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NOTES ON THE FISHES OF WESTERN NEW GUINEA I

by

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INTRODUCTION

In the summer of 1954, I received an invitation from the Netherlands New Guinea Government to undertake a faunistic investigation of the fish fauna of the area. It was thought advisable for the promotion of the local New Guinea fisheries, to first obtain a more thorough knowledge of the fish fauna of the region, based on a collection as complete as could be attained within a reasonable time. As such a collecting trip could be expected to yield results of considerable zoological and zoogeographical importance, I gladly accepted this unique opportunity.

A most fortunate circumstance was that my visit coincided with an already previously planned collecting trip to the same area by two of my colleagues, Dr. L. D. Brongersma, at the time deputy-director and curator of herpetology, now director of the Leiden Museum, and Dr. L. B. Holthuis, curator of carcinology at the same institution. The resulting mutual assistance and pooling of technical facilities subsequently proved to contribute notably to the success of my explorations.

While the voyage was sponsored by the Netherlands Government, numerous facilities and much, often indispensable, support were rendered by the Government of Netherlands New Guinea, by the Royal Netherlands Navy, by the missions of the Dutch Reformed Church and the Roman Catholic Church, and by the Christian and Missionary Alliance. Invaluable further assistance was received from private persons too numerous to be mentioned here all by name.

The following notes, though primarely based on the material collected during our 1954-1955 survey, will occasionally also include data based on specimens collected by others in the same region, both before and after my

visit. Before starting with the results, I give a short itinerary of my own activities and short descriptions of the principal collecting localities

Itinerary

(8 October 1954-13 May 1955)

8-12 October 1954: journey to Hollandia.

8: Schiphol (airfield) to Cairo; 9: to Karachi and beyond; 10: via Bangkok to Manila; 11: to Biak (Schouten Islands); 12: to Hollandia.

12-20 October 1954: Hollandia and environs.

16: short orientation visits to the restaurant "Meerzicht" and the missionary settlement Joka, both on the shores of the Sentani Lake; 17: cruise by motorboat on Sentani Lake, with short visits to the native villages Ifar Lama and Ase.

20-30 October 1954: Joka and environs.

21: trips to Sentani village, the Agricultural Research Station at Kota Nica, and the mountainous ridge south of Joka; 22: visit to Hollandia and a cruise by motorboat on Sentani Lake with two short disembarkations slightly west of Joka; 23: collecting in coastal waters of Sentani Lake near Joka and on ridge south of Joka; 25: visit to Hollandia with collecting trip to Kloofkamp (mountain cleft west of Hollandia), in the evening collecting by lamplight on Sentani Lake near Joka; 27: cruise by motorboat on Sentani Lake with visits to the native villages Simporo, Sisiri, Ase, and Borowai; 28: collecting trips by motorboat and native canoe ("proa") on Sentani Lake; 29: excursion to Ajapo and the caves south of it.

30 October-2 November 1954: Hollandia and environs.

1: cruise by motorboat on Humboldt Bay.

2-5 November 1954: Nimboran Plain around Genjem.

2: journey to Genjem via Joka, Sentani Lake, Borowai, and Meikari; 3: collecting trip to the Ibaroe River, the Grime River, and the native villages Nangkoepkoe and Benjom; 4: trip to the native village Berap and the Berap River; 5: back to Hollandia via Meikari, Borowai, Sentani Lake (Poejo Besar, Ase), and Joka.

5-18 November 1954: Hollandia and environs.

6: excursion to the caves south of Ajapo, via Joka, Sentani Lake, and Ajapo; 7: short trip to the farm "Rhijnauwen" in the foothills of the Cycloop Mountains; 10: cruise by motorboat on Humboldt Bay; 12: visit to the reefs along "Base G" (north of Hollandia); 13: collecting trip by motorboat to near Poeë, near the Sentani Lake outlet; 14: trip to Joka; 16: collecting trip to eastern Humboldt Bay, near Holtekang; 18: in native canoe across Humboldt Bay to near Holtekang, with visit to the Boeaja River (Labo River).

19-22 November 1954: Tami-Bivouac and environs.

19: from Holtekang to Tami-Bivouac at cut-off arm of Tami River; 20: Tami River southeast of Bivouac; 21: environs of Bivouac; 22: back to Hollandia via Holtekang and Humboldt Bay.

22 November-4 December 1954: Hollandia and environs.

24: trip to Joka and environs; 27: visit to the reefs at "Base G"; 30: collecting trip to Ifar, Sentani village, the so-called "Marinierspoeltje" (Marinerspool) in the

foothills of the Cycloop Mountains, with a short stop at a rivulet slightly east of "Meerzicht"; 1: collecting cruise in the coastal waters of the northwestern Humboldt Bay.

4-7 December 1954: Naval Barracks Biak and environs.

6: collecting on reef before Naval Barracks.

7-13 December 1954: Gariau (Jamoer Lake) and environs.

7: journey to Gariau via Etna Bay, a short collecting trip on Jamoer Lake, and some collecting along the southern shore near Gariau; 8: collecting trips along southern shore of Jamoer Lake and in a rivulet slightly south of Gariau; 9: collecting around Gariau; 10: by native canoe to the village Goreda; 11: collecting near Gariau in lake and on shore; 12: idem; 13: back to Biak via Etna Bay (south coast).

13-24 December 1954: Naval Barracks Biak and environs.

17: visit to reefs before Barracks; 19: collecting trip along coastal road eastward to the native villages Mokmer and Parai, the coastal waters (mangroves) and the Blauwe Grot (Blue Cave); 20: collecting on reef before Barracks and in caves near Barracks; 23: to Wissel Lakes.

24 December 1954--18 January 1955: Enarotali (Wissel Lakes) and environs.

25: trip to mountain ridge south of Enarotali; 26: collecting trip along eastern shores of Paniai Lake to the Bobairo peninsula and the Weaboe delta; 28: trip by native canoe on Paniai Lake, southward to the upper Jawej River, returning overland across mountain ridge south of Enarotali; 29: trip by canoe to upper Jawej River, overland westward to Epouto, a missionary settlement on eastern shore of Tage Lake, collecting along beach near settlement, and back to Enarotali; 1: collecting near Enarotali; 2: collecting trips east and northeast of Enarotali and along Paniai Lake north of Enarotali; 3: by canoe to the Dimija River and northern Tage Lake near Dimija village; 4: by canoe along the shore of Paniai Lake to the Bobairo pensinsula; 5: by canoe across Paniai Lake to the Dimija River and Tage Lake, returning via the native village Baupapa; 9: visit to the Governmental experimental gardens near Enarotali; 10: by canoe across Paniai Lake to the Bobairo pensinsula; 11: by plane to Itarokebo, subsequently by motorboat across Tigi Lake to Waghete; 12: collecting in coastal area near Waghete, by canoe across Tigi Lake to the rocky shore opposite Waghete; 13: collecting along marshy coast near Waghete, short trip by canoe on Tigi Lake, about south and southeast of Waghete; 14: collecting trip to the area east of Waghete; 16: to the environs east and south of Waghete (Jobadimi); 17: environs of Waghete; 18: coastal area near Waghete, and back to Biak.

18 January-1 March 1955: Naval Barracks Biak and environs.

24: short trip to Borokoe airstrip; 28: collecting east of Barracks and along beach; 29: to reef before Barracks; 30: collecting trip along coastal road eastward, via native villages Mokmer, Parai, Bosnik, to Saba, collecting along beach and in mangroves; 1, 4, 5, 9, 10, 23, 24, 25: collecting trips to reefs before Naval Barracks; 26: visit to caves near the native village Bosnik.

1-24 March 1955: Ajamaroe and environs.

1: journey by plane to Ajamaroe; 2: short visit to Setà by canoe; 3-6: collecting in and around Ajamaroe; 7: journey along the three Ajamaroe lakes eastward by canoe, to Djitmaoe; 8: collecting in Djitmaoe and environs; 9: idem, and in caves near the road to Fan (Akwasok); 10: journey continued via the native villages Fan and Tehak to Aitinjo at the southeastern end of Aitinjo Lake; 11: collecting in and around Aitinjo; 12: idem, and collecting trip by canoe on the lake; 13: Aitinjo and environs; 14: by

canoe to northernmost navigable part of Aitinjo Lake, then overland to Tehak; 15: from Tehak via Fan and Djitmaoe to the native village Kaoemboeja (Kamboeaja); 16: via the villages Jokwer and Semoe back to Ajamaroe; 24: first part of return voyage to Biak, via Jefman to Sorong; 25: from Sorong via Jefman and Manokwari to Biak.

25-29 March 1955: Naval Barracks Biak and environs.

29 March-1 April 1955: Hollandia and environs.

31: visit to Joka with short collecting trip by motorboat on Sentani Lake.

1-8 April 1955: Merauke and environs.

1: journey to Merauke; 3: trip to the beach at Lampoe Satoe and the native village Boeti, a small rivulet near Boeti, the banks of the Merauke River near the outlet (landing-stage), and a small brackish pond nearby; 4: again to the beach near Lampoe Satoe and Boeti; 5: collecting cruise on the Governmental trawler "De Goede Hoop" on the Arafoera Sea before Merauke; 6: visit to the beach near Sepadim Laoet.

8-19 April 1955: Tanah Merah and environs.

8: journey to Tanah Merah, via Kepi; 9, 10: collecting in and around Tanah Merah; 11: visit to the Digoel River embankment near the landing-stage; 12: again to the landing-stage; 13: trip by native canoe upstream along the Digoel River, to the Rawah Wan (a cut-off arm of the Digoel River), with stops at various marshy outlets of small tributaries; 14: by canoe downstream along Digoel River to near the native village Okiba, with stops at marshy outlets of tributaries; 15-18: collecting in and around Tanah Merah; 19: back to Merauke.

20 April-3 May 1955: Naval Barracks Biak and environs.

20: from Merauke via Sentani airstrip (Hollandia) to Biak.

3-4 May 1955: short visit to Hollandia.

3: by plane over Mamberamo, Baliem, and Idenburg Rivers; 4: back to Biak.

4-7 May 1955: Naval Barracks Biak and environs.

7-9 May 1955: Enarotali and environs.

7: journey from Biak to Enarotali; 8: trip to mountain ridge northeast of Enarotali; 9: back to Biak via Seroei.

9-12 May 1955: Naval Barracks Biak and environs.

12-13 May 1955: return voyage to the Netherlands.

12: from Biak to Karachi, via Manila, Bangkok, Rangoon; 13: via Dhahran, Cairo, Frankfurt, to Schiphol airport.

Physiography and climate (fig. 1).

General. — On the whole, our knowledge of the geology of western New Guinea is still fragmentary, partly because sufficient interest developed only recently, and partly because most of the territory is extremely difficult to penetrate. It is evident that most of the island is, in its present shape and geologically speaking, very young. Volcanism does not occur on the western part, but tectonic forces are still actively at work, as was shown during our

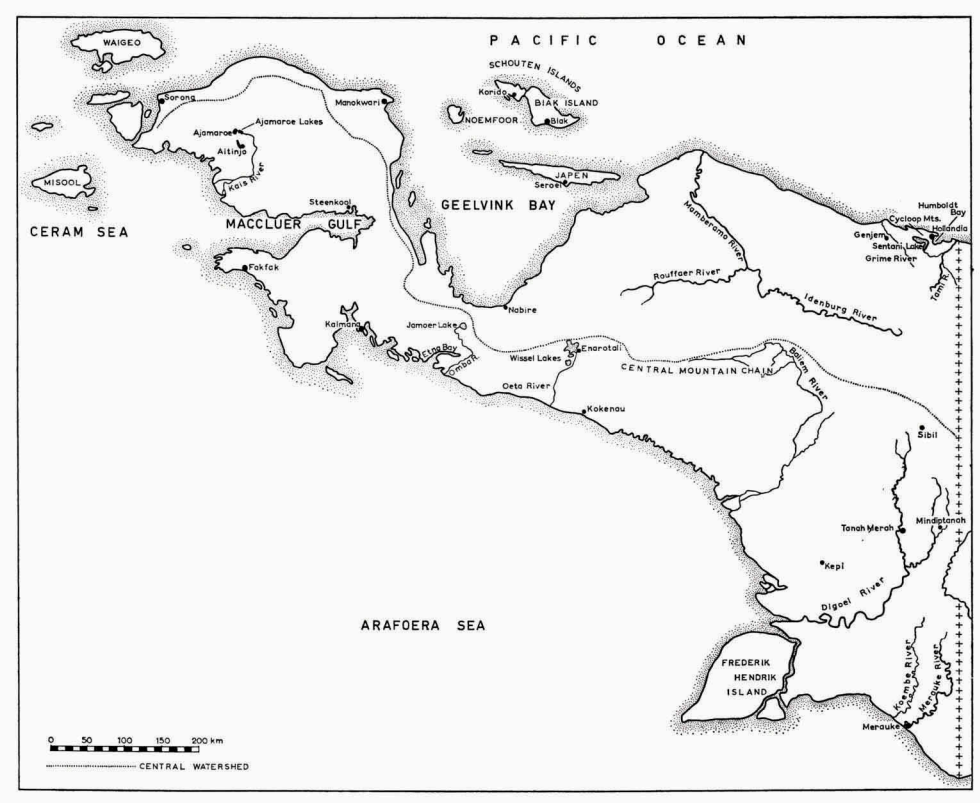

Fig. 1. General map of western New Guinea.

visit by a few minor earthquakes. As a consequence, the mountains are usually characterized by extremely steep slopes and sharp ridges, the valleys being deep and narrow. Adding a heavy rainfall, it is clear that erosion is very strong at most places. The soil is very poor, excepting a few places where pre-tertiairy intrusions reach the surface (Cycloop Mountains, northern Vogelkop peninsula). While a connection of New Guinea with southeast Asia has been interrupted at least 75 million years ago, a connection with the Australian mainland persisted during the pleistocene, approximately 1 million years ago. The close affinity with Australia is also confirmed by our faunistic knowledge.

The mainland is crossed by two major mountain chains, running approximately east-west. The central chain, which has a total length of more than 2500 km and reaches a height of more than 5000 m, provides the principal watershed and is the source of all the larger rivers of the island. A northern chain, closely following the northern coast, is much less imposing, reaching

heights of only slightly more than 2000 m; its continuation may be found on Japen (island), the Schouten Islands, and the northern Vogelkop peninsula. Both chains are separated by the drainage systems of the Mamberamo and Sepik Rivers, each running through a wide plain almost wholly surrounded by mountains, where the rivers slowly meander forming marshes and lakes, finally breaking through the northern chain to empty into the Pacific Ocean. To the south, the central mountain chain steeply descends to a coastal plain, largely widening towards the east in western New Guinea, crossed by numerous rivers slowly meandering through the mostly marshy region.

The major rivers all have their sources on the central mountain chain, the higher tops of which are covered by snow. The rapidity of their current in the mountainous areas, and the occurrence of rapids and small cascades, with probably the low temperature of the water, seem to have prevented the penetration of fishes into most of the central regions. In the wide plains, especially that of the Mamberamo River system and the southern plain, the slowly meandering rivers often overflow considerable parts of the surrounding swampy forests and savannas.

About 80% of the total surface of New Guinea is covered with forest, one of the few exceptions being the lowland around Merauke where the vegetation mainly consists of grassy savannas with occasional trees, alone or in clusters (Eucalyptus, palms). Where the mountains do not reach the coast, the coastal zone is covered with mangroves and dense swamp-forests, though sometimes separated from the sea by beaches of coral sand. Slightly higher begin extremely dense rainforests, including oaks on the dryer parts. At an altitude of about 1200 m, beeches and conifers make their appearance, the forest becoming less dense. Above 3200 m, the conifers begin to predominate, the forest gradually becoming shrubby and still more open. Between 3800 and about 4300 m altitude, there only persists a subalpine and alpine vegetation, composed of small shrubs, ferns, and grasses, including numerous representatives of the heather family. On the bare mountain tops, snow is found above approximtely 4400 m.

Rainfall is primarily affected by the characteristics of the wind and the geomorphology of the environs. In general, one can distinguish two seasons, with southeastern winds during the months May to November, and with northwestern winds during the months December to April. The rainfall, though occurring throughout the year, shows a more or less distinct seasonal increase in the lower areas of the mainland, usually during the first four or five months of the year. To give a general idea, some relevant rainfall data are compiled in the following table.

TABLE I

Approximate average and total amount of monthly rainfall (in mm), and the average number of rainy days, at various localities. The data for Gariau and Tami based on inadequate information, those indicated by asterisks (*) on one or two records only.

Months:	J	F	M	A	M	J	J	A	S	O	N	D	total/days
Ajamaroe	450	265	430	420	700	540	280	340	360	165	320	260	4550/220
Biak	255	225	235	195	220	230	230	215	235	180	185	185	2600/215
Enarotali (Wissel L.)	210	310	220	275	275	340	335	310	315	240	255	195	3300/255
Gariau (Jamoer L.)	125	165*	120*	—	—	170	115	23*	42*	135*	235*	171*	—/—
Genjem (Nimboran Pl.)	360	270	330	290	170	130	140	135	130	180	200	270	2650/180
Hollandia (harbour)	330	290	285	230	215	160	170	170	130	170	190	245	2550/160
Merauke	270	225	260	175	125	45	30	20	25	40	80	180	1500/100
Sentani	231	242	240	184	82	76	71	108	143	70	178	207	1850/150
Tami	198*	238*	268*	122*	142	164*	232	270*	169	102	180	182	2250/—
Tanah Merah	380	375	475	475	435	300	305	260	340	330	380	425	4500/230

Throughout the lowland, the temperature usually varies between about 20° C in the early morning and about 35° C at noon, the medium being approximately 26° C; only near Merauke the temperature may drop to merely 16° C during periods with southeastern wind. The lowland relative humidity usually varies between 98 in the early morning and 70 at noon.

Sentani Lake (fig. 2; pls. VII figs. 1 & 2, VIII figs. 3-5). — Situated in the hilly region west of Hollandia and just south of the Cycloop Mountains, this lake is presumed to represent an old sea arm separated from the ocean by regional opheaval. It has an approximate length of 30 km, a width varying between 2 and 5 km, an altitude of 75 m above sea level and, as far as known, a greatest depth of 50 m. Several small streams, mainly originating on the Cycloop Mountains, flow into the lake, while there is only a single effluent, the Djafoeri, a branch of the Tami River which empties into the Pacific Ocean about 15 km east of the Humboldt Bay. The shores are as a rule variably steep, but low and swampy at some places, generally covered with secondary vegetation (grasses, shrubs, and some forest), the original vegetation having almost completely been destroyed by the native population. The water is clear, the bottom of the shallower places was found to consist of mud and sand, covered with some aquatic vegetation which may be dense locally. Efforts to collect plankton samples during our survey (31 March 1955) met with little success, but according to local information occasional (seasonal?) explosive increases of algae occur, even causing fish mortality. Fishing is usually practiced only by the women, who are experts at swimming and diving, with nets, or with a kind of fish traps called boogereh

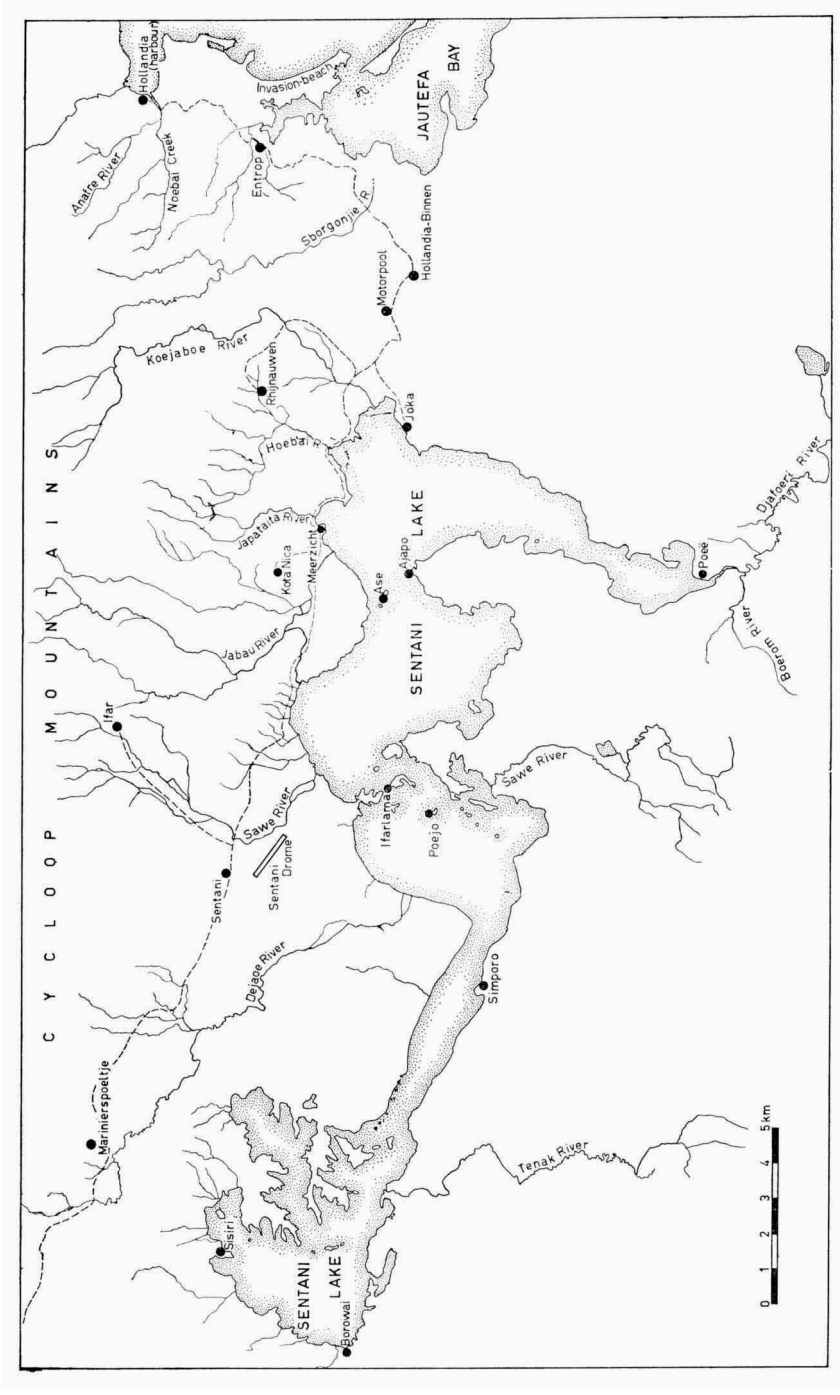

Fig. 2. Map of the Sentani Lake region.

or sero (not to be confounded with the different Indonesian sero). The boogereh consists of a circle of stakes firmly implanted in the muddy bottom of the shallower parts of the lake, and filled with all kinds of debris, branches and vegetable refuse, in which the fishes hide; after about half a year, a screen of bamboo strips is bound around the boogereh, a new circle of stakes is implanted nearby, the contents of the old boogereh are removed to this new one, and the fishes deprived of their hiding places are collected with small oval nets. Occasionally and apparently more as a pastime, the men overcome their aversions and fish, using less tiring methods: with fishing spears or, preferably, with float, hook, and line.

Nimboran Plain (fig. 3; pl. IX fig. 1). — Situated about 15-30 km west of the Sentani Lake, around the governmental post Genjem. The actual plain

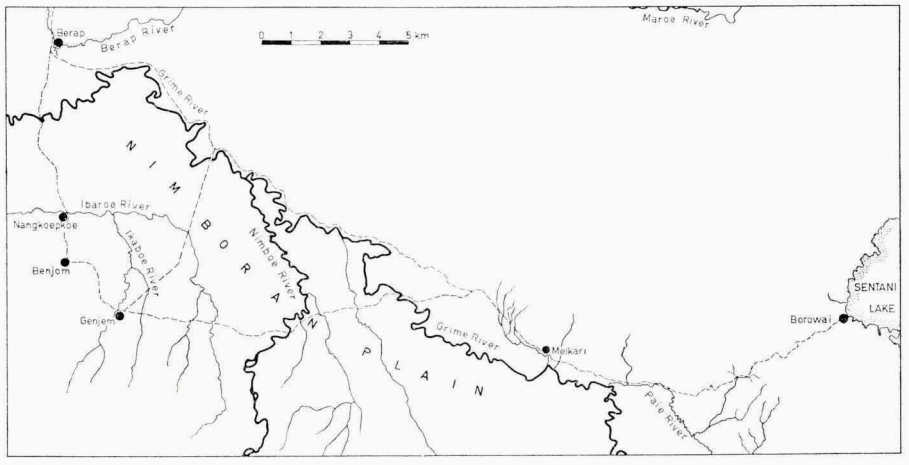

Fig. 3. Map of the Nimboran Plain region.

has a height of only about 65-100 m above sea level and is surrounded by a hilly countryside with heights up to about 200 m. The vegetation, excepting the cultivated agricultural areas, consists of grassy marshes and sago swamps, rainforest and secondary forest. The plain is crossed by several moderate rivers (Ikaboe, Ibaroe, Berap, Grime Rivers), flowing rather slowly at the time of our visit, all having their outlets into the Pacific Ocean along the north coast. Stony parts with rapids and occasional cataracs (Berap) occur, but most of the river beds are sandy or muddy, the water was clear and of moderate depth, about knee-deep in the Ibaroe River. Aquatic vegetation was scarce, but plant debris and dead branches assembled here and there. Only few fishes were collected, primarily because of lack of cooperation by

the local population. Thus small sawfishes and catfishes, reported to occur there, could not be obtained. The only local fishing activities actually observed were performed with the aid of a kind of primitive under-water gun, constructed from a pointed straight piece of heavy iron wire and a strong rubber band, and a pair of home-made under-water goggles, made of wood, pieces of glass, and a string or rubber band; both accessories evidently being constructed under western influence and apparently used rather for sport.

Holtekang and Tami-Bivouac (fig. 4; pl. IX fig. 2). — Situated east of the Humboldt Bay. Holtekang (Forestry Bivouac) is located at the wide

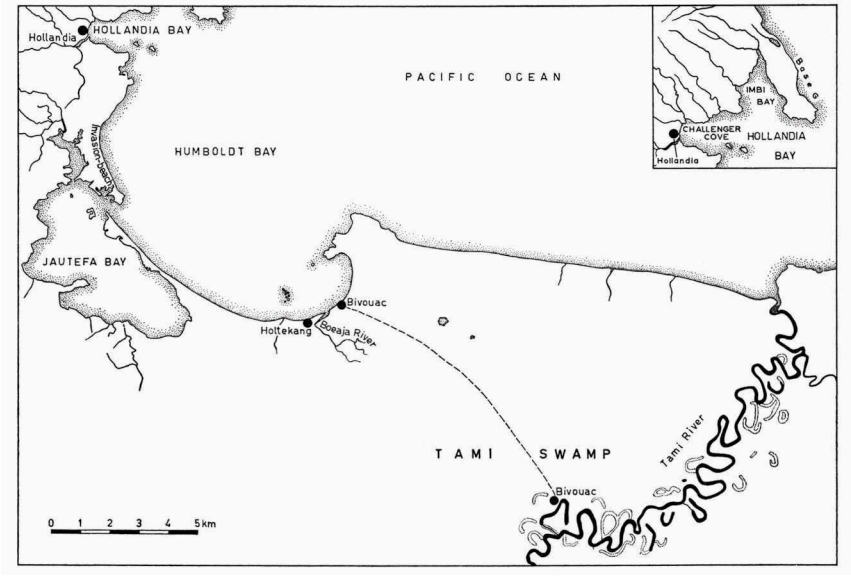

Fig. 4. Map of Humboldt Bay and the Tami River region.

sandy beach along the eastern shore of the bay; behind the beach and some secondary growth, the dense and humid tropical rainforest extends to the border of the Australian territory and beyond. A short distance south of Holtekang bivouac is the outlet of the Boeaja (or Labo) River, a small stream of which only the shrubby and wooded marshy banks of the lower reaches were visited. From Holtekang a narrow trail cut for most of its length of about 10 km through the dense jungle leads southeast to the Tami-Bivouac of the Foresty Department. This bivouac is situated on the western shore of a cutt-off arm of the Tami River, which now flows more eastward. It is surrounded by heavy rainforest, the banks are steep, the width may be

estimated at 35 to 40 m, the depth was not ascertained, the bottom muddy with variably dense aquatic vegetation, while the stagnant water was considerably less clear than in the Tami River. At the time of our visit, no collecting was possible in the Tami River itself on account of the height and torrential flow of its water. Fishing by the local population was not observed and must be of limited importance.

Biak (fig. 5; pl. X figs. 1 & 2). — Situated on the southern shore of Biak Island, one of the Schouten Islands. The southern regions of this island wholly consist of coral chalk, covered by dense vegetation. The rivers, having their sources in the central and northern parts (which were not visited), are here subterraneous, coming to the surface only near the southern coast where

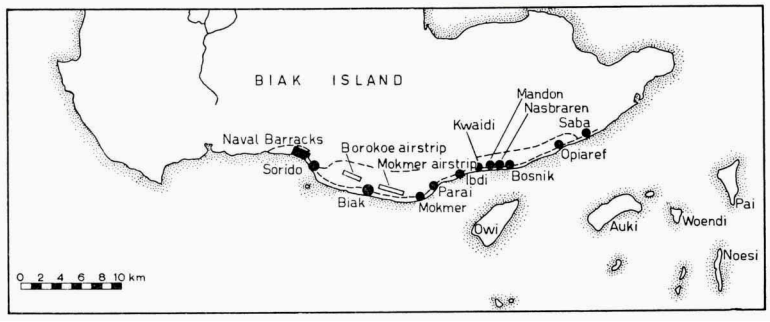

Fig. 5. Map of the southern part of Biak Island

they empty into the ocean either directly by crossing the sandy beach or after first flowing into the swampy tidal forest or mangrove forest. Native fishing seems wholly restricted to the sea, which provides commercially better species.

Jamoer Lake (fig. 6; pl. XI figs. 1 & 2). — Situated on the narrow "neck" of the Vogelkop (= Birdshead) peninsula, closer to the north coast but south of the watershed, at approximately 134° E. L. It is subcircular in shape with a diameter of about 6 to 8 km, slightly variable as flat marshy banks may submerge during rainy periods. Several small rivers and streamlets, in the lower reaches slowly flowing through the jungle, empty into the lake which, by way of the Waoedoe and Omba Rivers, is in open connection with the Arafoera Sea east of Etna Bay. The total length of the effluent rivers may be estimated at about 130 km; they are at least occasionnally passable for boats, hence for fishes, but rapids may exist. The lake is surrounded by a hilly region covered with dense rainforest and, at a wider distance, by

mountains reaching heights of 650 to more than 1000 m, a circumstance which may account for the rather moderate rainfall as deduced from the scant data. The height is only about 90 m above sea level, the depth was not measured but may well reach several meters, though shallow parts occur (e.g., near Gariau); the water is clear, pH about 6, the observed aquatic vegetation moderate but, according to local information, much denser near the outlet. The population of the area being limited, fishing is not intense; fishing

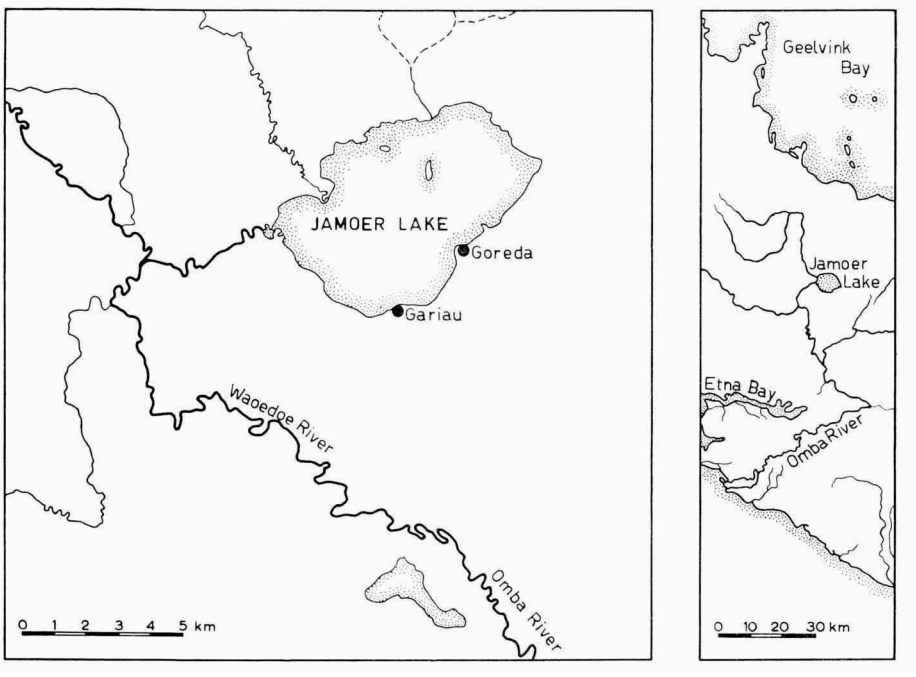

Fig. 6. Maps of the Jamoer Lake region.

methods were not observed, but the use of fishing spears was evident from some of our samples, whilst sharks were collected (at our special request) with hook and line.

Wissel Lakes (fig. 7; pls. XII figs. 1 & 2, XIII figs. 1 & 2, XIV fig. 1).— Situated in the central mountain chain, consisting of three lakes in a north-south row at approximately 136° 15′ E. L. The northernmost, Paniai Lake, is the largest, with a roughly quadrangular outline, a length of 16 and a width of 9 km; it has an altitude of about 1740 m above sea level, a depth of at least 50 m but also extensive shallow parts near the mouths of entering rivers. Tage Lake, slightly more south, is the smallest of the three, with an

oval outline, a length of 8 km and a width of 3 km, an altitude above sea level of about 1750 m, and a depth not yet sounded but probably considerable throughout. The southernmost Tigi Lake has the outline of an equilateral triangle pointing south, with a wide T-shaped peninsula projecting from the northern coast; the maximum diameter is about 8 km, the altitude above sea

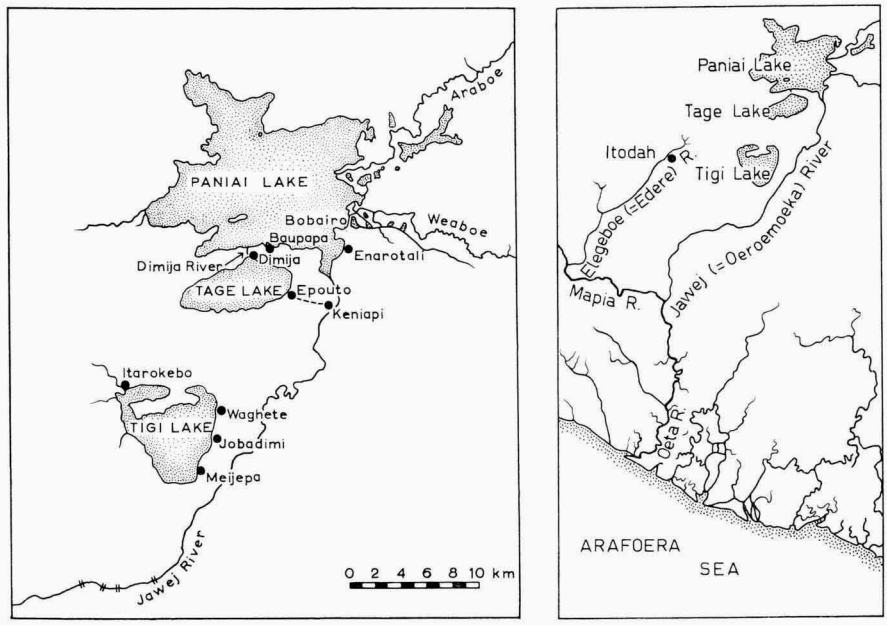

Fig. 7. Maps of the Wissel Lakes region.

level 1640 m, the depth apparently everywhere very moderate though no accurate figures are available. The mountainous surroundings, including heights nearby of more than 3500 m, are still largely covered with rather dense forest, though at places areas with secondary forest and grassy slopes are found as a result of burning by the native population; grassy marshes with occasional shrubs and trees characterize the outlets of the rivers emptying into the lake. The shores of Paniai and Tage Lakes, and the T-shaped peninsula in Tigi Lake, for a considerable part consist of steep calcareous rock, often almost perpendicular but at other places leaving room for narrow stony beaches; large flat muddy areas are found near the river deltas and around most of Tigi Lake, covered with low vegatation. Aquatic vegetation may be abundant locally, especially on the mudflats before entering rivers, but also here and there along the shores at suitable places and in the rivers. The water is moderately clear in the lakes and the Jawej River, but less so in the lower reaches of the rivers entering the lakes, pH varying between 6 and 6.8.

Lake Tage empties into Paniai Lake through the Dimija River, with the first 30 or 40 m of its upper course subterranean; both Paniai- and Tigi Lake, the second via a partly subterranean link near Meijepa on the southeastern shore, have as a mutual effluent the Jawej River, part of the Oeta River drainage system which empties southward into the Arafoera Sea. Fishing is primarily one of the many duties of the native women, who use either baited sinknets with a diameter of 3 to 4 m or large dipnets with diameters of more than 2 m; the sinknets are employed at places with a considerable depth (up to 20 m, possibly more) and were not observed on the shallow Tigi Lake, the dipnets at shallower places from canoes (depth up to about 3 m) or walking backwards through the aquatic vegetation (depth to 1 m). During our visits, a severe northwestern wind starting around noon invariably prevented fishing with the primitive canoes which sink when filled with water, restricting these activities to the morning and possibly the night. Apparently only crayfish is fished for, incidentally captured fishes being used as bait. The male population occasionally ventures to fish using fishing spears.

Ajamaroe Lakes (fig. 8; pls. VIII figs. 1 & 2, XIV fig. 2, XV figs. 1 & 2). — Actually widened parts of the west-east streaming Ajamaroe River, situated about in the centre of the Vogelkop peninsula. From west to east, the first lake, called Jow, has a length of 7 km and a width of 2 km; the second, Semitoe or Maroemèga, a length of only 2 km and a width of 1½ km; the third, Jate or Hain, a length of 3 and a width of not even 1 km. The lakes are surrounded by a low marshy plain of varying width and, beyond

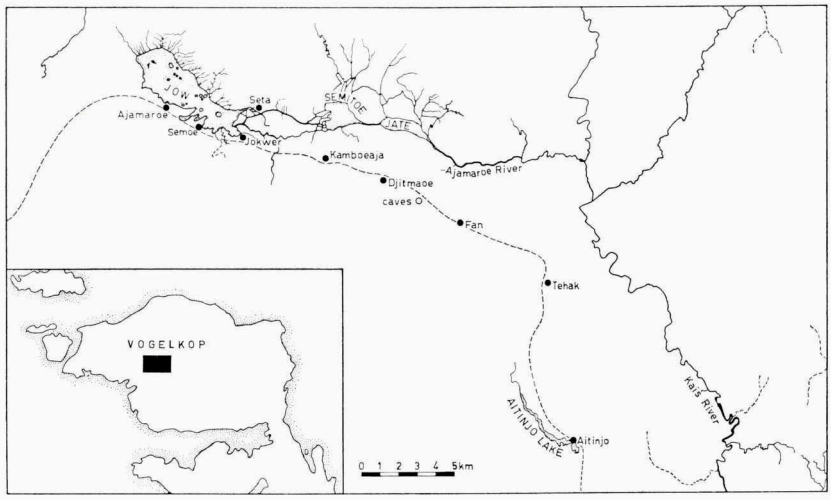

Fig. 8. Map of the Ajamaroe Lakes region.

the plain, by hills and mountains reaching heights up to about 1500 m, covered with forest. Several small streams enter the lakes which have an altitude of about 250 m above sea level, a depth of rarely more than 3 m, clear water almost stagnant except near entering rivers and outlets, pH approximately 6.4, a soft muddy bottom mostly covered with a rich aquatic vegetation, while the low shores and coastal plains are usually covered with secondary vegetation consisting primarely of grasses and low shrubs. Efforts to collect plankton were disappointing. This whole complex belongs to the Kais River drainage system which empties on the southwestern coast of the peninsula into the Ceram Sea.

To the same system also belongs Aitinjo Lake, situated about 25 km southeast of Ajamaroe. It is also a widened river, flowing southeast, with a length of 4 km and a strongly varying width with a maximum of about 350 m. At the northwestern end, the principal river widens to become a lake which consists of two parts separated by considerable rapids and small cataracts; at the southeastern end, the lake abruptly stops, but a subterranean connection with the Kais River is supposed to exist here. The mountains at most places closely surround the lake which has steep and rocky shores, almost perpendicular at some places but elsewhere allowing some wider marshy banks. The altitude above sea level is still uncertain, probably about 90 m, the depth is said to be about 15 or 20 m, but large shallow parts occur; the water is clear, pH about 6.5, flowing rather strongly only at the narrower parts of the lake, including the upper reaches; the bottom is rocky, at most places covered with sand, stones, or large rocks, but muddy at some places. Both the aquatic and the terrestrial vegetation are dense, at least where the stony substratum allows growth. Plankton sampling was disappointing. Native fishing was observed at various places during a trip across the four lakes, and includes the employment of fishing spears, bamboo fish traps, and bamboo shelters. The fish traps, constructed according to the same principle as hoopnets, are placed in screens across streams and narrow parts of the lakes, the screens being either straight (Ajamaroe region) or zigzag with the traps at the backward angles (Aitinjo). The bamboo shelters, simple tubes of bamboo with a length of about 1 m and a width of 10 to 12 cm, are put on the bottom at appropriate places to provide hidingplaces, especially for crayfish; to be emptied, they are lifted from the bottom with a long forked pole.

Merauke (fig. 9; pl. XVI figs. 1 & 2). — Situated in the southern lowlands near the mouth of the Merauke (or Maro) River. Most of our collecting took place in stagnant pools and ditches, in small streams, and along the wide sandy

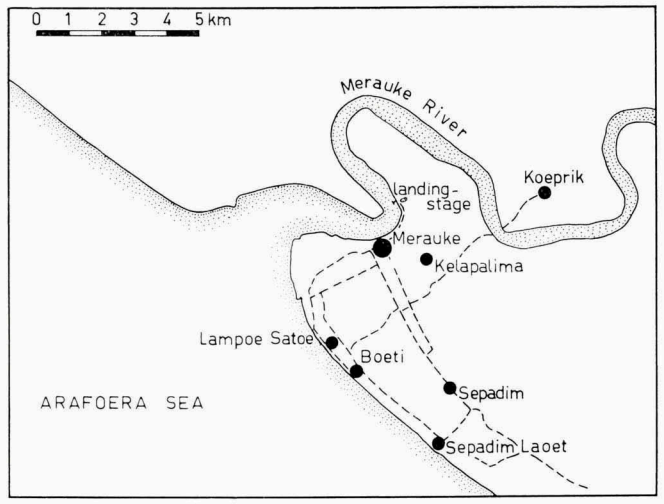

Fig. 9. Map of Merauke and environs.

beach. In the pools and ditches, the water was more or less brackish, turbid, with a very dense aquatic growth, the bottom muddy. Before the beach, at low tide, there are numerous sandbanks visible, all parallel to the coast and extending far into the Arafoera Sea.

Tanah Merah (fig. 10; pl. XVII figs. 1 & 2). — Situated on the eastern shore of the Digoel River, 260 km north of Merauke, not far from the southern foothills of the central mountain chain, at a height of only about 15 m; along the Digoel River, the distance from the sea is about 450 km, all of it navigable. While Tanah Merah stands on a rather high bank, the environs are mostly swampy; the strongly meandering Digoel River, often changing its course, is accompanied by numerous cut-off arms, in various stages of gradual disappearance beneath the encroaching dense tropical forest, and filled up by an abundant aquatic vegetation. The river embankments are of moderate height, at times flooded, with low swampy parts and marshy deltas where small streams enter. The speed of the river may be estimated at about 6 km per hour, the water is turbid, pH about 6.3 (6 in cut-off arm), the depth presumably only a few meters, the vegetation dense along the banks which are usually bordered by high tropical jungle. Fishing by the native population was not oberved, but fishing trips with the inhabitants of the local prison, using a large seine, yielded ample results.

While most of the above information is based on my own observations,

additional data were taken from the yearly official reports published by the Netherlands Government (Rapport inzake Nederlands-Nieuw-Guinea, The Hague, 1953-1959), the publications of the Meteorological and Geophysical Bureau (Hollandia, 1957-1962), the "Vademecum voor Nederlands-Nieuw-Guinea" published by the New Guinea Institute (Rotterdam, 1956), and a publication by Dr. L. B. Holthuis (Contributions to New Guinea Carcinology I, in: Nova Guinea, new ser., vol. 7 (2), pp. 123-137, 3 figs., 8 pls., Leiden, 1956) giving information on habitats and fishery techniques.

The photographic illustrations added to the present paper are of various origins, as indicated in their legends. I gratefully acknowledge my indebted-

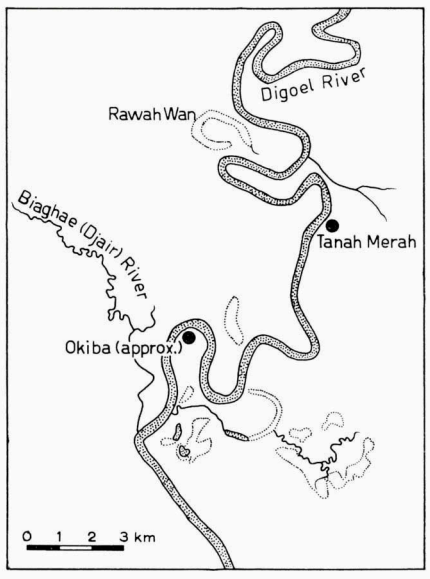

Fig. 10. Map of Tanah Merah and environs.

ness to the authors for their kind permission to have them reproduced here. The maps were expertly drawn by Mr. W. Bergmans, artist of the Rijksmuseum van Natuurlijke Historie.

List of geographic names

All New Guinea names occurring on the previous pages are listed with references to the maps. Whenever data were available and of apparent interest, the approximate elevation above sea level is added (in metres); most of these date were taken from the publications of the Meteorological Bureau at Hollandia. The orthography used was customary at the time of our visit

and up to the present, and can be found on most recent maps. However, changes can be expected in the near future, the principal probably being a replacement of Dutch names by Indonesian and of the "oe" in New Guinea names by the usual Indonesian "u".

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EXPLANATION OF THE PLATES

Plate VII

Fig. 1. View of Sentani Lake from the heights near Ifar. Phot. F. W. Rappard, formerly Chief Forestry Division, Netherlands New Guinea.

Fig. 2. Boogereh (fish trap) in Sentani Lake. Phot. F. W. Rappard.

Plate VIII

Figs. 1, 2. Fish trap from Jow Lake, Ajamaroe region (collection Rijksmuseum voor Volkenkunde Leiden, no. 3257.1).

Fig. 3. Women putting up screens around a boogereh near Poeë, Sentani Lake.

Fig. 4. Removal of dead branches from inner part of boogereh.

Fig. 5. Close-up of fully enclosed boogereh. Figs. 3-5, phot. L. B. Holthuis.

Plate IX

Fig. 1. View of Grime River, Nimboran region. Phot. L. van der Hammen.

Fig. 2. View of cut-off arm of Tami River. Phot. F. W. Rappard.

Plate X

Fig. 1. Reef before Naval Barracks near Sorido, south coast of Biak Island. Phot. L. B. Holthuis.

Fig. 2. Tidal forest east of Parai, south coast of Biak Island. Phot. L. van der Hammen.

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Fig. 1. View of Jamoer Lake from the shore near Gariau. Phot. L. B. Holthuis.

Fig. 2. Streamlet through dense tropical forest near Gariau. Phot. L. B. Holthuis.

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Fig. 1. View of the shore of Paniai Lake near Enarotali and Bobairo Peninsula, Wissel Lakes. Phot. F. W. Rappard.

Fig. 2. Proa and sinknets, Jawej River near Wissel Lakes. Phot. F. W. Rappard.

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Fig. 1. View of Tage Lake (Wissel Lakes) near subterranean outlet. Phot. L. B. Holthuis.

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Fig. 1. View of Tigi Lake and its marshy shores, seen from Waghete. Phot. L. B. Holthuis.

Fig. 2. Scenery at one of the narrow parts of Aitinjo Lake. Phot. M. F. Hofman; courtesy of Museum voor het Onderwijs, The Hague (from Nationaal Nieuw Guinea Comité).

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Fig. 1. View of Jow Lake (Ajamaroe Lakes) and surrounding scenery, seen from near Jokwer. Phot. M. Boeseman.

Fig. 2. Closer view on shallow Jow Lake near Ajamaroe. Phot. L. van der Hammen.

Plate XVI

Fig. 1. Sandy beach near Boeti, with numerous sand-bars far into the Arafoera Sea. Phot. L. B. Holthuis.

Fig. 2. Dense vegetation in and around a ditch along the road from Merauke to Lampoe Satoe. Phot. L. B. Holthuis.

Plate XVII

Fig. 1. View of the Digoel River slightly south of Tanah Merah. Phot. M. Boeseman.

Fig. 2. Fishing in the Rawah Wan, a cut-off arm of the Digoel River near Tanah Merah. Phot. M. Boeseman.

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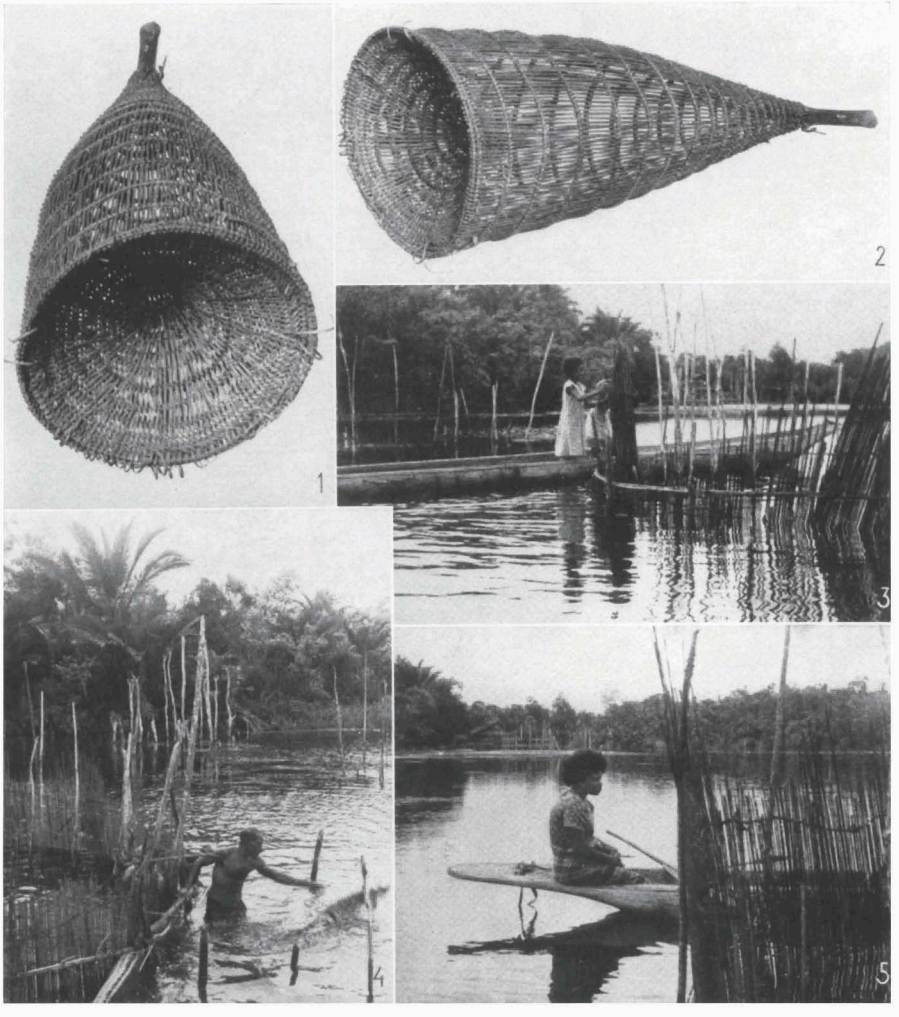
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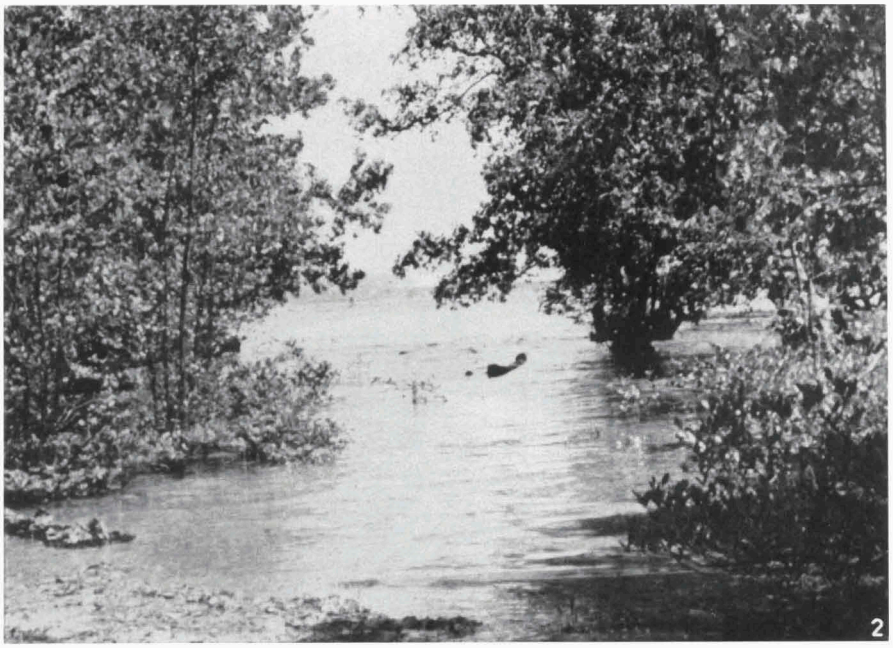
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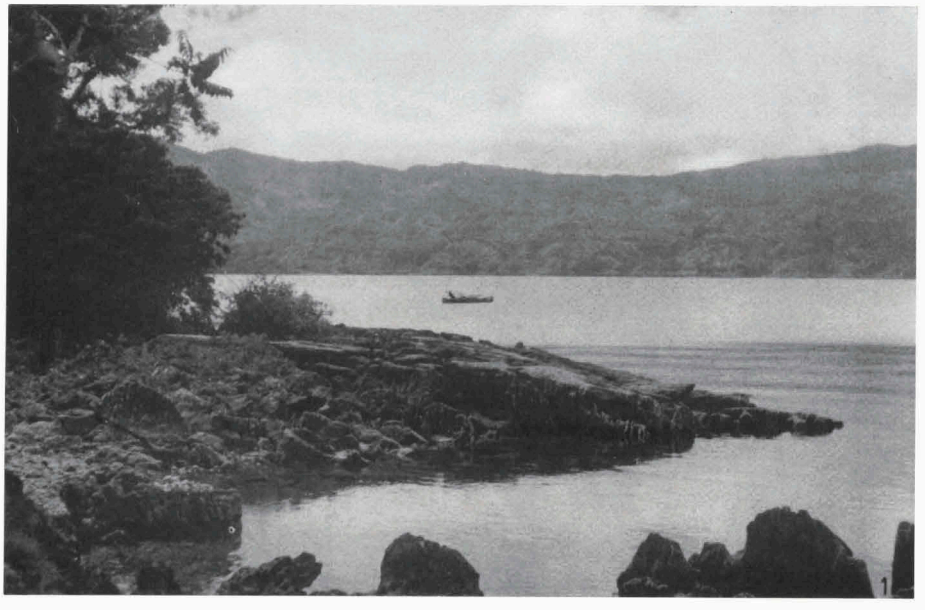

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