

New records of freshwater Palaemonidae (Crustacea, Decapoda) from New Caledonia

John W. SHORT

Queensland Museum,
P.O. Box 3300, South Brisbane Qld 4101 (Australia)
JohnSh@qm.qld.gov.au

Gérard MARQUET

LERVEM, Université française du Pacifique,
BP 4477 Nouméa, Nouvelle-Calédonie (France)

Short J. W. & Marquet G. 1998. — New records of freshwater Palaemonidae (Crustacea, Decapoda) from New Caledonia. *Zoosystema* 20 (2) : 401-410.

ABSTRACT

A freshwater survey of over thirty-five river catchments throughout mainland New Caledonia ("la Grande Terre") and a number of caves on Lifou, the Loyalty Islands, yielded four new records of Palaemonidae for the region, viz., *Macrobrachium grandimanus* (Randall, 1839), *M. latimanus* (von Martens, 1868), *M. microps* Holthuis, 1978, and *Palaemon concinnus* Dana, 1852, which are reported here. Six species had previously been recorded: *M. aemulum* (Nobili, 1906), *M. australe* (Guérin-Méneville, 1838), *M. caledonicum* (J. Roux, 1926), *M. equidens* (Dana, 1852), *M. lar* (Fabricius, 1798) and *Palaemon debilis* Dana, 1852, bringing the total fauna to ten species. A key is provided to the freshwater Palaemonidae of New Caledonia.

KEY WORDS

Crustacea,
Decapoda,
Palaemonidae,
Macrobrachium,
Palaemon,
New Caledonia,
Indo-West Pacific,
new records.

RÉSUMÉ

Additions à l'inventaire de Palaemonidae (Crustacea, Decapoda) d'eau douce de Nouvelle-Calédonie. Un inventaire effectué sur plus de trente-cinq rivières de la Grande Terre et sur quelques grottes de Lifou (archipel des Îles Loyauté) a permis de recenser quatre espèces signalées pour la première fois en Nouvelle-Calédonie : *Macrobrachium grandimanus* (Randall, 1839), *M. latimanus* (von Martens, 1868), *M. microps* Holthuis, 1978, et *Palaemon concinnus* Dana, 1852. Six autres espèces avaient été recensées auparavant : *M. aemulum* (Nobili, 1906), *M. australe* (Guérin-Méneville, 1838), *M. caledonicum* (J. Roux, 1926), *M. equidens* (Dana, 1852), *M. lar* (Fabricius, 1798) et *Palaemon debilis* Dana, 1852. Le nombre total d'espèces inventoriées s'élève dorénavant à dix. Une clé de détermination des Palaemonidae d'eau douce de Nouvelle-Calédonie est proposée.

MOTS CLÉS

Crustacea,
Decapoda,
Palaemonidae,
Macrobrachium,
Palaemon,
Nouvelle-Calédonie,
Indo-ouest Pacifique,
nouveaux signalements

INTRODUCTION

The freshwater Palaemonidae of New Caledonia were first studied by J. Roux (1926) based on collections made by Roux and F. Sarasin in 1911 and 1912. Three species were reported, including one new to science. Kamita (1967) published an account of the freshwater shrimps collected by the 1958 Osaka Melanesia Expedition but included no new records or species of Palaemonidae. The most detailed survey of the freshwater shrimps of New Caledonia was conducted by the Zoological Institute of the University of Vienna in 1965 led by Professor Dr Ferdinand Starmühlner. In all, 124 stations were sampled in mainland New Caledonia. This material was studied by Holthuis (1969) who listed three new records of Palaemonidae.

The present report is largely based on collections made between September and October 1991 throughout mainland New Caledonia (project PEDCAL). A total of thirty-five river catchments were investigated (Marquet 1996). Later a number of other rivers of "Grande Terre" (surveyed by G. M.) and a few caves on Lifou, in the Loyalty Islands (first by B. Séret, ORSTOM, then by G. M.), were also investigated. In total, this collecting campaign yielded four new records of freshwater Palaemonidae.

MATERIALS AND METHODS

The present material was collected by electrofishing in rivers and using baited traps in caves. The majority of specimens have been lodged in the Muséum national d'Histoire naturelle, Paris (MNHN), with the remainder in the Queensland Museum (QM). Specimen lengths are carapace length (CL) from the orbital margin to the posterior carapace. The second pereopods (large

chelipeds) are abbreviated as P2.

The presence or absence of a pre-anal carina is introduced as an important character for distinguishing species of *Macrobrachium* Bate, 1868. Although the morphology of the pre-anal carina has been widely used in atyid taxonomy it does not appear to have been utilized for palaemonids. The carina is found on the sclerite between the ventral uropods, hereby termed the inter-uropodal sclerite, as it does not appear to have been named previously in the literature. Unlike many features of *Macrobrachium* morphology the presence or absence of a pre-anal carina does not change significantly during development and is present in both sexes. It is therefore a very useful key character.

The morphology of the epistome, sometimes used as a taxonomic character in other decapod groups, is also introduced here for distinguishing species in the genus. This structure shows more developmental variation than the pre-anal carina but can sometimes be used to discriminate between otherwise similar species and is useful for both sexes.

Another useful character not widely used for distinguishing species is the shape of the inferior orbit. In most species this is reasonably consistent between the sexes and at different stages of development.

These new characters have been used in the following key to New Caledonian freshwater Palaemonidae. Unlike previous keys to *Macrobrachium* this key can be used for all adult specimens, not just mature male specimens with fully developed second pereopods. Regrettably, it was still necessary to use the morphology of the second pereopods to some extent (often broken off during the process of preservation and handling), but this has been kept to a minimum and fully developed males (often a small percentage of material collected) are not obligatory for accurate determinations.

KEY TO THE FRESHWATER PALAEMONIDAE OF NEW CALEDONIA

1. Anterior carapace with hepatic spine; P2 hypertrophied in developed males, covered in numerous modified setae (spinules, tubercles, spines of previous authors) *Macrobrachium* 3
- Anterior carapace with branchiostegal spine; P2 similarly developed in both sexes, smooth, not covered in numerous modified setae *Palaemon* 2

- 2 (1). Upper antennular flagellum with fused portion clearly less than half length of shorter free ramus; first male pleopod with vestigial appendix interna *P. concinnus*
- Upper antennular flagellum with fused portion over half length of shorter free ramus; first male pleopod without appendix interna *P. debilis*
- 3 (1). Pre-anal carina absent on inter-uropodal sclerite (between ventral uropods) 4
- Pre-anal carina well-developed on inter-uropodal sclerite 5
- 4 (3). Second pereopods of developed males strongly dimorphic, differing in shape, size and setation; inferior orbit obtuse *M. grandimanus*
- Second pereopods of developed males isomorphic; inferior orbit distinctly angular *M. equidens*
(Freshwater records generally restricted to areas under tidal influence.
More typically an inhabitant of mid to high salinity estuarine areas.)
- 5 (3). Ocular cornea well-developed; fourth abdominal pleura posteroventrally rounded or bluntly angular 6
- Ocular cornea reduced; fourth abdominal pleura posteroventrally acute *M. microps*
- 6 (5). Adult P2 merus clearly longer than carpus 7
- Adult P2 merus about equal to or clearly shorter than carpus 8
- 7 (6). Epistome lobes poorly-developed, low and rounded, not produced anteroventrally in adults; P2 stout, chela without enlarged incisor tooth on each finger in developed males *M. latimanus*
- Epistome lobes strongly-developed, produced anteroventrally in adults; P2 elongate, chela with enlarged incisor tooth on each finger in developed males *M. lar*
- 8 (6). Epistome lobes strongly diverging and widely separated anteriorly *M. aemulum*
- Epistome lobes not strongly diverging anteriorly, poorly to moderately separated 9
- 9 (8). P2 manus clearly longer than dactylus, subcylindrical on major chela of developed males, minor cheliped pubescent on all segments *M. australe*
- P2 manus *ca.* equal to or clearly shorter than dactylus, markedly broadened on major chela of developed males, minor cheliped of developed males without setal pubescence *M. caledonicum*

SYSTEMATICS

Macrobrachium grandimanus (Randall, 1839) (Figs 1C-E, 2)

Restricted synonymy:

Palemon (sic.) *grandimanus* Randall, 1839: 142.

Macrobrachium grandimanus – Holthuis 1950:14, 110 (key), 230-233; 1973: 23-24, text-fig. 7; 1980: 92. – Choy 1984: 272.

Not *Macrobrachium grandimanus* – Liang & Yan 1983: 214, 215, fig. 3. – Liu *et al.* 1990: 103 (key), 113, 114, fig. 11.

MATERIAL EXAMINED. — **Wé.** New Caledonia, Lifou Island, 20°55'S - 167°15'E, in large cave in coconut plantation at border of the sea, netted, 28.VIII.1993, B. Séret, ORSTOM: 1 specimen (MNHN Na13286); 1 ♀, 10.7 mm CL (QM W20013).

Luengoni. New Caledonia, Lifou Island, 21°02'S - 167°25'E, at entrance of cave, netted, 25.VIII.1993, B. Séret, ORSTOM: 2 specimens (MNHN Na13287).

DISTRIBUTION. — Previously recorded from the Ryukyus, the Philippines, Hawaii and Fiji.

DIAGNOSIS

Rostrum of medium length in developed males, with well developed dorsal and ventral carinae, dorsal margin generally straight or slightly convex, occasionally sinuous or upturned, armed with fourteen to fifteen (rarely up to seventeen) teeth, four to five postorbital, teeth more or less evenly spaced, ventral carina with three to five (rarely up to seven) teeth, first tooth located in proximal half or at mid-length of carina.

Ocular cornea large, well-pigmented. Inferior orbit moderately produced, generally obtuse, postantennular carapace margin convex. Epistome distinctly bilobed, lobes widely separated, rounded.

P2 of developed males fully dimorphic, short, minor cheliped reaching tip of scaphocerite by carpus or more distal segments. Major cheliped

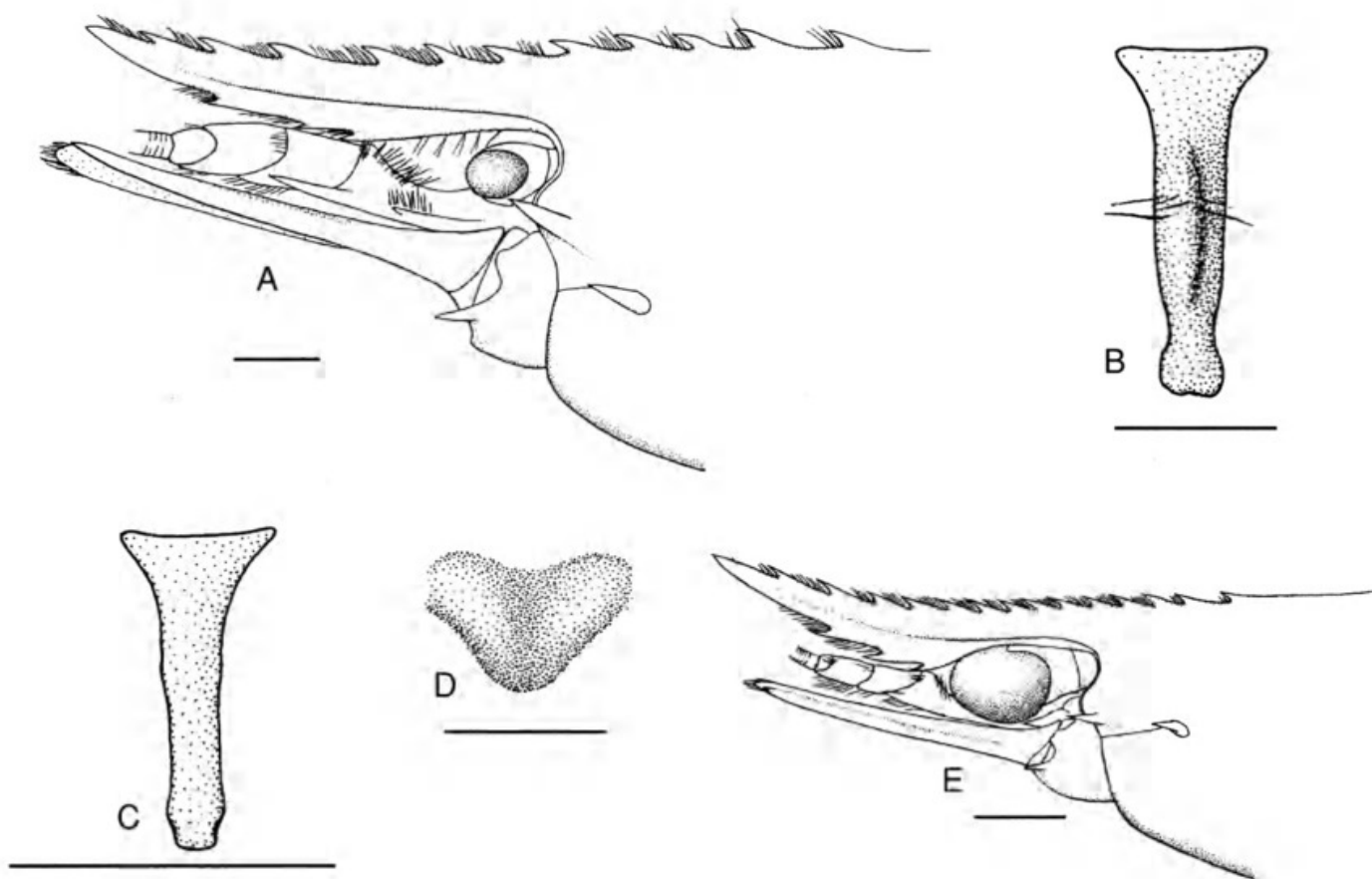


FIG. 1. — A, B, *Macrobrachium microps* Holthuis, 1978, ♂ (21.6 mm CL); A, anterior carapace; B, inter-uropodal sclerite; C-E, *M. grandimanus* (Randall, 1839), ♀, 10.7 mm CL; C, inter-uropodal sclerite; D, epistome; E, anterior carapace. Scale bars: A, E, 2 mm; B-D, 1 mm.

with well-developed setal pubescence on manus, chela with well-developed gape between fingers, opposable edges armed with small to moderately large teeth along length and a large incisor tooth, manus broadened, maximum breadth much greater than maximum breadth of merus; carpus clearly shorter than chela; merus *ca.* equal in length to carpus. Minor cheliped without setal pubescence, chela with well-developed gape between fingers, opposable edges of fingers dentate proximally, distally entire, manus clearly shorter than dactylus, slightly broadened; carpus clearly shorter than chela; merus *ca.* equal in length to carpus.

Thoracic sternite 4 with well-developed median process. Fourth abdominal pleura bluntly angular posteroventally, fifth pleura acutely angular posteroventally, inter-uropodal sclerite without pre-anal carina.

REMARKS

M. grandimanus has previously been recorded from anchialine caves in the Hawaiian Islands (Holthuis 1973). The present records are all from caves adjacent to the sea which were fresh at the time of collection. It is local knowledge that the water level rises in these caves when the tide is very high but undetermined whether the water becomes brackish.

Although the collection does not include a developed male, the characteristic rostrum with many, more or less evenly-spaced, dorsal teeth, the lack of a pre-anal carina, the shape of the inferior orbit and the widely separated epistome lobes are sufficient to confirm the identity of the species.

Liang & Yan (1983) recorded as *M. grandimanus* a species from Hainan Island, China. However the second pereiopods do not agree with typical

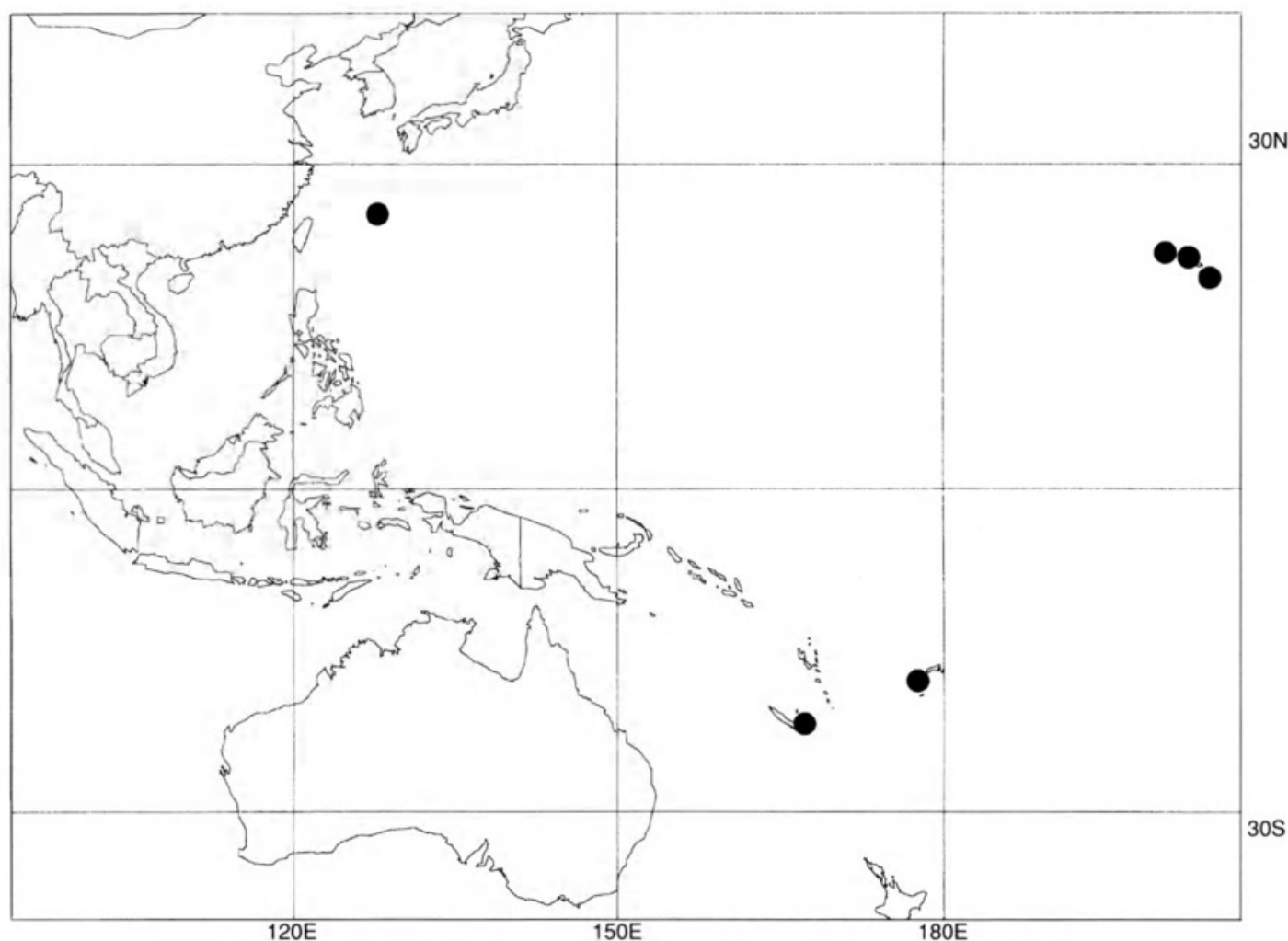


FIG. 2. — Distribution of *Macrobrachium grandimanus* (Randall, 1839).

M. grandimanus. Liang & Yan's illustration shows a distinctive setal pubescence which continues from the superior manus onto the proximal pollex. In *M. grandimanus* the setal pubescence is restricted to the proximal half of the manus. Liu *et al.* (1990) also figured a specimen which agrees closely with Liang & Yan's. This species appears to be undescribed.

Macrobrachium latimanus

(von Martens, 1868)

(Fig. 3)

Restricted synonymy:

Palaemon latimanus Von Martens, 1868: 44.

Macrobrachium latimanus – Holthuis 1950: 16, 109 (key), 205-209, fig. 43a, b; 1980: 97, 98. – Tiwari 1955: 233, fig. 2; 1961: 98-104, figs 1, 2. – Costa 1979, pl. 1d. – Hwang & Yu 1982: 171, text-fig. 11, pl. III fig. B. – Chace & Bruce 1993: 23 (key), 31-32, fig. 11.

MATERIAL EXAMINED. — **Napoemien River.** New

Caledonia, PEDCAL str 17, 20°58'S - 165°20'E, altitude 165-200 m, river breadth 2 m, water temperature 19 °C, depth 0.5 m, electrofished, 15.IX.1991: 1 specimen (MNHN Na13288).

Padyeem River. New Caledonia, 20°34'S - 164°48'E, depth 0.2 m, electrofished, 6.VI.1997, G. Marquet: 1 ♂, 23.5 mm CL, 2 ♀♀, 17.1, 20.5 mm CL (QM W22255).

DISTRIBUTION. — Wide-ranging Indo-West Pacific, from India and Sri Lanka to the Ryukyus Islands and the Marquesas Islands.

DIAGNOSIS

Rostrum short in developed males, with well-developed dorsal and ventral carinae, dorsal margin generally convex, occasionally sinuous, armed with six to twelve teeth, one to two post-orbital, teeth tending to be more closely spaced distally than proximally above orbit; ventral carina dentate, two to four teeth, generally unarmed on proximal half with first tooth located clearly within distal half.

Ocular cornea large, well-pigmented. Inferior

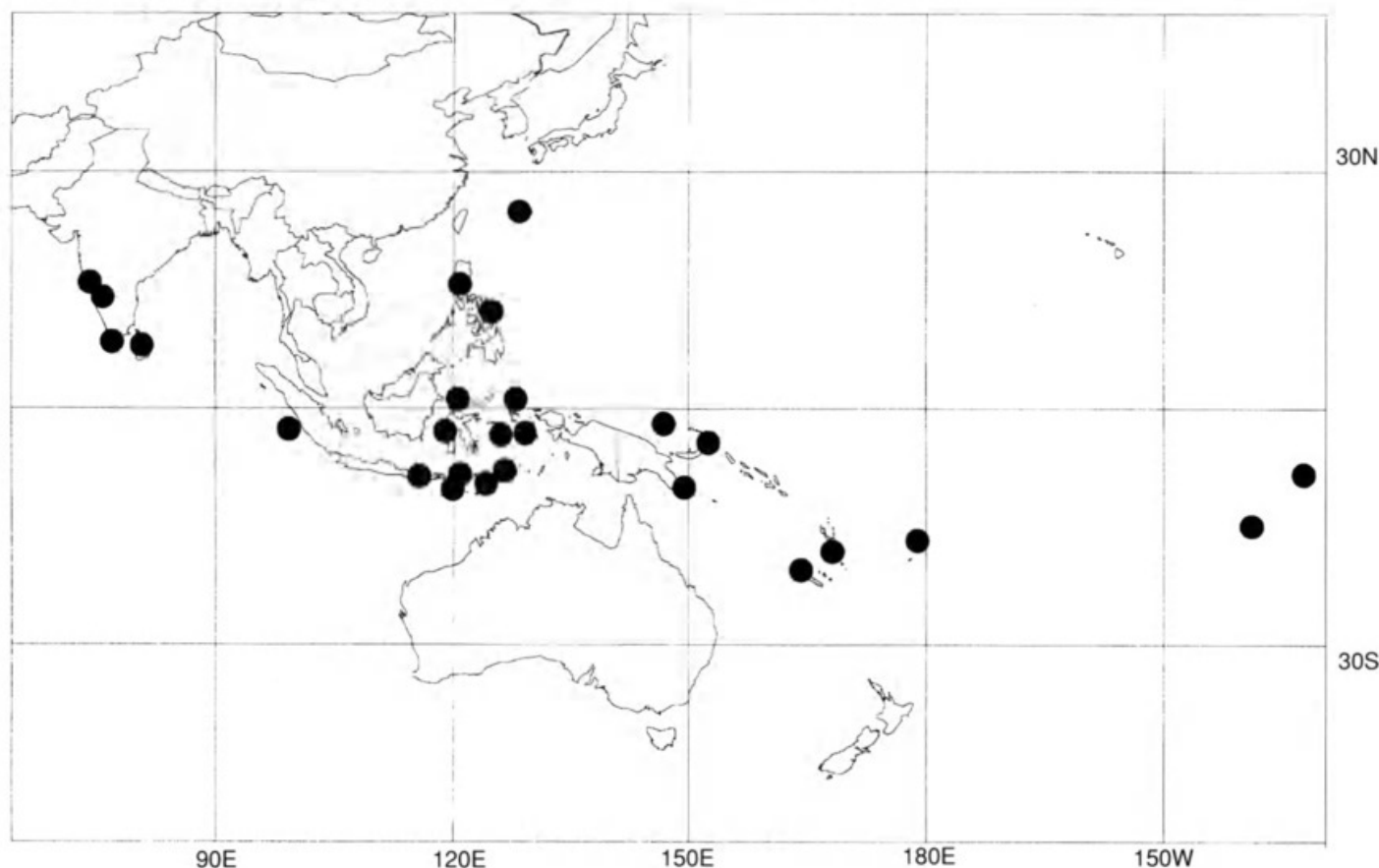


FIG. 3. — Distribution of *Macrobrachium latimanus* (von Martens, 1868).

orbit moderately produced, obtuse, postantennular carapace margin evenly rounded. Epistome distinctly bilobed, lobes rounded, widely separated.

P2 of developed males isomorphic (may be subequal in length), long, merus reaching tip of scaphocerite; chela with weak gape, short setal pubescence on manus and fingers, manus moderately broadened, breadth clearly greater than maximum merus breadth, manus clearly longer than dactylus; carpus clearly shorter than chela; merus clearly longer than carpus.

Thoracic sternite 4 with well-developed median process. Fourth abdominal pleura bluntly angular posteroventrally, fifth pleura angular posteroventrally, inter-uropodal sclerite with elevated pre-anal carina.

REMARK

This species appears restricted to mountain streams in the higher rainfall areas of eastern New Caledonian e.g. Napoemien River in the north and the Rivière du Trou bleu in the south (photograph sent to J. S. for identification by Christine Pöllabauer, Erbio, Nouméa).

Macrobrachium microps Holthuis, 1978

(Figs 1A, B, 4)

Macrobrachium microps Holthuis, 1978: 210-214, figs 1, 2. — Bruce & Iliffe 1993: 83-96, figs 1-6.

MATERIAL EXAMINED. — **Luengoni**. New Caledonia, Lifou Island, 21°02'S - 167°25'E, cave, trapped, 29.XII.1994, G. Marquet: 2 ♂♂, 21.6, 23.1 mm CL (QM W19913).

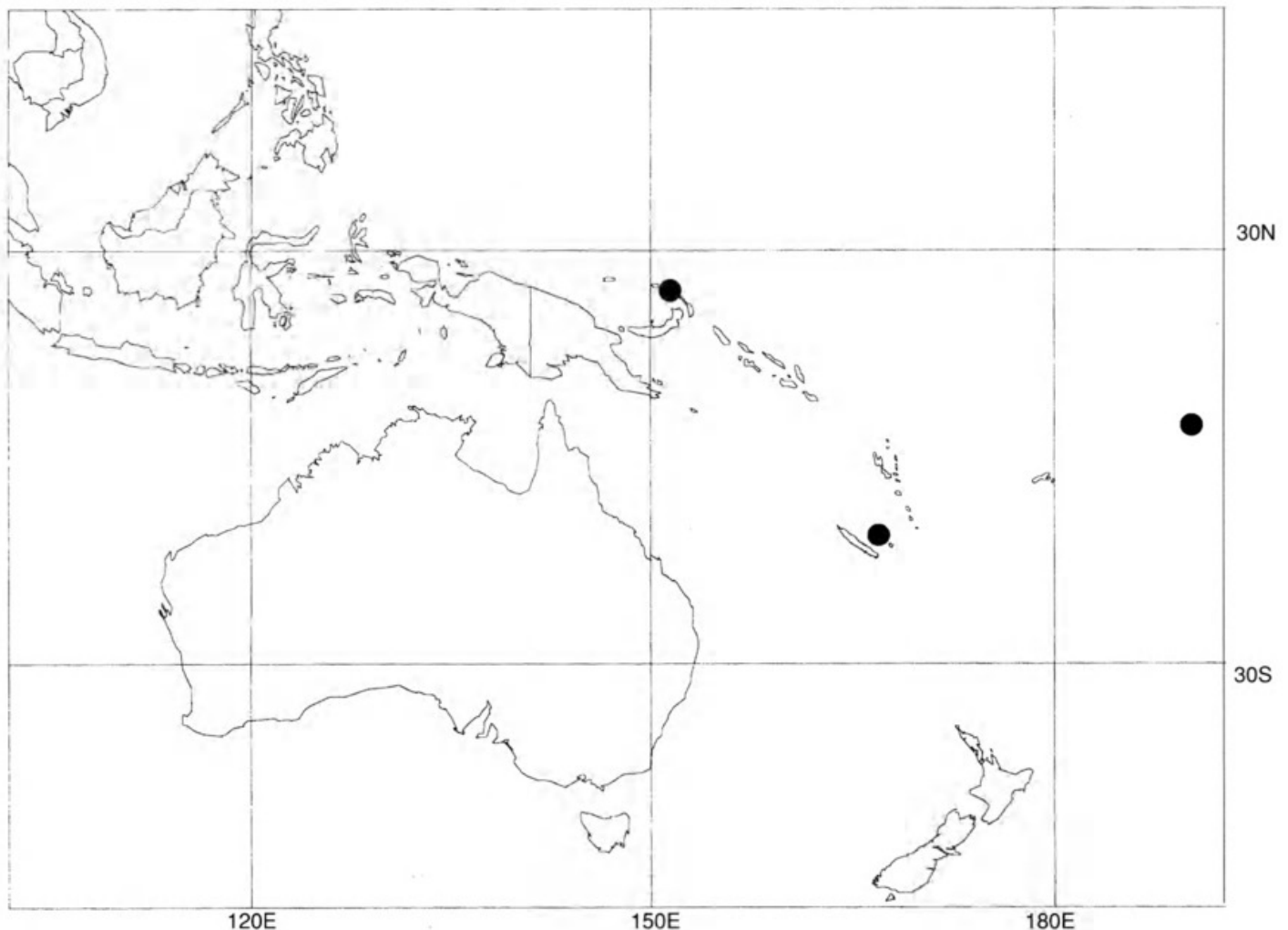


FIG. 4. — Distribution of *Macrobrachium microps* Holthuis, 1978.

DISTRIBUTION. — Previously recorded from the type locality Danmin Cave, near Konogusgus, New Ireland and West Samoa.

DIAGNOSIS

Rostrum short in developed males, with well-developed dorsal and ventral carinae (ventral carina sometimes reduced), dorsal margin slightly sinuous, armed with ten to eleven teeth, four to five postorbital, teeth more or less evenly-spaced, ventral carina with three to four teeth, first tooth located in proximal half to about mid-length.

Ocular cornea reduced, but well-pigmented. Inferior orbit obtuse, postantennular carapace margin evenly rounded. Epistome distinctly bilobed, lobes rounded, widely separated.

P2 of developed males fully dimorphic, short, minor cheliped reaching scaphocerite by carpus or more distal segments. Major cheliped without setal pubescence, chela without gape between fingers, manus broadened, maximum breadth much greater than maximum merus breadth, strongly inflated at mid-length; carpus clearly shorter than chela; merus *ca.* equal in length to carpus or slightly shorter. Minor cheliped without setal pubescence, chela with well-developed gape between fingers, manus moderately broadened, breadth clearly greater than maximum merus breadth, clearly shorter than dactylus; carpus clearly shorter than chela; merus slightly shorter than carpus.

Thoracic sternite 4 with low median boss. Fourth abdominal pleura posteroventrally acute, inter-uropodal sclerite with elevated pre-anal carina.

REMARKS

The present material, which does not include a fully-developed male, agrees with the two previously known specimens in the following unique combination of characters for the genus: fourth and fifth abdominal pleurae posteroventrally acute; ocular cornea reduced, but well-pigmented; and the obtuse, evenly rounded, inferior orbit. Rostrum morphology also falls within the previous range of variation recorded for the species.

Although nothing is known of the life cycle of

M. microps, the present distributional records suggest recruitment of juveniles from haline waters and an extended, planktonic larval cycle rather than a land-locked life cycle.

Palaemon concinnus Dana, 1852

Restricted synonymy:

Palaemon concinnus Dana, 1852: 26. — Chace & Bruce 1993: 40. — Short 1995: 622.

Palaemon (Palaemon) concinnus — Holthuis 1950: 61, fig. 12.; 1980: 109.

MATERIAL EXAMINED. — **Néra River.** New Caledonia, 21°36'S - 165°27'E, netted, 29.V.1995, G. Marquet: 4 ♂♂, 9.4-10.6 mm CL; 1 ovig. ♀, 11.1 mm CL; 1 non-ovig. ♀, 11.3 mm CL (QM W20738).

DISTRIBUTION. — Wide-ranging Indo-West Pacific: Eastern Africa to Hong Kong, the Philippines, Australia and the Tuamotu Archipelago.

DIAGNOSIS

Carapace armed with submarginal branchiostegal spine. Rostrum long, with well-developed dorsal and ventral carinae, dorsal carina sinuous or upturned, with distinct unarmed region, bearing five to eight teeth, one tooth postorbital, ventral carina dentate, three to seven teeth.

Ocular cornea large, well-pigmented. Inferior orbit strongly produced, bluntly angular, postantennular carapace margin straight. Antennule upper flagellum with fused portion less than half total length of shorter free ramus. Vestigial appendix interna present on first male pleopod.

REMARKS

This widely-distributed species is an inhabitant of both lowland fresh and brackish waters.

DISCUSSION

The New Caledonian freshwater palaemonid fauna, which now totals ten species in two genera, is comparable to the ten species (plus one introduced species, *M. rosenbergii*) recorded from neighbouring Fiji (Choy 1984). Interestingly, there are three wide-ranging, Indo-West Pacific

species recorded from Fiji, but so far absent from New Caledonia, viz. *M. gracilirostre* (Miers, 1875), *M. lepidactyloides* (de Man, 1892) and *M. placidulum* (de Man, 1892). It is likely that at least one of these will be found during future collecting campaigns.

It is also interesting that all but one New Caledonian species, *M. caledonicum* (J. Roux, 1926), the only endemic, are wide-ranging in the Indo-West Pacific. No large-egged, oligohaline palaemonids have so far been recorded from New Caledonia or from the other islands of Oceania. This contrasts with the larger continental land mass of Australia, directly west across the Coral Sea, which has four large-egged, oligohaline species of *Macrobrachium*, viz. *M. australiense* Holthuis, 1950; *M. bullatum* Fincham, 1987; *M. handschini* (J. Roux, 1933); and one undescribed species (Short unpublished data).

Acknowledgements

The PEDCAL freshwater survey of New Caledonia was funded by a grant from the Commission de Coordination de la Recherche dans les Départements et Territoires d'Outre-Mer (CORDET). Professor Alain Crosnier (MNHN, Paris) and B. Séret (ORSTOM) provided help at different levels during the survey, the former also performed preliminary sorting and sent the material to Australia (to J. S.) for study.

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Short, John W and Marquet, Gérard. 1998. "New records of freshwater Palaemonidae (Crustacea, Decapoda) from New Caledonia." *Zoosystema* 20(2), 401–410.

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