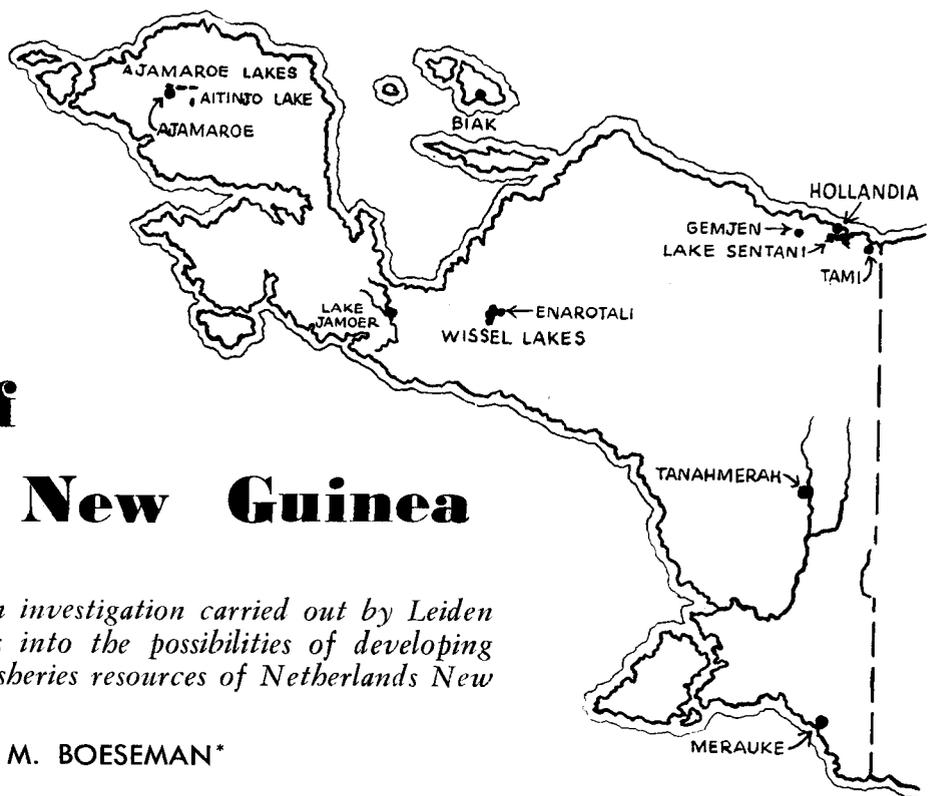


Map showing principal localities visited during the investigations.

# The Lake Resources Of Netherlands New Guinea

*An account of an investigation carried out by Leiden Museum scientists into the possibilities of developing the fresh-water fisheries resources of Netherlands New Guinea.*

By M. BOESEMAN\*



WHEN the development of fresh water fisheries in Netherlands New Guinea was being considered recently, it soon became evident that the scarcity of faunistic data hitherto published for the region could not provide a satisfactory starting point for specialized fishery-biological investigations. The few scientific papers on the subject cover only a very small part of the immense area; they are also rather incomplete, even for the best-known parts.

Consequently, it was thought advisable to start investigations of the fish fauna by collecting sufficient material from the principal waters (generally lakes) to enable compilation of an inventory of the various species, and more or less to establish their geographical distribution. This would provide the data necessary for future investigations by a fishery expert.

To execute this initial programme, the author was invited to visit Netherlands New Guinea. As this visit coincided with that of the sub-Director of the Leiden Museum, Dr. L. D. Brongersma, herpetologist, and Dr. L. B. Holthuis, carcinologist, our efforts could be pooled, yielding considerably improved results in our various fields. The facilities provided by the Government and the Royal Netherlands Navy, hereby gratefully acknowledged, proved essential to the success of our investigations.

In the course of seven months, locali-

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ties all over the Dutch territory were visited, the principal being (in chronological order): Lake Sentani, the Tami River (south-east of Hollandia), Biak, Lake Jamoer, the Wissel Lakes (Panial, Tage, Tigi), the three Ajamaroe Lakes, Aitindo Lake (south-east of Ajamaroe), the surroundings of Merauke, and the Digoel River near Tanah Merah.

## Lake Sentani

This lake is situated a short distance south-west of Hollandia. Its waters are among the best investigated in the territory. Its shape is very irregular. Narrow at some places, it has a maximum diameter of approximately 26 k.m. Altitude is about 75 metres; depth at least 50 metres. The water is rather clear, but there is said to occur an intense seasonal (?) increase of algae. Aquatic vegetation is generally scarce, and an attempt to collect planckton (end March, 1955) virtually failed. Even very long hauls showed minimum results. There seems to be an open effluence via the Tami River to the Pacific coast, slightly east of Humboldt Bay.

The rather numerous species of fish have but little economic importance, only the smaller species being in any abundance. Larger specimens of the Gobiiform "gaboos" (e.g., *Ophiocara* sp.) are captured and eaten by the native population, but other edible fishes are rather scarce.

Fishing is generally the task of the women, working singly or in groups. They are excellent swimmers and expert

divers. The less fatiguing collection of fish from artificial hiding-places, erroneously called "séros", is mostly done by the male population.

The "séros", which are found almost everywhere along the shores, especially in the numerous bays, are family property. They consist of a number of large stakes firmly planted in the mud in a circle with a diameter of about three metres. Within this frame, the space is filled with branches, leaves, rubbish, and dirt, forming an ideal hiding-place for all kinds of fish.

Twice a year the male members of the family owning the "séro" collect the fish with primitive dip-nets. They first put a kind of mat around the "séro", and then take the rubbish and branches out, throwing them into a new circle of stakes erected next to the old "séro". In this way they build up their new "séro" while demolishing the old.

We had the privilege to be present at such an event, and saw the natives collect some large eels, numerous "gaboos" of various sizes, and quite a number of small specimens. However, the total result seemed rather disappointing.

As well as numerous "gaboos", probably belonging to more than one species, we collected beautiful, often orange and bluish Melanotaeniidae, small gold-glimmering perch, catfish, mullet, jacks(!), eels, etc.

The occurrence of formidable saw-fish was remarkable. Two, measuring 286 and 332 cm., were captured, preserved in



Left: Shore of Lake Sentani, near Joka. Native prau in foreground. Right: View of Lake Sentani, with so-called "sero" vaguely visible, right centre.

formalin, and shipped to the Netherlands, a feat well noticed by press and news services.

From local sources we were informed of the occasional (probably seasonal) occurrence of mass mortality of fish, coinciding with the temporary increase of algae, spreading across the lake from west to east. This seems to be of the utmost importance in connection with future fishery possibilities, but it still needs confirmation.

A small bay near Borowai (s.w. Lake Sentani), connected with the open main lake by only a very narrow outlet, and said to possess the same physical characteristics, may at little cost be transformed into a reservoir fit for future use in fishery experiments (e.g., transplantation).

#### Tami River

Only a short visit was paid to the Tami River, but unforeseen circumstances (the extremely high level and speed of the water) did not permit any thorough research. In a dead arm of the river we collected with rotenon a considerable number of Melanotaeniidae, small goldfish perch with beautiful purplish brown stripes, and numerous "gaboos". The Tami River itself yielded a large catfish.

#### Biak

During most of the time, Biak was the base from which we planned and started our various trips to the mainland. Here only a few examples were collected in the brackish waters of the south-eastern part, but real fresh water species (e.g., "gaboos") probably occur in the few small streams far inland.

A considerable part of this island consists of coral rock, the small rivers flowing beneath the surface towards the sea. The rather intense native fishery seems to be entirely marine.

#### Lake Jamoer

This lake, situated far inland on the narrow "neck" of western New Guinea, is almost circular with a diameter of approximately  $7\frac{1}{2}$  k.m. It is connected

with the Arafura Sea by the Omba River. No accurate data are available, but the altitude may be about 60 metres, the depth probably 12-15 metres. The water is rather clear, the aquatic vegetation moderate to scarce, except at some localities along the shore, which is mostly swampy. The local population is small, and fishing must be very moderate. This hitherto almost unexplored lake yielded some of the most interesting results of our present investigations.

The most spectacular fish collected here was, beyond doubt, a kind of shark probably confined to fresh water. With the help of the local population we were able to collect three whole specimens, of sizes varying between 75 and 150 cm., and the jaws of a fourth.

Although there is an open effluence to the sea via the Omba River, difficult physical circumstances said to exist in this river make it unlikely that these sharks are occasional visitors only. Moreover, though some sharks (*Eulamia*, *Carcharias*) freely enter estuaries and rivers, no such reports are available from the present region.

The Jamoer sharks do not seem dangerous to man. The local population took no precautions while swimming or bathing at the precise points where sharks had been observed.

Among other fish collected during our short stay the most interesting were garfish, very large perch, catfish, eels, and some archer fish of considerable size. Saw-fish are said to occur in the deeper parts of the lake, but could not be obtained on account of the high level of the water. (Afterwards we were able to obtain a nice saw from this locality.)

The density of the fish population seems considerable, and an important part attains a large size. Most interesting is the completely marine aspect of most of the species, a phenomenon also observed in the Upper Digoel River and, less strikingly, in the Sentani Lake.

The Lake also harbours fresh water turtles (*Carettochelys insculpta* Ramsay), crocodiles (*Crocodylus novaeguineae*

Schmidt), and a species of water snake (*Acrochordus granulatus* Schneider). In the marshes along the shores of the lake, turtles belonging to a species of the genus *Emydura* are abundant. Both turtles and crocodiles serve as food to the native population.

Some small streamlets emptying into Lake Jamoer yielded several examples of Melanotaeniidae, "gaboos", catfish, and crayfish.

#### Wissel Lakes

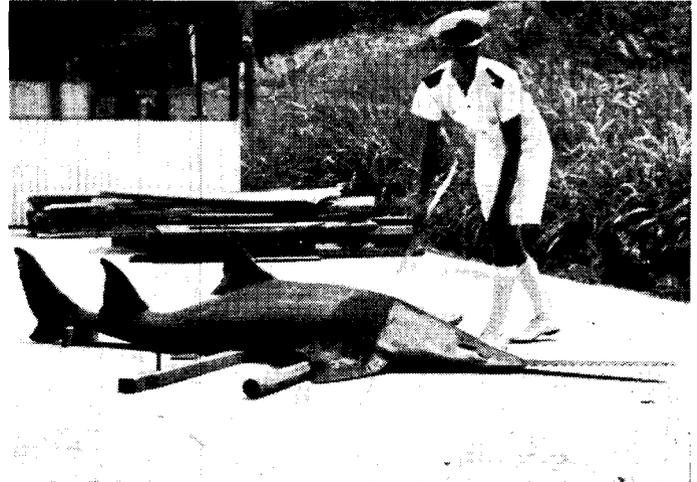
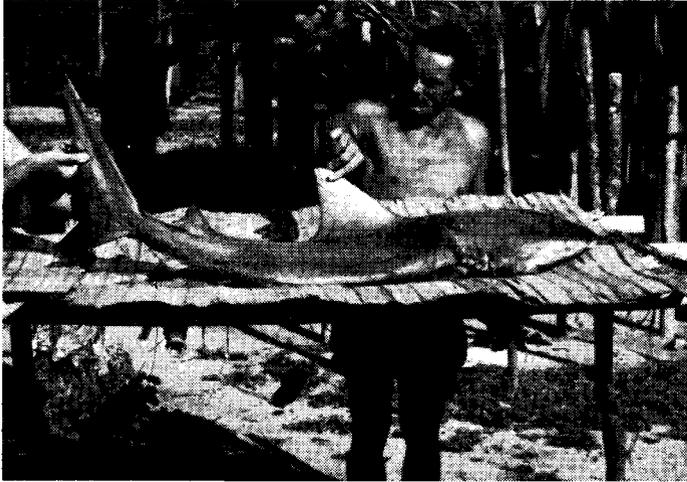
In the three Wissel Lakes, Paniai, Tage, and Tigi, of maximum diameters of approximately 16 k.m.,  $8\frac{1}{2}$  k.m., and  $7\frac{1}{2}$  k.m., only a single small Gobiid species could be collected. This species, *Oxyeleotris fimbriatus*, principally inhabits the effluent rivers, seldom straying into the open lakes. It is not eaten by the local population, but is used as bait in the very intense native crayfish fisheries. Rumours concerning a second species remained unconfirmed, and can be neglected.

The general impression we gradually acquired during our investigations is that there seems to be a definite connection between the quantitative occurrence of fishes and crayfish or large shrimps, one of these groups generally more or less excluding the other. Seldom are both groups co-existent in sufficient quantities to be of some economic importance. Because of this it seems extremely risky to import fish into the Wissel Lakes, the crayfish at present being by far the most important source of proteins for the native population.

#### Ajamaroe Lakes

These three lakes have a maximum diameter of about  $6\frac{1}{2}$  k.m.,  $2\frac{1}{2}$  k.m., and 5 k.m., and are connected by a river which flows eastward through the lakes, further on turning to the south coast.

The water is very clear and shallow, the depth seldom exceeding two metres. The bottom is extremely muddy, and the aquatic vegetation often remarkably dense. Nevertheless, the amount of plancton collected at the time of our visit (March, 1955) was very poor.



Left: Shark taken from Lake Jamoer, possibly a new fresh-water species. Total length 1.52 metres. Right: Saw-fish taken from Lake Sentani. Total length 3.32 metres.

Numerous well-constructed fish traps are placed by the native population in the tributary and effluent rivers, generally in a series across the river, with the interspaces filled up with stakes, branches, and weeds. Fish spears are also used.

The fish fauna is very poor, and, though some species ("gaboos" and Melanotaeniidae) occur in considerable numbers, is of limited economical importance. We collected species of "gaboos", Melanotaeniidae, catfish, and the imported Labyrinthid *Trichogaster pectoralis*, a small gourami-like fish of some value as food for the native population. Rumours concerning a larger Labyrinthid species remained unconfirmed.

#### Lake Aitinjo

This lake consists of two oddly-shaped parts connected by a short, fast-flowing stream, with numerous small cataracts breaking through a narrow cleft. The southern part especially shows a completely different aspect in comparison with the Ajamaroe Lakes. The latter are shallow and surrounded by marshy shores, while Lake Aitinjo has a highly variable depth (to 15-20 metres according to local information) and is surrounded mostly by steep, high, rocky shores, especially along the southern part.

Though marshy at some places, the bottom is generally rocky, with sand, gravel, and boulders. The density of aquatic vegetation is highly variable. Locally it is very dense. The effluence is said to be subterranean, probably over a considerable distance. The speed of the clear water gradually diminishes southwards, the water being almost stagnant near the presumed outlet in the southernmost part. The amount of planckton was extremely small (March, 1955).

The same kind of fish traps as are used in the Jamaroe Lakes are placed in series in primitive screens, but here the screens are built zigzag, with the traps

at the downstream angles.

The fish fauna is even slightly poorer than in the Ajamaroe Lakes. We collected only a single species of "gaboos", a Melanotaeniid, and a species of catfish. According to local information, there occurs a large species of eel, but as these are captured only during periods of extremely low water, no specimens could be obtained.

#### Merauke

Some collecting took place in puddles and ditches in the surroundings of Merauke. The water was stagnant, moderately clear, and is presumed to be slightly brackish. The aquatic vegetation was considerable. The species collected included mullet and a kind of sole, all collected with dip- and cast-nets.

Fishing here is mostly done along the wide sandy seashore and in the salty or brackish lower reaches of the Merauke River.

#### Digoel River (near Tanah Merah)

The strongly meandering Digoel River, flowing fairly rapidly through the flat marshy plains of southern New Guinea, often changes its course and is consequently accompanied by numerous old meanders more or less completely cut off from the main stream, and filled with almost stagnant water. According to local information, this is the habitat of a species of fish named "kloso" ("o" as in "more"), known from this region only from an old photograph (1909), and identified as *Scleropages leichardti* Gunther. Because of the circumstances, however, this identification should not be regarded as definite: the *Scleropages* from the Digoel River may represent an entirely new species.

Principally to try to collect specimens of this very interesting species, which belongs to a scientifically most important family (Osteoglossidae), this region was visited, but again the high level of the Digoel caused further failure.

However, it is expected that specimens will be collected and sent to the Leiden Museum soon.

Except for this failure, our visit proved a great success. In the river and in one of the abandoned meanders we collected about twenty different species of fish, often of considerable size, and almost all of a definitely marine aspect. This was further stressed by the capture of some specimens of normally marine sea snakes, a very strange thing to happen about 700 or 800 k.m. from the sea.

In the dead arm of the river we collected several specimens of large garfish, large herring-like fish, anchovies, Melanotaeniidae, and "gaboos". The Digoel River itself yielded also some large catfish, anchovies, herring-like fish, several species of catfish, large perch, mullet, croakers, specimens of *Kurtus*, archer fish, and some smaller species. We also obtained some small saw-fish, and three cut-off saws.

The turtle *Carettochelys insculpta* Ramsay is of common occurrence in the Digoel River. In the marshes of dead river arm and in the smaller streams emptying into the Digoel, turtles belonging to the genus *Emydura* are found.

The above account gives only a superficial impression of the very important results obtained. As containers with alcohol were left at several localities, still more acquisitions may be expected soon. With this material in hand, it may be possible to compose a reasonably complete list of the fishes of Netherlands New Guinea.

As further scientific research is necessary to identify the various species, some of which may be new to science, and as a considerable part of the collections has not yet arrived at the Leiden Museum, the present author generally has had to abstain from giving definite Latin names.

Dr. L. D. Brongersma has kindly provided the herpetological data.