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SCIENTIFIC RESULTS OF THE SURINAM EXPEDITION 1948—1949. PART II. ZOOLOGY No. 1. CRUSTACEA DECAPODA MACRURA

by

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During the 1948-1949 Scientific Surinam Expedition, thorough zoological, botanical and geological explorations have been made in the coastal area and in the anterior mountain region of Dutch Guiana.

The number of macrurous Decapods collected is large, though the number of species represented is relatively small. These shrimps have been collected at the following localities:

1. Coronieweg. This is the highway from Coronie to Paramaribo. Coronie is situated in the N.W. part of Surinam, about at $5^{\circ} 53' N$ $56^{\circ} 20' W$. The Coronieweg localities are accompanied by a piket- and a km-number, e.g., Coronieweg, piket 216, km N 0.2. The piket-number indicates the distance in hundreds of meters which a certain point on the highway (the piket) is situated east of Coronie. The km-number indicates the number of kilometers that the actual locality is situated due north or south of the piket. The indication Coronieweg, piket 216, km N 0.2, thus means that the locality is situated 0.2 km north of a point on the highway, which point lies 21.6 km E. of Coronie.

2. Republiek. This is a locality on the railway, which runs from Paramaribo southwards into the interior of Surinam. Republiek is situated about 43 km S. of Paramaribo, on the Coropina creek, which empties in the Para, a branch of the Surinam River.

3. Paramaribo.

4. Plantation "Peperpot", a plantation on the east bank of the Surinam River, somewhat above Paramaribo.

5. Moengotapoe. A locality in the N.E. part of Surinam at about $5^{\circ} 34' N$ $54^{\circ} 14' W$. The expedition went from Moengotapoe in a straight line due north, till a very large swamp (the Third Swamp) made further progress impossible at about 19 km N. of Moengotapoe.

6. Wia Wia. The Wia Wia bank is a bank off the N.E. coast of Surinam about due north of Moengotapoe. When the Third Swamp made it impossible for the expedition to continue northwards to the coast, it started from the other end of the intended tracé and worked from the coast near the Wia Wia bank southwards till it again met with the Third Swamp. In this way a continuous survey was obtained of the bottom, the flora, and the fauna from Moengotapoe to the coast. In the following text the localities on the tracé from the coast southwards are given in km "S. of Wia Wia", actually, however, the distance given is not measured from the Wia Wia bank itself, but from the high tide mark on the shore near the Wia Wia bank.

7. Galibi and Langamankondre. These two are localities on the Dutch shore of the mouth of the river Marowijne, which forms the border between French and Dutch Guiana. Galibi lies closer to the sea than Langamankondre.

8. Nassau Mountains. A mountain complex, which attains an altitude of about 540 m and belongs to the anterior mountain range of Surinam. The mountains are wholly clad with forests. The base camp was situated on the left bank of the Marowijne River at about $4^{\circ} 47' N$. The expedition went straight west from the base camp.

The first seven localities lie in the coastal belt of Surinam, which is very low and flat, lying at or somewhat below sea level. The soil consists mainly of clay, deposited there by the rivers and the sea. Sandy ridges, often containing sea shells ("sand- or shell reefs") rise above the surface of the surrounding land, they generally lie parallel to the coast. Close near the barren muddy shore there are swampy mangrove forests, which more to the interior change to virgin forest and savannas. For a description of the various types of swamps of Surinam I refer to Geijskes's (1945) paper.

The present collection for the larger part consists of species, which already have been reported previously from Surinam. Though the material thus does not contribute very much to our knowledge of the number of species inhabiting Surinam, it is nevertheless extremely important as the two zoologists of the expedition, Dr. D. C. Geijskes, entomologist of the Agricultural Experiment Station at Paramaribo, and Mr. P. H. Creutzberg, at present biologist of the Institution for Marine Fisheries Research at The Hague,

made careful and interesting notes concerning the ecology, biology and colour of the animals collected. Dr. Geijskes provided me with the description of each of the localities, of which in many instances also the acidity, the salinity and the temperature of the water are given. Mr. Creutzberg gave me his general impression of the habitats, the biology and the colour of each species. These informations obtained from Dr. Geijskes and Mr. Creutzberg undoubtedly form the most important part of the present paper. It is therefore that I want to express here my sincere gratitude to these two gentlemen for their willingness to provide me with these data, the more so as the extensive report on this expedition by Dr. Geijskes, who was its general leader, has not yet been published.

A preliminary account of the expedition has been given by Bakker & Lanjouw (1949), the leaders of the geological and botanical sections of the expedition respectively.

As most of the species treated in the present paper also have been mentioned in a previous publication on Surinam shrimps (Holthuis, 1948), I refer to the latter publication for the data on the distribution of the species. At the end of the present article a list of the 14 species of Decapoda Macrura Natantia known at present from Surinam is given.

All the material mentioned here is preserved in the Rijksmuseum van Natuurlijke Historie at Leiden, Holland, unless stated otherwise.

***Penaeus ? aztecus* Ives, 1891**

Penaeus aztecus Holthuis, 1948, Proc. Kon. Nederl. Akad. Wetensch., vol. 51, p. 1104.

Material examined:

0.2 km S. of Wia Wia, swamp behind first shore ridge, an open swamp, about 0.1 to 0.3 m deep, with clear water, pH 7.7, salinity 21000-33760 mg/l Cl, temperature 28°-33° C, bottom soft clay; November 11, 1948, no. 2613. — 75 juveniles.

Same locality, November 13, 1948, no. 3412. — 19 juveniles.

The specimens are very small, which is the reason that their identity cannot be made certain. It also is possible that they belong to *Penaeus brasiliensis* Latreille or to *P. duorarum* Burkenroad. *Penaeus aztecus*, however, is the only of these three forms, which has already been mentioned from Surinam.

The swamp in which the present specimens were found lacked all cover of trees. Dead stumps of parwa-trees *Penaeus ? aztecus* acq.) indicated the former presence of these trees, which have been chopped down by fishermen to obtain fuel for the smoking and drying of their fish. The swamp thus is fully exposed to the influence of the sun, which is the cause

of the high temperature and salinity of the water. The salinity of the sea close by is about 15000 mg/l Cl. Sea water enters the swamp over the shore ridge only during spring tide or with heavy storms. In the wet season the salinity and the temperature will be considerably diminished by the heavy rains.

The animals are perfectly colourless and transparent.

Euryrhynchus wrzesniowskii Miers, 1877

Euryrhynchus wrzesniowskii Holthuis, 1948, Proc. Kon. Nederl. Akad. Wetensch., vol. 51, p. 1111.

Material examined:

Lai creek, Moengotapoe, a savanna creek with brown, acid water, pH 5-5.5, temperature 25° C, bottom sand with dead leaves; September 21, 1948, no. 386. — 9 specimens, found together with *Palaemonetes carteri* Gordon.

Small forest creek, 0.4 km N. of Moengotapoe, similar to Lai creek, but smaller and flowing deeper inside the forest, curves of this creek with rather deep holes, which are the only parts of the creek which keep the water during the great dry season, bottom sand with many dead leaves; September 21, 1948, no. 387. — 1 specimen, found together with *Macrobrachium brasiliense* (Heller) and *Palaemonetes carteri* Gordon.

Djai creek, 8.4 km N. of Moengotapoe, an almost dry swamp creek, filled with a large amount of dead leaves and branches, for the larger part it is grown over by moko-moko plants (*Montrichardia arborescens* (L.) Schott), the rest is covered with waterlilies (*Nymphaea* spec.), water turbid brown, pH 5.3-5.4, temperature 25° C (two days later, after some rain, the pH was 6.4-6.5, the temperature 23.5° C); October 8, 1948, no. 1262. — 2 specimens, found together with *Palaemonetes carteri* Gordon.

Third Swamp, 19 km N. of Moengotapoe, a large open swamp with bullrushes and a floating cover of a tight mass of plants (forming a kind of peat-moor) at some places showing holes, which contain clear brown water in which waterlilies (*Nymphaea* spec.) and many species of bladderwort (*Utricularia* spec.); the prawns were caught in these holes; October 22, 1948, no. 2298. — 1 specimen, found together with *Palaemonetes carteri* Gordon.

13.7 km S. of Wia Wia, pool on the south side of the last sand reef, open swamp similar to the previous; November 27, 1948, no. 3966. — 33 specimens (including 4 ovigerous females), found together with *Palaemonetes carteri* Gordon.

13.3 km S. of Wia Wia, south side of a large open swamp with bullrushes, similar to the Third Swamp (see above); November 27, 1948, no. 3965. — 4 specimens, found together with *Palaemonetes carteri* Gordon.

12.6 km S. of Wia Wia, shallow pool, under mauritie palms (*Mauritia flexuosa* L.f.) and bushes, water clear, brown, acid, bottom with many dead leaves and roots; November 26, 1948, no. 3825. — 6 specimens, found together with *Palaemonetes carteri* Gordon.

9.2 km S. of Wia Wia, swamp with bullrushes and bushes (southernmost *Cyperus giganteus* Vahl swamp), prawns in a kind of ditch with clear water, salinity 60 mg/l Cl, bottom clay; November 28, 1948, no. 3969. — 2 specimens, found together with *Palaemonetes carteri* Gordon.

The species was found in shallow water in dark, heavily shaded localities, mostly in woods or bushes. It lives in small pools and creeks (in flowing

as well as in stagnant water), which have the bottom covered with a thick layer of dead tree-leaves. These layers of leaves at some places had a thickness of a meter or more. The water in which *Euryrhynchus* lives as a rule is acid. The present data on the habitat of *Euryrhynchus* agree well with those given by Gordon (1935) for specimens from British Guiana. Up till now all Surinam specimens of this species known, were found in company of *Palaemonetes carteri* Gordon. In Gordon's British Guiana material, on the contrary, no specimens of *Palaemonetes carteri* were present from the localities where *Euryrhynchus* was found.

Mr. Creutzberg made the annotation with the above specimens, that in life they were generally of a pale bluish grey colour, sometimes tinged with a pale pink. Specimens from Zanderij (a locality 40 km due south of Paramaribo), which recently were received from Dr. Geijskes, were provided with the indication that in life the body was coloured bluish green.

Macrobrachium amazonicum (Heller, 1862)

Palaemon Dieperinkii (De Haan MSS) De Man, 1879, Notes Leyden Mus., vol. 1, p. 167.

Palaemon lamarrei Thompson, 1901, Catal. Crust. Mus. Dundee, p. 19.

Material examined:

Langamankondre, western shore of Marowijne River near its mouth, shallow, brackish water, sandy bottom; September 19, 1948, no. 282. — 1 specimen.

Surinam River near plantation "Peperpot", S. of Paramaribo, muddy shore of the river, water brackish at this moment, but fresh during the wet season, under strong influence of the tides (up to 3 m difference between high and low tide); January 5, 1949, no. 6209. — 1 specimen.

Both localities lie near the mouth of a large river, where the water is brackish and very turbid because of the large amount of silt which it contains. The Langamankondre specimen was caught by natives, it was attracted by the bait of their fishing lines. The other specimen was caught in a basket, which for this purpose was filled with bait (a piece of dried cod) and lowered into the water.

The animals are colourless transparent.

The species has been recorded from Surinam (without a more accurate indication of locality) by De Man (1879) and Thompson (1901). In the Rijksmuseum van Natuurlijke Historie at Leiden material of this species is present from the following localities in Surinam: "Geijersvlijt" plantation, mouth of Surinam River, just N. of Paramaribo; Paramaribo; Kabelstation, a locality on the Surinam River, about 100 km S. of Paramaribo, Groningen, a locality on the Saramacca River. *Macrobrachium amazonicum*

(Heller) is known from the Amazon and Paraguay River basins and from the rivers of Venezuela and the Guianas. It inhabits fresh and brackish waters.

Macrobrachium jelskii (Miers, 1877)

Macrobrachium jelskii Holthuis, 1948, Proc. Kon. Nederl. Akad. Wetensch., vol. 51, p. IIII.

Material examined:

Republiek, creek near Vierkinderen bridge, a large open savanna creek, which is a branch of the Coropina creek. This side creek flows through swampy ground, which partly is turned into grass land, a species of *Cabomba* and waterlilies (*Nymphaea* spec.) are growing in this creek, water pale brown, pH 5.5-6, temperature 28° C, bottom kaolin-clay with rather much vegetable mould; September 5, 1948, no. 79. — 1 specimen, found together with *Palaemonetes carteri* Gordon.

Galibi, western shore of mouth of Marowijne River, in small creek near plantation, this creek empties in the Marowijne River and is influenced by the tides, water brackish and muddy; November 9, 1948, no. 2911. — 4 specimens.

Coronieweg piket 216, km N o.o., in artificial pool (made by a dynamite explosion in 1941), which lies on the north side of a shell reef, water clear, pH 8, salinity 90 mg/l Cl, temperature 27° C, bottom clay; December 20, 1948, no. 4387. — 11 specimens, found together with *Palaemonetes carteri* Gordon.

The species seems to be able to live in widely different milieus. It is found here in acid and alkaline, in fresh and brackish, and in clear and muddy water. It is possible that the animals, like many other species of this genus, migrate from fresh to brackish or salt water in the time that the eggs are ready to hatch.

In the collection of the Rijksmuseum van Natuurlijke Historie specimens of this species are present from the following Surinam localities: "Geijersvlijt" plantation, just N. of Paramaribo, on the mouth of the Surinam River; Paramaribo. The U.S. National Museum in Washington, D.C., U.S.A., possesses some specimens from Paramaribo.

Macrobrachium brasiliense (Heller, 1862)

Macrobrachium brasiliense Holthuis, 1948, Proc. Kon. Nederl. Akad. Wetensch., vol. 51, p. IIII.

Material examined:

Small forest creek, 0.4 km N. of Moengotapoe, similar to Lai creek (see p. 28), but smaller and flowing deeper inside the forest, curves of the creek with rather deep holes, which are the only parts which keep the water during the great dry season, water acid, brown, bottom sand, with many dead leaves; September 21, 1948, no. 387. — 3 specimens, found together with *Euryrhynchus wrzesniowski* Miers and *Palaemonetes carteri* Gordon.

Nassau Mountains, 2 km W. of base camp, in a mountain creek in the forest, with

fast flowing clear water, pH 6.7, temperature 22° C, bottom shingle and sand, with clay walls; February 22, 1949, no. 7392. — 27 specimens.

Nassau Mountains, same locality as previous lot (no. 7392), fished with nekoe (fish poison); February 25, 1949, no. 7646. — 29 specimens.

Nassau Mountains, 7 km W. of base camp, below a large fall in Bleeders creek, a mountain creek in the forest, with fast flowing clear water; the prawn was collected between branches and leaves among the stones at the foot of the fall; March 7, 1949, no. 8327. — 1 specimen.

Nassau Mountains, 3.6 km W. of base camp, in a small creek with fast flowing clear water, coming down in cascades; March 11, 1949, no. 8697. — 25 specimens.

Nassau Mountains, 11.2 km W. of base camp, in shaded mountain creek, about 0.7 m deep, flowing through a slightly swampy forest, water clear, pH 6.5, temperature 21°-22° C, bottom sand and shingle; the prawns were collected in the deeper parts of the creek between leaves and branches; March 15, 1949, no. 9008. — 147 specimens (including 1 ovigerous female).

Macrobrachium brasiliense was almost exclusively found in heavily shaded forest creeks with clear water. The creeks of the Nassau mountains mentioned above, all are fast or very fast flowing, with the bottom rocky, with coarse sand, shingle or stones. The water is clear and rather acid, it is strongly oxygenated. The animals always were found there among accumulations of dead leaves and branches, which had been carried down by the creeks, but stopped in their progress by stones. The animals also were plentiful among the denuded bushy tree roots, which stuck out into the water. They were not met with in the stagnant places in the curves of the creeks.

The prawns, like so many Palaemonids do (I had the same experience with *Palaemon elegans* Rathke of the Mediterranean), came nibbling at the toes and legs of the members of the expedition, when these took their baths in the creeks.

Old specimens of this species are coloured brick red to brownish red when living. They often have the dorsal region very dark brown to almost blackish. Younger specimens are of a much paler red, while juveniles are practically colourless.

Recently the Rijksmuseum van Natuurlijke Historie received from Dr. Geijskes a number of specimens of this species from Bigidjampo creek, Lolobroki creek and Mispel creek. These creeks are situated near the railway which runs from Paramaribo into the interior of Surinam, at about 121 kilometers south of Paramaribo.

Macrobrachium carcinus (Linnaeus, 1758)

Palaemon jamaicensis p.p. Semper, 1868, Proc. zool. Soc. Lond., 1868, p. 585.

Palaemon jamaicensis De Man, 1912, Ann. Soc. Roy. zool. malac. Belg., vol. 46, pp. 234, 241, 243.

Palaemon jamaicensis Tesch, 1914-1917, Encycl. Nederl. West Indië, p. 250.

Palaemon (Macroterochair) jamaicensis De Man, 1925, Ann. Mus. Congo Belge, Zool., ser. 3 sect. 3 vol. 1 pt. 1, p. 51, fig. 13.

Material examined:

Surinam River near Marine-trap, Paramaribo, between stones of the stone facing of the river side; June 3, 1949, no. 9726. — 1 specimen.

The present specimen is a fully developed male.

Macrobrachium carcinus (L.) is better known under the name *Macrobrachium* (or *Palaemon*) *jamaicensis* (Herbst), but as will be pointed out more extensively in a future publication, *Cancer Carcinus* of Linnaeus undoubtedly is identical with the present form, so that its name has to be *Macrobrachium carcinus* (L.).

The species has been recorded in literature from Surinam (without a more precise indication of the locality) by Semper (1868) and De Man (1912, 1925), while Tesch (1914-1917) reports it from the mouth of the Surinam River. *Macrobrachium carcinus* probably also is the species described by Kappler (1887, p. 200) as "einen Krebs, *Astacus*, der in Felsenlöchern und hohlen angeschwemmten Bäumen in der Mündung des Maroni [= Marowijne] vorkommt, grösser als der Edelkrebs [= the European *Astacus astacus* (L.)] ist, manchmal fusslang wird, und 12 cm lange, aber ziemlich schmale Scheeren hat. Er ist schwarzbraun, wird aber beim Kochen hochrot und übertrifft den Edelkrebs an Wohlgeschmack. In manchen Flüssen kommt er gar nicht vor." The specimens mentioned by Kappler on the same page as "Garneele, *Palaemon*, die man in kleinen Netzen fängt" and which "Sehr häufig ... ist an den Flussmündungen im Brackwasser" probably are a mixture of *Penaeus aztecus* Ives, *Xiphopenaeus krøyeri* (Heller) and *Palaemon schmitti* Holthuis.

The Rijksmuseum van Natuurlijke Historie at Leiden possesses various specimens of the species with the indication "Suriname".

Macrobrachium carcinus inhabits fresh and brackish waters, it is known from Florida to S.E. Brazil.

***Palaemonetes carteri* Gordon, 1935**

Palaemonetes carteri Holthuis, 1948, Proc. Kon. Nederl. Akad. Wetensch., vol. 51, p. 113.

Material examined:

Republiek, side creek of Coropina creek near railroad, a savanna creek with rather rapidly flowing brown acid water, pH 5, temperature 25° C, bottom sand, deeper holes in the curves of the creek; the prawns were collected between dead leaves and water-plants in the shade; September 4, 1948, no. 26. — 38 specimens.

Republiek, side creek of Coropina creek near Vierkinderen bridge, a large open

savanna creek, flowing through swampy ground, which partly is turned into grass land, a species of *Cabomba* and waterlilies (*Nymphaea* spec.) are growing in this creek, water pale brown, pH 5.5-6, temperature 28° C, bottom kaolin-clay with rather much vegetable mould; September 5, 1948, no. 79. — 6 specimens, found together with *Macrobrachium jelskii* (Miers).

Republiek, W. of Vierkinderen, same creek as from where the previous lot (no. 79) was obtained; September 5, 1948, nos. 81 and 82. — 222 specimens (including 1 ovigerous female).

Lai creek, Moengotapoe, a savanna creek with brown acid water, pH 5-5.5, temperature 25° C, bottom sand with dead leaves; September 21, 1948, no. 386. — 41 specimens (including 8 ovigerous females), found together with *Euryrhynchus wrzesniewskii* Miers.

Small forest creek, 0.4 km N. of Moengotapoe, similar to Lai creek, but smaller and flowing deeper inside the forest, curves of this creek with rather deep holes, which are the only parts of the creek that keep the water during the great dry season, bottom sand with many dead leaves; September 21, 1948, no. 387. — 1 specimen, found together with *Euryrhynchus wrzesniewskii* Miers and *Macrobrachium brasiliense* (Heller).

Wane creek, 5.3 km N. of Moengotapoe, a large, fully 2 m deep savanna creek, which flows through forest with occasionally rather large open spaces; large quantities of prawns were caught in one of these open spaces between floating wooden beams and water plants belonging to the genus *Cabomba*; the water of the creek is still under the influence of the tides (there is a difference of 0.5 m between high and low tide); water brown, acid, pH 5.3, salinity 15 mg/l Cl, temperature 25°-25.5° C; September, 1948, no. 856. — more than 1500 specimens.

Djai creek, 8.4 km N. of Moengotapoe, a swamp creek which is almost dry, being filled with a large amount of dead leaves and branches, for the larger part it is grown over by moko-moko plants (*Montrichardia arborescens* (L.) Schott), the rest is covered with waterlilies (*Nymphaea* spec.), water turbid brown, pH 5.3-5.4, temperature 25° C (two days later, after rainfall, the pH was 6.4-6.5, the temperature 23.5° C); October 8, 1948, nos. 1258 and 1262. — 131 specimens, found together with *Euryrhynchus wrzesniewskii* Miers.

First Swamp, 17.3 km N. of Moengotapoe, a large open swamp with bullrushes, having the water knee-deep, pH 6.7, salinity 10 mg/l Cl, bottom clay; October 24, 1948, no. 2299. — 1 specimen.

Third Swamp, 19 km N. of Moengotapoe, a large open swamp with bullrushes and a floating cover of a tight mass of plants (forming a kind of peat-moor), showing holes at some places, these holes contain clear brown water in which waterlilies (*Nymphaea* spec.) and many species of bladderwort (*Utricularia* spec.); the prawns were caught in these holes; October 22, 1948, no. 2298. — 9 specimens, found together with *Euryrhynchus wrzesniewskii* Miers.

13.7 km S. of Wia Wia, pool on the south side of the last sand reef, open swamp similar to the previous; November 27, 1948, no. 3966. — 14 specimens (including 1 ovigerous female), found together with *Euryrhynchus wrzesniewskii* Miers.

13.3 km S. of Wia Wia, south side of a large open swamp with bullrushes, similar to the Third Swamp (see above); November 27, 1948, no. 3965. — 37 specimens (including 4 ovigerous females), found together with *Euryrhynchus wrzesniewskii* Miers.

12.6 km S. of Wia Wia, shallow pool under mauritie palms (*Mauritia flexuosa* L. f.) and bushes, water clear, brown, acid, bottom with many dead leaves and roots; November 26, 1948, no. 3825. — 24 specimens (including 6 ovigerous females), found together with *Euryrhynchus wrzesniewskii* Miers.

12.1 km S. of Wia Wia, small drinking pool in an open space in the forest, bottom black mouldy mud with dead leaves and branches; November 26, 1948, no. 3826. — 4 specimens.

9.2 km S. of Wia Wia, swamp with bullrushes and bushes (southernmost *Cyperus giganteus* Vahl swamp), prawns collected in a kind of a ditch with clear water, salinity 60 mg/l Cl, bottom clay; November 28, 1948, no. 3969. — 73 specimens (including 3 ovigerous females), found together with *Euryrhynchus wrzesniowskii* Miers.

7.8 km S. of Wia Wia, an almost dry forest pool with moko-moko plants (*Mont-richardia arborescens* (L.) Schott) and duckweed, water with pH 6.6, salinity 60 mg/l Cl; November 24, 1940, no. 3612. — 12 specimens.

7.7 km S. of Wia Wia, large swamp with *Cyperus giganteus* Vahl, water standing about 0.15 m high between the plants, water brownish, pH 5.2-5.5, salinity 60 mg/l Cl; November 24, 1948, no. 3624. — 3 specimens.

Coronieweg, piket 216 km N o.o., in artificial pool (made by a dynamite explosion in 1941), which lies on the north side of a shell reef, water clear, pH 8, salinity 90 mg/l Cl, temperature 27° C, bottom clay; December 20, 1948, no. 4387. — 28 specimens (including 10 ovigerous females), found together with *Macrobrachium jelskii* (Miers).

Coronieweg, piket 197-198 km N o.o., swamp creek with clear brown water, pH 5.5, salinity 80 mg/l Cl, temperature 26° C; December 21, 1948, no. 4574. — 4 specimens.

The species does not seem to be restricted to a special type of habitat. It lives in stagnant pools as well as in flowing creeks of various size, in shallow and in deeper water, in acid and more alkaline milieus. Mainly, however, it is found close to the surface of the water and seems to prefer to be among delicate waterplants at warm and sunny shallows near the shore of the creeks or pools. Generally the water in which the animals live is rather acid. It is the opinion of the collectors that this species shows more distinctly a preference for light sunny places than *Euryrhynchus wrzesniowskii*, though the two species often are found together.

The animals are perfectly colourless and transparent, except for a dark mass which lies in the thorax around the stomach.

The Leiden Museum possesses specimens of this species from the following localities within Surinam: Paramaribo; Guyana Goud Placer, a locality lying about 75 km S. of Paramaribo on the railway from Paramaribo to the interior of Surinam; Saramacca River basin; Makami creek near Kabelstation, a locality about 130 km S. of Paramaribo on the Surinam River.

LIST OF THE KNOWN SPECIES OF DECAPODA MACRURA NATANTIA FROM SURINAM

The following list gives an enumeration of all species of *Macrura Natantia* at present known to inhabit Surinam. Of those species, which have been dealt with in the present or in my previous (1948, 1950) publications, generally only the name is given with a reference to one of these three papers. The only other form is treated somewhat more extensively. References to all those places in literature dealing with specimens from

Surinam belonging to the present group, are inserted in the following list, as far as they have not been given in the first part of this paper.

1. *Penaeus aztecus* Ives, 1891 (vid. present paper p. 27).
2. *Xiphopenaeus krøyeri* (Heller, 1862) (vid. Holthuis, 1948, p. 1105).

Recently Dr. Geijskes sent for examination 26 specimens of this species from the mouth of the Warappa creek, which creek lies east of the Surinam River near Matappica (north bank of Commewijne River) and empties in the sea. The creek is muddy and about 50 m broad, nearby there are many pools in which the natives do some fishing. Some shrimps enter these pools from the creek. Salinity between 6000 and 13000 mg/l Cl, temperature about 30° C. The natives name this species: "redi sarasara" (= red shrimp).

Furthermore 10 specimens of *Xiphopenaeus krøyeri* were obtained at Coppename Punt near the mouth of the Coppename River, Surinam.

3. *Acetes americanus* Ortman, 1893 (vid. Holthuis, 1948, p. 1105, fig. 1).
4. *Hippolysmata (Exhippolysmata) oplophoroides* Holthuis, 1948 (vid. Holthuis, 1948, p. 1106, figs. 2, 3).

Two more specimens of this species were received recently from Dr. Geijskes. These specimens have been collected at Coppename Punt near the mouth of the Coppename River, Surinam (October 25, 1949, leg. R. Wirtz).

5. *Euryrhynchus wrzesniowskii* Miers, 1877 (vid. present paper, p. 28).
6. *Macrobrachium amazonicum* (Heller, 1863) (vid. present paper, p. 29).
7. *Macrobrachium jelskii* (Miers, 1877) (vid. present paper, p. 30).
8. *Macrobrachium acanthurus* (Wiegmann, 1836).

Palaemon (Eupalaemon) acanthurus De Man, 1912, Ann. Soc. Roy. zool. malac Belg., vol. 46, p. 243.

The species has been recorded in literature from Surinam (without a more precise indication of the locality) by De Man (1912). The collection of the Rijksmuseum van Natuurlijke Historie at Leiden contains specimens of this species from the following Surinam localities: Surinam (without more accurate indication of the locality); Coppename River, Surinam.

9. *Macrobrachium surinamicum* Holthuis, 1948 (vid. Holthuis, 1948, p. 1112).

Apart from the material mentioned in my 1948 paper, the Rijksmuseum van Natuurlijke Historie possesses specimens of this species from Surinam (without more accurate indication of the locality) and Surinam River near Paramaribo.

10. *Macrobrachium brasiliense* (Heller, 1862) (vid. present paper, p. 30).
11. *Macrobrachium ? olfersii* (Wiegmann, 1862) (vid. Holthuis, 1948, p. 1112).

12. *Macrobrachium carcinus* (Linnaeus, 1758) (vid. present paper, p. 31).

13. *Palaemon schmitti* Holthuis, 1950 (vid. Holthuis, 1950, p. 97).

Material examined:

Mouth of Surinam River near Resolutie. In shrimp traps. Bottom mud, water muddy, brown, salinity 15890 mg/l Cl, temperature 27° C; December 22, 1942, 9 h a.m.; D. C. Geijskes leg. — about 100 specimens (including ovigerous females).

Mouth of Warappa creek near Matappica, north bank of Commewijne River, just E. of Paramaribo, water muddy, salinity 6000-13000 mg/l Cl, temperature about 30° C (see also under *Xiphopenaeus krøyeri*); December 11, 1942; D. C. Geijskes leg. — 28 specimens (including ovigerous females).

Paramaribo, shore of the Surinam River at spring-tide; December 1949; D. C. Geijskes leg. — 5 specimens.

In the introduction of my 1948 paper I stated that Dr. Waldo L. Schmitt, head curator of the Department of Zoology, U.S. National Museum, Washington, D.C., U.S.A., intended to describe the present form as new. Recently, however, Dr. Schmitt informed me that because of his many duties he could not find the time to make this description and offered me the opportunity to do so. A preliminary account of the species has just been published by me, a more extensive description and figures will be given in a future paper.

Native name. The native population near the Warappa creek named this species "witti bere" [= white belly]. Some of the fishermen think specimens of this species to be juveniles of *Xiphopenaeus krøyeri* (Heller).

14. *Palaemonetes carteri* Gordon, 1935 (vid. present paper, p. 32).

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