

ÉTUDES HYDROBIOLOGIQUES EN NOUVELLE-CALÉDONIE (Mission 1965 du Premier Institut de Zoologie de l'Université de Vienne) (suite)*

IX. The freshwater shrimps (Crustacea Decapoda, Natantia) of New Caledonia

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RÉSUMÉ

Les 21 espèces de crevettes d'eau douce connues de la Nouvelle Calédonie sont énumérées. Elles appartiennent à deux familles (les Palaemonidae et les Atyidae) et 5 genres. Dans la collection du Dr. STARMÜHLNER étudiée ici, 16 espèces sont représentées, 5 d'elles étant rapportées ici pour la première fois de la Nouvelle Calédonie : une espèce est décrite comme nouvelle pour la science.

SUMMARY

An enumeration is given of the 21 species of freshwater shrimps known from New Caledonia. They belong to two families (the Palaemonidae and Atyidae) and five genera. In Dr. STARMÜHLNER'S collection, which is studied here, 16 species are represented, five of those are new to New Caledonia, one is even new to science.

ZUSAMMENFASSUNG

Die 21 Arten von Süßwassergarnelen die bis auf heute von Neu-Caledonien bekannt sind, werden hier besprochen. Sie gehören zwei Familien (die Palaemonidae und Atyidae) und fünf Gattungen an. Von diesen Arten sind sechzehn in den hier untersuchten Sammlungen Dr. STARMÜHLNER'S vertreten; fünf davon sind neu für Neu-Caledonien, und eine Art ist neu für die Wissenschaft.

* Les articles I à VI ont paru dans le cahier O.R.S.T.O.M., sér. Hydrobiol., II, 1, 1968, l'article VII dans le cahier O.R.S.T.O.M., sér. Hydrobiol., II, 2, 1968 et l'article VIII dans le cahier O.R.S.T.O.M., sér. Hydrobiol., II, 3-4, 1968.

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Between June and October 1965 an Austrian expedition under the leadership of Prof. Dr. Ferdinand STARMÜHLNER of the Zoological Institute of the University of Vienna, explored the fresh waters of New Caledonia. At 124 stations all over the island samples were taken, and of each of the localities the accurate data as to the nature of the water and the environment were noted (see STARMÜHLNER, 1968). The present report deals with the shrimps collected during the expedition.

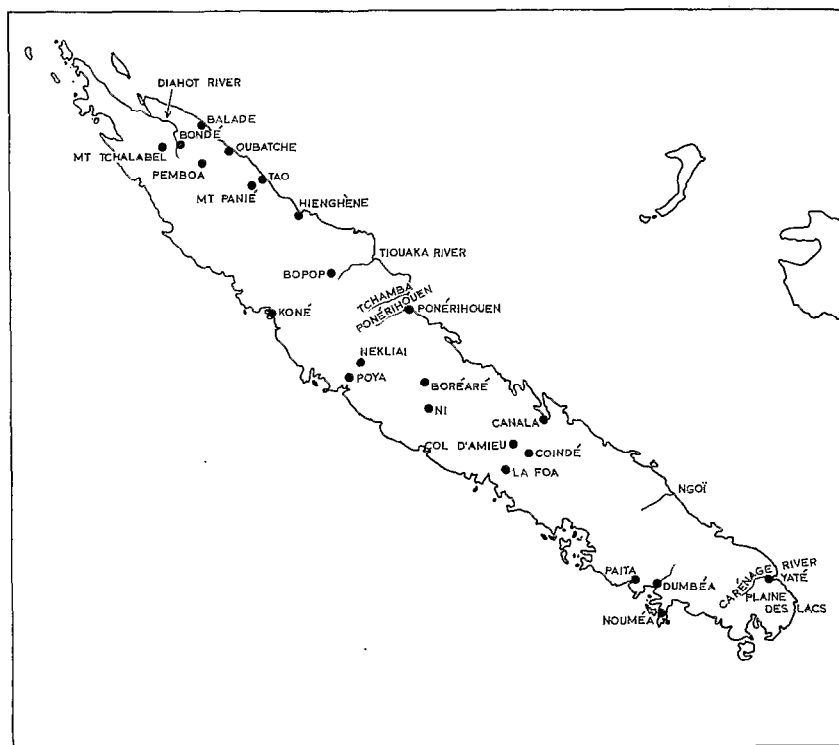


Fig. 1. — Map of New Caledonia with localities mentioned in the text.

The main source of information on the freshwater Decapoda of New Caledonia is J. ROUX's (1926) report on the collections made in 1911 and 1912 by himself and F. SARASIN. Before the publication of ROUX's paper only three freshwater prawns had been reported from New Caledonia. In ROUX's account no less than 14 species and 5 additional subspecies are dealt with. In 1967 T. KAMITA published an account of the freshwater shrimps collected by the Osaka Melanesia Expedition of 1958 in New Caledonia; in this report 5 species are dealt with, one of these not mentioned by ROUX. Dr. STARMÜHLNER's expedition collected 16 species, 5 of which are now reported for the first time from the island. At present 21 species of freshwater shrimps are known from New Caledonia, three of which are of rather uncertain status. I have tried to give in the present paper a complete list of the known species of freshwater shrimp of New Caledonia with all published New Caledonia records.

The map of fig. 1 contains all the localities mentioned in the text, of which I have been able to find the exact situation. For tracing the localities mentioned by J. ROUX (1926) the narrative by F. SARASIN (1917) proved to be of great value.

It is a pleasant duty to express here to Dr. STARMÜHLNER my sincere gratitude for entrusting me with the study of his interesting collection, which, thanks to his accurate description of the localities adds considerably to our knowledge of the various species represented in it.

The abbreviation cl. is used in the text to denote carapace length.

PALAEMONIDAE

Macrobrachium Bate, 1868

Of this genus, which he indicated as *Palaemon*, J. Roux (1926) mentioned three species for New Caledonia. Two of these were later also reported from the island by KAMITA (1967). The present material brings the number of species known from New Caledonia at five.

Macrobrachium caledonicum (J. Roux, 1926)

Palaemon (Macrobrachium) caledonicus J. Roux, 1926, p. 224, figs. 52-54.

Macrobrachium caledonicum, HOLTHUIS, 1950, p. 123; KAMITA, 1967, p. 6, text-fig. 6, pl. 1 figs. D, E.

MATERIAL EXAMINED.

Nérihouen River, left branch of Nimbaye River, near Saint-Yves, Ponérihouen area, east coast; altitude 8 m, a deep valley between mountains of 121 and 274 m high, width of river 10 to 15 m, depth 0.1 to 0.5 m, t° 18.6 $^{\circ}$ C, flow 0.2 to 1 m/sec., bottom gravel and sand, pH 7.6; 27 August 1965; FNK 82. — 1 juvenile.

The specimen is very young (cl. 6 mm) and moreover lacks the second pereopods. Its rostrum agrees quite well with the figures given by J. Roux (1926) and KAMITA (1967) for the present species, and differs from that of all other species known from New Caledonia. The rostrum reaches to the end of the antennular peduncle and has the formula $\frac{2}{3} \frac{12}{3}$.

The species is not known outside New Caledonia. J. Roux (1926) reported it from the northeastern and central part of the island: Bondé, Tao, Koné and surroundings, Bopope (= Bopop), Coula River near Boréaré, Ni, La Foa, Coindé, and Canala. KAMITA's (1967) material came from the Nouméa fish market and evidently had been caught near Nouméa. The species seems to occur all over New Caledonia and is used there as food.

Macrobrachium australe (Guérin, 1838)

MATERIAL EXAMINED.

Middle reaches of Tchamba River, 5 km below the village of Tchamba and 6 km above its mouth, Ponérihouen area, east coast; altitude 5 m, width of stream 10 to 20 m, depth 0.05 to 1.00 m, t° 19.2 to 20.1 $^{\circ}$ C, flow 0 to 1 m/sec., bottom gravel and sand with algae and aquatic plants, pH 7.5, Cl. 8.9 mg/l; 26 August 1965; FNK 80. — 1 juvenile.

Middle reaches of Hienghène River near Gné, 10 km above its mouth, Hienghène area, east coast; altitude 12 m, a wide valley between high mountains, width of river 4 to 15 m, depth 0.02 to 1.00 m, t° 22.0 to 23.7 $^{\circ}$ C, flow 0 to 1 m/sec., bottom gravel and sand with algae and aquatic plants, pH 7.3, Cl. 8.2 mg/l; 3 September 1965; FNK 89. — 2 juveniles.

Although the specimens are all juvenile (cl. 12 to 13 mm) they can confidently be assigned to the present species. They show the rostral formula $\frac{2}{3} \frac{8+2}{3}$.

So far the species has not been reported from New Caledonia, but it could be expected there as its range extends from Madagascar and the Seychelles to Polynesia.

Macrobrachium aemulum (Nobili, 1906)

Palaemon (*Parapalaemon*) *aemulus*, J. ROUX, 1926, p. 221, figs. 47-51.

Macrobrachium aemulum, HOLTHUIS, 1950, p. 135 ; KAMITA, 1967, p. 8, text-fig. 7, pl. 1 figs. F, G. not *Palaemon* (*Parapalaemon*) *aemulus*, BOONE, 1935, p. 157, pl. 40.

MATERIAL EXAMINED.

Upper course of Hienghène River near Kavatch, Hienghène area, east coast ; altitude 25 m, a deep valley between mountains of 238 and 698 m; width of the river 3 to 5 m, depth 0.05 to 0.5 m, t° 19.0 °C, flow 0.5 to 1.5 m/sec., bottom rubble, gravel and sand, pH 7.5, Cl. 7.8 mg/l ; 6 September 1965 ; FNK 94. — 1 specimen.

Upper reaches of Ouen Koh River near forest station of Col d'Amieu, between La Foa and Canala, central part of the island; altitude 300 m, width of river 10 to 15 m, depth 0.1 to 0.7 m, t° 15.3 °C, flow 0 to 0.2 m/sec., bottom shale, pH 7.1; 30 July 1965; leg. M. Gay. — 9 specimens.

Carénage River near La Capture, southeastern part of the island ; 4 January 1967; 17 H. — 2 specimens.

The specimens are full grown and agree with previously published descriptions and figures.

J. Roux (1926) reported the species from the following localities in New Caledonia : Col de Poraris above Balade, Tao, Tiouaka Valley, Bopope (= Bopop), Koné, Coula River near Boréaré, Mt. Canala, Coindé, Ngoï Valley, Yaté, Madeleine (Plaine des Lacs) ; of only two of these localities the altitude is given, viz., 600 m for Mt. Canala and 200 m for Ngoï Valley. KAMITA (1967) reported a specimen from the Kiki swamp in the southern part of the island, his other specimen came from Nouméa fishmarket and was evidently caught near Nouméa.

The species was originally described from Gatavaké, on Mangaréva Island, Gambier Archipelago, Polynesia, from a rivulet at an altitude of 180 m. *M. aemulum* is not known with certainty from any other locality but Mangaréva and New Caledonia. HOLTHUIS (1950, p. 136), basing himself solely on the published descriptions, synonymized *Palaemon nobilii* HENDERSON et MATTHAI (1910) from S.E. India, with the present species. TIWARI (1955, p. 233), who had Indian material at his disposal treated *Macrobrachium nobilii* as a distinct species; it seems best to follow Tiwari here.

BOONE (1935) described and figured under the name *Palaemon* (*Parapalaemon*) *aemulus* a specimen of *Macrobrachium* said to originate from Nouméa, New Caledonia. BOONE's account shows clearly that what she had was *Macrobrachium novaehollandiae* (De Man) (see HOLTHUIS, 1950, p. 136, 155), a species so far only known from eastern Australia (Queensland and New South Wales). It seems likely that Boone's specimen was incorrectly labelled as to locality.

Macrobrachium equidens (Dana, 1852)**MATERIAL EXAMINED.**

Mangrove swamp near Nouméa, southern New Caledonia; 25 July 1965 ; FNK 34. — 1 juvenile.

The specimen obtained by Dr. STARMÜHLNER is a juvenile (cl. 11 mm) and therefore its identification caused some difficulty. However, it shows the typical shape of the rostrum of *M. equidens*, curved upward with formula $\frac{2}{5}$ 9. The antennal and hepatic spine are situated in one line. The second legs resemble those of juvenile *M. equidens*. Also the habitat, brackish

water, agrees with what is known of the species. I have therefore no hesitation in identifying the specimen with *M. equidens*.

The species has a wide range: East Africa to S. China, New Guinea and New Britain. It has so far not been reported from New Caledonia and this record forms an eastward extension of its known range of distribution.

Macrobrachium lar (Fabricius, 1798)

Palaemon (Eupalaemon) lar, J. ROUX, 1926, p. 221.

Macrobrachium lar, HOLTHUIS, 1950, p. 176, fig. 37.

MATERIAL EXAMINED.

Tiari River, north of Col d'Amoss, cascade zone 1 km above the mouth, Balade area, north east coast; altitude 10 m, width of river 2 to 5 m, depth 0.02 to 1 m, t° 24.6 °C, flow more than 1 m/sec., bottom cristalline schists and rubble, muddy sand in the deeper holes, pH 7.1, Cl. 21.7 mg/l; 17 September 1965; FNK 107. — 4 specimens.

Upper reaches of Ouen Koh River near forest station of Col d'Amieu, between La Foa and Canala, central part of the island; altitude 300 m; width of river 10 to 15 m, depth 0.1 to 0.7 m, t° 15.3 °C, flow 0 to 0.2 m/sec., bottom shale, pH 7.1; 30 July 1965; leg. M. Gay. — 1 ovigerous female.

The specimens are fullgrown and quite characteristic for the species.

Macrobrachium lar has a very extensive range of distribution, it is known from East Africa to the Riukiu Islands and Polynesia. The only previous record from New Caledonia is that by J. Roux (1926), who reported material from the following localities : Tchalabel, Tao, Hienghène, Tiouaka Valley, Coula River near Boréaré, Ni and Canala. It is thus known from the northern and central part of the island.

Palaemon Weber, 1795

Most species of this genus are restricted to marine habitats, a few are pure freshwater animals, while others can tolerate a wide range of salinity and are found both in the sea, and in brackish, sometimes practically fresh, water. One species of the latter category was found in Dr. Starmühlner's collection.

Palaemon debilis Dana, 1852

MATERIAL EXAMINED.

Mangrove swamp near Nouméa, southern New Caledonia; 25 July 1965; FNK 34. — 1 ovigerous female.

The present specimen is an ovigerous female, the tip of the rostrum of which is broken. It was found in one sample with *Macrobrachium equidens*.

Palaemon debilis is known from fresh, brackish and marine habitats. Its range extends from the Red Sea and the islands in the western Indian Ocean to the Riukiu Islands and the Hawaiian Archipelago. It is now reported for the first time from New Caledonia.

ATYIDAE

Atya Leach, 1816

Four species of *Atya* have been reported from New Caledonia, but of only two the occurrence there is certain. A. MILNE EDWARDS (1864, p. 148) described two new species from New Caledonia *A. margaritacea* and *A. robusta*. As shown by later authors (e.g. BOUVIER, 1925, p. 314; J. ROUX, 1926, p. 217) the former species is identical with *Atya scabra* (LEACH, 1815), a species known from the Atlantic slope of Central and South America and the West Indies. *Atya robusta* is identical with *Atya innocous* (HERBST, 1792) of the same general area (see HOLTHUIS, 1966, p. 237). It seems most likely therefore that A. MILNE EDWARDS's type material was incorrectly labelled as to the locality and *Atya margaritacea* (= *A. scabra*) and *A. robusta* (= *A. innocous*) can be safely removed from the list of species indigenous to New Caledonia, even though BOUVIER (1925) and J. ROUX (1926) still thought it possible that these species might turn up there.

Thus only two species of *Atya* are considered here to be actually native to the island:

Atya spinipes Newport, 1847

Atya moluccensis, BOUVIER, 1905, p. 113 ; BOUVIER, 1925, p. 303 ; J. ROUX, 1926, p. 218.

This species, which is not represented in the collection of Dr. STARMÜHLNER, was first reported from New Caledonia by BOUVIER (1905 and 1925) who gave no more accurate locality indication. J. ROUX (1926) found the species rather common in New Caledonia and mentioned material from the following localities: Oubatche and surroundings (on the slope of Mt. Ignambi), slope of Mt. Panié, Tao, Tiouaka Valley, Coula River near Borearé and Canala. The first two localities are situated at altitudes of about 600 and about 500 m respectively.

Atya spinipes, which perhaps is better known as *A. moluccensis* DE HAAN (1849), has a range which extends from India to Japan and Polynesia.

Atya pilipes Newport, 1847

Atya pilipes, J. ROUX, 1926, p. 220.

This species is not represented in the present collection either. An ovigerous female was reported by J. ROUX from near Oubatche on the slope of Mt. Ignambi at an altitude of about 600 m, where it was found among *Atya spinipes*.

Atya pilipes is known from Madagascar and the Seychelles eastward to Polynesia.

Caridina H. Milne Edwards, 1837

Dr. STARMÜHLNER's collection contains 6 species of this genus. Three more species have been reported from New Caledonia by previous authors. The status of some of the species is rather unsatisfactory and much work has still to be done to straighten out the systematics of the genus and its species. Of the present six species four have a very wide range of distribution, two are endemic to the island, one of the latter being new to science.

***Caridina typus* H. Milne Edwards, 1837**

Caridina typus, BOUVIER, 1904, p. 134; KAMITA, 1967, p. 3, text-fig. 4, pl. 1 fig. B.

Caridina typus caledonica BOUVIER, 1925, p. 253, figs. 296, 297.

Caridina typa, J. ROUX, 1926, p. 201.

MATERIAL EXAMINED.

Side branch of Dumbéa River, 14.9 km below the dam, south west coast; altitude 10 m, width of stream 4 to 6 m, depth 0.1 m, t° 17.8 $^{\circ}$ C, flow 0.0 to 0.5 m/sec., bottom gravel, sand and ferruginous deposits; 11 July 1965; FNK 4. — 1 specimen.

La Farino River, near La Farino village, area of Col d'Amieu between La Foa and Canala, central part of the island; altitude 230 m, width of stream 2 to 5 m, depth 0.1 to 0.5 m, t° 16.1 $^{\circ}$ C, flow 0.5 to 1 m, bottom crystalline schists, rubble and muddy sand, pH 7.4, Cl. 10.3 mg/l; 23 July 1965; FNK 44. — 1 specimen.

A small cold water stream which flows into the effluent of a hot spring, near La Crouen, area of Col d'Amieu between La Foa and Canala, central part of the island; altitude 40 m, width of stream 0.2 to 0.5 m, depth 0.05 to 0.10 m, t° 25 $^{\circ}$ C, bottom rock, gravel, and muddy sand, pH 7.7, Cl. 9.2 mg/l; 29 July 1965; FNK 47. — 2 specimens.

Small stream near Col de Boa cave, Poya-Nekliai area, west coast; altitude 300 m, width of stream 0.5 to 1.5 m, depth 0.02 to 0.15 m, t° 17.2 $^{\circ}$ C, flow 0 to 1 m/sec., bottom calcareous rock, gravel and sand, pH 8.2, Cl. 7 mg/l; 11 August 1965; FNK 64. — 1 specimen.

Ouarau, side branch of the upper Tchamba River near Letocart farm north of Tchamba village, Ponérihouen area, east coast; altitude 45 m, width of stream 1.5 to 2 m, depth 0.05 to 0.5 m, t° 15.2 $^{\circ}$ C, flow 0 to 1 m/sec., bottom crystalline schists, rubble and sand, pH 7.2, Cl. 9.9 mg/l; 25 August 1965; FNK 79. — 4 specimens.

Pool in a dried creek bed near Le Cresson cave, near the highway Koumac-Ouégoua (Bondé), north coast; altitude 60 m, width 1 m, depth, 0.05 to 0.3 m, t° 19.5 $^{\circ}$ C, bottom calcareous rock, sand with some stones and many dead leaves, pH 7.5, Cl. 15.6 mg/l; 18 September 1965; FNK 110. — 3 specimens.

The largest specimen has a carapace length of 12 mm. BOUVIER (1925), who had 6 specimens from New Caledonia at his disposal assigned them to a separate subspecies *Caridina typus caledonica* on account of the short dactyli of the walking legs (1/5 instead of 1/4 of the length of the propodus for p^3 and 1/4 instead of 1/3 of the length of the propodus in p^4). These and the few other differences mentioned by Bouvier (more slender stylocerite, longer carpus and palm of the chelipeds, etc.) are unimportant and fall well within the range of variation of the species. The present material does not support Bouvier's views that the New Caledonian form is a distinct subspecies. Therefore the subspecific name *caledonica* is not accepted here. A far greater material from all over the range of the species is necessary, I believe, before one seriously can start distinguishing subspecies within the species of *Caridina*, which especially in the characters employed by BOUVIER (like relative length and width of various parts of the body) show usually a great variation. BOUVIER's subspecies has neither been adopted by J. ROUX (1926) or KAMITA (1967).

BOUVIER (1904, 1925) mentioned the species from New Caledonia without a more specified locality. J. ROUX (1926) reported it from the following New Caledonia localities: Mt. Tchalabel, creek between Diahot valley and Col Poraris, between Pouébo (S. E. of Balade) and Oubatche, Oubatche, Hienghène, Canala, Ciu above Canala, and Yaté. The only altitude given is 300 m. KAMITA's (1967) specimen came from a small stream near Mt. Koghi. The range of the species is very wide and extends from East Africa to Japan and Polynesia. Its range within New Caledonia extends over the full length of the island.

Caridina nilotica* (P. Roux, 1833)*MATERIAL EXAMINED.**

South west bank of Lac en Huit, Ouénarou area, southern part of the island; altitude 250 m, water 0 to 0.5 m deep, t° 21.5 °C, bottom peridotite rock with holes and fissures, with bullrushes, pH 6.6; 19 August 1965; FNK 76. — 6 specimens.

Lac en Huit; 3 January 1967. — 1 ovigerous female.

Lac de Barrage; 4 January 1967. — 1 ovigerous female.

The specimens agree quite well with the description given by me for Madagascar specimens (Holthuis, 1965, p. 15, fig. 5). The ovigerous females have the eggs rather large, with diameters of 0.6-0.7 $\times$ 1.0-1.2 mm. The total length of the ovigerous female from Lac en Huit is 21 mm, in the one from Lac de Barrage the rostrum is broken.

Caridina nilotica has a very wide distribution, it has been reported from East Africa to Japan and Polynesia. However, the status of this species and its various subspecies and varieties is not too well known and much remains to be done to clear up the existing confusion.

***Caridina longirostris* H. Milne Edwards, 1837**

Caridina Wycki BOUVIER, 1904, p. 130; BOUVIER, 1905, p. 79.

Caridina nilotica brachydactyla BOUVIER, 1925, p. 155.

Caridina nilotica gracilipes J. ROUX, 1926, p. 203.

Caridina nilotica brevidactyla J. ROUX, 1926, p. 204.

Caridina nilotica meridionalis J. ROUX, 1926, p. 207.

MATERIAL EXAMINED.

Tributary of Dumbéa River, 14.9 km below the dam, south west coast; altitude 10 m, width of stream 4 to 6 m, depth 0.1 m, t° 17.8 °C, flow 0.0 to 0.5 m/sec., bottom gravel, sand and iron deposits; 11 July 1965; FNK 4. — 1 specimen.

Dam in the Dumbéa River, south west coast; altitude 150 m, t° 18.0 °C, water not flowing near the banks, bottom stones and mud, vegetation near the shore; 15 July 1965; FNK 8. — 39 specimens.

Tributary of Fonwhary River near La Foa, near bridge of highway La Foa-Canala, central area; altitude 15 m, width of stream 1 to 1.5 m, depth 0.05 m, flow 0.3 to 0.5 m/sec., bottom gravel and sand; 26 July 1965; FNK 35. — 27 specimens.

Cut off branch of Fonwhary River, near previous locality; altitude 15 m, width of water 3 to 5 m, depth 0 to 0.5 m, t° 18.6 °C, stagnant water, bottom mud with dead leaves and wood, aquatic plants; 26 July 1965; FNK 36. — 14 specimens.

Upper reaches of Ouen Koh River, near forest station of Col d'Amieu, between La Foa and Canala, central area; altitude 300 m, width of stream 10 to 15 m, depth 0.1 to 0.7 m, t° 15.3 °C, flow 0 to 0.2 m/sec., bottom rocks, rubble and sand, pH 7.1, Cl. 11 mg/l; 26 July 1965; FNK 37. — 6 specimens.

La Farino River near La Farino village, between La Foa and Canala, central area; altitude 230 m, width of stream 2 to 5 m, depth 0.1 to 0.5 m, t° 16.1 °C, flow 0.5 to 1 m/sec., bottom crystalline schists, rubble and muddy sand, pH 7.4, Cl. 10.3 mg/l; 28 July 1965; FNK 44. — 11 specimens.

Lower reaches of Négropo River, 4 km above Canala and 3 to 5 km above its mouth, east

coast; altitude 8 m, influence of tides noticeable, width of stream 25 to 30 m, depth 0.5 to 1 m at low tide, t° 19 $^{\circ}$ C, flow 0.15 m/sec., bottom mud, reeds and Cyperaceae near the banks; 29 July 1965; FNK 48. — 1 juvenile.

Négropo River near the school of Négropo, 10 km above Canala, east coast; altitude 20 m, width of river 15 to 20 m, depth 0.2 to 1 m, t° 18.4 $^{\circ}$ C, flow 0.1 to 1 m/sec., bottom crystalline schists, rubble, gravel, sand and muddy sand, reeds and Cyperaceae near the banks, pH 7.7, Cl. 9.2 mg/l; 29 July 1965; FNK 49. — 13 specimens (2 ovigerous).

Upper reaches of Sarraméa River near Sarraméa, foot of Mt. Dogny, central area; altitude 80 m, width of stream 2 to 5 m, depth 0.05 to 0.30 m, t° 16.4 to 17.3 $^{\circ}$ C, flow 0.5 m/sec., bottom rubble, gravel and sand with here and there mud, pH 7.0; 30 July 1965; FNK 52. — 12 specimens.

Nekliai River, 5 km above the Roman Catholic Mission of Nekliai, area of Poya-Nekliai, west coast; altitude 50 m, width of stream 10 m, depth 0.1 to 0.5 m, t° 19.3 to 20.0 $^{\circ}$ C, flow 0 to 1 m/sec., bottom rubble, gravel and muddy sand, pH 8.2; 10 August 1965; FNK 62. — 3 specimens.

Upper reaches of Poya River in the Ndokoa gorge, Poya-Nekliai area, west coast; altitude 25 m, width of stream 20 to 30 m, depth 0.05 to 1 m, t° 20.8 to 23.0 $^{\circ}$ C, flow 0 to 1.5 m/sec., bottom gravel, rubble and rocks, also muddy sand and ferruginous deposits, pH 8.2, Cl. 8.5 mg/l; 12 August 1965; FNK 66. — 10 specimens (2 ovigerous).

Upper reaches of Népoui River near Mt. Graunda, Poya-Nekliai area, west coast; altitude 85 m, width of stream 4 to 6 m, depth 0.1 to 0.5 m, t° 18.4 to 19.4 $^{\circ}$ C, flow 0.1 to 0.75 m/sec., bottom rock, rubble and sand, pH 7.8; 13 August 1965; FNK 67. — 2 specimens.

Lower reaches of Népoui River; altitude 14 m, width of stream 5 to 10 m, depth 0.05 to 0.2 m, t° 21.1 $^{\circ}$ C, flow 0.3 to 0.75 m/sec., bottom gravel, sand, here and there muddy; 13 August 1965; FNK 68. — 10 specimens (1 ovigerous).

Ouarau Creek, side branch of the upper reaches of Tchamba River near Letocart farm, N. of Tchamba, Ponérihouen area, east coast; altitude 45 m, width of stream 1.5 to 2 m, depth 0.05 to 0.5 m, t° 15.2 $^{\circ}$ C, flow 0 to 1 m/sec., bottom crystalline schists, rubble and sand, pH 7.2, Cl. 9.9 mg/l; 25 August 1965; FNK 79. — 3 specimens.

Middle reaches of Tchamba River, 5 km below Tchamba village, 6 km above the mouth, Ponérihouen area, east coast; altitude 5 m, width of stream 10 to 20 m, depth 0.05 to 1 m, t° 19.2 to 20.1 $^{\circ}$ C, flow 0 to 1 m/sec., bottom gravel and sand, aquatic plants, pH 7.5, Cl. 8.9 mg/l; 26 August 1965; FNK 80. — 4 specimens.

Nérihouen River, branch of the Nimbaye River near Saint-Yves, Ponérihouen area, east coast, altitude 8 m, width of stream 10 to 15 m, depth 0.1 to 0.5 m, t° 18.6 $^{\circ}$ C, flow 0.2 to 1 m/sec., bottom gravel and sand, pH 7.6; 27 August 1965; FNK 82. — 4 specimens (1 ovigerous).

Lower reaches of Nimbaye River, 7 km above its mouth at Ponérihouen, east coast; altitude 2 m, tidal influence, width of stream 20 to 50 m, depth 0.1 to 1 m, t° 22.6 $^{\circ}$ C, flow 0.1 to 0.2 m, dry at low tide, bottom gravel, pH 7.4, Cl. 540 mg/l; 27 August 1965; FNK 83. — 1 specimen.

Branch of Néavin River, 3 km above Néavin village, south of Ponérihouen, east coast; altitude 25 m, width of stream 1 m, depth 0.01 to 0.5 m, t° 19.0 $^{\circ}$ to 22.1 $^{\circ}$ C, flow 0.5 to 1 m/sec., bottom crystalline schists, rubble, muddy sand, dead leaves, pH 7.6, Cl. 10.7 mg/l; 29 August 1965; FNK 85. — 15 specimens.

Middle reaches of Hienghène River near Gné, 10 km above the mouth, east coast; altitude 12 m, width of stream 4 to 15 m, depth 0.02 to 1 m, t° 22.0 $^{\circ}$ to 23.7 $^{\circ}$ C, flow 0 to 1 m/sec., bottom gravel and sand, pH 7.3, Cl. 8.2 mg/l; 3 September 1965; FNK 89. — 15 specimens (1 ovigerous).

Upper reaches of Hienghène River near Kavatch, east coast; altitude 25 m, width of stream 3 to 5 m, depth 0.05 to 0.5 m, t° 19.0 $^{\circ}$ C, flow 0.5 to 1.5 m/sec., bottom rubble, gravel and sand, pH 7.5, Cl. 7.8 mg/l; 6 September 1965; FNK 94. — 7 specimens (2 ovigerous).

Middle reaches of Diahot River near Ouenia village, Bondé region, north coast; altitude 70 m, width of stream 20 to 30 m, depth 0.05 to 1 m, to 20.5 °C, flow 0 to 1 m/sec., bottom gravel, sand and muddy sand, pH 6.7, Cl. 6.0 mg/l; 16 September 1965; FNK 105. — 14 specimens (4 ovigerous).

Nassirah River near the highway Boulouparis-Thio, near Boulouparis, west coast; altitude 18 m, width of stream 1 to 3 m, depth 0.05 to 0.3 m, to 17.1 °C, flow 0.2 to 1 m/sec., bottom rock, gravel, sand, muddy sand and dead leaves; 26 September 1965; FNK 120. — 16 specimens (4 ovigerous).

The present specimens are assigned with some reserve to *Caridina longirostris*. They agree in most important points with the description of that species based by me on Madagascar material (HOLTHUIS, 1965, p. 20, fig. 6). The carpus of the first pereopod is 1.7 to 3 times as long as wide, that of the second leg 4.3 to 6 times. The propodus of the third leg is 4.5 to 5.5 times as long as the dactylus; that of the fifth leg 3.7 to 5.0 times. This agrees rather well with what is found in the Madagascar material, although the ranges are wider here. Of the present material only ovigerous females were measured to ensure a homogeneous sample. The eggs of the New Caledonia material, although distinctly smaller than those of *C. nilotica* are larger than in the Madagascar material, the former measure $0.4-0.43 \times 0.6-0.7$ mm, the latter $0.2-0.25 \times 0.3$ to 0.4 mm.

The problem of the relation between the various forms of *Caridina nilotica* and *C. longirostris* remains most intricate and still awaits a solution.

I have brought BOUVIER's (1904, 1905, 1925) New Caledonia specimens to this species as he assigned them in 1925 to *Caridina nilotica brachydactyla*, most specimens of which, judging by BOUVIER's description (e. g., small eggs), belong to the present species.

In his New Caledonia material J. Roux (1926) distinguished three varieties of what he thought to be *C. nilotica*, viz. *Caridina nilotica gracilipes* De Man, *C. n. brevidactyla* J. Roux and *C. n. meridionalis* J. Roux. The more important measurements of the adult specimens of Roux's New Caledonia material were the following.

	<i>C. n. gracilipes</i>	<i>C. n. brevidactyla</i>	<i>C. n. meridionalis</i>
(a) p1, length/width of carpus	2-2.5	2-2.7	1.8-2.1
(b) p2, length/width of carpus	4.8-5.7	4.4-6	3.7-4.6
(c) p3, length propodus/dactylus	4-4.5	5.1-6.3	4.6-5.3
(d) p5, length propodus/dactylus	4	4.9-6	3.5-4.3
(e) eggs, length	0.36	0.37-0.43	0.43-0.67
(f) eggs, width	0.23	0.21-0.26	0.26-0.42

These characters show so much variation and the differences between the varieties are of such a minor nature and overlap so considerably, that I do not think the separation of these varieties justified, the more so as the present material does not fit into any of Roux's three categories. Character (a) in my material (1.7-3) has a wider range than all three of Roux's varieties taken together, so that it could contain 2, or even all 3 varieties. Character (b) in my material (4.3-6) agrees with that in *C. n. gracilipes* and *C. n. brevidactyla*, but differs somewhat from that in *C. n. meridionalis*. As to character (c), in the present specimens it is similar (4.5-5.5) to the situation found in *C. n. meridionalis* and to some extent to that in *C. n. brevidactyla* but is different from that in *C. n. gracilipes*. Character (d), in my material (3.7-5.0) is similar to

what is found in *C. n. gracilipes* and *C. n. meridionalis*, but different from that in *C. n. brevidactyla*. Finally the eggs of my material resemble in their measurements most those of *C. n. meridionalis*, although both the upper and lower limit of the range lies higher than in those of Roux's form.

This situation seems to be an indication that the characters based on the relative size of of the various segments of the legs are not as valuable as BOUVIER and J. ROUX seemed to think and what J. Roux (1926, pp. 202-203) stated about the value of the rostrum as a character for the distinction of the various forms also holds good for these other characters. It will be necessary, in order to solve the problem of the taxonomic status of *Caridina nilotica* and its numerous « varieties » to study carefully the various types of variation that are possible : variation of the characters due to age, to individual variation within a population, to influence of the habitat on the various characters, to geographic variation, etc. A most interesting field of study is open here to field naturalists in the Indo-West Pacific tropics.

The exact range of the present species is not known, due to the confused state of its taxonomy, but it seems likely that it has a wide Indo-West Pacific distribution. The records from New Caledonia are as follows: New Caledonia (BOUVIER, 1904, 1905, 1925), Diahot valley, Pemboa (= Pamboa), Oubatche, Tao, Koné, Upper Tiouaka River, Coula River near Boréaré, La Foa, Coindé, Canala, Katiramona Creek (between Nouméa and Paita) (J. Roux, 1926). It thus is distributed over the full length of the island.

***Caridina leucosticta* Stimpson, 1858**

Caridina leucosticta KAMITA, 1967, p. 5, text. fig. 5, pl. 1 fig. C.

This species has not been collected by Dr. STARMÜHLNER. KAMITA (1967) reported upon a single female from Mt. Koghi. This is so far the only record of the species from New Caledonia. It has been reported before from Japan, the Riukiu Islands and Formosa. BOUVIER (1925, p. 143) synonymized *C. leucosticta* with *C. nilotica*, and the last word about this question is not yet spoken. KAMITA remarked that his specimen closely resembled those reported by J. Roux (1926) from New Caledonia under name *Caridina nilotica brevidactyla*. Perhaps, therefore, KAMITA's specimen is identical with *Caridina longirostris* of the present paper, but it is peculiar in that the upper margin of the rostrum is evenly toothed over its whole length, without the usual unarmed distal portion. This of course may be an individual trait of this particular specimen.

***Caridina serratirostris* De Man, 1892**

Caridina serratirostris celebensis J. Roux, 1926, p. 210.

MATERIAL EXAMINED.

Lower reaches of Négropo River, 4 km above Canala, near Ménéremé bridge at 3 to 5 km from the mouth, east coast; altitude 8 m, the water level is influenced by the tides, width of stream 25 to 30 m, depth 0.5 to 1 m (at low tide), t° 19 °C, flow 0.15 m/sec., bottom muddy sand with reeds and bullrushes near the banks; 29 July 1965; FNK 48. — 5 specimens (1 ovigerous).

Nekliai River, 5 km above the Roman Catholic mission of Nekliai, Poya-Nekliai area, west coast; altitude 50 m, width of stream 10 m, depth 0.1 to 0.5 m, t° 19.3 to 20.0 °C, flow 0 to 1 m/sec., bottom rubble and gravel with muddy sand, pH 8.2; 10 August 1965; FNK 62. — 1 specimen.

Middle reaches of Tchamba River, 6 km above its mouth, 5 km below Tchamba village, Ponérihouen, east coast; altitude 5 m, width of stream 10 to 20 m, depth 0.05 to 1 m, t° 19.2 to 20.1 °C, flow 0 to 1 m/sec., bottom gravel and sand, with aquatic plants near the banks, pH 7.5, Cl. 8.9 mg/l; 26 August 1965; FNK 80. — 57 specimens (1 ovigerous).

Middle reaches of Hienghène River near Gné, 10 km above the mouth, Hienghène area, east coast; wide valley between high mountains (583 and 848 m), width of river 4 to 15 m, depth 0.02 to 1 m, t° 22.0 to 23.7, flow 0 to 1 m/sec., bottom gravel, sand and aquatic plants, pH 7.3, Cl. 8.2 mg/l; 3 September 1965; FNK 89. — 2 specimens (1 ovigerous).

This very characteristic species has only been reported once before from New Caledonia: J. Roux (1926) mentioned specimens from Koné and Yaté. He brought these to var. *celebensis* de Man. As with *Caridina typus caledonica*, here too the differences between the variety and the typical form are in the relative length and width of various organs, which characters are notoriously variable within the species of *Caridina*; they are possibly influenced by the habitat. The latter circumstance may be the explanation why such characters seem to be constant within a population. There seems to be no good reason, at least judging by the available material, to recognize var. *celebensis*. The present material shows both characters of the typical form and those of the variety.

Caridina serratirostris is sometimes found rather close to the sea, even in slightly brackish water (Roux, 1926); however, usually it is reported from pure fresh water often far inland.

The range of the species extends from Madagascar and the Seychelles to Okinawa, N. E. Australia and Polynesia.

Caridina novaecaledoniae J. Roux, 1926

Caridina novaecaledoniae J. Roux, 1926, p. 214, figs. 40-46.

MATERIAL EXAMINED.

Dam in the Dumbéa River, south-west coast; altitude 150 m, t° 18.0 C, no current near the banks, bottom stones and mud, with vegetation near the banks; 15 July 1965; FNK 8. — 31 specimens.

Upper reaches of Thir River, near St. Louis, E. of Nouméa; altitude 120 m, width of stream 4 to 6 m, depth 0.10 to 0.15 m, t° 16.6 °C, flow 0.2 to 2.0 m/sec., bottom gravel, stones and dead leaves; 5 August 1965; FNK 59. — 2 specimens.

Crique Pernod before the confluence with Rivière des Lacs, near highway to Nouméa, southern part of island; altitude 180 m, stream 10 m wide, 0.2 to 1.0 m deep, t° 20.8 °C, flow 0 to 1 m/sec., bottom peridotite rocks and rubble, muddy sand and ferruginous deposits, pH 7.1, Cl. 10.4 mg/l; 17 August 1965; FNK 72. — 12 specimens (1 ovigerous).

Branch of Diahot River at the Col d'Amoss near Ouégoua, Bondé region, north coast; altitude 250 m, width of stream 5 m, depth 0.05 to 0.20 m, t° 20.2 °C, flow 0.5 to 1 m/sec., bottom crystalline schists and rubble, pH 7.5; 15 September 1965; FNK 104. — 8 specimens.

Pool in the dry bed of a stream near Le Grisson caves, near Koumac, north coast; altitude 60 m, width of stream 1 m, depth 0.05 to 0.30 m, t° 19.5 °C, flow nil, bottom calcareous rock and sand, with a few stones and many dead leaves, pH 7.5, Cl. 15.6 mg/l; 17 September 1965; FNK 110. — 30 specimens (2 ovigerous females).

Branch of Nehoué River, calcareous area near Koumac, north coast; altitude 60 m, width of stream 1 to 2 m, depth 0.02 to 0.05 m, t° 21.4 °C, flow 0 to 0.5 m/sec., bottom calcareous rock, rubble, gravel and sand, pH 8.0, Cl. 12.4 mg/l; 18 September 1965; FNK 111. — 48 specimens (3 ovigerous females).

DESCRIPTION. — The rostrum is short, as a rule it fails to reach the end of the antennular peduncle. In some specimens it just reaches beyond the first peduncular segment, in others it may reach even slightly farther than the middle of the third segment. Usually it is straight; sometimes the tip is directed slightly upward. In the adults there are 12 to 19 movable dorsal teeth on the rostrum, the proximal one or two being placed behind the orbit, the third sometimes over

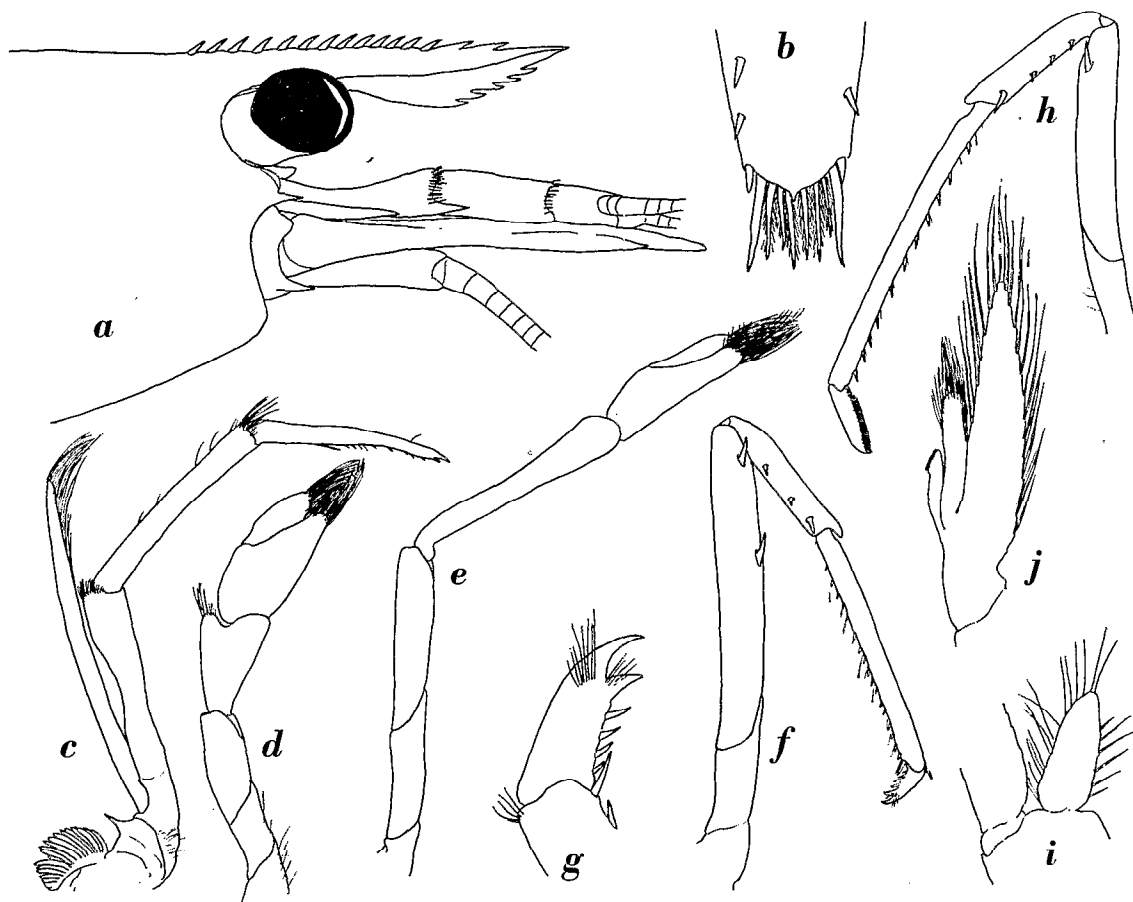


Fig. 2. — *Caridina novaecaledoniae* Roux, from Sta. FNK 110. a, anterior part of body in lateral view; b, distal part of telson; c, third maxilliped; d, first pereopod; e, second pereopod; f, third pereopod; g, dactylus of third pereopod; h, fifth pereopod; i, endopod of first pleopod of male; j, endopod of second pleopod of male. a, c-f, h $\times 16$; b, i, j $\times 35$; g $\times 55$.

the posterior orbital margin. The distal part of the rostrum bears no movable teeth at all but sometimes shows some serrations or immovable teeth (0 to 3 in number). In the juveniles the dorsal rostral teeth, all of which are placed before the posterior limit of the orbit, number 7 to 9, there are 0 or 1 immovable distal teeth. The lower margin of the rostrum bears 3 to 10 teeth in the adults, 1 to 3 in the juveniles. The lateral rostral carina divides the rostrum in two parts of about equal height. It continues posteriorly in the orbital margin. The antennal spine stands some distance below the very distinct lower orbital angle. The pterygostomian angle is broadly rectangularly rounded.

The sixth abdominal somite measures about 0.6 times the length of the carapace (rostrum excluded). The pleura of the sixth somite is rounded, the posterolateral angle ends in a sharp point. The telson bears 3 to 5 pairs of dorsal spinules. The posterior margin is rounded with a small sharp median tooth. The outer pair of posterior spinules is short, reaching about $1/4$ of the length of the lateral spines. There are 2 to 7 intermediate spines, which are narrower than but almost as long as the laterals; they are finely setose. The preanal carina is high, rounded and provided with feathery hairs, it bears no spine.

The eyes are well developed. The antennular carina forms a blunt triangular process. The stylocerite fails to reach the end of the basal antennular segment. The anterolateral angle

of that segment is acute and reaches about 1/3 of the length of the second segment. The second segment is distinctly shorter than the first, but about 1.5 times as long as the third. The antennal peduncle reaches about as far as the end of the first antennular segment. The scaphocerite reaches distinctly beyond the antennular peduncle. The outer margin is about straight, ends in a distinct tooth and is far overreached by the lamella. A sharply pointed tooth is present near the base of the scaphocerite, on the outside of the antennal peduncle.

There are epipods on the bases of the first 4 pereopods.

The third maxilliped reaches about to the end of the scaphocerite. The last segment is slightly shorter than the penultimate. It ends in a distinct claw and shows some movable spinules in the distal part of the ventral margin. The carpus of the first leg is about 0.4 to 0.6 times as high as long, it is deeply excavated anteriorly. It is about as long as the merus and shorter than the chela. The carpus of the second leg is 4 to 6 times as long as high, it is by far the longest segment of the leg. The chela is almost three times as long as high.

The dactylus of the third leg ends in two strong teeth, behind which the posterior margin bears 4 or 5 spines. The posterior of the distal two teeth is slightly shorter and broader than the apical tooth. The propodus is 4 to 5 times as long as the dactylus and bears numerous spinules on the posterior margin. The carpus bears on its outer surface one large distal spine, proximal of which there are two or three much smaller ones. The merus has two strong spines in the posterior part of the outer surface, one distal and one somewhat before the middle. The fifth leg has the propodus about 4 times as long as the dactylus. The latter bears numerous spinules on the posterior margin. The carpus resembles that of the third leg. The merus shows only a single spine on the outer surface, viz., the distal one.

The first pleopod of the male has the endopod short and ovate, without any appendix. The appendix masculina of the second male pleopod is longer than the stylamblys and bears numerous bristles in the distal part.

The diaeresis bears 10 to 15 spinules.

The eggs measure 0.6×1.0 –1.1 mm in diameter.

The specimens measure 8 to 22 mm. The ovigerous females 16 to 22 mm.

DISTRIBUTION. — So far the species is only known from New Caledonia. Roux (1926) reported it from the following localities: Mt. Tchabalabel, Diahot valley (on the way to Col Poraris), east slope of Col Poraris, Pemboa and Haute Tiouaka; the former four localities in the north of the island, the last in the central part. The species seems to occur all over the island as shown by Dr. STARMÜHLNER's material. It has been found at altitudes between 60 and 250 m (60, 60, 120, 150, 180 and 250 m in the present material; 100 and 150 m in Roux's material).

REMARKS. — The present specimens agree well with Roux's account so that I confidently assign them to that species. Some of the characters mentioned by Roux prove to be more variable than he thought them to be.

***Caridina imitatrix* new species**

MATERIAL EXAMINED.

Rivière Bleue near the bridge near Ouénarou (Mont des Sources), southern part of the island; in virgin forest, altitude 165 m, width of stream 10 m to 20 m, depth 0.1 to 0.2 m, t° 18 $^{\circ}$ C, flow 0.3 to 2 m/sec., bottom peridotite rock and rubble with sand and gravel, pH 6.9, Cl. 10.7 mg/l; 21 July 1965, FNK 24. — 3 specimens.

Marsh of Rivière Blanche, Ouénarou region, southern part of the island; altitude 160 m, depth 0 to 0.5 m, t° 20.2 $^{\circ}$ C, bottom mud with ferruginous deposits, rushes; 22 July 1965; FNK 28. — 10 specimens.

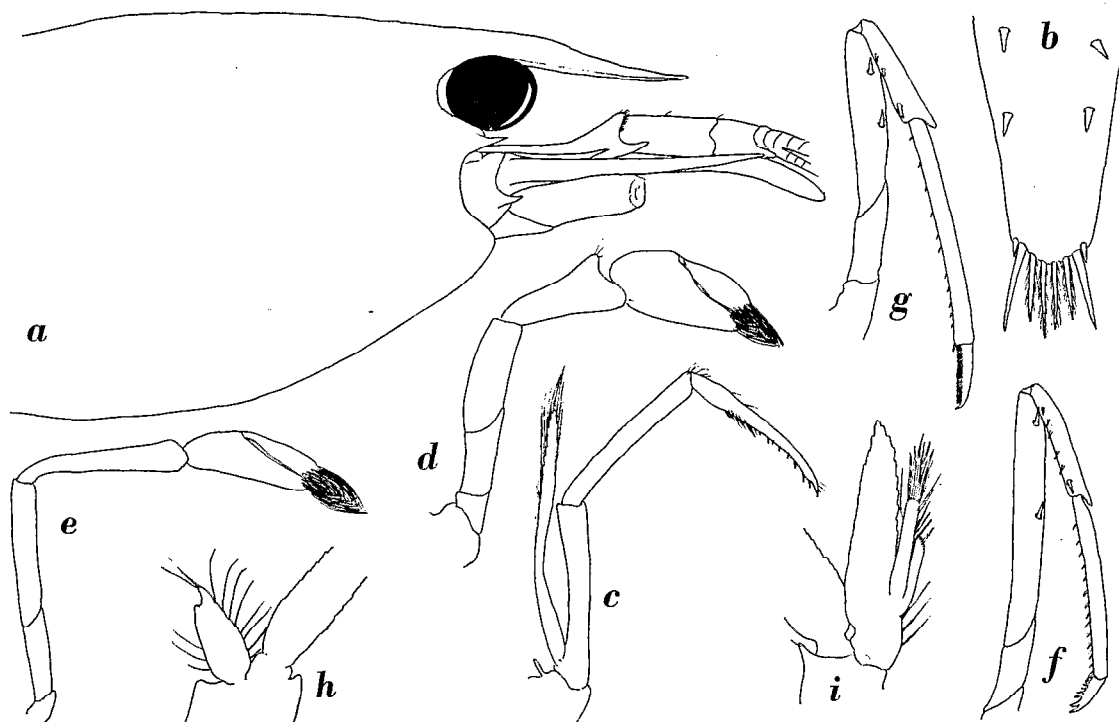


Fig. 3. — *Caridina imitatrix* nov. sp. from Sta. FNK 28. a, anterior part of body in lateral view; b, distal part of telson in dorsal view; c, third maxilliped; d, first pereopod; e, second pereopod; f, third pereopod; g, fifth pereopod; h, endopod of first pleopod of male; i, endopod of second pleopod of male. a, c-g $\times 15$; b, h, i $\times 30$.

Side branch of Rivière Blanche, near the forest road leading from Ouénarou forestry station to the forestry log cabin on the western slope of Mt. Pouéhihi, Ouénarou region; altitude 300 m, width of stream 2 m, depth 0.05 to 0.50 m, t° 18.3 $^{\circ}\text{C}$, flow 0.1 to 1.0 m/sec., bottom peridotite rock and rubble, muddy sand, ferruginous deposits, and dead leaves; 22 July 1965; FNK 29. — 16 specimens.

Same branch, near the log cabin; altitude 300 m, width of stream 3 to 5 m, depth 0.1 to 0.5 m, t° 18.7 $^{\circ}\text{C}$, flow 0.5 to 1.0 m/sec., bottom peridotite rock and rubble, with sand, dead leaves and wood, pH 7.5; 22 July 1965; FNK 31. — 1 specimen.

Thir River near the confluence with a side branch, granite area near St. Louis, S.E. of Nouméa, southern part of island; altitude 100 m, width of stream 10 m, depth 0.2 m, t° 17.0 $^{\circ}\text{C}$, flow 0.1 to 1.5 m/sec., bottom granite rock, rubble, gravel, quartz sand and mica, pH 7.7, Cl. 9.9 mg/l; 5 August 1965; FNK 58. — 1 specimen.

Rivière des Lacs, which empties in the Lac en Huit, near highway to Nouméa, southern part of island; altitude 180 m, width of stream 20 to 30 m, depth 0.2 to 0.5 m, t° 18.6 $^{\circ}\text{C}$, flow 0 to 1.5 m/sec., bottom peridotite rock, rubble and gravel, ferruginous deposits near the shore, pH 7.1, Cl. 11.4 mg/l; 17 August 1965; FNK 71. — 2 specimens.

DESCRIPTION. — The rostrum is short and unarmed. It is usually directed slightly downward and reaches beyond the first segment of the antennular peduncle, but fails to reach beyond the base of the third. Sometimes there is a faint indication of a blunt tooth in the distal part of the lower margin; a few hairs may be implanted on the margin. In one specimen the lower margin bears three teeth. In side view the rostrum is narrow with the lateral carina closer to the ventral than to the dorsal margin. In dorsal view it is elongate triangular, being much wider than high at the base and being about as long as its basal width.

The antennal spine is strong and is placed a short distance below the lower orbital angle which is folded somewhat inwards. The pterygostomian angle is rectangularly rounded and somewhat forwards produced.

The sixth abdominal somite is about 0.4 to 0.5 times as long as the carapace, and about as long as or slightly shorter than the telson. The dorsal surface of the telson shows 2 or 3 pairs of spines, all of which are situated in the posterior half of the telson. The posterior margin of the telson is broad and convex. The outer spines are short, measuring about 1/4 of the length of the lateral spines. The intermediate spines are 2 to 5 in number, as long as the laterals or slightly longer, showing a chitin plug in about the middle; they are somewhat setose. The preanal carina is low and evenly rounded.

The eyes are well developed and have the cornea rounded.

The antennular carina is rather high and blunt. The stylocerite is large and pointed, but it fails to reach the end of the basal segment of the antennular peduncle. The anterolateral tooth of the segment is also sharp and does not reach the middle of the second segment. The scaphocerite reaches with its final tooth about to the end of the antennular peduncle. The lamella distinctly overreaches the final tooth. A distinct tooth is visible in the basal part of the antennal peduncle near the outer part of the base of the scaphocerite.

The branchial formula is typical for the genus. Epipods are present at the bases of the first four pereopods. The third maxilliped reaches with about the entire ultimate segment beyond the antennular peduncle. The distal segment, which is about as long as the penultimate, ends in a sharp tooth and bears some movable spinules in the distal half of the posterior margin.

The first pereopod reaches about to the middle of the basal antennular segment. The carpus is about twice or somewhat more than twice as long as high, it is distinctly hollowed anteriorly. It is slightly longer than the merus and shorter than the chela. The fingers are slightly longer than the palm. The second legs reach about to the end of the antennular peduncle. The carpus is about 5 to 6 times as long as high and is by far the largest segment of the leg; the fingers are distinctly longer than the palm. The third pereopod reaches with the dactylus beyond the scaphocerite. The dactylus is rather elongate, it ends in two teeth with a row of about 5 or 6 spinules on the posterior margin. The propodus is about 3.5 times as long as the dactylus. Its posterior margin bears a row of short movable spinules, the distal being not much longer than the others. The carpus bears in the distal part of the outer surface a large movable spine followed by a row of 4 or 5 spinules. The merus shows two movable spines in the distal half of the outer surface, it is fully twice as long as the carpus. The fifth leg reaches only slightly farther forwards than the first. The dactylus is elongate and bears at its posterior margin a row of about 40 comb-like arranged spinules. The propodus and carpus are similar to those of the third leg; the propodus is about three times as long as the dactylus; the merus is about 1.5 times as long as the carpus.

The first pleopod of the male bears no appendix interna. The endopod is oval, being rather suddenly narrowed in a slender tip. In the second male pleopod the appendix masculina is distinctly longer than the appendix interna and ends in numerous strong bristles. The diaeresis of the uropod bears 8 to 11 spines. No ovigerous females are present in this material.

The carapace length of the specimens varies from 2.5 to 5 mm. The total length is 11 to 16 mm.

In most instances the present species was found together with *Paratya typa*, which species it resembles in the shape of the rostrum, but from which it differs in the generic characters, e. g., the fact that it has no supra orbital spines, and no exopods on the pereopods. All the material comes from the southern part of the island, where it was found in flowing and stagnant waters at altitudes between 100 and 300 m.

With the first superficial sorting of the material the specimens of the present species were placed with *Caridina typus*, on account of the unarmed rostrum. They can, however, immediately be distinguished by the presence of a rounded lower orbital angle, by the shape of the posterior spines of the telson, by the absence of an appendix interna on the first male pleopod, etc.

***Caridina vitiensis canacorum* J. Roux, 1926**

Caridina vitiensis canacorum J. Roux, 1926, p. 199, figs. 32-36.

Since the status of *Caridina vitiensis* is uncertain, that of the present form is still more so. I am not quite convinced that the 5 specimens found by Roux should not be assigned to either *C. novaecaledoniae* or *C. weberi*.

DISTRIBUTION. — ROUX's material was obtained at Canala. The typical form was reported from the Fiji Islands. No specimens of this species are present in Dr. STARMÜHLNER's collection.

***Caridina weberi longicarpus* J. Roux, 1926**

Caridina weberi longicarpus J. Roux, 1926, p. 212, figs. 37-39.

This form, which is not represented in the collections studied, was described as a new variety by Roux. His specimens came from above Oubatche on the slope of Mt. Ignambi (altitude about 600 m), and Ciu, above Canala (altitude about 300 m).

***Paratya* Miers, 1882**

The present genus, which contains about a dozen species, has an interesting distribution. It is known from Japan, the Asiatic mainland (S.E. Siberia, Corea, Annam and perhaps Assam), from the Lesser Sunda Islands (Adonara near Flores), many localities in eastern Australia (Queensland to Tasmania), Norfolk Island, Lord Howe Island, New Caledonia and New Zealand. These localities form more or less an arc along the western border of the Pacific basin. J. Roux (1926) reported three species, one with 2, another with 3 varieties from New Caledonia, all forms being endemic. All of Roux's species are represented in the present collection. Roux placed these species and those of Lord Howe and Norfolk Islands in a separate subgenus *Xiphatyoida* of which *Paratya (Xiphatyoida) typa* Roux automatically becomes the type. The differences between the two subgenera are slight, while the species from Annam proved to be more or less intermediate between the two. Therefore later authors as a rule have not recognized these subgenera.

***Paratya typa* J. Roux, 1926**

Paratya (Xiphatyoida) typa J. Roux, 1926, p. 196, figs. 23-31.

MATERIAL EXAMINED.

Rivière Bleue near the bridge near Ouénarou (Mont des Sources), Ouénarou region, southern part of the island; in virgin forest, altitude 165 m, width of stream 10 to 20 m, depth 0.1 to 0.2 m, t° 18 °C, flow 0.3 to 2 m/sec., bottom peridotite rock and rubble with sand and gravel, pH 6.9, Cl. 10.7 mg/l; 21 July 1965; FNK 24. — 4 specimens.

Side branch of Rivière Blanche, coming from the virgin forest of Mont des Sources, near a bridge in the wood, Ouénarou region; altitude 160 m, width of stream 2 to 4 m, depth 0.1 to 0.3 m, t° 19.7 to 20 °C, flow 0.75 to 1 m/sec., bottom peridotite rubble, pH 7.6, Cl. 8.9 mg/l; 21 July 1965; FNK 26. — 5 specimens.

Side branch of Rivière Blanche near the forest road leading from Ouénarou forestry station to the forestry log cabin on the western slope of Mt. Pouédihi, Ouénarou region; altitude 300 m,

width of stream 2 m, depth 0.05 to 0.50 m, t° 18.3 $^{\circ}$ C, flow 0.1 to 1.0 m/sec., bottom peridotite rock and rubble, muddy sand, ferrugineous deposits and dead leaves; 22 July 1965; FNK 29. — 67 specimens (1 ovigerous).

Same branch, near the log cabin; altitude 300 m, width of stream 3 to 5 m, depth 0.1 to 0.5 m, t° 18.7 $^{\circ}$ C, flow 0.5 to 1.0 m/sec., bottom peridotite rock and rubble, with sand and dead leaves and wood, pH 7.5; 22 July 1965; FNK 31. — 2 specimens.

Rivière des Lacs, which empties in Lac en Huit, near highway to Nouméa, southern part of the island; altitude 180 m, width of stream 20 to 30 m, depth 0.2 to 0.5 m, t° 18.6 $^{\circ}$ C, flow 0 to 1.5 m/sec., bottom peridotite rock, rubble and gravel, ferrugineous deposits near the shore, pH 7.1, Cl. 11.4 mg/l; 17 August 1965; FNK 71. — 14 specimens.

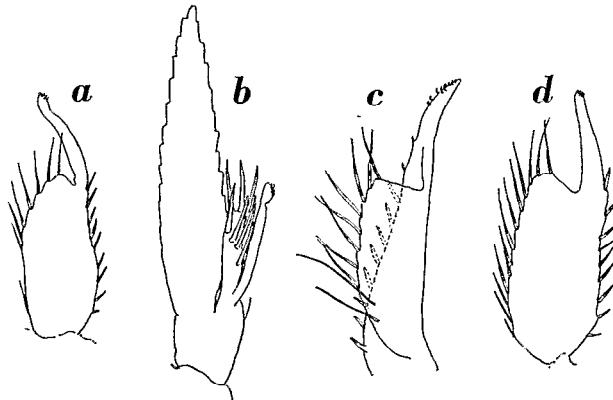


Fig. 4. — a, c, e, endopod of first pleopod of male; b, endopod of second pleopod of male. a, b, *Paratya tyta* Roux from Sta. FNK 29; c, *Paratya intermedia* Roux from Sta. FNK 22; d, *Paratya caledonica* Roux, from Sta. FNK 27. a-d $\times 40$.

The present specimens agree well with Roux's (1926) extensive description. Roux figured the antennal spine as situated on the lower orbital angle, but actually it is placed slightly below the angle which is bluntly rounded. The curious rather weak post orbital spines, which are placed on the orbital margin, and resemble more a tooth than a spine, distinguish this species from related forms.

The telson bears two pairs of dorsal spines in the distal half. The posterior margin bears one pair of short outer spines, one pair of much longer lateral spines and 4 setose inner spines which are as long as or slightly longer than the lateral.

The first pleopod of the male is ovate and bears a long appendix interna. In the second male pleopod the appendix masculina is shorter than the appendix interna and provided with many strong spines on the distal and outer margins and on the posterior surface. The endopod of the first pleopod of the female ends in a slender apex.

The exopod of the uropod has the outer margin with a row of long hairs. The outer margin ends in a blunt angle which carries a single spine.

Only one ovigerous female is present in this material, it carried only 2 eggs.

The carapace length of the examined specimens varies between 2.5 and 5 mm (rostrum included), and between 1.7 and 3.3 mm (rostrum excluded). The ovigerous female has a carapace length (minus rostrum) of 3.3 mm and (inclusive of rostrum) 5 mm. The diameter of the eggs is 0.6×1.2 mm.

Paratya typa was so far known only from the original description (Roux, 1926), which was based on numerous specimens from La Madeleine, Plaine des Lacs, altitude 200 m. As all the present specimens also originate from the same general region, it is possible that the range of the species is restricted to the Ouénarou area of southeastern New Caledonia. The species has been found in running water at altitudes between 160 and 300 m. It was found in company of *Paratya intermedia* and *Caridina imitatrix*.

***Paratya intermedia* J. Roux, 1926**

Paratya (Xiphalyoida) caledonica intermedia J. Roux, 1926, p. 195, figs. 20-22.

MATERIAL EXAMINED.

Right hand branch of the Pirogue River near the highway Nouméa-Yaté, 5 km before Ouénarou forestry station, Ouénarou region, southern part of the island; altitude 95 m, width of stream 5 to 10 m, depth 0.1 to 0.5 m, t° 20.1 $^{\circ}$ C, flow 0 to 1 m/sec., bottom peridotite rubble and gravel, ferruginous deposits near the shore, pH 7.0; 20 July 1965; FNK 22. — 3 specimens (1 ovigerous female).

Rivière Bleue near the bridge near Ouénarou (Mont des Sources), Ouénarou region, southern part of the island; in virgin forest, altitude 165 m, width of stream 10 to 20 m, depth 0.1 to 0.2 m, t° 18 $^{\circ}$ C, flow 0.3 to 2 m/sec., bottom peridotite rock and rubble with sand and gravel, pH 6.9, Cl. 10.7 mg/l; 21 July 1965; FNK 24. — 19 specimens.

Side branch of Rivière Blanche, coming from the virgin forest of Mont des Sources near a bridge in the wood, Ouénarou region; altitude 160 m, width of stream 2 to 4 m, depth 0.1 to 0.3 m, t° 19.7 to 20 $^{\circ}$ C, flow 0.75 to 1 m/sec., bottom peridotite rubble, pH 7.6, Cl. 8.9 mg/l; 21 July 1965; FNK 26. — 45 specimens (2 ovigerous).

Side branch of Rivière Blanche near the forest road leading from Ouénarou forestry station to the forestry log cabin on the western slope of Mt. Pouéhihi, Ouénarou region; altitude 300 m, width of stream 3 to 5 m, depth 0.1 to 0.5 m, t° 18.7 $^{\circ}$ C, flow 0.5 to 1.0 m/sec., bottom peridotite rock and rubble, with sand and dead leaves and wood, pH 7.5; 22 July 1965; FNK 31. — 11 specimens.

Rivière des Lacs, which empties in Lac en Huit, near highway to Nouméa, southern part of the island; altitude 180 m, width of stream 20 to 30 m, depth 0.2 to 0.5 m, t° 18.6 $^{\circ}$ C, flow 0 to 1.5 m/sec., bottom peridotite rock, rubble and gravel, ferruginous deposits near the shore, pH 7.1, Cl. 11.4 mg/l; 17 August 1965; FNK 71. — 25 specimens.

Roux (1926) considered the present form to be a variety of *Paratya caledonica*. In my opinion the differences are such that it better can be treated as a full species. *C. caledonica* and *C. intermedia* do not show transitional forms, and are never found together. *C. intermedia* in my opinion actually is closer to *C. typa* than to *C. caledonica*.

The supraorbital tooth, like in *C. typa* is placed on the orbital margin, but is more of a spine than a serration. The lower margin of the orbit is a very blunt and rounded angle, below which the antennal spine is placed. The telson is like in *P. typa*. Also the male pleopods and the uropods are very similar to those of that species. Only the first pleopod is less ovate but has the distal margin wide, straight and unarmed; the appendix interna also is less slender than in *P. typa*.

This species is distinctly larger than *P. typa*. The carapace length of the examined material varies from 2.5 to 6 mm inclusive of the rostrum, and about from 1.5 to 4 mm exclusive of the rostrum. Ovigerous females have the carapace 6 mm long including the rostrum, 4 mm excluding

the rostrum. Males have the carapace up to 6 (respectively 4) mm long. The eggs are 0.7×1.1 mm in diameter.

Like *P. typa* the present species is found only in the southeastern part of New Caledonia in the Ouénarou region. Roux's specimens were also found in that area, viz. near La Madeleine, Plaine des Lacs. The species is found in flowing water at altitudes between 95 and 300 m.

***Paratya caledonica* J. Roux, 1926**

Paratya (Xiphatyoida) caledonica J. Roux, 1926, p. 192, figs. 9-16.

Paratya (Xiphatyoida) caledonica magna J. Roux, 1926, p. 194, figs 17-19.

Paratya caledonica Kamita, 1967, p. 1, text-figs. 1-3, pl. 1 fig. A.

MATERIAL EXAMINED.

Cut off branch of Rivière Blanche, in the area influenced by the Yaté reservoir, Ouénarou region, southeastern part of the island; altitude 165 m, stagnant water, depth 0 to 0.5 m, t° 19.5 $^{\circ}$ C, bottom muddy sand with ferruginous deposits, pH 7.3; 22 July 1965; FNK 27. — 15 specimens.

Marsh of Rivière Blanche, Ouénarou region; altitude 160 m, stagnant water, depth 0 to 0.5 m, t° 20.2 $^{\circ}$ C, bottom mud with ferruginous deposits and tufts of bullrushes; 22 July 1965; FNK 28. — 8 specimens (1 ovigerous female).

Crique Pernod River, before its confluence with the Rivière des Lacs, near the highway to Nouméa, Ouénarou region; altitude 180 m, width of stream 10 m, depth 0.2 to 1 m, t° 20.8 $^{\circ}$ C, flow 0 to 1 m/sec., bottom peridotite rock and rubble, muddy sand and ferruginous deposits near the shore, pH 7.1, Cl. 10.4 mg/l; 17 August 1965; FNK 72. — 7 specimens.

Lacs en Huit, south west shore, Ouénarou region; altitude 250 m, stagnant water, depth near the shore 0 to 0.5 m, t° 21.5 $^{\circ}$ C, bottom peridotite with holes and cracks, tufts of bullrushes, pH 6.6; 19 August 1965; FNK 76. — 33 specimens (4 ovigerous females).

Grand Lac, south shore, Ouénarou region; altitude 250 m, stagnant water, depth near the shore 0 to 0.5 m, t° 20.8 to 21.1 $^{\circ}$ C, bottom sand with ferruginous deposits and some peridotite pebbles, pH 6.7 to 7.2, Cl. 8.0 mg/l; 20 August 1965; FNK 78. — 14 specimens (2 ovigerous females).

Grand Lac; altitude 250 m; 3 January 1967. — 4 specimens.

Lac en Huit; 3 January 1967. — 13 specimens (7 ovigerous females).

The specimens agree well with Roux's account. The very young specimens have the rostrum, although slender, distinctly shorter and often less strongly dentate than the adults.

Like in the previous two species the lower orbital angle is blunt and the antennal spine is placed slightly below it. The supra-orbital spine is better developed than in either of the previous two species. The tailfan has the same shape as in *P. typa* and *P. intermedia*.

The eyes have a distinct ocellus, which is fused with the cornea, but is more distinctly set off from it than in the previous species.

Here too the first pleopod of the male is ovate with a long and slender appendix interna.

SIZE. — The species is much larger than *P. typa* and also larger than *P. intermedia*. The carapace length of the examined specimens varies from 1.1 to 4.5 mm (without rostrum) or from 2 to 9 mm (rostrum included). Ovigerous females have the carapace length 2.6 to 4.5 mm (without rostrum) or from 6 to 9 mm (rostrum included). The eggs are large, measuring 0.6×1.0 mm; they are rather few: most ovigerous females carry less than 15 eggs. In the eggs of some females from Lac en Huit, collected in January 1967, the eyes of the embryo are visible.

DISTRIBUTION. — The species is only known from the Ouénarou area of S.E. New Caledonia. Roux's type material came from Lac en Huit. KAMITA (1967) reported it from Marais Kiki in the same area. It is interesting to note that while *Paratya typa* and *P. intermedia* were found in running water, the present species evidently lives almost exclusively in stagnant water (lakes, cut off branches of rivers, etc.), only the material from Sta. FNK 72 was collected in a stream. The present material was found at altitudes between 160 and 250 m.

REMARKS. — KAMITA's (1967) account forms a valuable complement to Roux's original description and figures. The variability of the rostrum is well illustrated by KAMITA, whose figure of the carapace is also superior to that by Roux.

***Paratya bouvieri* J. Roux, 1926**

Paratya (Xiphatyoidea) bouvieri J. Roux, 1926, p. 189, figs. 1-5.

Paratya (Xiphatyoidea) bouvieri ngoiensis J. Roux, 1926, p. 190, figs. 6-8.

MATERIAL EXAMINED.

Dam in the Dumbéa River, near south-west coast; altitude 150 m, t° 18.0 °C, no current near the banks, bottom stones and mud, with vegetation near the banks; 15 July 1965; FNK 8. — 3 specimens.

Right hand branch of Dumbéa River, 1 km below the dam; altitude 117 m, width of stream 3 to 6 m, depth 0.1 to 0.5 m, t° 18.1 °C, flow of water 0 to 1.5 m/sec., bottom gravel and rubble, muddy sand with ferruginous deposits; 15 July 1965; FNK 9. — 1♂, 1 ovigerous female.

Baraoua River near the bridge between Bourail and Poya, Boulouparis-Bourail region, west coast; altitude 8 m, width of stream 4 to 6 m, depth 0.2 to 0.5 m, t° 19.8 °C, flow 0.1 to 1.0 m/sec., bottom gravel and sand, pH 8.0, Cl. 7.1 mg/l; 9 August 1965; FNK 61. — 3 specimens (2 ovigerous).

Carénage River near the Ancienne Laverie, Ouénarou region, southern part of the island; altitude 260 m, width of stream 5 to 10 m, depth 0.2 to 0.5 m, t° 20.0 °C, flow 0.5 to 1 m/sec., bottom peridotite rock with some rubble, pH 7.3, Cl. 9.9 mg/l; 19 August 1965; FNK 77. — 1 specimen.

The rostrum usually is longer than described by Roux and reaches beyond the second segment of the antennular peduncle; only in the specimen from Sta. FNK 77 does it reach to the middle of the second segment. The upper margin bears 20 to 29 movable teeth 3 to 5 of which are placed behind the orbit. There are 4 to 8 small immovable ventral teeth, situated in the extreme distal part. The rostrum is rather high, the midrib divides it in two parts of about equal height. The supraorbital spine is strong. The lower angle of the orbit is rectangularly rounded and some distance below it stands the antennal spine.

The telson is similar to that of *P. typa*.

The ocellus is rather distinct.

The antennular peduncle is less slender than shown in Roux's figure. It reaches only with the last segment beyond the rostrum and attains just the tip of the outer anterolateral tooth of the scaphocerite. The scaphocerite itself reaches beyond the antennular peduncle with the distal part of the lamella.

The first pleopod of the male, like in the other New Caledonian species has a long and slender appendix interna on the endopod.

SIZE. — The carapace length in the present material varies from 3 to 5.2 mm (rostrum excluded). In ovigerous females it is 4 to 5.2 mm.

The eggs are numerous and small and are 0.3×0.6 mm in diameter, eggs in which the eyes of the young are clearly visible measured 0.5×0.8 mm.

REMARKS. — As already indicated by Roux, this is the largest of the *Paratya* species of New Caledonia. It shows some variation in various characters. So in our material the number of dorsal teeth on the rostrum is consistently higher than in Roux's material: in his typical subspecies there were 13 to 18 dorsal teeth and in his var. *ngoiensis* 11 to 20.

Also in the present specimens the rostrum is usually longer. The eggs in our material are evidently larger than in Roux's specimens (he gave as measurements for var. *bouvieri* 0.30 to 0.31×0.47 to 0.49 mm and for var. *ngoiensis* 0.30×0.53 mm). These differences and also those found by Roux in the proportions of the legs, may be those of local populations (unlike the other *Paratya* species, *P. bouvieri* is widely distributed over the island) and they are so insignificant and variable, that it does not seem justified to recognize the various populations as distinct subspecies. Therefore I have not recognized var. *ngoiensis* and synonymized it with the typical form.

DISTRIBUTION. — ROUX (1926) reported his typical form the river of Mt. Panié and from Tao, both localities in the N.E. of the island, while the type material of his var. *ngoiensis* came from the Ngoi valley (200 m altitude) in S.E. part. The present material came from localities near the central and southern part of the westcoast and from the southeast. It was collected at altitudes ranging from 8 to 260 m (8, 117, 150, 200, 260 m), in running water.

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