

THE DECAPOD CRUSTACEA OF BROKOPONDO LAKE, SURINAM

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ABSTRACT

The changes in the Decapod fauna of the middle Suriname River basin, caused by the construction of the hydro-electrical dam near Afobaka in 1964, are discussed.

Brokopondo Lake in Surinam is a man-made lake, formed by the construction of a dam for hydro-electrical purposes in the Suriname River near the village of Afobaka at 4°59'N 55°00'W. The dam was completed on 1 February 1964.

In connection with this project hydrobiological investigations were carried out in the area before and after completion of the dam. These investigations were organized by the Netherlands Foundation for the Advancement of Research in Surinam and the Netherlands Antilles (WOSUNA). From November 1963 until July 1967, a team of hydrobiologists worked in the area of the Suriname River basin that was affected by the project, while later, at a few occasions, some incidental investigations were carried out there. A general account of the hydrobiological work and its results was published by Leentvaar(1975).

Most of the Decapod Crustacea dealt with in the present paper were collected by the ichthyologists working with the team: Dr.M.Boeseman, Curator of Fishes of the Rijksmuseum van Natuurlijke Historie (now called Nationaal Natuurhistorisch Museum) at Leiden, stayed in the Brokopondo area from 13 November 1963 to early October 1964. Dr.G.F.Mees, Curator of Birds of the same Museum, and also a specialist in fishes, was there from March 1965 to April 1966. Furthermore some material was obtained in the Brokopondo region in 1972 by the late Dr.D.C.Geijskes, the former Director of the Surinaams Museum in Paramaribo, who was an entomologist and general zoologist, and since 1938 had intensively studied the Surinam fauna. A few specimens were also obtained by other members of the hydrobiological team.

The Suriname River takes its origin in the mountainous area of southern Surinam at about 3.5° N and flows in a mainly northward direction between 55° and 56° W; it reaches the north coast of South America at 5°55' N 55°10' W. It is roughly 400km long and flows through a mountainous and hilly area until it

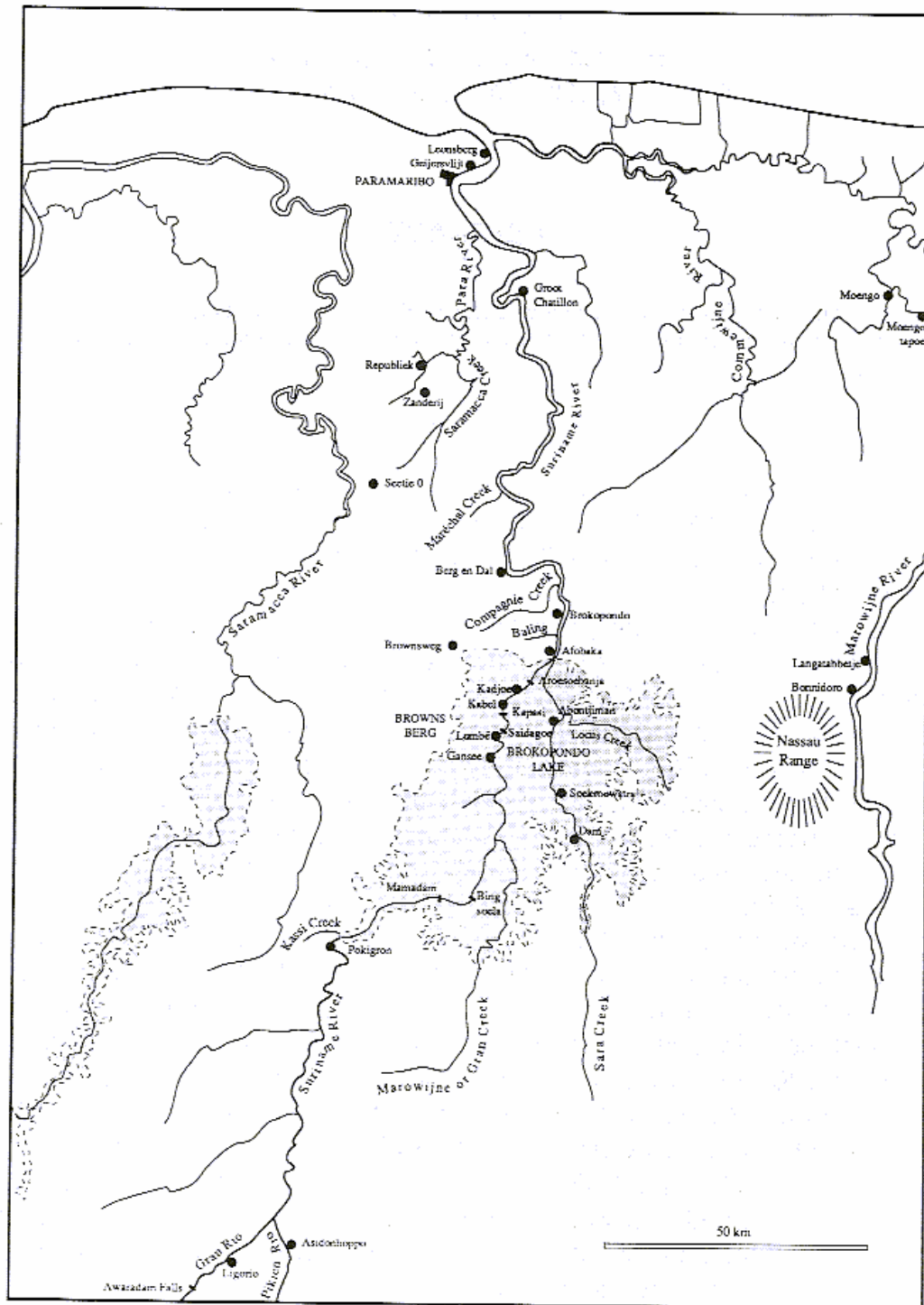


Fig. 1 Suriname River with localities mentioned in the text. Shaded: the area that is flooded at present.

reaches the coastal region, which is an area about 80 to 100 km wide between the last falls of the rivers and the coast.

Brokopondo Lake is roughly 60 km long 40 km wide and lies about 150 km from the mouth of the Suriname River, thus well above the coastal region. Before the construction of the dam, the Suriname River in the Brokopondo area was a wide river with a rocky bottom, sandy in a few places. It flowed through tropical rain forest, which came up to the river banks; no swampy areas being present along this stretch of the river. The river itself in that area was about 300 m wide in the dry season. The water was poor in minerals and of a brown colour, pH was rather low. The current was rather swift and several rapids and falls were present; in these rapids the vegetation and the fauna were concentrated, the fauna of the river itself being rather poor. After the completion of the dam, an area of roughly 1.500 km² was flooded south of the dam and it now forms the so-called Brokopondo Lake. In the lake the water is mostly stagnant, and the greatest depth is about 50 m. The main object of the hydrobiological investigations was to observe the change in the fauna and flora from that of a fast flowing river to one of a stagnant lake, and also observe the physical and chemical changes in the environment.

The following account deals with the Decapod Crustacea collected during these investigations. The species obtained are 13 in number, viz., 9 species of shrimps and 4 species of crabs.

Decapoda Natantia

Family Atyidae

Atya gabonensis Giebel, 1875

A female of this most interesting species was collected on 14 February 1964 in the rapids of the Suriname River near Brokopondo by Dr.M.Boeseman.

At that time the species was known in South America only from a single find. In 1884, namely, Koelbel (1884: 317, pl.3) gave an excellent description and beautiful figure a new species, *Euatya sculptilis*, from the Orinoco River in Venezuela. The species showed a strong resemblance to the West African species *Atya gabonensis* described in 1875 by Giebel. Most authors synonymized the two species, assuming that Koelbel's material was incorrectly labelled as to the locality and probably also originated from West Africa; so Bouvier (1925: 318-319) in his monograph of the Atyidae stated: "les exemplaires bien décrits et figurés par Kölbl sous le nom d'*Euatya sculptilis* sont indiqués comme provenant de l'Orénoque, ce qui tient peut être à une fausse indication de provenance". Dr. Boeseman's specimen showed that the species really does occur in South America.

The first published record showing that the species indeed is an inhabitant of the South American continent is by Hobbs (1980: 111) who reported *Atya gabonensis* from Rio Piaui near Boa Esperanza in Piaui State, Brazil. He compared his five male specimens with material from West Africa and could not find any good specific difference and continued to consider *Atya sculptilis* (Koelbel, 1884) a junior synonym of *A. gabonensis* Giebel, 1875. In an important monograph of the genus *Atya*, Hobbs & Hart (1982: 48-56, figs. 1n, 3,9,10,11f,20,21) dealt extensively with the species; they also saw the present Brokopondo specimen. If one day specific differences should be found between the West African and South American forms, the specific name *sculptilis* is available for the latter.

Atya gabonensis is a species that in West Africa is predominantly found in rapids of rivers with a rocky bottom and clear water, which agrees with what is known of the present Surinam specimen. No details of the habitat are known of the specimens from the Orinoco and Piaui Rivers.

The species is of considerable size and is largest *Atyid* known. The Surinam female has a carapace length of 27.5 mm. The largest of Koelbel's numerous Orinoco specimens measured 45 mm in carapace length, and Hobbs' five males had a carapace length of 50 to 53 mm. West African specimens reach about the same size.

In view of the habitat of this species it is unlikely that it will settle in the Brokopondo Lake.

Family Palaemonidae

Macrobrachium amazonicum (Heller, 1862)

This species was collected in 1964 and 1965 in the Suriname River at Hermanskondre near Brokopondo (1 specimen on 1 June 1964) and at Brokopondo (29 specimens, 20 March 1965), both localities below the dam at Afobaka.

In the Brokopondo Lake the species was also found rather abundantly. Near Afobaka one specimen was collected on 18 March 1964 near a pier above the dam. On 1 June 1964 and 9 August 1965 *Macrobrachium amazonicum* was again found in the lake near Afobaka, likewise in small numbers (1 and 3 specimens respectively). On 11 August 1965 Dr.G.F. Mees collected more than 20 specimens near the eastern accessory dam in the lake at 3.5 km S.E. of Afobaka, and on 2 August 1972 Dr.D.C. Geijskes found the species in great numbers near the southern shore of the lake south of the former Mamadam Falls. He noted that the species was so abundant there, that the bush negro population regularly caught the shrimps as food.

Macrobrachium amazonicum is one of the common shrimps of the lower Suriname River. The species is also found in the Saramacca Canal and the

Sommelsdijk Creek both near Paramaribo. It is not infrequently encountered in pools and creeks near the rivers. Although *M. amazonicum* is commonest in the coastal region of Surinam, there is a single old record from the Brokopondo area: between 21 and 28 September 1938 ten specimens were collected near Kabel by Dr.D.C. Geijskes. It is clear that the species has now become fully established in Brokopondo Lake, and to all appearances is much more common in the area than it was previously.

***Macrobrachium brasiliense* (Heller, 1862)**

During the Brokopondo investigations three samples of this species have been collected. Two of these were obtained in the area above the present site of the lake, viz., in Kassi Creek near Pokigron (3 specimens, 20 March 1964) and in a branch creek of the Pikien Rio above Asidohoppo (2 specimens, 13 August 1964). The third sample came from below the lake: Compagnie Creek, N. of Brokopondo (61 specimens, 20 December 1965). In the lake itself the species was not collected at all.

Judging by previous records, this species prefers shadowy forest creeks of the interior of Surinam (Emma Range; Brownsberg and surrounding area; area of Kabel; forest creeks in the Commewijne River area; near Moegotapoe; Nassau Range). Its absence from the lake might be explained by its habitat preference for small shaded streams with running water.

***Macrobrachium carcinus* (Linnaeus, 1758)**

During the Brokopondo investigations of 1964 and 1965 eight samples of this species were collected. One of these originated from a locality situated above the present site of the lake: Gran Creek (= Marowijne Creek) near Bofroedèdè (1 specimen, 5 March 1964). Six of the samples originated from below the lake: somewhat above Baling between Afobaka and Brokopondo (4 specimens, 19 March 1965), between Afobaka and Brokopondo (February 1964), near Brokopondo (1 specimen, 7 June 1964; 1 specimen, 20 April, 1965), Hermanskondre near Brokopondo (3 specimens, 13 May 1964), near Berg en Dal (1 specimen, 1 December 1963). Only once a specimen was collected in Brokopondo Lake itself. This specimen was taken on 18 March 1964 near a pier above the dam at Afobaka, only a month after the completion of the dam.

Macrobrachium carcinus, is a species inhabiting the larger rivers in Surinam. Before 1963 it has frequently been taken in the Suriname River (in its lower course near Paramaribo and Groot Chatillon, but also higher up the

river near Kabel and Gansee). Also in the Marowijne River which forms the eastern border of Surinam, the species has been found in several localities (St. Laurent; Bonnidoro; Langatabbetje). *Macrobrachium carcinus* seems to prefer running water and a rocky bottom; this may be the reason that it has not been found more frequently in the lake.

***Macrobrachium jelskii* (Miers, 1877)**

The Brokopondo investigations of 1964 and 1965 found this species exclusively in the lake. It was collected at the following localities: near Gansee (a few specimens, 12 August 1965; 75 specimens, 7 October 1965), near Saidagoe (1 specimen, 26 May 1964), between Kadjoe and Aroesoebanja (many specimens, 2 June 1964), near Aroesoebanja (very many specimens, 23 June 1964), near Soekroewatra (1 specimen, 9 July 1964), and between Kabel and Abontjiman (30 specimens, 25 March 1965). In five of the samples the animals were taken from among the roots of the water hyacinth, *Eichhornia crassipes* (Mart.) Solms; the sample from Soekroewatra was collected in a swamp dominated by the waterfern, *Ceratopteris*. The abundant occurrence of the species in the lake shows that it has become entirely acclimatized there.

Macrobrachium jelskii, judging by previous finds in Surinam, is a species that by preference inhabits swamps, pools, roadside ditches and slow flowing creeks in the coastal area. It is found throughout the coastal area, but had not been reported from the interior.

***Macrobrachium olfersii* (Wiegmann, 1836)**

This species is very abundantly represented in the collections made during the 1964 and 1965 investigations. It is contained in no less than 26 samples, but only three of these were taken from the lake itself. Above the lake *M. olfersii* was found at the following localities (the last of these is now situated in the lake, but at the time of collecting the locality was not yet flooded): Gran Creek (=Marowijne Creek) near Bofroedèdè (2 specimens, 5 March 1964), in a rapid in the lower part of the same creek (many specimens, 6 March 1964; 2 specimens, 29 July 1964), below the Mamadam Falls in the Suriname River (1 specimen, 17 January 1964). Below the present lake the species was collected at the following places: Suriname River near Afobaka (many specimens, 8 February 1964), near Baling, between Afobaka and Brokopondo (very many specimens, 19 March 1964), near Drepada, about 8 km N. of Brokopondo (8 specimens, 12 December 1963), near Brokopondo (a few specimens, 3-4

February 1964; 11 specimens, 13 February 1964; 1 specimen, 14 February 1964; 1 specimen, 25-26 April 1964; a few specimens, 2 May 1964; about 12 specimens, 12 May 1964; 1 specimen, 3 June 1964; about 10 specimens, 7 June 1964; 1 specimen, 24 June 1964; 1 specimen, 2 September 1964; 8 specimens, 20 March 1965), Hermanskondre near Brokopondo (very many specimens, 13 May 1964; about 20 specimens, 1 June 1964), Compagnie Creek (many specimens, 10 December 1963; 2 specimens, 13 April 1965), Mama Creek near Afobaka (5 specimens, 30 April 1965). The three samples collected in the lake itself are the following: Saidagoe, S. of Kapasi (about 30 specimens, 26 May 1964), Aroesoebanja (5 specimens, 23 June 1964), lake shore near the first eastern accessory dam, S.E. of Afobaka (1 specimen, 28 May 1964).

Before 1963 *Macrobrachium olfersii* has been reported from the three large rivers of Surinam, viz., the Coppename, Suriname and Marowijne Rivers. In all three it was found among the vegetation, like Podostemonacea, growing on the rocks in rapids and falls. Although the species has been collected in Brokopondo Lake, the stagnant water of the lake and the often muddy bottom do not seem to be the ideal habitat for it. It will be interesting to see whether or not the species will be able to maintain itself in the lake.

***Macrobrachium surinamicum* Holthuis, 1948**

Five samples of this species were collected during the Brokopondo investigations, none of those in the lake itself. Two samples came from localities situated above the lake: Gran Creek (=Marowijne Creek) near Bofroedèdè (1 specimen, 5 March 1964), and in a rapid of the same creek near its mouth (1 specimen, 6 March 1964). The three others samples are both from below the lake: Suriname River at Hermanskondre near Brokopondo (a few specimens, 13 May 1964), Compagnie Creek near Brokopondo (5 specimens, 13 April 1965), and Maréchal Creek (9 specimens, 25 April 1965).

Until now *Macrobrachium surinamicum* was know only from the lower Suriname River (near Paramaribo, and near the plantation "Geijersvlijt" just N. of Paramaribo), and from the Saramacca Creek near Paramaribo. The preferred habitat of this species is not yet exactly known. Some of the localities where it was found seem to have a muddy bottom and sluggish water, so that this species would seem more promising as a future inhabitant of Brokopondo Lake than for instance *Macrobrachium olfersii*.

***Palaemonetes carteri* Gordon, 1935**

During the 1964 and 1965 Brokopondo investigations this species was frequently collected both outside and in Brokopondo Lake. It was taken in the following localities situated above the lake: Gran Creek (=Marowijne Creek) near Bofroedèdè (1 specimen, 5 March 1964), and Kassi Creek near Pokigron (1 specimens, 20 March 1964). Below the Afobaka dam it was found in the following places: pool near Brownsveg (about 14 specimens, 28 March 1965), Sabakoe Creek near Zanderij (17 August 1965), Maréchal Creek (1 specimen, 25 April 1965), Saramacca Creek (40 specimens, 7 April 1965; about 30 specimens, 20-27 April 1965; 25 specimens, 21 May 1965), Republiek (18 specimens, 5 May 1965). Six of the samples were taken in Brokopondo Lake itself: Gansee (12 specimens, 12 August 1965; 2 specimens, 7 October 1965), between Kabel and Abontjiman (4 specimens, 24 and 25 March 1965; several specimens, 14 June 1965), Soekroewatra (2 specimens, 9 July 1964), and Amanipari Creek, a branch creek of the Sara Creek between Locus Creek and Dam (1 specimen, 24 February 1964). The specimens from Brokopondo Lake were often found among the roots of floating water hyacinths, *Eichhornia crassipes*.

Palaemonetes carteri is a very abundant species in the coastal region of Surinam, where it is found in ditches, pools, and creeks in the swamp region and outside. It occurs in stagnant and flowing water, which may be fresh or slightly brackish, slightly acid or alkaline; it is found from close to the coast to as far inland as the falls line. It is not surprising therefore that this species has immediately colonized Brokopondo Lake.

***Euryrhynchus wrzesniowskii* Miers, 1877**

This species has not been found in Brokopondo Lake, but exclusively in acid savannah creeks north of the lake: Sabakoe Creek near Zanderij (1 specimen, 17 August 1965), Saramacca Creek, S. of Zanderij (74 specimens, 20-27 April 1965), Republiek (2 specimens, 5 May 1965).

Euryrhynchus wrzesniowskii is not rare in Surinam, but so far has only been found in acid savannah creeks with slow flowing, clear, but often brownish coloured water. The species therefore is not likely to be encountered in Brokopondo Lake.

Brachyura

Family Trichodactylidae

***Dilocarcinus dentatus* (Randall, 1840)**

Three samples of this species have been collected during the Brokopondo investigations of 1964 and 1965. All three came from the lake itself: Aroesoebanja, N. of Kabel, among roots of the water hyacinth, *Eichhornia crassipes*, and filamentous algae (1 specimen, 23 June 1964), Soekroewatra, in swamp with water fern, *Ceratopteris* (2 specimens, 9 July 1964), in pool along the road to the accessory dam S.E. of Afobaka (1 specimen, 21 December 1963).

Dilocarcinus dentatus was known from several localities in the coastal region of Suriname, but it has also been found in the interior, viz., in the Lucie River. It was collected on the banks of ditches, and also in rotting wood in the forests.

***Dilocarcinus spinifer* H. Milne Edwards, 1853**

During the 1964 and 1965 investigations 6 samples of this species were collected in the Suriname River basin. Two of these are from above the lake: Ligorio on Gran Rio (1 specimen, 16 July 1965), and Kassi Creek near Pokigron (3 specimens, 20 March 1964). One sample was taken below the lake, viz., in the Compagnie Creek near Brokopondo (6 specimens, 13 April 1965). Three samples came from the lake itself: between Kadjoe and Aroesoebanja, among roots of the water hyacinth *Eichhornia crassipes* (1 specimen, 2 June 1964), near Aroesoebanja, among the roots of the water hyacinth (2 specimens, 23 June 1964) and from the lower Sara Creek, among roots of the water fern *Ceratopteris* (1 specimen, 19 June 1964).

Dilocarcinus spinifer is not rare in the coastal region and is often found in creeks and pools of swampy areas (e.g., in the Agricultural Experiment Garden at Paramaribo; near Leonsberg, N. of Paramaribo; and in the swamps N. of Moengo). It has also been found in the interior (Sectie O; Kabel) and even close to the Brazilian border (upper Paru River). It is not only found in swamps, but also in forest, sometimes in rotting wood rather far away from the actual streams.

***Valdivia serrata* White, 1847**

Of the four samples of this species collected during the 1964 and 1965 investigations, two were taken above the lake and two below. The former two are from Ligorio at the Gran Rio (1 specimen, 16 July 1965), and from a branch creek of the Gran Rio between Ligorio and the Awaradam Falls (1 specimen, 15 August 1964). The two other samples are from the Saramacca Creek S. of Zanderij (4 specimens, 20 April 1965; 2 specimens, 27 April 1965). The species was not found in the lake itself.

Valdivia serrata, although occurring in the coastal area (Coppename River; Republiek; Sectie O; upper Para River; Paramaribo) seems to avoid the close proximity of the coast. It is also found quite deep in the interior of Surinam, e.g., in the Feti and Litani Creeks in the upper Marowijne basin in the extreme S.E. of Surinam. The animals live in burrows in steep clay banks of streams, but are also found among dead leaves on the bottom of creeks. The water in which they live can be somewhat acid.

Pseudothelphusidae

***Kingsleya latifrons* (Randall, 1840)**

Ten samples obtained during the 1964-1965 investigations of the Brokopondo area contained this species; only one these samples came from Brokopondo Lake itself. Above the lake the following samples were taken (the last three are now covered by the lake, but at the time that the samples were collected the area was not yet flooded): Gran Creek (= Marowijne Creek) near Bing Soela (3 specimens, 29 July 1964), Kassi Creek near Pokigron (1 specimen, 20 March 1964), Suriname River near Mamadam (11 specimens, 16-17 January 1964), Suriname River below the Mamadam Falls (3 specimens, 15 January 1964), between Kabel and Lombé (1 specimen, 18 February 1964). Below the lake the species was found in the following localities: Suriname River near Afobaka (1 specimen, 20 January 1964), between Afobaka and Brokopondo (1 specimen, February 1964), creek near Drepada, 8 km N. of Brokopondo (1 specimen, 22 December 1963), Compagnie Creek near Brokopondo (4 specimens, 13 April 1965). Only a single specimen was found in the lake itself, namely between Arosoebanja and Kadjoë, among the roots of the water hyacinth, *Eichhornia crassipes* (2 June 1964).

Kingsleya latifrons is a species inhabiting the upper reaches of the larger Surinam rivers. It is found exclusively south of the line that connects the northernmost falls in these rivers, and lacks entirely in the coastal region (see the map in Holthuis, 1959: 224, fig.56, under *Potamocarcinus latifrons*). The

species seems to prefer fast flowing clear water and a rocky bottom; it is often found in rapids and falls. It is therefore not surprising at all that the species has not been found more frequently in Brokopondo Lake.

GENERAL REMARKS

Of the 13 species of Decapod Crustacea that during the 1964-1965 Brokopondo investigations were collected in the Suriname River basin, five (*Atya gabonensis*, *Macrobrachium brasiliense*, *M. surinamicum*, *Euryrhynchus wrzesniowskii*, and *Valdivia serrata*) were not encountered in the lake itself at all. Of the eight other species, three (*Macrobrachium carcinus*, *M. olfersii* and *Kingsleya latifrons*) were collected in the lake in only very few specimens. It is possible that these finds represent only the remnants of the original Suriname River population, and that the species ultimately will entirely disappear from the lake, as their preferred habitat, namely clear fast flowing water and rocky bottom, is nowhere offered by the lake. The five remaining species (*Macrobrachium amazonicum*, *M. jelskii*, *Palaemonetes carteri*, *Dilocarcinus dentatus*, and *D. spinifer*) possibly have adapted themselves to the environmental conditions of the lake and may prove to become permanent inhabitants, as the habitats in which they usually occur agree rather well with conditions found in the lake. Of the three species of shrimp rather large numbers have been collected in the lake, and one (*M. amazonicum*) is so plentiful that it is used as food by the inhabitants of the area.

Definite conclusions can as yet not be drawn as (1) our knowledge of the distribution, ecology, and biology of the Surinam freshwater Decapoda is still very incomplete, and (2) too few data are at our disposal at this moment to allow us to give a clear picture of the composition of the present Decapod population in the lake. It would be to great importance to make renewed investigations in the lake area, now that a condition of equilibrium has been reached.

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