

species is related to *L. rugata* (H. MILNE EDWARDS) among many congeners. In both species the areola 2M is convex and imperfectly divided to be U-shaped. In *L. rugata*, however, the areola 1M is entirely fused with the inner part of 2M, the areola 4 and 5L are confluent with each other and prominently transverse, and the ambulatory legs are normal without the nodules.

After the examination of a series of the considerable specimens, ODHNER (1925) remarked as, "Keine Riff-Form, sondern in einiger Tiefe lebend." It is true also in the specimens dealt with by BUITENDIJK (1960). Therefore, in reality, it would be desirable to compare directly the specimens from the flat reefs with the type specimens.

Distribution. This species ranges from the Ogasawara Islands through several localities such as the Sulu Sea, the Kei Islands and Sumbawa in the West Pacific to the Torres Straits, and is additionally recorded from Cocos Keeling in the Eastern Indian Ocean and Aldabra Island in the Western Indian Ocean. The bathymetric range is from the coral reef to 75 m.

Liomera cinctimana (WHITE, 1847)

Carpilius cinctimanus WHITE, 1847, *Voy. H. M. S. "Fly,"* 2, p. 336, pl. 2 fig. 3; ADAMS and WHITE, 1818, p. 37, pl. 7 fig. 4.

Liomera lata DANA, 1852, *Proc. Acad. nat. Sci. Philad.*, 6, p. 73; 1852, p. 161.

Liomera cinctimana: DANA, 1852, p. 161; A. MILNE EDWARDS, 1865b, p. 219; 1873a, p. 176, pl. 5 fig. 4; ORTMANN, 1893, p. 450, pl. 17 fig. 8; ALCOCK, 1898, p. 88 (lit.); CALMAN, 1900, p. 4; BORRADAILE, 1902, p. 253; NOBILI, 1906a, p. 221; GRANT and McCULLOCH, 1906, p. 9; RATHBUN, 1911, p. 212; BOUVIER, 1915, p. 293; EDMONDSON, 1925, p. 53; MONTGOMERY, 1931, p. 433; GARTH, 1946, *Allan Hancock Pac. Exp.*, 5, p. 426, pl. 74 figs. 1-4; FOREST and GUINOT, 1961, p. 39, fig. 27; GUINOT, 1962b, p. 234.

Carpilodes cinctimanus: MIERS, 1880, p. 234; HENDERSON, 1893, p. 354; ODHNER, 1925, pp. 10 (in key), 14; HALE, 1929, p. 69; RATHBUN, 1930, p. 242, pl. 100; WARD, 1932, p. 240; 1942b, p. 84; MIYAKE, 1936, p. 507; 1939, p. 206 (in list); SAKAI, 1939, pp. 471 (in key), 474, pl. 92 fig. 3; BUITENDIJK, 1960, p. 256, fig. 2 (a).

Liomera cinctimanus: BARNARD, 1950, pp. 237 (in key), 238.

Material examined. Melekéiok, Babldáob I., 1 juv. ♂, ZLKU 2787, July 19, 1939, S. MIYAKE leg.

Remarks. The present specimen available is very young, but well agreeable with a series of the specimens from the Ryukyu Islands. The full-grown specimens attain the enormous size, and have the palm with a broad black cross-band merging with the back of the immovable finger in the male. In the medium sized specimens, however, the cross-band is imperfect. It is otherwise notable that the carapace is brick red for its entire surface in the full-grown specimens, brick red with the white last two anterolateral teeth in the medium sized specimens and entirely white in the smaller specimens. The contour of the carapace is fairly constant in the various

developmental stages except the enormous specimens in which the last two anterolateral teeth are rather blunt, but the granulation of the dorsal surface of the carapace is variable. In the very young specimens with the carapace breadth about 8 mm including the present specimen the dorsal surface is rather granulated like in *L. semigranosa* DE MAN and agreeable with the figure of that species by ODHNER (1925). It is uncertain that ODHNER's material is adult. ODHNER's material is said to have the white carapace, while according to the original description, the carapace is orange with a white band along the frontal, supraorbital and anterolateral borders. *L. semigranosa* is apparently much more smaller than the present species.

The present author examined a male from Okinawa-jima Island closely related to *L. semigranosa* and also to the juvenile specimens of the present species. The specimen bears the well developed pleopods in spite of its small size. The dorsal surface of the carapace is granulated somewhat like that of *L. semigranosa*, but the anterolateral teeth are sharper and the fronto-orbital border is wider, so that the sole specimen is probably distinct from the both species.

The male first pleopod of the present species is represented by BUITENDIJK (1960) and FOREST and GUINOT (1961).

Distribution. This species bears a markedly wide distribution ranging from the Red Sea and the east and south coasts of Africa to the west coast of America from lower California to the Calapagos Islands.

Liomera laevis (A. MILNE EDWARDS, 1873)

(Pl. IX, fig. D)

Carpilodes laevis A. MILNE EDWARDS, 1873a, p. 179, pl. 5 fig. 3; DE MAN, 1888, p. 236; ? NOBILI, 1906a, p. 215; ? LAURIE, 1915, p. 443; ? BALSS, 1924, p. 5; ODHNER, 1925, pp. 10 (in key), 13, pl. 1 figs. 2, 3; MIYAKE, 1939, p. 206; 1940b, p. 155; SAKAI, 1939, pp. 471 (in key), 473, fig. 35.

Nec *Liomera laevis*: BORRADAILE, 1900, p. 583 (= *Zosimus laevis* DANA).

Material examined. Ngarekobasang passage, Ngarelobasang I, 2 ♂♂, 1 ♀, ZLKU 2717, January 5, 1938, S. MURAKAMI leg.

Remarks. In the present specimens the dorsal surface of the carapace is everywhere glabrous and ill-defined only with the linear furrow parting and surrounding the gastric regions; the median bifurcating line is faded out near the posterior angle of 2M. Of the four anterolateral teeth the third is most prominently convex; the dorsal surface of the carapace along the first and second anterolateral teeth is somewhat sunken; from the notch between the second and third teeth a weak furrow runs rather obliquely backwards, and also a less prominent furrow is extended more or less transversely from the notch between the third and fourth teeth.

The present species resembles *L. tristis* (DANA), *L. edwardsii* (KOSSMANN) and *L.*

guttata DE MAN in the general formation of the carapace. The present species is, however, distinguished from *L. tristis* by having the areola 2M entire and the linear regional furrows of the dorsal surface, from *L. edwardsii* by having the areola 1M not at all divided from 2M, and from *L. guttata* by having four distinct anterolateral teeth.

The materials reported by BORRADAILE (1900) is referred to DANA's species, *Zosimus laevis*, which is quite imperfectly known. If the species really belong to *Liomera*, the present species should be renamed.

Distribution. This species ranges from the Ryukyu Islands southwards to Fiji and New Caledonia. There are otherwise some records of occurrence in the Red Sea, but it is highly probable that the records are due to the confusion with *L. edwardsii*.

***Liomera monticulosa* (A. MILNE EDWARDS, 1873)**

(Pl. IX, fig. A)

Carpilodes monticulosus A. MILNE EDWARDS, 1873a, p. 181, pl. 5 fig. 1; DE MAN, 1888, p. 233; 1895, p. 496; ORTMANN, 1894, p. 51; BORRADAILE, 1900, p. 585; 1902, p. 260; LENZ, 1901, p. 463; RATHBUN, 1906, p. 844; 1907, p. 37; 1911, p. 212; NOBILI, 1907, p. 387; EDMONDSON, 1925, p. 53; ODHNER, 1925, pp. 11 (in key), 21, pl. 1 fig. 18; WARD, 1932, p. 240; 1942b, p. 83; SAKAI, 1939, pp. 471 (in key), 475, pl. 92 fig. 4; HOLTHUIS, 1953, p. 13; SERÈNE and LUOM, 1960, p. 178, fig. 2 (C); BUITENDIJK, 1960, p. 256, fig. 1 (d).

Phymodius rugipes: MIERS, 1884a, p. 531.

Carpilodes cariosus ALCOCK, 1898, pp. 82 (in key), 86; BORRADAILE, 1902, p. 261; LAURIE, 1906, p. 394; RATHBUN, 1911, p. 212; BOUVIER, 1915, p. 294; EDMONDSON, 1925, p. 53.

Liomera monticulosus: BARNARD, 1950, pp. 238 (in key), 240, fig. 44 (c, d).

Liomera monticulosa: GUINOT, 1964c, p. 11.

Material examined. Ngadarák Reef, 2 ♀♀, ZLKU 2781, June 17, 1939, S. MIYAKE leg.

Remarks. The present materials are immature and attain more large size, though the present species is apparently a small one somewhat related to *L. caelata* (ODHNER). The dorsal surface of the carapace is very distinctly divided into strongly convex regions by deep and rather wide furrows. The areolae are thickly covered with granules, while the furrows are pitted. The areola 2M is completely divided into two areolets. By the formation of 2M the present species is most readily distinguished from *L. caelata* in which the areola 2M is U-shaped. In the middle of the outer areolet of 2M is a small shallow depression. The ambulatory legs are more or less nodular like those of *L. caelata*. The male first pleopod is represented by BARNARD (1950), SERÈNE and LUOM (1960) and BUITENDIJK (1960).

Distribution. This species ranges from the East and South African coasts to Tahiti in the South Pacific, and northwards to Hawaii and the Ryukyu Islands.

Liomera rugata (H. MILNE EDWARDS, 1834)

Zozymus rugatus H. MILNE EDWARDS, 1834, p. 385.

Carpilodes rugatus: A. MILNE EDWARDS, 1865b, p. 230, pl. 12 fig. 3; 1873a, p. 180; RICHTERS, 1880, p. 146; MIERS, 1884a, p. 529; ORTMANN, 1893, p. 468; LENZ, 1905, p. 347; NOBILI, 1906a, p. 219; 1907, p. 387; RATHBUN, 1907, p. 37; CALMAN, 1909, p. 704; KLUNZINGER, 1913, p. 139, pl. 1 fig. 2, pl. 5 fig. 5; LAURIE, 1915, p. 443; BALSS, 1924, p. 31; ODHNER, 1925, pp. 11 (in key), 20, pl. 1 fig. 16; WARD, 1932, p. 241; 1934, p. 11; 1912b, p. 83; GORDON, 1934, p. 25; RAMADAN, 1937, p. 31; MIYAKE, 1939, p. 207; SAKAI, 1939, pp. 471 (in key), 476, pl. 92 fig. 2; BUITENDIJK, 1950, p. 74; 1960, p. 259, fig. 9 (a); HOLTHUIS, 1953, p. 13; EDMONDSON, 1962a, pp. 247 (in key), 249, fig. 9 (a); SANKARANKUTTY, 1962, p. 123.

Carpilodes monticulosus: RATHBUN, 1911, p. 212.

Liomera rugatus: BARNARD, 1950, p. 23 (in key).

Liomera rugata: GUINOT 1964c, p. 9.

Material examined. Ngadarák Reef, 1 ♂, ZLKU 2783, June 17, 1939, 1 ♂, 1 ♀, ZLKU 2791, June 20, 1939, S. MIYAKE leg. Melekéiok, Babldáob I, 1 ♀, ZLKU 2784, July 17, 1939, S. MIYAKE leg.

Remarks. The male first pleoped is represented by BUITENDIJK (1960).

Distribution. This species is a common inhabitant of the coral reefs of the whole Indo-West Pacific waters like *L. bella* (DANA).

Liomera stimpsonii (A. MILNE EDWARDS, 1865)

Carpilodes Stimpsonii A. MILNE EDWARDS, 1865b, p. 232, pl. 11 fig. 2; 1873a, p. 181; DE MAN, 1888, p. 234; 1902, p. 578; BORRADAILE, 1902, p. 260.

Nec Carpilodes Stimpsonii: DE MAN, 1887, p. 25 (= *L. venosa* (H. MILNE EDWARDS)).

Nec Carpilodes Stimpsonii: ZEHNTNER, 1894, p. 143 (= *L. bella* (DANA)).

Carpilodes Stimpsonii: ALCOCK, 1898, pp. 81 (in key), 82; ODHNER, 1925, pp. 10 (in key), 17, pl. 1 fig. 10; GORDON, 1934, p. 25; MIYAKE, 1936, p. 507; 1939, p. 207; SAKAI, 1939, pp. 471 (in key), 476; WARD, 1912b, p. 83; TWEEDIE, 1950b, p. 113; BUITENDIJK, 1960, p. 259, fig. 2 (c).

Carpilodes Stimpsonii: RATHBUN, 1911, p. 212.

Liomera stimpsonii: GUINOT, 1964c, p. 8.

Material examined. Songél a Lise, Goréor I, 1 ♂, ZIKU 2720, April 4, 1939, S. MIYAKE leg.

Remarks. In the Zoological Laboratory, Kyushu University is a female from Ishigaki-jima in the Ryukyu Islands already reported by MIYAKE (1936) which agrees well with the present specimen. The carapace is very transverse, strongly convex fore and aft, and glabrous to the unaided eye. The gastric regions are separated by the shallow narrow furrows, while the anterolateral regions by the deep wide furrows. The areola 2M is imperfectly subdivided, and 1M is fused with the inner part of 2M. The anterolateral border of the carapace is cut into four blunt teeth, the first of which is wide but very low. From the notch between the second and third teeth a deep transverse furrow runs inwards towards the posterior part of 2M. A transverse furrow extended from the notch between the third and fourth teeth is also deep, but

much shorter. A transverse areola between the two furrows is completely fused with the third anterolateral tooth and may represent the united 4-6L. The male first pleopod is represented by BUITENDIJK (1960).

The present specimen is recorded in the field note as being collected from *Seriatorpora* sp. on the reef flat.

Distribution. This species ranges from the Amirantes, Aldabra Island and the Coetivy Islands in the Western Indian Ocean to New Caledonia, and then northwards to Ishigaki-jima in the Ryukyu Islands.

Liomera tristis (DANA, 1852)

Carpilodes tristis DANA, 1852, *Proc. Acad. nat. Sci. Philad.*, 6, p. 77; 1852, p. 193; A. MILNE EDWARDS 1865b, p. 225; ALCOCK, 1898, pp. 8 (in key), 82 (lit.); BORRADAILE, 1900, p. 585; DE MAN, 1902, p. 577; LENZ, 1905, p. 347; LAURIE, 1906, p. 394; RATHBUN, 1906, p. 842; 1907, p. 37; 1911, p. 211; ODHNER, 1925, pp. 10 (in key), 12, pl. 1 fig. 1; WARD, 1932, p. 240; MIYAKE, 1939, p. 207 (in list); SAKAI, 1939, pp. 471 (in key), 476; TWEEDIE, 1950b, p. 113; HOLTHUIS, 1953, p. 13; GUINOT, 1958, p. 85, fig. 12; BUITENDIJK, 1960, p. 254, fig. 1 (c); EDMONDSON, 1962a, pp. 247 (in key), 248, fig. 8 (d); SANKARANKUTTY, 1962, p. 122, figs. 1, 2.

Carpilodes granulatus HELLER, 1862, p. 520; A. MILNE EDWARDS, 1865b, p. 226.

Carpilodes erythrus: MIYAKE, 1936, p. 507.

Liomera tristis: BARNARD, 1950, p. 237 (in key); FOREST and GUINOT, 1961, p. 38.

Material examined. Ngadarák Reef, 1 ♀, ZLKU 2769, May 22, 1939, S. MIYAKE leg. Ngaiánges I., 1 ovig. ♀, ZLKU 2770, July 16, 1939, S. MIYAKE leg.

Remarks. The present fine species has hitherto been unrecorded from the Japanese waters, but in the Zoological Laboratory, Kyushu University, are several specimens from the Ryukyu Islands. One of them reported by MIYAKE (1936) as *Carpilodes erythrus* (LANCHESTER) is in reality referable to the present species. The male first pleopod is represented by GUINOT (1958), BUITENDIJK (1960) and SANKARANKUTTY (1962).

Distribution. This species is not uncommon in the coral reefs of the whole Indo-West Pacific waters.

Liomera venosa (H. MILNE EDWARDS, 1834)

Carpilius venosus H. MILNE EDWARDS, 1834, p. 383.

Cancer (Xantho) obtusus DE HAAN, 1835, p. 47, pl. 13 fig. 5.

Liomera obtusa: STIMPSON, (1858), 1907, p. 38.

Carpilodes venosus: A. MILNE EDWARDS, 1865b, p. 227, pl. 12 fig. 2; 1873a, p. 179; MIERS, 1881a, p. 213; HENDERSON, 1893, p. 353; ALCOCK, 1898, pp. 81 (in key), 83; ODHNER, 1925, pp. 12 (in key), 22, pl. 2 fig. 1; URITA, 1926, p. 13; YOKOYA, 1933, p. 190; SAKAI, 1936a, p. 157, pl. 47 fig. 3; 1939, p. 471 (in key), 474, pl. 60 fig. 3, pl. 91 fig. 6; MIYAKE 1939, p. 207; BUITENDIJK, 1960, p. 259, fig. 2 (e).

Carpilodes granulatus HASWELL, 1882b, p. 751; 1882c, p. 57.

Carpilodes Stimpsonii: DE MAN, 1887, p. 25.

Carpilodes socius LANCHESTER, 1900, p. 731, pl. 44 fig. 4.

Carpilodes ruber: RATHBUN, 1914b, p. 657; 1924b, p. 15.

Liomera venosa: SAKAI, 1965b, p. 143, pl. 71 fig. 5.

Material examined. Ngaláp, Songél a Lise, Goréor I., 1 ♂, 1 ♀, ZLKU 2761, April 19, 1939, S. MIYAKE leg. Malagál Harbour, Ngurkdápel I., 2 ♂♂, ZLKU 2763, May 6, 1939, S. MIYAKE leg. Songél a Lise, Goréor I., 1 ♂, ZLKU 2765, June 15, 1939, S. MIYAKE leg.

Remarks. The present specimens were compared with two males and a female from Amakusa and a male and a female from the Arafra Sea without definite locality. The carapace is markedly transverse, convex fore and aft and glabrous. The dorsal surface is for its anterior half well divided into regions by narrow deep furrows. The areola 1M is large and distinctly separated from the inner areolet of 2M which is completely subdivided. The posterior end of the inner areolet of 2M is, however, not distinctly separated from 3M. A furrow behind the external orbital angle and that just inside of the second anterolateral tooth, which are continuous, are very deep. An areola inside the latter furrow is prominent and bears a vestigial shallow incision, representing the united 2 and 3L. The areola 4L is prominently transverse, rather oblique, and shallowly separated from 5 and 6L which are fused, being confluent laterally with the third anterolateral tooth. A transverse areola behind 4L is also prominent, but slightly smaller than 4L, including the last anterolateral tooth. Among the materials examined, it is noted that in each of the specimens from the Arafra Sea and the Palau Islands the areolation of the carapace is more distinct than in the Japanese specimens. The male first pleopod is represented by BUITENDIJK (1960).

Distribution. This species ranges from Tokyo Bay southwards to Tahiti, New Caledonia and Queensland in the Pacific, and to Cape Jaubert and the Monte Bello Islands in Western Australia, the Mergui Archipelago and Sri Lanka in the Eastern Indian Ocean.

Genus *Macromedaeus* WARD, 1942

Macromedaeus WARD, 1942b, p. 92; GUINOT, 1968, p. 708.

The present genus emended by GUINOT, (1968) is composed of seven Indo-West Pacific species and one subspecies hitherto referred to the genera *Xantho* LEACH and *Leptodius* A. MILNE EDWARDS. In those species closely related to the two genera the front is narrow and the tips of the fingers are imperfectly hollowed out. They are most characterized by having the male first pleopod armed with the more or less curved, numerous spiny setae along the subterminal part and the beak. The type species is *M. punctatus* WARD, 1942.

Macromedaeus crassimanus (A. MILNE EDWARDS, 1867)

Xantho crassimanus A. MILNE EDWARDS, 1867, p. 267; RATHBUN, 1906, p. 847; ODINER, 1925, p. 80; EDMONDSON, 1925, p. 51; 1962a, pp. 237 (in key), 239, fig. 6 (c); BUITENDIJK, 1960, p. 318, fig. 9 (c-f).

Leptodius crassimanus: A. MILNE EDWARDS, 1873a, p. 226, pl. 11 fig. 4; HASWELL, 1882c, p. 61; DE MAN, 1887, p. 287; 1895, p. 522; BALSS, 1924, p. 10; FOREST and GUINOT, 1961, fig. 48.

Xantho exaratus var. *crassimana*: ORTMANN, 1893, p. 448.

Xantho (Leptodius) crassimanus: ALCOCK, 1898, pp. 118 (in key), 120; MIYAKE, 1939, pp. 179, 209, fig. 6, pl. 13 fig. 8.

Macromedaeus crassimanus: GUINOT, 1968, figs. 18, 22.

Material examined. Ngadarák Reef, 1 ♀, ZLKU 2861, June 17, 1939, S. MIYAKE leg.

Remarks. The present species recently transferred to the present genus by GUINOT (1968) is rather close to *M. nudipes* (A. MILNE EDWARDS) and *M. punctatus* WARD. The last species, the type species of the genus, is in reality not vigorously distinguished from the early known species. The male first pleopod is represented by MIYAKE (1939), FOREST and GUINOT (1961) and GUINOT (1968).

Distribution. This species ranges from the Hawaiian Islands and Tahiti through the coast of India to the Red Sea.

Genus ***Nanocassiope*** GUINOT, 1967

Nanocassiope GUINOT, 1967a, p. 355.

Carapace wide, more or less ovate and evenly convex in both directions. Dorsal surface minutely granulated without hairs and well divided into regions by linear furrows. Front wide, bilobed and almost truncated or very slightly convex. Each lobe granulated with more or less produced lateral angle and bears a weak accessory row of granules on its dorsal surface. Anterolateral border with four lobes or teeth behind inconspicuous external orbital angle. First tooth usually a granulated lobe, but rarely more or less tuberculiform. Second and third teeth prominent and conical. Last tooth rather produced, but smaller than precedings. Chelipeds very unequal. Larger chela massive with short fingers, while smaller chela much slender with cutting edges of fingers sharply toothed. Ambulatory legs long usually with serrulate anterior borders of meri and carpi. Male first pleopod short, stout and twisted with spiniform tubercles along its distal half, and terminally with a tuft of some recurved strong setae.

The present genus is most characterized by having the male first pleopod curiously formed with a terminal tuft of some recurved strong setae. The type species is a West African species, *Xanthodius melanodactylus* A. MILNE EDWARDS, and in addition to two Indo-West Pacific species, a West American *Micropanope polita* RATHBUN is

referred to the present genus by the original author. The two Indo-West Pacific species are *N. alcocki* (RATHBUN, 1902) and *N. granulipes* (SAKAI, 1939).

***Nanocassiope alcocki* (RATHBUN, 1902)**

(Pl. X, fig. C)

Xanthias alcocki RATHBUN, 1902c, p. 128, figs. 9, 10; 1911, p. 223.

Micropanope alcocki: ODHNER, 1925, p. 85.

Micropanope ? *alcocki*: GUINOT, 1961c, pp. 29, 31 (in lists).

Nanocassiope alcocki: GUINOT, 1967c, p. 356, figs. 9, 12.

Description. The carapace is wide and weakly convex fore and aft; the dorsal surface is almost smooth for its greater part and minutely granulated near the frontal, supraorbital and anterolateral borders, being divided into regions by the linear furrows; there is a short transverse granulated crest on each epigastric, hepatic and anterior branchial region; the anterior lateral part of the protogastric region is also provided with two or three indistinct, transverse rows of granules. The front is cut into two granulated lobes that are only weakly convex, each bearing an accessory row of granules on the dorsal part; the true margin of the front is therefore only partially visible in the dorsal view; the lateral angle of each lobe is slightly produced, being shallowly separated from the lobe and deeply from the supraorbital angle. The eyestalk and cornea are large and stout, the former bearing two conical granules just near the cornea. The supraorbital border is minutely granulated, weakly raised and bears two depressions which are not the distinct notches. The inner infraorbital angle is strongly extended forwards. The antennal basal segment is just touched with the ventral prolongation of the front; the flagellum is fine and about as long as the major diameter of the orbit.

The anterolateral border of the carapace is not strongly arched and is armed with four teeth behind the inconspicuous external orbital angle; the first is in reality not the tooth, but only a truncated granulated lobe, but that of the left side bears a small indistinct prominence near the posterior end; the subhepatic region is granulated and fairly convex, being partially visible in the dorsal view along the first anterolateral lobe; the second is almost conical and directed a little forwards, while the third is also of good size, sharper and more directed outwards; the fourth is very small but distinct and close to the third. The posterolateral border of the carapace is hardly convex behind the end of the posterior slope of the last anterolateral tooth, then straight and strongly convergent.

In the present specimen only the left cheliped is present. The merus is short and nearly concealed beneath the carapace; its upper border bears some conical granules, and the outer surface is covered with fine granules. The carpus is large and covered with more or less scaly granules and with some low nodular prominences;

the inner angle is slightly tuberculated. The palm is also covered with the scaly or rather conical granules, and bears a longitudinal rows of granules. The fingers are rather long, as long as the upper border of the palm and rather curved downwards; the cutting edges are sharply toothed; in the immovable finger each tooth is more or less three-toothed with a middle main one and two small, blunt ones on each slope.

The ambulatory legs are slender and sparsely haired. The anterior borders of the merus and carpus are serrulate, and the anterior border of the propodus is microscopically serrulate. The distal part of the anterior border of the merus is more or less produced into a conical tooth.

Material examined. Ngaiánges I., 1 ♀ infested by a boyprid, ZLKU 1651, July 16, 1939, S. MIYAKE leg.

Measurements. Female: Breadth of carapace, 5.1 mm; length of carapace, 3.4 mm; breadth of front, 1.8 mm; fronto-orbital breadth, 3.8 mm.

Remarks. The present specimen is referred with a great hesitation to the present rare species hitherto known from the Western Indian Ocean at the considerable depths. Though the decided differences cannot be enumerated, the examination of the male specimen is very desirable. Only a minute difference may be found in the first anterolateral tooth. In the present specimen it is almost truncated without a distinct protuberance, while that of the typical specimen may be rather distinctly angulated near the posterior end somewhat like that of *N. granulipes* (SAKAI) which is unexpectedly close to the present species. *N. granulipes* may be, however, different from the present species only in the features that the granulated ridges on the dorsal surface of the carapace are rather indistinct, the front is almost truncated with a median very small notch, the third anterolateral tooth is closer to the second, and that the last tooth is larger. Otherwise, the male first pleopod is acute at the tip in *N. granulipes*. The first male pleopod of the present species is represented by GUINOT (1967a), and that of *N. granulipes* by SERÈNE (1964b).

Distribution. This species has hitherto been known from the Maldive Islands, the Saya de Malha Bank, Providence Island, the Amirantes and the Seychelles in the Western Indian Ocean. The known bathymetric range is from 35 to 145 m. The close congener, *N. granulipes*, is known from Sagami Bay in Japan, the East China Sea and off Durban in South Africa at the depths of 30 to 120 m.

Genus *Neoliomera* ODHNER, 1925

Neoliomera ODHNER, 1925, p. 25; SAKAI, 1939, p. 442 (in key); 1969, p. 262; TWEEDIE, 1950a, p. 89; BARNARD, 1950, pp. 203 (in key), 240; FOREST and GUINOT, 1961, p. 84; EDMONDSON, 1962a, p. 221 (in key).

In the species of the present genus the carapace is very wide and ovate usually with the ill-defined, granulated and more or less hairy dorsum, the anterolateral border

of the carapace is obscurely four-lobed, and the ambulatory legs are hairy. The antennal basal segment embraces the ventral prolongation of the front and rather enters the antennular fossa. The present genus is close to the genus *Liomera* DANA, but distinguished from it by the above features.

According to FOREST and GUINOT (1961), *Liomera lippa* (NOBILI) is close to the present genus, *N. sakagutii* SAKAI is identical with *Atergatis granulatus* DE MAN, and *N. ovata* TWEEDIE is probably a species referable to the genus *Atergatis* DE HAAN. The male first pleopod of *L. lippa* represented by GORDON (1934) is in reality close to that of *N. pubescens* (H. MILNE EDWARDS) figured by FOREST and GUINOT (*op. cit.*), bearing curious projection at the apex. SAKAI (1969) also suggested that *N. immigrans* EDMONDSON may be transferred to the genus *Atergatopsis* A. MILNE EDWARDS.

The present genus is therefore composed of fifteen species. The type species is *Zozymus pubescens* H. MILNE EDWARDS, 1834, but it is noted that the material dealt with by the original author are really referable to *N. demani* FOREST et GUINOT.

Neoliomera demani FOREST et GUINOT, 1961

Actaeodes pubescens: MIERS, 1884b, p. 10; DE MAN, 1891, p. 4, pl. 1 fig. 1.

Liomera pubescens: ORTMANN, 1893, p. 452.

Neoliomera pubescens: ODHNER, 1925, p. 28, pl. 2 figs. 6, 7; MIYAKE, 1939, p. 207 (in list).

Neoliomera demani FOREST and GUINOT, 1961, p. 80, fig. 69, pl. 3, figs. 3-5; SAKAI, 1967, pp. 73, 81, frontispiece fig. 2.

Material examined. Ngadarák Reef, 1 juv., ZLKU 2785, June 1, 1939, S. MIYAKE leg.

Remarks. Unfortunately, the present juvenile specimen is somewhat damaged, but agrees well with the previous descriptions and figures in spite of its small size. The carapace is markedly wide and thickly covered with pearly granules that are rather conical near the anterolateral borders. The dorsal surface of the carapace is ill-defined only with faint indications of the regions. The anterolateral border of the carapace is cut into four lobes or teeth. The first two are subequal and weakly arched, being separated from each other by a small indentation. There is a fairly deep groove along the borders of the two lobes. The following two are smaller than the precedings, but strongly convex, the last being the smaller. A short furrow extends obliquely backwards from the notch between the second and third, and also there is a short transverse furrow from the notch between the third and fourth, so that the third tooth is dorsally indicated by a more or less triangular region.

The present species is, as well discussed by FOREST and GUINOT (1961), readily distinguished from *N. pubescens* (H. MILNE EDWARDS) by the different contour of the carapace, ornamentation of the carapace and formation of the anterolateral border

and chelipeds.

SAKAI (1967) noted and figured the present species that the colour in life is vermilion with rounded whitish markings rimmed with deep vermilion red on the dorsal surface of the carapace.

Distribution. This species is known from Mauritius in the Western Indian Ocean, and the Ryukyu, Palau, Fiji, Samoa, Tahiti and Tuamotu Islands.

Neoliomera insularis (ADAMS et WHITE, 1848)

(Pl. IX, fig. C)

Atergatis insularis ADAMS and WHITE, 1848, p. 38, pl. 8 fig. 2.

Atergatis Montrouzieri A. MILNE EDWARDS, 1873a, p. 186, pl. 5 fig. 5.

Atergatis montrouzieri: ORTMANN, 1893, p. 461.

Neoliomera insularis: ODHNER, 1925, p. 32, pl. 2 fig. 14; WARD, 1932, p. 241; SAKAI, 1936a, p. 159, pl. 48 fig. 4; 1939, p. 477, pl. 61 fig. 4, pl. 92 fig. 1; 1965b, p. 145, pl. 72 fig. 1; MIYAKE, 1939, p. 207; TWEEDIE, 1950a, p. 89; BUITENDIJK, 1960, p. 262.

Material examined. Malagál Harbour, Ngurkdápel I., 3 ♀♀, 1 carapace, ZLKU 1349, March 23, 1938, S. MURAKAMI leg.

Remarks. The present species is different from the congeners most remarkably in having the crested anterior borders of the meri of the ambulatory legs. The crested formation of the anterolateral border of the carapace is somewhat similar to those of *N. richtersii* (DE MAN), *N. praetexta* (RATHBUN) and *N. richteroides* SAKAI, but most strongly developed in the present species.

Distribution. This species is restricted to the West Pacific, ranging from Tokyo Bay, Sagami Bay and the Ogasawara Islands southwards to New Caledonia and the coast of Queensland.

Neoliomera richtersii (DE MAN, 1889)

Actaeodes richtersii DE MAN, 1889, p. 412, pl. 9 fig. 2.

Actaeodes Richtersii: DE MAN, 1890, p. 51.

Liomera richtersi: ORTMANN, 1893, p. 451; BORRADAILE, 1900, p. 583.

Neoliomera richtersi: ODHNER, 1925, p. 33, pl. 2 fig. 13; MIYAKE, 1939, p. 207 (in list); EDMONDSON, 1916, p. 292; 1962a, pp. 251 (in key), 252, fig. 9 (e); FOREST and GUINOT, 1961, p. 79, fig. 74; GUINOT, 1964c, fig. 17; SAKAI, 1969, p. 262 (in list), fig. 10.

Neoliomera richtersii: BUITENDIJK, 1960, p. 262 (pt.).

Nec Neoliomera richtersi: SAKAI, 1967, pp. 73, 81, frontispiece fig. 1 (= *N. richteroides* SAKAI).

Remarks. The present distinctive species was recorded from the Palau Islands by ODHNER (1925). In considering the geographical range, BUITENDIJK's record of a female from Jiddah in the Red Sea is probably incorrect, and it may be referable to *N. themisto* (DE MAN) which is finely figured and compared with the present species by GUINOT (1964c).

Distribution. This species is restricted to the West Pacific, being known from the Palau Islands, New Guinea, the Ellice Islands, Rotuma Island, Tahiti, the Tuamotu Islands, the Hawaiian Islands and Bikini Island.

Genus *Paramedaeus* GUINOT, 1967

Paramedaeus GUINOT, 1967a, p. 373.

The present genus is in reality closely related to the genus *Medaeus* DANA emended by GUINOT (1967a). In *Medaeus*, however, the carapace and chelipeds are covered with the granulated nodules, the areola 4M is distinct, the cardiac region is prominent, and the thoracic sternum is comparatively narrow with the long male abdomen. The last feature is apparently the most important generic criterion for the demarcation between the present genus and *Medaeus*.

The type species is *Medaeus simplex* A. MILNE EDWARDS, 1873, and the additional two species hitherto referred to *Medaeus* are referred to the present genus with question by the original author.

Paramedaeus noelensis (WARD, 1934)

Lophozozymus (Lophoxanthus) bellus var. *leucomanus*: MIERS, 1886, p. 115, pl. 11 fig. 1.

Xantho distinguendus: KLUNZINGER, 1913, p. 203, pl. 1 fig. 7 (pt.).

Medaeus granulatus: BALSS, 1934a, p. 507 (pt.).

Medaeus noelensis WARD, 1934, p. 17, pl. 1 fig. 1; FOREST and GUINOT, 1961, p. 56, figs. 42-44, pl. 1 fig. 1; SAKAI, 1965b, p. 131, pl. 79 fig. 1.

Material examined. Ngadarák Reef, 1 ♀, ZLKU 1857, June 17, 1939, S. MIYAKE leg.

Remarks. The present specimen is agreeable with the figures given by MIERS (1886), KLUNZINGER (1913), WARD (1934), FOREST and GUINOT (1961) and SAKAI (1965b). Though GUINOT (1967a) suggested that the present species may be included in the present genus, to which *Medaeus planifrons* SAKAI is also referred with some question, the general formation of the carapace is not always quite close to the type species, *P. simplex* (A. MILNE EDWARDS). In the present species the carapace is rather strongly convex fore and aft, and the four anterolateral teeth are not acute. The present species is therefore referred to with a slight hesitation, but closer to the present genus rather than to the other genera related to *Medaeus* DANA. The male first pleopod is represented by FOREST and GUINOT (1961).

Distribution. This species has hitherto been recorded from the Red Sea, Mauritius, Christmas Island in the Indian Ocean, Samoa, Tahiti and Japan.

Paramedaeus simplex (A. MILNE EDWARDS, 1873)

(Pl. X, fig. B)

Medaeus simplex A. MILNE EDWARDS, 1873b, p. 79; DE MAN, 1902, p. 603; RATHBUN, 1906, p. 849, pl. 9 fig. 10; 1911, p. 216; EDMONDSON, 1925, p. 50; 1962a, p. 235, fig. 5 (c); WARD, 1912b, p. 93; GUINOT, 1964a, p. 18, fig. 4.

Paramedaeus simplex: GUINOT, 1967a, p. 373, fig. 25; TAKEDA, 1972, p. 15, pl. 1 fig. A.

Description. The anterior one third of the carapace is rather strongly sunken; the dorsal surface is well separated into regions which are more or less eroded and not markedly convex; the regions are thickly covered with small granules, and those on 2M are beaded to form short transverse rows; the areola 2M is imperfectly subdivided by a longitudinal indistinct furrow; the inner areolet of 2M is confluent with 1M; an areola just outside of 2M is convex and represents the united 2 and 3L; the areolae 4, 5 and 6L are distinctly demarcated; of those areolae, 4L is low, transverse and more or less confluent with the third anterolateral tooth, while 5L is large; a transverse region at the gastro-cardiac separation is deeply sunken; the areola 1P is convex fore and aft, being more or less confluent with the posterolateral regions; just behind the middle of 1P and in front of 2P is a small transverse region; the areola 2P is not distinctly incised in the middle.

The front is rather produced beyond the orbits, being cut into two lobes by a median narrow V-shaped sinus; each lobe is obliquely truncated and angulated at the median sinus, bearing a rather prominent, angulated lateral angle. The supraorbital angle is small but very distinctly isolated from the lateral angle of the front.

The anterolateral border of the carapace is armed with four teeth that are rather tuberculated and weakly curved upwards; the first is the smallest of the series and at the much lower level, its anterior border being confluent with the granulated sub-hepatic region and then with the anterior angle of the buccal cavern; each of the anterior and posterior slopes of the second and third is provided with one or two large accessory granules; behind the summit of the fourth the posterolateral border of the carapace is strongly convergent.

The chelipeds are unequal in both sexes; the upper border of the merus is armed with a series of several tubercular granules; the outer surface of the carpus is eroded with many small depressions and minute granules, its inner angle being tuberculated; the outer surface of the palm is for its greater part smooth; in reality, however, it bears two or three linear, low longitudinal prominences; the outer upper and inner upper surfaces are ornamented each with a longitudinal shallow furrow that is also ornamented with many short transverse depressions; the inner upper surface of the palm is armed with several large granules that are obtuse in the larger specimens and conical in the smaller ones. The fingers are short, high and irregularly toothed,

the tips being pointed and crossed; the upper border of the movable finger is rather prominently crested; the colour of the immovable finger is not extended onto the palm.

The ambulatory legs are short; the anterior border of the merus is crested; in the first three pairs each of the crests is entire, but in the last pair it bears some indistinct depressions and is armed with some conical granules near its proximal end.

Material examined. Ngaláp, Songél a Lise, Goréor I., 1 ♂, ZLKU 1856, July 11, 1939, S. MIYAKE leg.

Remarks. In the Zoological Laboratory, Kyushu University are two males and two ovigerous females from Maézato, Ishigaki-jima in the Ryukyu Island, which are well agreeable with the present specimen.

Recently GUINOT (1967a) transferred the present species to the new genus *Paramedaeus* as the type species. The general appearance is rather similar to that of *P. planifrons* (SAKAI), but in the species the carapace is apparently narrower, the dorsal areolation is different, the front is very strongly extended forwards, and each carpus of the ambulatory legs is carinated with two broad lobes and the propodus with one. On the other hand, in *Medaeus serratus* SAKAI, the true systematic position of which is questionable, the formation of the carapace is closely allied to that of the present species, but the crest of each merus of the ambulatory legs is cut into four or five teeth, that of the carpus into two lobes and that of the propodus is marked with a proximal lobe. The first male pleopod of *M. serratus* bears no long hairs unlike that of the present species, but the transparent spatulated tip. The male first pleopod is represented by GUINOT (1964a).

Distribution. This species is widely distributed in the Indo-West Pacific waters, ranging from Madagascar and the Red Sea to the Fiji and Samoa Islands, and then northwards to the Ryukyu and Hawaiian Islands.

Genus *Paraxanthias* ODHNER, 1925

Paraxanthias ODHNER, 1925, pp. 84, 85; RATHBUN, 1930, pp. 236 (in key), 465; SAKAI, 1939, pp. 442 (in key), 469; EDMONDSON, 1962a, p. 220 (in key); GUINOT, 1964c, p. 30; 1967c, pp. 716-720; TAKEDA and MIYAKE, 1968, p. 196.

GUINOT (1967c) made an important contribution to the present genus, in which the relation to the other genera, especially the genus *Lachnopodus* STIMPSON, is discussed in detail. According to her, *L. subacutus* (STIMPSON), *L. bidentatus* (A. MILNE EDWARDS) and *L. ponapensis* (RATHBUN) are also included in the present genus *s. lato*.

The type species is *Xanthodes notatus* DANA, 1852, and only an additional Indo-West Pacific species is *P. parvus* (BORRADAILE, 1900). In both species the male first pleopod bears no long hairs unlike those of the genus *Xanthias* RATHBUN.

Paraxanthias notatus (DANA, 1852)

Xanthodes notatus DANA, 1852, p. 178; A. MILNE EDWARDS, 1873a, p. 201; HASWELL, 1882c, p. 49; DE MAN, 1888, p. 264; ALCOCK, 1898, pp. 157 (in key), 158; GRANT and McCULLOCH, 1906, p. 12; NOBILI, 1907, p. 392.

Xantho notatus: HELLER, 1895, p. 10.

Xanthias notatus: BORRADAILE, 1900, p. 582; 1902, p. 252; LAURIE, 1906, p. 405; RATHBUN, 1906, p. 855; 1907, p. 45; EDMONDSON, 1925, p. 48; SANKARANKUTTY, 1962, p. 134.

Paraxanthias notatus: ODHNER, 1925, p. 84; WARD, 1932, p. 248; BALSS, 1938a, p. 51; MIYAKE, 1939, p. 213; SAKAI, 1939, p. 470, fig. 33; 1965b, p. 142, pl. 71 fig. 3; HOLTHUIS, 1953, p. 24; FOREST and GUINOT, 1961, p. 76, fig. 70; GUINOT, 1962b, p. 7, fig. 8; 1967c, fig. 47; EDMONDSON, 1962a, p. 246, fig. 8 (b).

Material examined. aUgulpelú Reef, aUgulpelú I., 1 juv. ♂, ZLKU 1611, May 5, 1939, S. MIYAKE leg. Ngadarák Reef, 11 ♂♂, 16 ♀♀, ZLKU 1113, May 23-June 17, 1939, S. MIYAKE leg. Melekéiok, Babldáob I., 6 ♂♂, 3 juv. ♂♂, 1 ovig. ♀, 3 ♀♀, 1 juv. ♀, ZLKU 1004, July 19, 1939, S. MIYAKE leg.

Remarks. The male first pleopod is represented by FOREST and GUINOT (1961).

Distribution. This species which is an inhabitant of the coral flat reefs is distributed in the Indo-West Pacific waters from the Maldivé Islands in the Indian Ocean to the coast of New South Wales and the Tahiti and Tuamotu Islands, and northwards to Hawaii and Sagami Bay in Japan.

Genus *Xanthias* RATHBUN, 1897

Xanthodes DANA, 1852, *Proc. Acad. nat. Sci. Philad.*, 6, p. 73; 1852, p. 175; A. MILNE EDWARDS, 1873a, p. 200; HASWELL, 1882c, p. 49; MIERS, 1886, p. 127; ALCOCK, 1898, pp. 74 (in key), 156 (*nom. preocc.*).

Xanthias RATHBUN, 1897, p. 165; 1930, pp. 236 (in key), 464; ODHNER, 1925 p. 84; SAKAI, 1939, p. 442 (in key); BARNARD, 1950, pp. 203 (in key) 241; GUINOT, 1964c, p. 27.

Juxtaxanthias WARD, 1942b, p. 91.

In the species of the present genus the male first pleopod bears a small beak with long feathered hairs. The species known at present are rather natural with the type species, *Xantho lamarckii* H. MILNE EDWARDS, 1834. Fifteen species are known from the Indo-West Pacific waters, and a new name, *X. rathbunae* is at present proposed for *Lioxantho latifrons* RATHBUN, 1911, nec *X. latifrons* (DE MAN, 1888). The genus *Lioxantho* ALCOCK established on three species is synonymized partly with *Xanthias* RATHBUN, 1897, and partly with *Lachnopus* STIMPSON, 1858. RATHBUN's species from Salomon may be closer to *X. punctatus* (H. MILNE EDWARDS) rather than to the species of *Lachnopus*.

Xanthias lamarckii (H. MILNE EDWARDS, 1834)

Xantho lamarckii H. MILNE EDWARDS, 1834, p. 391.

Xantho cultrimanus WHITE, 1847c, p. 225; 1848, p. 285; ADAMS and WHITE, 1848, p. 39.

- Xanthodes granosomanus* DANA, 1852, p. 175.
Xanthodes lamarckii: A. MILNE EDWARDS, 1873a, p. 200, pl. 7 fig. 3; ALCOCK, 1898, p. 157 (lit.); LENZ, 1905, p. 350.
Xanthodes Lamarckii: CALMAN, 1900, p. 11.
Xanthias lamarcki: BORRADAILE, 1900, p. 582; 1902, p. 251; LAURIE, 1906, p. 405; BALSS, 1935a, p. 134; 1938b, p. 50; MIYAKE, 1936, p. 508; HOLTHUIS, 1953, p. 26; GUINOT, 1962a, p. 235.
Xantho Lamarcki: DOFLEIN, 1904, p. 101.
Xanthias lamarckii: RATHBUN, 1906, p. 854; 1907, p. 44; 1911, p. 223; GRANT and McCULLOCH, 1906, p. 12; SENDLER, 1923, p. 37; EDMONDSON, 1925, p. 48; 1946, p. 291; 1962a, pp. 242 (in key), 243, fig. 7 (c); MCNEILL, 1926, p. 313; 1968, p. 57; HALE, 1929, p. 69; WARD, 1932, p. 248; 1934, p. 20; YOKOYA, 1933, p. 190; MIYAKE, 1939, pp. 181, 213, pl. 14 fig. 1; SAKAI, 1939, p. 466, fig. 30; TWEEDIE, 1950a, p. 89; BARNARD, 1950, p. 242, fig. 44 (g, h); SANKARANKUTTY, 1962, p. 134, figs. 28, 29.
Xanthias Lamarcki: NOBILI, 1907, p. 393.
Xantho lamarcki: PESTA, 1913, p. 43.
Xanthodes Lamarcki: BOUVIER, 1915, p. 273.

Material examined. aUgulupelú Reef, aUgulupelú I., 2 ♂♂, 1 ♀, ZLKU 1485, 1 ♀ infested by *Thompsonia*, ZLKU 1723, May 5, 1939, S. MIYAKE leg. Ngadarák Reef, 1 juv. ♂, ZLKU 1616, 1 juv. ♀ infested by *Thompsonia*, ZLKU 1779, May 23, 1939, S. MIYAKE leg.

Remarks. The male first pleopod is represented by BARNARD (1950) and SANKARANKUTTY (1962).

Distribution. This common species is widely distributed in the whole Indo-West Pacific waters.

Xanthias latifrons (DE MAN, 1888)

(Pl. X, fig. D)

- Panopaeus latifrons* DE MAN, 1888, p. 265, pl. 9 fig. 4.
Xanthodes minutus RATHBUN, 1893b, p. 238.
Xanthias minutus: RATHBUN, 1906, p. 855, fig. 16, pl. 9 fig. 14; 1911, p. 225; WARD, 1939, p. 6.
Chlorododius tuberosicarpus KLUNZINGER, 1913, p. 230, pl. 1 fig. 9, pl. 6 fig. 12.
Xanthias latifrons: SAKAI, 1939, pp. 466 (in key), 468, fig. 32; WARD, 1942b, p. 97; FOREST and GUINOT, 1961, p. 70, fig. 67; EDMONDSON, 1962a, pp. 242 (in key), 244, fig. 7 (e).

Material examined. Kajangél Atoll, 1 ♀, ZLKU 1940, July 16, 1939, H. OHSIIMA and S. MIYAKE leg.

Remarks. The present small species is characteristic in having the features that the carapace, chelipeds and ambulatory legs are naked and glabrous, the areolae are well defined by rather deep furrows, and the carpus of the cheliped is ornamented with seven or eight nodules. *X. glabrous* EDMONDSON is close to the present species, but the protogastric and hepatic regions are quite entire, the carpus bears no distinct nodules, and in the male the palm is ornamented with the broad black band encompassing its greater part. The male first pleopod is represented by FOREST and GUINOT (1961).

Distribution. This species has been recorded from the Red Sea, the Amirantes, the Seychelles and the Chagos Archipelago in the Western Indian Ocean and from Amboina, Japan, Hawaii and the Tuamotu Islands in the Pacific.

***Xanthias lividus* (LAMARCK, 1818)**

Xantho lividus LAMARCK, 1818, *Hist. Nat. Anim. sans Vert.*, 10, p. 272; H. MILNE EDWARDS, 1831, p. 393; BOUVIER, 1915, p. 281.

Xanthias tetraodon: BALSS, 1938a, p. 47, pl. 2 fig. 1; MIYAKE, 1939, p. 213 (in list); SAKAI, 1939, pp. 466 (in key), 467, pl. 91 fig. 5.

Juxtaxanthias livida: WARD, 1942b, p. 92, pl. 5 fig. 7.

Xanthias lividus: FOREST and GUINOT, 1961, fig. 69.

Description. Only a juvenile specimen is available. The carapace is smooth and glabrous, and the areolae are rather deeply defined, each areola being fairly convex; the gastric regions are convex as a whole and not distinctly subdivided; the areola 1M is entirely continuous to the inner part of 2M without any interruption; the longitudinal depression outside of 1M only slightly invades the areola 2M; the usual furrows between 2 and 3M are traceable, but very shallow; the areolae 2 and 3L represent a fused large areola, and 4L is also distinct; the outer borders of the two areolae are strong and more or less ridge-like.

The front is very narrow, being about one fifth the greatest breadth of the carapace; it is divided into two convex lobes by a median, wide V-shaped sinus; each lobe is distinctly separated from the supraorbital angle which is enough to be a lobe. The orbit is small and orbicular, its major diameter being as long as each of the frontal lobes; there are two closed fissures on the supraorbital border and one just below the inconspicuous external orbital angle; the inner infraorbital angle is very strongly developed and extended forwards as a more or less tubercular tooth.

The anterolateral border of the carapace bears four prominent teeth exclusive of the external orbital angle; the first is very broad and distinctly lobulate, its obtuse tip reaching the level of the eye; the second is rather similar to the first, but sharper and almost conical in the dorsal view; the third and the last are subequal and distinctly tuberculated teeth, the former being more strongly directed forwards.

The chelipeds are equal and devoid of hairs. The carpus bears a large bifurcated tooth at its inner angle, the upper one of which is strong and curved upwards. The palm is impressed by a longitudinal furrow on the outer upper surface. The cutting edges of both fingers are not strongly toothed.

The ambulatory legs are stout and densely fringed with yellowish stiff hairs along the anterior borders; the proper surfaces of the anterior borders are not observable without removal of the fringes.

Material examined. Ngadarák Reef, 1 juv., ZLKU 1482, May 31, 1839, S. MIYAKE leg.

Remarks. The present species is closely related to *X. tetraodon* (HELLER), but as well shown by FOREST and GUINOT (1961), distinguished from it most readily by having the obtuse first anterolateral tooth instead of the pyramid-shaped sharp tooth. The Japanese materials previously recorded and those from the Ryukyu Islands examined are identical with the present specimen. In the adult male the black colour of the immovable finger is strongly extended back near to the proximal part of the palm along the lower border.

Distribution. This species is known from Mauritius, the Chagos Archipelago and the west coast of Sumatra in the Indian Ocean, and from the Marshall Islands, the Ryukyu Islands including Northern Daito-jima Island and Kagoshima Bay in the Pacific. *X. tertaodon* is, on the other hand, known from the Tuamotu, Tahiti, Gambier and Hawaiian Islands. Therefore, the geographical distributions of both species are fairly distinct.

Xanthias pachydactylus (A. MILNE EDWARDS, 1867)

(Pl. XI figs. A-C)

Xanthias pachydactylus A. MILNE EDWARDS, 1867, p. 268; 1873a, p. 201, pl. 7 fig. 4; DE MAN, 1888, p. 265.

Paraxanthias pachydactylus: ODHNER, 1925, p. 84; WARD, 1932, p. 248.

Xanthias pachydactylus: FOREST and GUINOT, 1961, fig. 71; GUINOT, 1961c, p. 29 (in list).

Description. The carapace is transversely oval, declivous anteriorly and flattened laterally and posteriorly; the dorsal surface is rather well divided into regions and glabrous without granules and hairs; the epigastric (1M), protogastric (2M) and mesogastric (3M) regions are fairly distinct; the areola 1M is almost confluent with 2M, and its anterior margin is rather convex, but not distinctly ridge-like; the areola 2M is entire and the lateral part of the anterior margin is also distinct, and rather strongly defined in the smaller specimen; just inside of and along the first anterolateral tooth is an oblique prominence that is strongly developed and crested in the smaller specimen; obliquely behind of it a small prominence is found; a large areola that may represent 2 and 3L is distinct with the anterior oblique margin rather strong and slightly irregular in the middle; the areola is separated from 2M by a wide notch anteriorly but by a very shallow furrow posteriorly, and from a small transverse areola by a deep furrow posteriorly, and from a small transverse areola by a deep furrow; the latter areola is distinctly isolated from the third anterolateral tooth, and its inner end becomes narrower and is shallowly separated from the areola 6L; the cardiac region is transverse and only weakly convex fore and aft.

The frontal region is weakly convex, and the frontal margin is thin and nearly truncated with a median V-shaped notch; the lateral angle of each lobe is not strong, but more or less produced into a small lobe directed a little outwards and weakly

downwards, being separated from the frontal lobe by a shallow depression and from the supraorbital angle by a large notch. The supraorbital border bears two interruptions, of which the inner one is small but distinct and the outer is only a depression; the external orbital angle is small but rather sharp, being smaller than the conical outer infraorbital angle at the inside of a large notch below the external orbital angle; the inner infraorbital angle is also strongly extended forwards. The antennal basal segment is stout and touched with the ventral prolongation of the front by its inner angle; the flagellum is fine and as long as the major diameter of the orbit.

The anterolateral border of the carapace is armed with four teeth excluding the external orbital angle; the first is small and rounded, and obtuse in the larger specimen; between the external orbital angle and the first tooth a prominence of the subhepatic region is visible in the dorsal view; the second is rather conical with the rounded tip and more or less similar to but slightly larger than the first, each slope bearing some minute granules; the third and fourth are distinctly tuberculated and directed a little forwards, the former being the larger and deeply separated from the latter. The posterolateral border of the carapace is fairly convex and moderately convergent.

The chelipeds are heavy and distinctly unequal in both sexes. The merus is very small and concealed beneath the carapace, and its upper border is fringed with longish tubular hairs. The carpus and palm are quite bare and shining without distinct rugosities and granules. The carpus with two blunt teeth at its inner angle is large and bears a crescent depression on the outer surface along the distal margin, that is shallow in the large specimen. The outer upper surface of the palm is usually ornamented with a longitudinal furrow, but in the larger palm of the present male examined the furrow is so obliterated that the outer surface is regularly convex without interruption. In the smaller chela of the male the immovable finger is strongly curved downwards at the proximal part and upwards near the tip, while the finger of the larger chela is rather similar to the smaller one, but much stouter with less pronounced curvature. In the female the fingers of both chelae are not markedly curved.

The ambulatory legs are not strong and are rather sparsely fringed with setae of various length. The anterior border of the merus is serrulate with a series of conical and spiniform granules. The anterior border of the carpus is also roughened by the same granules, and each carpus of the first three pairs is otherwise armed with a longitudinal row of the same granules on the upper surface. The dactylus of the last pair is curved dorsally near the terminal claw unlike those of the preceding pairs.

Material examined. Ngadarák Reef, 1 ♂, 1 ovig. ♀, 1 ♀, ZLKU 1863, June 1, 1939, S. MIYAKE leg.

Remarks. The present species is unexpectedly close to *X. elegans* (STIMPSON). The considerable number of the specimens referable to the species is preserved in the Zoological Laboratory, Kyushu University including a large male from the coast of New South Wales identified as *Paraxanthias atromanus* (HASWELL) which is at present known as a synonym of the species and sent by the late Mr. M. WARD of the Australian Museum. In *X. elegans* the dorsal areolae are very distinct with the strongly defined anterior margins; the epigastric region (1M) is separated from the proto-gastric region (2M); the lateral angle of each frontal lobe is usually tuberculiform and directed forwards; the first and second anterolateral teeth are tuberculated; the subhepatic prominence is very low; the chelipeds are prominently covered with scaly granules in both sexes; those scaly granules on the outer surface of the palm are beaded to form some longitudinal rows; in the male chela the colour of the immovable finger is a good deal extended back onto the palm and the curvature of the immovable finger is less accentuated; the anterior borders of the ambulatory legs are heavily fringed with tubular hairs, and the propodus is also roughened by the conical granules.

Although the present specimens may be safely referable to the present species, the male first pleopod bears a rather long beak and appears to be somewhat different from the figure given by FOREST and GUINOT (1961) in which the beak is stout and not long.

Distribution. This species has hitherto been recorded from New Caledonia, the Capricorn Group in Queensland and Amboina. (To be continued)

Explanation of Plate IX

- Fig. A. *Liomera monticulosa* (A. MILNE EDWARDS), ♀. Breadth 5.7 mm, length 3.4 mm.
 Fig. B. *Liomera caelata* (ODINER), ♀. Breadth 6.9 mm, length, 4.1 mm.
 Fig. C. *Neoliomera insuralis* (ADAMS et WHITE), ♀. Breadth, 21.2 mm, length 14.3 mm.
 Fig. D. *Liomera laevis* (A. MILNE EDWARDS), ♀. Breadth 16.2 mm, length 9.8 mm.

Explanation of Plate X

- Fig. A. *Leptodius nudipes* (DANA), ♂. Breadth 18.2 mm, length 12 mm.
 Fig. B. *Paramedaeus simplex* (A. MILNE EDWARDS), ♂. Breadth 12.2 mm, length 7.8 mm.
 Fig. C. *Nanocassiope alcocki* (RATHBUN), ♀. Breadth 5.1 mm, length 3.4 mm.
 Fig. D. *Xanthias latifrons* (DE MAN), ♀. Breadth 13.8 mm, length 9.1 mm.

Explanation of Plate XI

- Figs. A-C. *Xanthias pachydactylus* (A. MILNE EDWARDS), A, B, ♂. Breadth 12.6 mm, length 8.5 mm. C, ovig. ♀. Breadth 8.4 mm, length 5.6 mm.
 Fig. D. *Lachnopodus subacutus* (STIMPSON), ♂. Breadth 19 mm, length 12.2 mm.

摘 要

オウギガニ科の種の同定は難かしいことに定評があるが、これは種類が多く、形態的にも変化に富んでいるため、近縁種を見い出すことに相当の経験を必要とするからであらう。種類が多いことは当然古来からの文献が多いことも意味し、各種の異名の整理や文献の入手もなかなか思うにまかせない。これらの前提条件がある程度かなえられれば、種の同定自体は決して難しくはないが、属以上の系統分類には多くの種を調べる必要があり、困難な問題が多い。オウギガニ科の属に関しては、最近の傾向として、パリ自然史博物館の D. GUINOT 女史やすでに引退した R. SERÈNE 博士が主として追及しているように、雄の第1腹肢による細分が著しい。さらに上位の体系として口腔部に位置する出水溝の形成の有無によって、無溝類と有溝類に分けられることが多い。しかし、これは亜科よりももっと広い意味をもっていることは明らかで、他の科と比較すれば、それぞれ Xanthidae と Pilumnidae として科に昇格させることも可能ではないかとさえ考えられる。

オウギガニ科に関してもっとも重要な貢献をしている ALCOCK (1898) は無溝類を3亜科に、有溝類を4亜科に細分しているが、有溝類はその後 BALSS (1932) によって3亜科にまとめられている。本報告ではパラオ諸島産のカニ類にもとづいて、1試論として14亜科に細分したが、とくに無溝類の亜科に異論があるものと思われる。Actaeinae, Carpiliinae, Chlorodiinae, Cymoinae, Etisinae, Euxanthinae, Galeninae, Xanthinae および Zosiminae の9亜科は無溝類の特徴を、Eriphiinae, Pilumninae, Polydectinae, Pseudoziinae および Trapeziinae の5亜科は有溝類の特徴をもつ。これらを一応系統順に解説するが、ここでは紙面の都合により Carpilinae と Xanthiinae のみを扱っている。



