TERRITORY OF PAPUA AND NEW GUINEA

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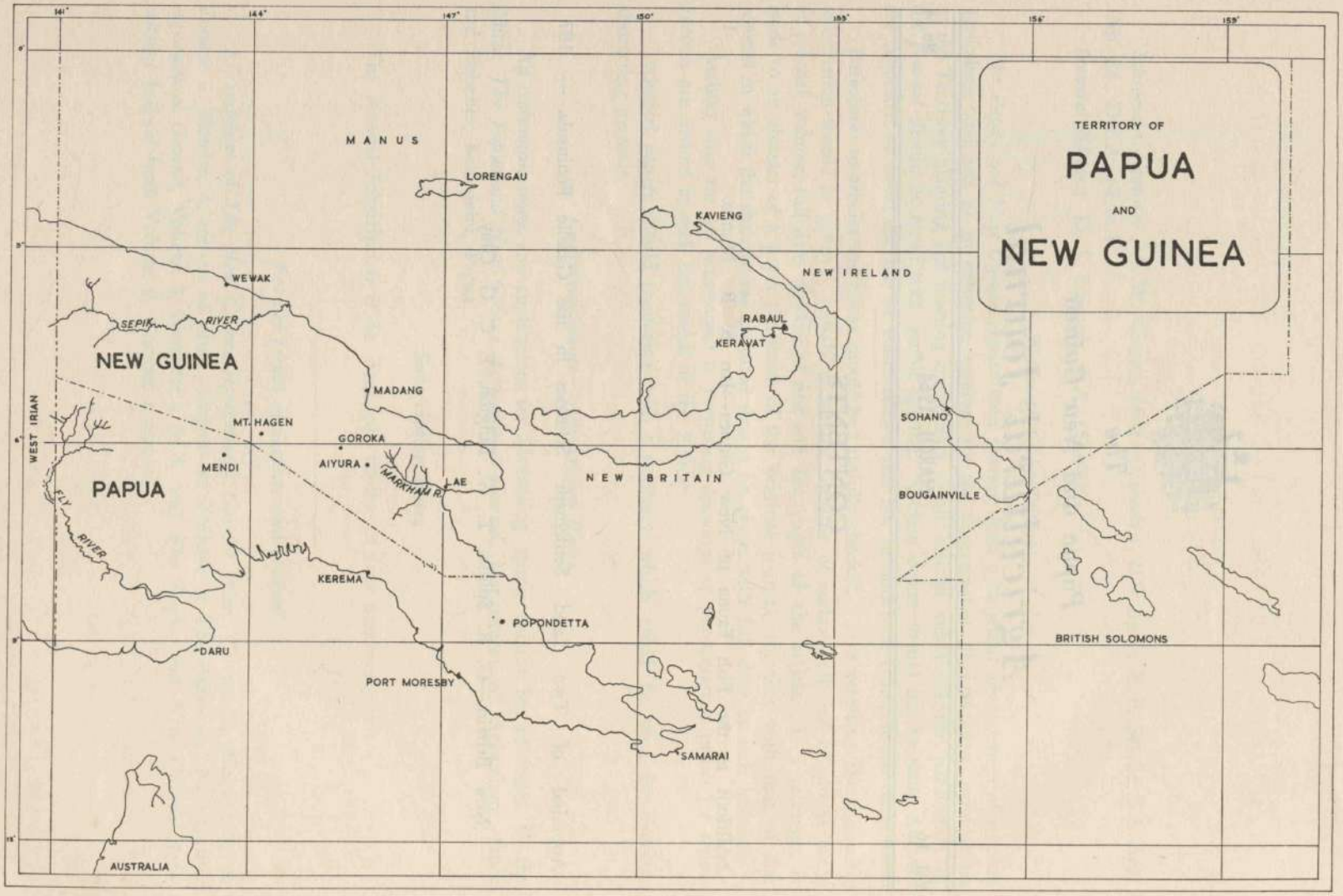
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AUSTRALIA

Additions to the Fish Fauna of New Guinea.

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INTRODUCTION

A checklist of the fish fauna of the New Guinea area by Munro (1958) *included records of fishes collected during the years* 1948-50 *by "M.V. Fairwind". Many of the species collected by that vessel represented new records for various parts of the Territory of Papua and New Guinea, both for the Territory as a whole as well as for the New Guinea area in general. An illustrated handbook of the marine and fresh water fishes of the Territory of Papua and New Guinea, begun before the checklist was published, is now ready for publication. During the preparation of the manuscript of this handbook several collections of fishes were obtained from the Territory, most of these being passed for identification to the C.S.I.R.O. Division of Fisheries and Oceanography by the Department of Agriculture, Stock and Fisheries. Amongst these collections were species not previously recorded from Papua, the Territory of Papua and New Guinea, or the New Guinea area as a whole. In addition there were species unknown to science. The purpose of this paper is to record these species officially and to provide descriptions and illustrations of those new to science. Opportunity is taken also to publish drawings of certain species that have not been illustrated before.*

NEW COLLECTIONS

During 1955 the Department of Agriculture Stock and Fisheries, of the Papua and New Guinea Administration carried out a series of experimental fishing tests in the Gulf of Papua and localities east to Samarai and Milne Bay. Rapson (1955) published general notes on one of these surveys which used trawls of small mesh in the Gulf of Papua. Dr. Rapson collected representative samples of the species obtained during these surveys and forwarded them for identification. This collection involves 59 new records for Papua, 46 new records for the Territory of Papua and New Guinea, and 28 new records for the general New Guinea area. These records include seven new species and types of two new genera and one new family. This material is treated in detail in the following pages. The following species* which do not represent new records were also obtained :—

Harengula ovalis (Bennett)	....	Hood Lagoon.
Sardinella melanura (Cuvier)	....	Milne Bay.
Dussumieria hasselti Bleeker	....	Red Scar Bay.
Stolephorus devisi (Whitley)	....	Kappa-Kappa ; Gaile.
Thrissina baelama (Forskal)	....	Caution Bay.
Plotosus anguillaris (Bloch)	....	Jokea.
Polydactylus plebeius (Broussonet)		Kerema Bay.
Rastrelliger kanagurta (Cuvier)	....	Samarai.
Kurtus gulliveri Castelnau	....	Panaroa River.
Alectis indica (Ruppell)	....	Jokea ; Samarai.
Selar crumenophthalmus (Bloch)		Samarai.
Leiognathus splendens (Cuvier)	....	Kerema Bay.
Pomadasys hasta (Bloch)	....	Red Scar Bay ; Panaroa River.
Caesio caerulaureus Lacepede	....	Samarai.
Pseudosciaena soldada (Lacepede)		Purari River ; Panaroa River.
Sillago sihama (Forskal)	....	Red Scar Bay ; Caution Bay.
Drepane punctata (Linnaeus)	....	Purari River.
Pterois volitans (Linnaeus)	....	Bootless Inlet.
Parapegasus natans (Linnaeus)	....	Yule Island.

The Department of Agriculture, Stock and Fisheries, also forwarded for identification several series of fishes from fresh waters, mostly from highland areas. Specimens collected on 31st May, 1954, at Sapphire Creek, a tributary of the Laloki River, included a new species of *Nematocentris* and a new species of *Xenambassis* in addition to *Papuservus trimaculatus* (Macleay). From the Asaro River in the Goroka district came a 346 mm. example of *Rhyacichthys aspro* (Valenciennes). A series of juveniles of *Oxyeleotris fimbriatus* collected on 12th March, 1955, came from Mendi. Specimens collected on 20th September, 1954, at Busianumu included *Mogurnda mogurnda mogurnda* and *Neosilurus bartoni* Regan. Specimens collected on 28th September, 1955,

* See Munro (1958).

by Mr. N. Blood in the Wahgi River at Korn Farm comprise juveniles of *Chilatherina campsi* and the type of a new gobiid genus. Mr. Blood also sent an example of *Glossogobius brunnoides* from Nondugl, and series of the same species came from Tari on the Tebi and Aiena Rivers. Species collected by Dr. Rapson in the Jimmi River system between 6th and 12th December, 1955, include *Neosilurus gjellerupi* (Weber) (Rink River bridge, Bonanga Creek), *Chilatherina campsi* (Rink River bridge, Yin River, Talo Creek, Bonanga Creek), *Centratherina crassispinosa* (Weber) (Rink River bridge, Yin River, Talo Creek), *Melanotaenia affinis* (Weber) (Rink River bridge, Yin River, Bonanga Creek), *Glossamia wichmanni gjellerupi* (Weber and De Beaufort) (Rink River bridge, Yin River, Talo Creek, Bonanga Creek), *Ophiocara aporos hoedti* (Bleeker) (Rink River bridge), and *Glossogobius celebius* (Valenciennes) (Rink River bridge, Yin River, Bonanga Creek, Ganz River junction). Dr. Rapson's collection was made subsequent to an expedition to the same area by the Australian Museum (July, 1954) which obtained five of the same species and several others (Whitley, 1956).

Another important collection was made at Lake Kutubu in March, 1955, by Patrol Officer C. E. T. Terrell. This includes a new species of *Melanotaenia* in addition to *Craterocephalus lacustris, Madigania adamsoni, Oxyeleotris fimbriatus* and eight varieties of *Mogurnda variegata.* Two of these species from Lake Kutubu were obtained by the British Museum in 1938 from Mr. J. C. Adamson (Trewavas 1940) and another by the American Museum of Natural History from the Archbold Expedition in 1936 (Nichols, 1951).

Mr. G. Morris, of C.B. Plantation, Warangoi, New Britain, forwarded examples of *Mesopristes cancellatus* (Cuvier), *Belobranchus belobranchus* and *Eleotris fusca* (Schneider) and the two first named constitute new records for New Britain.

Through the courtesy of Dr. J. W. Evans (Director) and Mr. G. P. Whitley (Curator of Fishes), I have been able to re-examine many specimens in the Australian Museum collection. A new species of *Fluvialosa* from the Strickland River is based on two examples collected by the Royal Geographical Society Expedition in January, 1886. A new species of *Nematocentris* is based on examples collected from the upper Fly River by Fl. Lt. Stuart Campbell in 1937 and others collected by Mr. W. Giblin from 25 miles inland of Port Moresby in 1933. As mentioned above this new Melanotaeniid was also collected in the Laloki River by Dr. A. M. Rapson.

Amongst the residue of collections made by M.V. *Fairwind* during 1948-1950 are two species of *Lestidium* which represent new records for New Britain and the Territory of Papua and New Guinea.

TRAWL FISHES FROM THE GULF OF PAPUA

The collection from the Gulf of Papua* is of particular interest because the majority of the species represent new faunal records for Papua. It also draws attention to the existence of certain endemic elements of very restricted distribution. Apart from a few species collected late in the nineteenth century by Mr. Andrew Goldie (Macleay, 1884) the present collection is the only one from this region. Although reasonably extensive it contains only 63 species taken on or near the bottom in depths of 5 to 15 fathoms, mostly in bays and near river mouths. The sea bed of the Gulf covers an area of over 6,000 square miles under a depth of 100 fathoms, and it is likely that the present collection represents a sampling of only a small percentage of the species that occur there. Of the 63 species seven are new to science, 15 have been recorded previously from other parts of Papua, 18 from the south coast of West New Guinea, 36 from tropical Australia, and 20 from the general New Guinea area other than Papua and the south coast of West New Guinea. Only *Cinetodus froggatti, Kurtus gulliveri* (Castlenau) and *Pomadasys hasta* (Bloch) have been recorded previously from the Gulf of Papua. Forty-four species in the collection also occur throughout the Indo-Pacific region and apparently comprise components of the tropical shelf fauna common to the Indo-Malay Subregion of the Oriental Region and the Papuan Subregion of the Australasian Region. Of these 27 occur also in Australian waters. *Kowala macrolepis, Nemapteryx stirlingi, Euristhmus nudiceps, Harpodon transtucens, Kurtus gulliveri* Castlenau, *Caranx*

* Obtained during the experimental trawling reported by Rapson (1955).

bucculentus, Apistops caloundra, Adventor elongatus and *Minous versicolor* occur also in the Solanderian, Banksian and Dampierian Marine Provinces of Australia, and are apparently components of the Australasian Region. The seven new species together with *Cinetodus froggatti, Polynemus intermedius* and *Collichthys novaeguineae* appear to be strictly Papuan, and at least the three named occur at the mouth of the Merauke River (West New Guinea) as well as the Gulf of Papua.

It is noted that all the above-mentioned Australasian components, with the exception of *Euristhmus nudiceps, Adventor elongatus* and the new species of *Leiognathus*, were collected in the river delta systems between Daru and Kerema. The seven new Papuan species are : the type of a new family allied to the Scatophagidae, type of a new genus of Engraulidae, and a new species in each of the genera *Setipinna, Polydactylus, Scomberomorus, Leiognathus* and *Pseudosciaena.*

Although the bulk of the components of the fish fauna of the Gulf of Papua are of Indo-Malay origin and a percentage possibly of Australasian origin, the remainder appear to have a very restricted distribution and are presumably endemic to Papua. Their habitat is the muddy mouths of the rivers that flow south to the point where Australia and the New Guinea island probably were joined several times in geological history. Possibly trawling exploration in the Gulf of Carpentaria will result in collections which will extend the distributional range of these apparently isolated species.

It is of interest to note that *Collichthys novaeguineae* and *Polynemus intermedius* which were originally collected by the Archbold Expeditions near the mouth of the Merauke River, have been found amongst the species in the present collection. Also it is possible to confirm that the *Harpodon* of southern New Guinea is identical with that of northern Australia, but the species occurring in northern New Guinea is the Indian *H. nehereus* (Hamilton-Buchanan).

SHORE FISHES FROM OTHER PAPUAN LOCALITIES

The collection of shore fishes sent by Dr. Rapson includes 18 species obtained from a number of localities between Port Moresby and Milne Bay. Of these nine constitute new faunal records for Papua, two confirm distribution on the mainland coast of Papua, six represent new records for the Territory of Papua and New Guinea, and three have not been recorded previously from the general New Guinea area. Seventeen of these species belong to the Indo-Malay Subregion of the Oriental Region, but all except *Amblygaster clupeoides, Stolephorus bataviensis, Brachypleura novaezelandiae* and *Pomacentrus chrysopoecilus* are known to extend to tropical Australia. *Stolephorus devisi* (Whitley) is probably an element of the Papuan Subregion of the Australasian region, its distribution being from tropical Queensland through New Guinea to New Britain. *Equulites novaehollandiae,* although not part of this collection but included in this paper for purposes of illustration, has a distribution similar to that of *S. devisi* (Whitley) and also appears to be an element of the Papuan Subregion.

FRESH WATER FISHES OF THE NEW GUINEA ISLAND

The present collection of fresh water fishes from various localities, supported by re-examination of material in the Australian Museum and types and co-types of Melanotaeniidae from the British Museum, Zoological Museum of Amsterdam, Stanford Natural History Museum and the American Museum of Natural History, has added greatly to interpretation of speciation and distribution. A stage has been reached where a preliminary analysis can be made of the fish components of the fluvifauna on a zoogeopraphical basis.

Observations on the distribution and speciation of the fresh water fishes support in general the theory that there are two distinct fluvifaunal provinces on the New Guinea island, and that these fluvifaunulae are isolated by the central dividing ranges which run lengthwise through the major axis of the island. Rivers flowing towards the north coast constitute the Gaimardian Province and those flowing towards the south coast constitute the Riechian Province. The rivers flowing north on the Australian continent between the Kimberley district in the west and the Gulf of Carpentaria on the east constitute the Leichhardtian Province. These provinces have been defined most recently by McMichael and Hiscock (1958, pp. 488-489). Earlier workers, notably Iredale and Whitley

(1938, pp. 64-68) considered that the Leichhardtian Fluvifaunula of north Australia extended to the southern half of New Guinea, embracing the Riechian Fluvifaunula. Table 1 gives an analysis of the fish components of the two fresh water provinces of New Guinea, indicating the Indo-Malay elements, and shows the overlap in Papuan elements common to the Riechian and Leichhardtian Provinces. The species listed are those forms considered to be basically fresh water but those marked with an asterisk (*) also occur in brackish and salt water. Possibly some so marked should be classified as estuarine with the physiological tolerance which enables them to penetrate into fresh water. Revisionary studies have been made on a number of groups in connection with the preparation of this paper and the manuscript of the New Guinea handbook, and as a result, certain names have been discarded on the basis of synonymy.

Analysis of the list of 145 species (including some subspecies and varieties) (see Table 1) indicates that 34 are of Indo-Malay origin, 33 of these occurring in the Gaimardian Province, 21 of these 33 extend into the Riechian Province, and a further 11 into the Leichhardtian Province. These elements comprise members of the families Anguillidae, Hemiramphidae, Chandidae, Theraponidae, Rhyacichthyidae, Eleotridae and Gobiidae. The majority belong to the two families named last.

The Papuan elements comprise 34 species indigenous to the Gaimardian Province and 43 species indigenous to the Riechian Province. In addition to these there are eight species (*Hexanematichthys leptaspis, Anguilla interioris, Cestraeus goldiei, Chilatherina campsi, Pseudomugil novaeguineae, Glossamia beauforti, Oxyeleotris urophthalmus novaeguineae, O. fimbriatus*) common to both provinces, and four others (*Anguilla obscura, Mogurnda mogurnda mogurnda, Prionobutis microps, Oxyeleotris lineolatus*) common to both provinces and extending to the Leichhardtian Province. Of these *Anguilla obscura* also extends eastwards through the Pacific Islands to about 140 degrees W. longitude, and should perhaps be regarded as an eastern Pacific rather than strictly Papuan element.

Comparing the Riechian Fluvifaunula with the Leichhardtian Fluvifaunula, it will be noted that, in addition to species mentioned in preceding paragraphs, there are 22 species common to both provinces.

These are :—

Pristiopsis leichhardti.
Scleropages leichardti.
Nemapteryx stirlingi.
Neosilurus brevidorsalis.
N. ater ater.
Prochilus obbesi.
Stenocaulus kreffti.
Melanotaenia nigrans.
M. goldiei.
Nematocentris ogilbyi.
N. rubrostriatus.
N. maculata.
Ambassis agrammus (?).
A. macleayi.
Parambassis gulliveri.
Glossamia aprion aprion.
Kurtus gulliveri.
Pelates romeri.
Papuservus trimaculatus (?).
Protoxotes lorentzi.
Hypseleotris compressus.
Liachirus klunzingeri.

Some of these were described originally from Papua and some from Australia. Neither Papua nor the tropical rivers of Australia can be regarded as fully investigated and it is possible that more species will be found to overlap between the two provinces. *Ambassis agrammus* in Papua and *Papuservus trimaculatus* in northern Australia are based on records which need confirmation. The Leichhardtian Province also has 21 indigenous elements which have not been indicated in Table 1.

These are:—

Fluvialosa paracome Whitley.
F. bulleri Whitley.
Hexanematichthys berneyi (Whitley)
Anodontiglanis dahli Rendahl.
Neosilurus rendahli (Whitley).
N. glencoensis (Rendahl).
N. mortoni Whitley.
Craterocephalus worrelli Whitley.
Quirichthys stramineus (Whitley).
Nematocentris australis (Castelnau).
Denariusa bandata Whitley.
Toxotes carpentariensis Castelnau.
T. dorsalis Whitley.
Leiopotherapon suavis Whitley.

Amniataba percoides (Gunther).

Mesopristes alligatoris (Rendahl).

Hephaestus carbo (McCulloch and Ogilby)

Scortum ogilbyi Whitley.

Madigania unicolor (Gunther).

Pingalla gilberti Whitley.

Hypseleotries simplex (Castelnau).

The overlap of species amounts to approximately 25 per cent., and 50 per cent. are indigenous to the Riechian Province and 25 per cent. indigenous to the Leichhardtian Province. From this it might be concluded that the two provinces should be regarded as distinct although there has been some mixing during geological history when southern Papua and northern Australia were bridged by land.

Table 1.—Distribution of fresh water fishes in northern and southern parts of the New Guinea island, showing relationships with fluvifauna of the Indonesian Archipelago and the tropical parts of Australia. Species marked with an asterisk (*) also inhabit salt or brackish water.

Family	Species	Leichhardtian Fluvifaunula	Riechian Fluvifaunula	Gaimardian Fluvifaunula	Indonesian Archipelago
		Tropical Australia	Southern New Guinea	Northern New Guinea	
PRISTIDAE					
	Pristiopsis microdon (Latham)	....	....	+	+
	P. le chhardti Whitely	+	+	....	....
OSTEOGLOSSIDAE					
	Scleropages leichardti Gunther	+	+	....	....
CLUPEIDAE					
	Clupeoides papuensis (Ramsay & Ogilby)	....	+	....	....
DOROSOMATIDAE					
	Fluvialosa papuensis sp. nov.	....	+	....	....
TACHYSURIDAE					
	Netuma microstoma (Nichols)	....	....	+	....
	Cinetodus froggatti (Ramsay & Ogilby) *	....	+	....	....
	Hexanematichthys leptaspis Bleeker	....	+	+	....
	H. acrocephalus (Weber) *	....	+	....	....
	H. latirostris (Macleay)	....	+	....	....
	H. digulensis (Hardenberg)	....	+	....	....
	H. danielsi (Regan) *	....	+	....	....
	H. carinatus (Weber)	....	+	....	....
	Nemapteryx stirlingi (Ogilby) *	+	+	....	....
	Tachysurus solidus (Herre)	....	....	+	....
	T. kanganamanensis (Herre)	....	....	+	....
	Brustiavius nox (Herre)	....	....	+	....
	Cochlefelis spatula (Ramsay & Ogilby)	....	+	....	....
	Hemipimelodus bernhardi Nichols	....	....	+	....
	H. crassilabris Ramsay & Ogilby	....	+	....	....
	H. velutinus Weber	....	....	+	....
	H. macrorhynchus Weber	....	+	....	....
	H. aaldereni Hardenberg	....	+	....	....
	H. papillifer Herre	....	....	+	....
	Nedystoma dayi (Ramsay & Ogilby)	....	+	....	....
	Tetranesodon conorhynchus Weber	....	+	....	....
DOIICHTHYIDAE					
	Doiichthys novaeguineae Weber	....	+	....	....
PLOTOSIDAE					
	Neosilurus equinus (Weber)	....	+	....	....
	N. idenburgi (Nichols)	....	....	+	....
	N. gjellerupi (Weber)	....	....	+	....
	N. meraukensis (Weber)	....	+	....	....
	N. novaeguineae (Weber)	....	....	+	....
	N. perugiae (Ogilby)	....	+	....	....
	N. bartoni Regan	....	+	....	....
	N. brev dorsalis (Gunther)	+	+	....	....
	N. ater ater (Perugia)	+	+	....	....
	N. ater sepikensis (Whitley)	....	....	+	....
	Prochilus obbesi Weber	+	+	....	....
	Otoplotosus mariae Weber	....	+	....	....

Family / Species	Leichhardtian Fluvifaunula — Tropical Australia	Riechian Fluvifaunula — Southern New Guinea	Gaimardian Fluvifaunula — Northern New Guinea	Indonesian Archipelago
ANGUILLIDAE				
Anguilla celebensis Kaup	....	....	+	+
A. interioris Whitley	....	+	+	....
A. marmorata Quoy & Gaimard	....	+	+	+
A. bicolor pacifica Schmidt	....	+	+	+
A. obscura Gunther	+	+	+	....
BELONIDAE				
Stenocaulis perornatus Whitley	....	....	+	....
S. kreffti (Gunther)	+	+	....	....
HEMIRAMPHIDAE				
Zenarchopterus brevirostris (Gunther) *	....	+	+	+
Z. novaeguineae (Weber)	....	+	....	....
Z. buffonis (Valenciennes) *	+	....	+	+
Z. kampeni (Weber) *	....	....	+	....
Z. sepikensis Herre	....	....	+	....
MUGILIDAE				
Cestraeus goldiei (Macleay)	....	+	+	....
MELANOTAENIIDAE				
Melanotaenia affinis (Weber)	....	....	+	....
M. nigrans (Richardson)	+	+	....	....
M. goldiei (Macleay)	+	+	....	....
M. lacustris sp. nov.	....	+	....	....
M. vanheurni (Weber & De Beaufort)	....	....	+	....
M. catherinae (De Beaufort)	....	....	+	....
Nematocentris ogilbyi (Weber)	+	+	....	....
N. rubrostriatus (Ramsay & Ogilby)	+	+	....	....
N. maculata (Weber)	+	+	....	....
N. sexlineatus sp. nov.	....	+	....	....
N. multisquamata (Weber & De Beaufort)	....	....	+	....
N. praecox (Weber & De Beaufort)	....	....	+	....
Chilatherina sentaniensis (Weber)	....	....	+	....
C. lorentzi (Weber)	....	....	+	....
C. campsi (Whitley)	....	+	+	....
Centratherina crassispinosa (Weber)	....	....	+	....
Glossolepis incisus Weber	....	....	+	....
TELMATHERINIDAE				
Charisella fredericki Fowler	....	....	+	....
PSEUDOMUGILIDAE				
Pseudomugil furcatus Nichols	....	+	....	....
P. novaeguineae Weber	....	+	+	....
ATHERINIDAE				
Craterocephalus nouhuysi (Weber)	....	+	....	....
C. annator Whitley	....	+	....	....
C. lacustris Trewavas	....	+	....	....
C. randi Nichols	....	+	....	....
CHANDIDAE				
Ambassis agrammus Gunther	+	(+)	....	....
A. buruensis Bleeker *	....	....	+	+
A. macleayi (Castelnau)	+	+	....	....
A. interuptus (Bleeker) *	....	+	+	+
Parambassis confinis (Weber)	....	....	+	....
P. gulliveri (Castelnau)	+	+	....	....
Tetracentrum apogonoides Macleay	....	+	....	....
Synechopterus caudovittatus Norman	....	+	....	....
Xenambassis honessi Schultz	....	....	+	....
X. simoni Schultz	....	....	+	....
X. lalokiensis sp. nov.	....	+	....	....
APOGONIDAE				
Glossamia wichmanni wichmanni (Weber)	....	....	+	....
G. wichmanni gjellerupi (Weber & De Beaufort)	....	....	+	....
G. beauforti (Weber)	....	+	+	....
G. trifasciata (Weber)	....	+	....	....

Species	Family	Leichhardtian Fluvifaunula — Tropical Australia	Riechian Fluvifaunula — Southern New Guinea	Gaimardian Fluvifaunula — Northern New Guinea	Indonesian Archipelago
G. sandei (Weber)		....	+	....	....
G. aprion aprion (Richardson)		+	+	....	....
Kurtus gulliveri Castelnau	KURTIDAE	+	+	....	....
Mesopristes cancellatus (Cuvier) *	THERAPONIDAE	....	+	+	+
Pelates romeri (Weber)		+	+	....	....
Pingalla lorentzi (Weber)		....	+	....	....
Madigania adamsoni (Trewavas)		....	+	....	....
Papuenwus trimaculatus (Macleay)		(+)	+	....	....
Amphitherapon habbemai (Weber)		....	+	....	....
Protoxotes lorentzi (Weber)	TOXOTIDAE	+	+	....	....
Rhyacichthys aspro (Valenciennes)	RHYACICHTHYIDAE	....	+	+	+
Prionobutis microps (Weber) *	ELEOTRIDAE	+	+	+	....
Eleotris fusca (Schneider) *		+	....	+	+
E. melanosoma Bleeker *		....	....	+	+
E. macrolepis (Bleeker) *		....	....	+	+
Bunaka gyrinoides (Bleeker) *		....	+	+	+
B. herwerdeni (Weber)		+	+	+	+
Butis amboinensis (Bleeker) *		+	+	+	+
B. butis (Hamilton-Buchanan) *		+	+	+	+
B. melanostigma (Bleeker) *		....	+	....	+
Ophiocara aporos aporos (Bleeker)		+	+	+	+
O. aporos hoedti (Bleeker)		+	+	+	+
O. aporos guentheri Koumans		....	+	+	+
O. porocephala porocephala (Valenciennes)		+	+	+	+
O. porocephala darwinense (Macleay)		+	+	+	+
Mogurnda mogurnda mogurnda (Richardson)		+	+	+	....
Mogurnda variegata Nichols		....	+	....	....
Tateurndina ocellicauda Nichols		....	+	....	....
Hypseleotris moncktoni (Regan)		....	+	....	....
H. compressus (Krefft)		+	+	....	....
H. guentheri (Bleeker)		....	....	+	+
Belobranchus belobranchus (Valenciennes) *		....	+	+	+
Bostrichthys strigogenys (Nichols)		....	+	....	....
B. zonatus (Weber) *		....	+	....	....
B. sinensis (Lacepede) *		....	....	+	+
Odonteleotris nesolepis (Weber)		....	+	+	....
Oxyeleotris lineolatus (Steindachner)		+	+	+	....
O. fimbriatus (Weber)		....	+	+	....
O. urophthalmus novaeguineae Koumans *		....	+	+	....
Stenogobius genivittatus (Valenciennes) *	GOBIIDAE	....	+	+	+
Stigmatogobius romeri (Weber) *		....	....	+	+
S. javanicus (Bleeker) *		+	+	+	+
S. poecilosoma (Bleeker) *		....	....	+	+
S. hoeveni (Bleeker) *		+	....	+	+
S. reticularis (Weber)		....	....	+	....
Ctenogobius tigrellus (Nichols)		....	....	+	....
Glossogobius celebius (Valenciennes)		....	+	+	+
G. giurus (Hamilton-Buchanan) *		+	+	+	+
G. brunnoides (Nichols)		....	+	....	....
Aloricatogobius asaro (Whitley)		....	+	....	....
Acentrogobius bulmeri (Whitley)		....	....	+	....
A. fusculus (Nichols)		....	....	(+)	....
Awaous grammepomus (Bleeker) *		....	....	+	+
Liachirus klunzingeri (Weber)	SOLEIDAE	+	+	....	....

Family CLUPEIDAE

HILSA BREVIS (Bleeker)

Alosa brevis Bleeker, Journ. Ind. Arch. ii, 1848, p. 638. (Bima, Sumbawa Island.)

2 examples (97-98 mm.)—2½ miles off east head of Purari River, 4¾ fathoms.

2 examples (97-102 mm.)—Off Red Scar Bay, 6-8 fathoms.

Previously recorded from Mimika River (West New Guinea) but unknown from the Territory of Papua and New Guinea. A new record for Papua.

KOWALA MACROLEPIS (Steindachner)

Clupea macrolepis Steindachner, Denschr. Akad. Wiss. Wien, xli (1), 1879, p. 13. (Townsville, Queensland.)

Escualosa macrolepis Whitley, Aust. Zoologist, ix (4), 1940, p. 402, fig. 8; Aust. Zoologist x (2), 1943, p. 170, fig. 2.

Examples immature and closely agreeing with a topotypical example of similar size illustrated by Whitley (1943, fig. 2). Yellowish but probably translucent in life. A thin black stripe along dorsal body profile from dorsal fin to caudal base where it widens above and has an isolated dark mark below. A basal row of black dots along dorsal and anal fins. Two large melanophores on occiput.

No examples are known of length greater than 84 mm. The mature example from Townsville illustrated by Whitley (1940, fig. 9) is *Harengula abbreviata* Valenciennes, which has the ventral fins inserted below the dorsal fin base at all ages, and in Australia ranges north to Princess Charlotte Bay. The insertion of the ventral fins in advance of the vertical through the origin of the dorsal fin is one of the characters which separate the genus *Kowala* Valenciennes from *Harengula* Valenciennes. This is not a difference due to age as contended by Whitley. The species is distinguished from *H. abbreviata* by having head length 5.0 instead of 3.3-4.2 in standard length, 35-38 instead of 44-45 scales in longitudinal series, and 7-9 instead of 12-13 scales in transverse series.

2 examples (78-84 mm.)—Gulf of Papua (Lat. 8° 16' S. Long. 144° 12' E.), 6-6½ fathoms.

Previously unknown from any part of the New Guinea area. A new record for Papua.

SARDINELLA JUSSIEU (Lacepede)

Clupanodon jussieu Lacepede, Hist. Nat. Poiss., v, 1803, pp. 469,474. (Mauritius.)

1 example (128 mm.)—Hood Lagoon, 1½-9 fathoms.

Previously recorded from Bramble Cay, Torres Strait, but a new record for the mainland of Papua.

AMBLYGASTER CLUPEOIDES Bleeker

Amblygaster clupeoides Bleeker, Journ. Ind. Arch., iii, 1849, p. 73. (Macassar.)

2 examples (200-209 mm.) — Koki Market, Port Moresby.

Previously recorded from Duke of York Islands, but a new record for Papua.

EUPLATYGASTER INDICA (Swainson)

Platygaster indicus Swainson, Hist. Nat. Fish., ii, 1839, p. 294. (Vizagapatam, India.)

2 examples (118-133 mm.)—2½ miles off east head of Purari River, 4¾ fathoms.

3 examples (102-116 mm.)—Off Port Romilly (Lat. 7° 55' S. Long. 144° 48' E.), 7 fathoms.

4 examples (105-128 mm.)—Off Kerema Bay, 5½ fathoms.

Previously unknown from any part of the New Guinea area. A new record for Papua.

Family ENGRAULIDAE

SCUTENGRAULIS HAMILTONI (Gray)

Thrissa hamiltonii Gray, Illustr. Ind. Zool., Hardwicke, 11, 1832-34, pl. 92, fig. 3. (No locality.)

4 examples (103-137 mm.)—2½ miles off east head of Purari River, 4¾ fathoms.

7 examples (82-277mm.)—Near mouth of Panaroa River, 1½ fathoms.

2 examples (142-193 mm.)—Off Jokea, 5-9 fathoms.

1 example (413 mm.)—Off Kerema Bay, 5½ fathoms.

Previously unknown from any part of the New Guinea area. A new record for Papua. Professor E. Tortonese informs me (*in litt.*) that there is an example from the Fly River in the Museum of Natural History, Genoa.

SCUTENGRAULIS KAMMALENSIS (Bleeker)

Engraulis kammalensis Bleeker, Verh. Bat. Gen., xxii, 1849, p. 13. (Madura Straits.)

2 examples (99-113 mm.)—2½ miles off east head of Purari River, 4¾ fathoms.

2 examples (115 mm.)—Off Kerema Bay, 5½ fathoms.

Previously recorded from Oetoemboewe River (West New Guinea) but unknown from the Territory of Papua and New Guinea. A new record for Papua.

STOLEPHORUS BATAVIENSIS Hardenberg

Stolephorus insularis bataviensis Hardenberg, Nat. Tijds. Ned. Ind., xciii, 1933, p. 261. (Batavia.)

1 example (68 mm.)—2½ miles off east head of Purari River, 4¾ fathoms.

2 examples (95 mm.)—Off Kerema Bay, 5½ fathoms.

1 example (66 mm.)—Gulf of Papua (Lat. 8° 16' S. Long. 144° 12' E.), 6-6½ fathoms.

3 examples (87-90 mm.)—Off Gamadodo, Milne Bay, 7 fathoms.

Previously unknown from any part of the New Guinea area. A new record for Papua.

STOLEPHORUS INDICUS (Van Hasselt)

Engraulis indicus Van Hasselt, Alg. Konst- en Letter-Bode, i (21) 1823, p. 329.(Java).

12 examples (61-84 mm.)—Hood Lagoon, 1½-9 fathoms.

1 example (124 mm.)—Off Kerema Bay, 5½ fathoms.

Confirmation of occurrence in Papua, being recorded previously on the assumption that *Engraulis samam inan* Thiolliere 1857 from Woodlark Island represented this species.

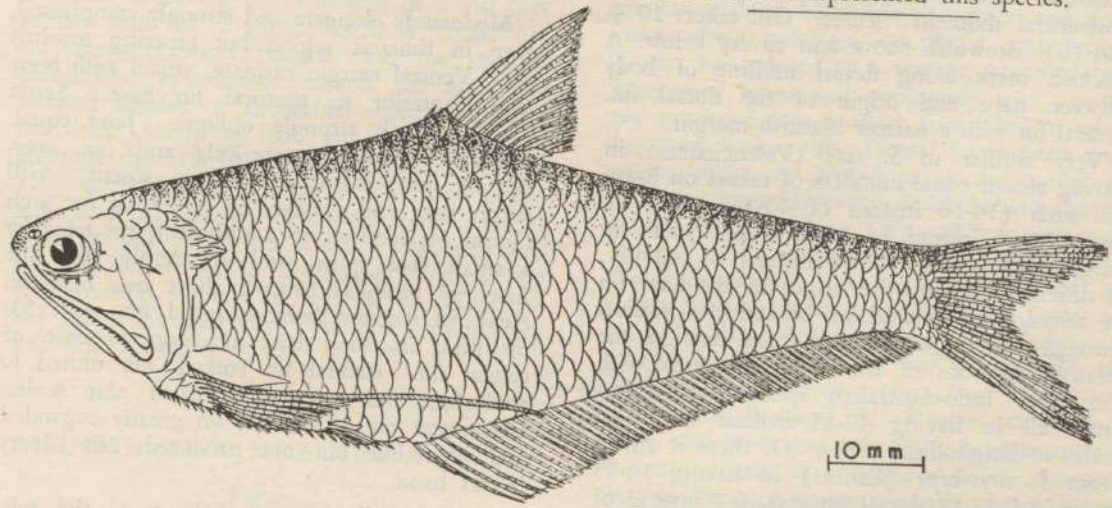

Figure 1. *Setipinna papuensis* sp. nov. Holotype, 117 mm. South of Port Romilly, Gulf of Papua (7° 55' S., 142° 48' E.). (C.S.I.R.O. Marine Biological Laboratory Reg. No. C3246.).

THRYSSA SETIROSTRIS (Broussonet)

Clupea setirostris Broussonet, Ichth., i, 1782, pl. 2. (Tanna Island, Society Group.)

2 examples (99-103 mm.)—2½ miles off east head of Purari River, 4¾ fathoms.

1 example (100 mm.)—Off Kerema Bay, 5½ fathoms.

2 examples (108-113 mm.)—Off Jokea, 5-9 fathoms.

Previously recorded from Merauke (West New Guinea) and Seeadler Harbour, Manus Island, but a new record for Papua.

SETIPINNA PAPUENSIS sp. nov.
(Figure 1)

D. i, 14-15. A. 53-64. P. i, 13. V. 7. Sc. 42-44. Tr. 12-13.

Depth 2.9-3.4, head 4.3-5.3 in standard length. Eye 4-4.5 in head. Maxilla does not extend back beyond margin of preoperculum. Origin of dorsal fin much nearer tip of snout than base of tail. Origin of anal fin slightly before the vertical passing through the origin of the dorsal fin. Ventral fins inserted much nearer origin of the anal fin than the base of the pectoral fin. Uppermost ray of pectoral fin produced into a long free filament which extends back to about the first quarter of the base of the anal fin. Predorsal scales 23-30. 19-22 preventral and 6-7 postventral abdominal scutes. Gill rakers 10 + (14-16). Brownish above and silvery below. A blackish mark along dorsal midline of body between nape and origin of the dorsal fin. Caudal fin with a narrow blackish margin.

Very similar to *S. taty* (Valenciennes) in having almost equal numbers of rakers on lower gill arch (14-16 instead of 15-16), anal fin rays (53-64 instead of 51-60), and scales in longitudinal series (42-44 instead of 40-46). It differs in having the origin of the anal fin in advance of, instead of behind the vertical through the origin of the dorsal fin. In the relative positions of these fins it agrees with the other Indo-Australian species but differs from all in having 42-44 instead of 50-60 scales in longitudinal series. Of these it differs from *S. breviceps* (Cantor) in having 14-15 instead of 17-18 dorsal fin rays, 6-7 instead of 9-11 postventral abdominal scutes, and in having the snout projecting beyond the tip of the lower jaw. Its gill raker count of 10 + (14-16) differs from *S. phasa* (Hamilton-Buchanan) with (14-15) + 18, and *S. melanochir* (Bleeker) with (7-9) + (9-12). Its anal fin count of 53-64 rays differs from *S. phasa* with 72-74, and *S. melanochir* with 49-53. It differs also from *S. melanochir* by having the filamentous ray of the pectoral fin extending beyond the origin of the anal fin instead of only to the insertions of the ventral fins.

8 examples (72-158 mm.)—2½ miles off east head of Purari River, 4¾ fathoms.

8 examples (55-143 mm.)—Off Port Romilly (Lat. 7° 55' S. Long. 144° 48' E.), 7 fathoms.

10 examples (75-104 mm.)—Off Kerema Bay, 5½ fathoms.

1 example (132 mm.)—Off mouth of Fly River.

Holotype—An example measuring 117 mm. from the above series from off Port Romilly (C.S.I.R.O. Marine Biological Laboratory Reg. No. C. 3246), illustrated in Figure 1.

Type Locality—Off Port Romilly (Lat. 7° 55' S. Long. 144° 48' E.), Gulf of Papua.

Genus PAPUENGRAULIS nev.

Moderately elongate and strongly compressed, deep in thoracic region but tapering towards tail. Ventral margin carinate, armed with bony scutes anterior to pectoral fin base. Snout short. Mouth strongly oblique. Jaws equal. Maxilla expanded posteriorly and not overlapping properculum. Canines absent. Gill rakers long and slender, 15 + 27 on fist arch Dorsal fin reduced to a rudiment, preceded by a small free spine, and apparently with the first ray produced into a short free filament. Anal fin inserted behind dorsal fin, with 53-59 rays, its long base reaching to base of caudal fin. Caudal fin forked, not united to anal fin, and without enlarged alar scales. Uppermost ray of pectoral fin greatly expanded and blade-like but not produced. No silvery lateral band.

This specialized genus belongs to the subfamily Stolephorinae *sensu* Jordan and Seale 1927. It differs from *Stolephorus* Lacepede

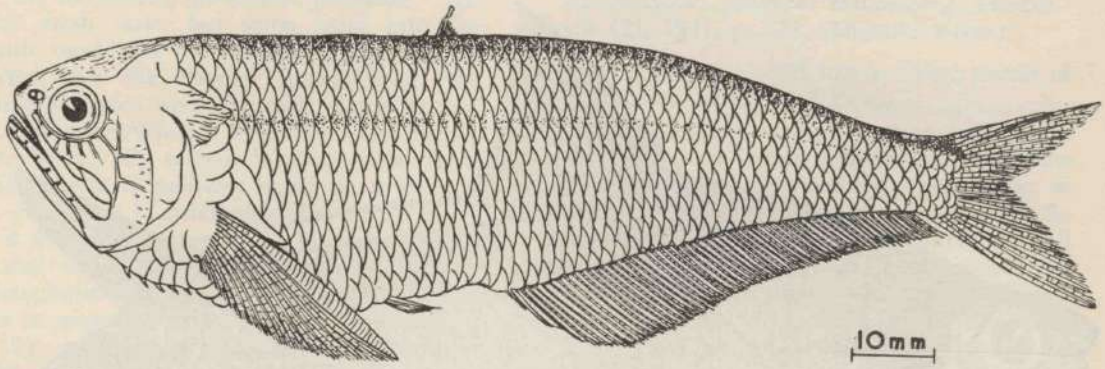

Figure 2. *Papuengraulis micropinna* sp. nov. Holotype, 139 mm. South of Port Romilly, Gulf of Papua (7° 55' S., 144° 48' E.). (C.S.I.R.O. Marine Biological Laboratory Reg. No. C3247.).

which has a slender body and silvery lateral band, and which lacks the free spine before the dorsal fin. Amongst those genera which have deep bodies and a free spine preceding the dorsal fin, it can be separated from *Setipinna* Swainson which has a filamentous prolongation of the upper pectoral ray. There are no canine teeth as in *Lycothrissa* Gunther and *Xenengraulis* Jordan and Seale, and *Lycothrissa* has the anal fin inserted before the dorsal fin. From the remaining genera *Scutengraulis* Jordan and Seale, *Thryssa* Cuvier(=*Thrissocles* Jordan and Evermann) and *Thrissina* Jordan and Seale, it differs in having 53-59 instead of 27-50 rays in the anal fin, a greatly reduced dorsal fin, an extremely short maxilla, and the swollen paddle-like uppermost pectoral fin ray. The reduced number of abdominal scutes, and their restriction solely to the isthmus, is unique amongst the Engraulidae; in *Scutengraulis* and *Thryssa* scutes extend from the isthmus to the vent, and in *Thrissina* they occur only between pectoral and pelvic fin bases. The reduction of the dorsal fin to a vestige parallels the specialization within the Family Clupeidae of the genus *Raconda* Gray which has completely lost this structure.

PAPUENGRAULIS MICROPINNA sp. nov.

Figure 2

D. i, 5-6. A. 53-59. P. i, 12. V. 7. Sc. 47-50. Tr. 10-12.

Depth 3.3-3.7, head 4.3-4.6 in stardard length. Eye 3.3-3.8 in head, entirely covered with thick skin. Maxilla expanded posteriorly, with 2 supplemental bones, not extending back beyond the front edge of the preoperculum. Head apparently naked but with prominent ridges visible under the skin below eye and on preoperculum and mandible. Snout not strongly projecting. Mouth oblique and jaws equal. Teeth small and pointed, arranged in a single row along both jaws, extending along the free lower edge of the maxilla throughout its length. A group of similar teeth on each side of vomer, and single rows along palatines, pterygoid and tongue. Dorsal fin reduced to a vestige, preceded by a short free spine and apparently with its first ray produced into a short free filament which has been broken off. Dorsal fin inserted much nearer snout tip than base of the caudal fin. Anal fin inserted several scales behind the end of the dorsal fin base. Ventral fins very small, inserted much nearer origin of the anal fin than the pectoral base. Pectoral fin inserted low down on body, with a large axillary scale, and with its uppermost ray broad and paddle-like. Caudal fin deeply forked but without enlarged alar scales, its lower lobe close to but not united with the anal fin. Ventral scutes (5-6) + 0, well-developed only along isthmus anterior to pectoral base; no calcified scute-like structures can be detected under the scale sheath behind the level of the pectoral fin. Gill rakers 15+27. Predorsal scales 17-19. Body scales large and deciduous. Silvery with a dark brown stripe along

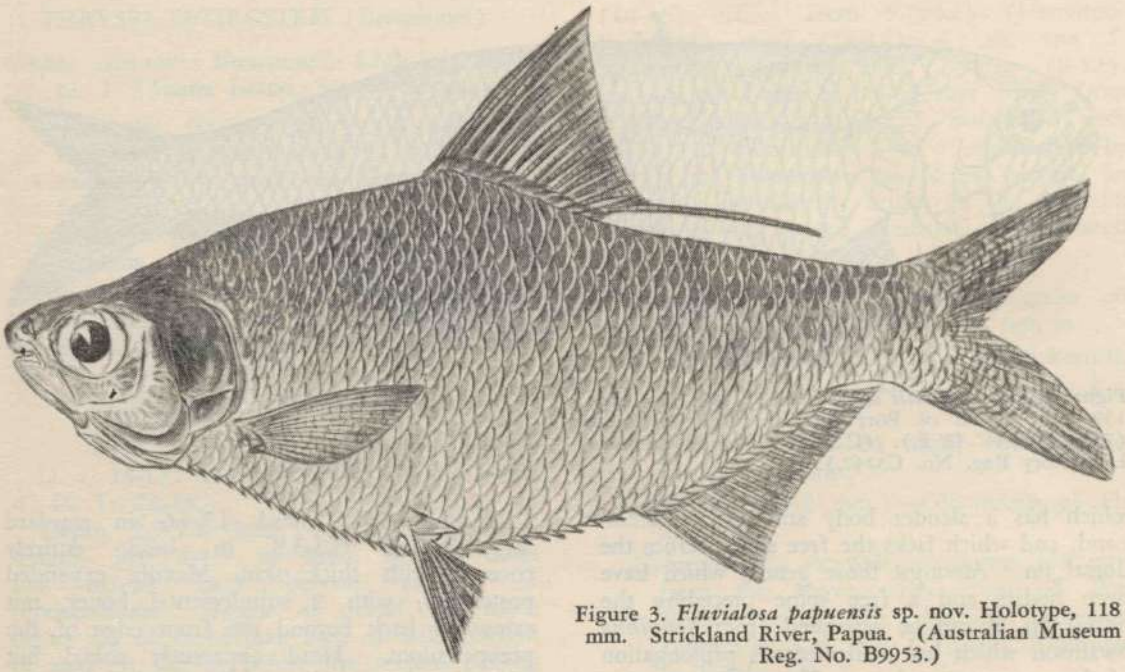

Figure 3. *Fluvialosa papuensis* sp. nov. Holotype, 118 mm. Strickland River, Papua. (Australian Museum Reg. No. B9953.)

dorsal mid-line between nape and upper part of caudal base. A dark mark at upper angle of operculum and indications of a lateral stripe from there to the caudal base.

7 examples (118-139 mm.)—Off Port Romilly (Lat. 7° 55' S. Long 114° 48' E.), 7 fathoms.

Holotype—An example measuring 139 mm. from the above series (C.S.I.R.O. Marine Biological Laboratory Reg. No. C 3247), illustrated in Figure 2.

Type Locality—Off Port Romilly (Lat. 7° 55' S. Long. 114° 48' E.), Gulf of Papua.

Family DOROSOMATIDAE.

FLUVIALOSA PAPUENSIS sp. nov.

(Figure 3)

Chatoessus nasus Ramsay and Ogilby (non *Clupea nasus* Bloch, 1795), Proc. Linn. Soc. N.S.W., (2), i (1), 1886, p. 8. (Strickland River.)

Clupanodon thrissa Fowler (non *Clupea thrissa* Linnaeus 1758), Mem. Bishop Mus., xi (6), 1934, p. 387 (same material).

D. iv, 12-13. A. ii, 21-22. P. 14. V. 8. Sc. 44-46. Tr. 20.

Body oval and compressed. Depth 2.5-2.7, head 3.5-3.9 in standard length. Eye 3.1-3.2 in head, greater than the prominent snout. Origin of dorsal fin slightly nearer the snout tip than the base of the caudal fin. Last ray of dorsal fin produced into a long free filament which reaches to the vertical through the end of the base of the anal fin. Anterior rays of anal fin forming a lobe. Pectoral fin without an axillary scale Ventral fins inserted slightly ahead of the vertical through the origin of the dorsal fin. No lateral line. Predorsal scales 21-22. Abdominal scutes 18 + 11. Back brown without horizontal darker lines. Belly silvery. No dark humeral spot.

A member of the Australasian gizzard shad genus *Fluvialosa* Whitley 1943, which differs from the genus *Nematalosa* Regan 1917 in having reduction or complete absence of the pectoral axillary scale. There appear to be five or six species in this group on the Australian mainland and their distribution conforms

with the rocognized fluvifaunal provinces. All inhabit fresh water but some move into the brackish conditions of estuaries. It might be expected that the Papuan species from the Riechian Province would be most closely related to *F. paracome* Whitely 1948 from the Fitzroy River, W.A. (*F. bulleri* Whitley 1948 from the Ord River is probably based on a juvenile of *F. paracome*) (Leichhardtian Province). However it differs in having 21-22 instead of 13-17 predorsal scales, 44-46 instead of 35-39 scales in longitudinal series, 20 instead of 13-16 scales in transverse series, and 18+11 instead of (16-17) + (10-12) abdominal scutes. The number of scales in longitudinal series is nearer *F. vlaminghi* Munro 1956 with 43-47, *F. richardsoni* (Castelnau 1873) with 41-42, and *F. erebi* (Gunther) 1868 with 40-43. The only other species which may have as many as 20 transverse series of scales is *F. vlaminghi* which also agrees in having a high count of predorsal scales (19-22). However *F. vlaminghi* has a small scale in the pectoral axilla, a distinct black humeral spot and horizontal brown streaks along the upper parts of the sides. In *F. vlaminghi* the ventral fins are inserted behind the vertical through the dorsal fin origin instead of before this vertical. The anal fin in *F. vlaminghi* is not elevated anteriorly, and originates a distance equal to the postorbital part of the head behind the vertical through the dorsal fin base, whereas in *F. papuensis* this distance does not exceed the eye diameter.

2 examples (90-118 mm.)—Strickland River Papua, from fresh water (Australian Museum Reg. Nos. B 9953 and B 9954) (col.: Royal Geographical Society Expedition, 1886).

Holotype—The larger of the two examples quoted above and illustrated in Figure 3 (Australian Museum Reg. No. B 9953).

Type Locality — Strickland River, Papua.

Family TACHYSURIDAE

CINETODUS FROGGATTI

(Ramsay and Ogilby)

Arius froggatti Ramsay and Ogilby, Proc. Linn Soc. N.S.W., (2), i, 1886, p. 14. (Strickland River.)

Septobranchus johannae Hardenberg, Treubia, xviii (2), 1941, p. 223. (Merauke River.)

2 examples (211-226 mm.)—Near mouth of Panaroa River, 1½ fathoms.

These examples warrant mention because the species has been known hitherto only from the unique holotype. Hardenberg's description of an example measuring 300 mm. and which he named *Septobranchus johannae* agrees in all essentials with the characters of this species. It follows that the genus *Septobranchus* Hardenberg 1941 becomes a synonym of *Cinetodus* Ogilby 1898 of which *Arius froggatti* is the orthotype.

It would appear from the localities of collection of the present examples and of Hardenberg's example, that this species inhabits saline water of river estuaries as well as penetrating into fresh water.

NEMAPTERYX STIRLINGI (Ogilby)

Arius Stirlingi Ogilby, Proc. Linn. Soc. N.S.W. xxiii, 1898. p. 281. (Adelaide River, Northern Territory.)

4 examples (83-120 mm.)—Off Kerema Bay 5½ fathoms.

Previously recorded from the Lorentz and Digul Rivers (West New Guinea) but unknown from the Territory of Papua and New Guinea. A new record for Papua.

Family PLOTOSIDAE

PLOTOSUS CANIUS Hamilton-Buchanan

Plotosus canius Hamilton-Buchanan, Fishes Ganges, 1822, p. 142, pl. 26. (Southern Bengal.); Weber and De Beaufort, Fishes Indo-Aust. Archipel., ii, 1913, p. 228.

2 examples (174-184 mm.)—Off Kerema Bay, 5½ fathoms.

Previously unknown from any part of the New Guinea area. Weber and De Beaufort (1913, p. 228) list this species from British New Guinea but they do not indicate having examined a specimen from that locality, and

there is nothing in the literature to support this record. Presumably a new record for Papua.

EURISTHMUS NUDICEPS (Gunther)

Cnidoglanis nudiceps Gunther, Rept. Voy. Challenger, Zool., i(6), 1880, p. 49. (Arafura Sea.); Hardenberg, Treubia, xviii (2), 1941 p. 220.

Exilichthys nudiceps Whitley, Rec. Aust. Mus., xix (1), 1933, p. 65 ; Mem. Q'land Mus., xi (2), 1937, p. 118.

A comparatively rare species known only from the holotype and a few examples recorded by Whitley (1937, p. 119) from Queensland and Hardenberg (1941, p. 220) from West New Guinea. Present examples differ from those previously described mainly in body proportions.

D. 1, 5; ca. 100. A. ca. 90. C. 10. P. I, 11. V. 12-13.

Depth 12.6-14.5, head 8.1-8.5 in total length. Head 0.9-1.0 in the distance between it and the vent. Eye 6.3-7.5 in head, 2.5 in snout, and 3.5 in postorbital part of head. Both lips papillate, the upper one thicker and much more prominent. Anterior nostrils in border of upper lip and point forwards. Nasal barbels reach 0.6-0.7, maxillary barbels 0.8-0.9 of the distance to the upper angle of the gill opening. Two pairs of mental barbels, the outer ones longer and reach almost as far as the maxillary ones. First dorsal and pectoral fins each with a pungent spine which is armed in front and behind with barbs. Fins embedded in thick skin. Two subtriangular patches of conical teeth near the symphysis of the upper jaw. A broad chevron-shaped patch of molars in 2-3 rows on vomer. A broad band of about 4 rows of concial teeth in the lower jaw. Branchial membranes united below with the very broad isthmus. Pectoral fins with axillary pores. Minute papillae scattered over the head. Occiput bony but covered with thin skin. Lateral line very conspicuous. A postanal dendritic organ present. Body and fins mottled with brown patches. Tips of first dorsal and paired fins black. Caudo-dorsal and anal fins margined with black.

Whitley (1933, p. 65) proposed the genus *Exilichthys* for this species because the occipital region is only barely covered with skin (loose fold of skin in *E. lepturus*) ; but it appears to be very closely allied to *Cnidoglanis lepturus* Gunther 1864 which is orthotype of *Euristhmus* Ogilby 1899. *E. lepturus* differs from *E. nudiceps* in having the depth 8.5 instead of 10-13, and head 6.3 instead of 7.3-8 in length without tail. Also it has more than 2 rows of teeth in the vomer.

2 examples (195-260 mm.)—Off Jokea, 5-9 fathoms.

Previously recorded from Merauke (West New Guinea) but unknown from the Territory of Papua and New Guinea. A new record for Papua.

Family HARPODONTIDAE

HARPODON TRANSLUCENS Saville-Kent

Harpodon translucens Saville-Kent, Proc. Roy. Soc. Q'land, vi (5), 1889, pp. 222, 234. (Ord River, Cambridge Gulf.)

Harpodon novaeguinensis Sundara Raj, Proc. Ind. Acad. Sci., xl, 1954, p. 61. (*Nomen nudum.*)

1 example (175 mm.)—2½ miles off east head of Purari River. 4¾ fathoms.

1 example (260 mm.)—near mouth of Panaroa River. 1½-5 fathoms.

This species is almost certainly the one noticed by Dr. Hardenberg amongst a collection of estuarine fish received from southern West New Guinea just prior to World War II. His examples were lost and he did not publish his observations but a copy of his notes on this species was passed on to Dr. Sundara Raj. Dr. Sundara Raj included the name *novaeguinensis* in his text being unaware that it was only a provisional manuscript name. Dr. Hardenberg (*in litt.*) informs me that he had not compared his material with descriptions of the Australian form. Unfortunately his notes and the copy sent to Dr. Sundara Raj are in storage and thus unavailable for examination.

Previously unknown from the Territory of Papua and New Guinea. A new record for Papua.

Family PARALEPIDAE

LESTIDIUM NUDUM Gilbert

Lestidium nudum Gilbert, Bull. U.S. Fish. Comm., xxiii (2), 1903 (1905), p. 607, fig. 236. (Pailolo Channel, Hawaiian Islands.)

2 examples (87-107) mm.) — Mowe Harbour, ,New Britain (col.: M.V. *Fairwind* 2.i.49, at surface with submarine lamp) (C.S.I.R.O Marine Biological Laboratory Reg. Nos. A 2097, A 2098).

Previously recorded as *L. bellottii* Ege 1933 from off West New Guinea but unknown from the Territory of Papua and New Guinea. A new record for New Britain.

LESTIDIUM ATLANTICUM Borodin

Lestidium atlanticum Borodin, Bull. Vanderbildt Oceanogr. Mus., i. (1), 1928, p. 10, pl. i, fig. 2. (Jamaica).

3 examples (85-114 mm.)—Mowe Harbour, New Britain (col.: M.V. *Fairwind*, 2.i.49, at surace with submarine lamp) (C.S.I.R.O. Marine Biological Laboratory Reg. Nos. A 2099, A 2100, A 2100.)

Previously recorded from off West New Guinea but unknown from the Territory of Papua and New Guinea. A new record for New Britain.

Family PSETTODIDAE

PSETTODES ERUMEI (Bloch and Schneider)

Pleuronectes erumei Bloch and Schneider, Syst. Ichth., 1801, p. 150. (Tranquebar.)

1 example (130 mm.) — Off Gamadodo, Milne Bay, 6-8 fathoms.

Previously unknown from any part of the New Guinea area. A new record for Papua.

Family BOTHIDAE

BOTHUS OVALIS (Regan)

Platophrys ovalis Regan, Trans. Linn. Soc. London, xii, 1908, p. 232, pl. xxvii, fig. 6. (Seychelles Group.)

5 examples (Postlarvals 39-50mm., female 76 mm., male 80 mm.)—Off north of Yule Island, 6-9½ fathoms.

Previously unknown from any part of the New Guinea area. A new record for Papua.

Family PLEURONECTIDAE

BRACHYPLEURA NOVAEZELANDIAE Gunther

Brachypleura novae-zelandiae Gunther, Cat. Fish. Brit. Mus., iv, 1862, p. 419. (New Zealand.)

1 example (male 115 mm.)—Head of Milne Bay.

Previously recorded from off West New Guinea and the Arafura Sea, but unknown from the Territory of Papua and New Guinea. A new record for Papua.

Family SOLEIDAE

DEXILLICHTHYS MUELLERI (Steindachner)

Synaptura muelleri Steindachner, Denschr. Akad Wiss. Wien, xli, 1879, p. 4. (Townsville, Queensland.)

1 example (92 mm.)—Caution Bay, 7-9 fathoms.

Previously recorded from the Arafura Sea but unknown from the Territory of Papua and New Guinea. A new record for Papua.

BRACHIRUS ORIENTALIS (Bloch and Schneider)

Pleuronectes orientalis Bloch and Schneider, Syst. Ichth., 1801, p. 157. (Tranquebar.)

1 example (130 mm.)—Off Kerema Bay, 5½ fathoms.

Previously unknown from any part of the New Guinea area. A new record for Papua.

Family CYNOGLOSSIDAE

CYNOGLOSSUS PUNCTICEPS
(Richardson)

Plagusia puncticeps Richardson, Rept. Brit. Assoc. Adv. Sci., 15th Meet., 1846, p. 280. (Chinese Seas.)

1 example (108 mm.) — Off Red Scar Bay, 6-8 fathoms.
1 example (100 mm.) — Near mouth of Panaroa River, 1½-5 fathoms.
1 example (110 mm.) — Caution Bay, 7-9 fathoms.

Previously recorded from Guadalcanal Island (British Solomons) but unknown from the Territory of Papua and New Guinea. A new record for Papua.

Family POLYNEMIDAE

ELEUTHERONEMA TETRADACTYLUM
(Shaw)

Polynemus tetradactylus Shaw, General Zoology, v, 1804, p. 155. (India.)

1 example (120 mm.) — Near mouth of Panaroa River, 1½-5 fathoms.

1 example (133 mm.) — Off east head of Purari River, 4¾ fathoms.

Previously recorded from Merauke (West New Guinea) but unknown from the Territory of Papua and New Guinea. A new record for Papua.

POLYNEMUS INTERMEDIUS Nichols

(?) *Polynemus evrekeri* Saville-Kent, Proc. Roy. Soc. Q'land, vi (5), 1889, pp. 222, 234, pl. xiii, fig. 1. (Ord River, Cambridge Gulf.)

Polynemus intermedius Nichols, Amer. Mus. Novitates, 1680, 1954, p. 3, fig. 2. (Meranbe River.)

4 examples (77-102 mm.) — Off mouth of Fly River.

Previously recorded from "Meranbe River" (=? Merauke River, West New Guinea) but unknown from the Territory of Papua and New Guinea. A new record for Papua.

Colours have faded from the present examples and those described by Nichols, but it is very likely that the species is a synonym of *P. verekeri* Saville-Kent which is described as having yellow fins, orange tail and vermilion pectoral filaments.

POLYDACTYLUS NIGRIPINNIS sp. nov.

(Figure 4)

D. VIII; I, 14. A. III, 13. P. (17-18 + 6 free filaments. L. lat. 47-49. Tr. 5 + (10-12).

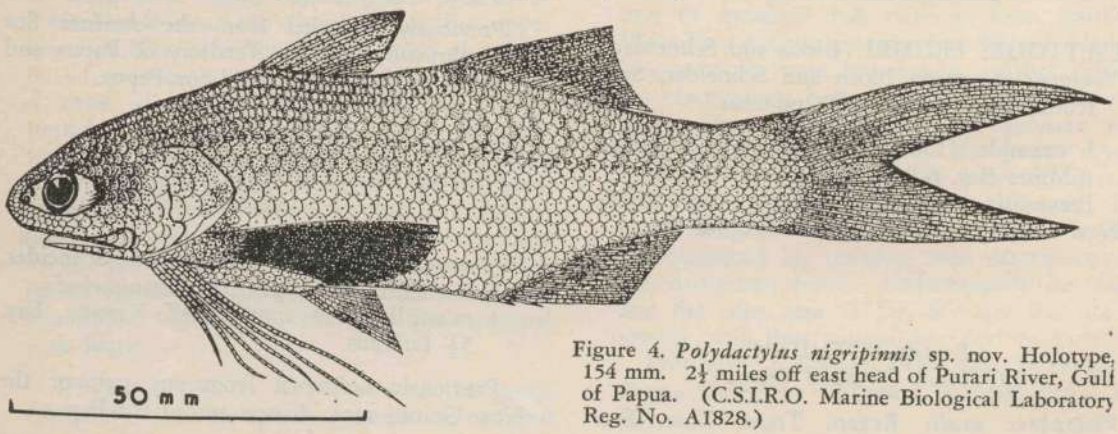

Figure 4. *Polydactylus nigripinnis* sp. nov. Holotype, 154 mm. 2½ miles off east head of Purari River, Gulf of Papua. (C.S.I.R.O. Marine Biological Laboratory Reg. No. A1828.)

Depth 3-3.2, head 3.2-3.3 in standard length. Eye 5.1-5.4 in head, 1.25 in interorbital. Snout 1-1.2 in eye. Snout strongly projecting above large mouth. Upper lip absent. Lower lip well-developed except at symphysis. Both jaws with narrow bands of fine teeth that do not extend outside the mouth. Similar teeth on palatines but none on vomer. Hind border of operculum coarsely serrated. Operculum bluntly angular. Origin of first dorsal fin slightly in advance of the vertical through the insertion of the ventral fins. Origin of anal fin slightly behind vertical through origin of the soft dorsal fin. Distance between insertion of ventral fins and origin of anal fin about equal to postorbital part of the head. All rays of pectoral fin simple. Pectoral fin slightly longer than head without snout. The free filaments of the pectoral fin extend to the vent but fail to reach the origin of the anal fin. Gill rakers 12 + (13-15). Lateral line nearly straight. Generally golden but head, back, and unpaired fins powdered with black speckles. Pectorals except the uppermost ray and the free filaments are intensely black.

Of the Indo-Pacific members of the genus *Polydactylus* Lacepede 1803 with six free pectoral filaments, this new species comes closest to *P. pfeifferi* (Bleeker 1853). Both offer from *P. sextarius* (Bloch and Schneider 1801) in having all pectoral rays simple instead of all but one divided, and also lack the oval black spot near the origin of the lateral line. Both differ also from *P. sexfilis* (Valenciennes 1831) in having 47-50 instead of 61-68 scales along the lateral line, in having the pectoral fin black instead of hyaline, and in lacking the intense black tip to the spinous dorsal fin. The new species is disinguished from *P. pfeifferi* by lacking teeth on the vomer, in having 17-18 instead of 12-14 rays in the pectoral fin, and in having the free pectoral rays scarcely reaching beyond the vent instead of well past the origin of the anal fin. The difference in size between my examples (146-158 mm) and *P. pfeifferi* (90 mm) might suggest that the last named might be a juvenile of the same species, but this possibility is ruled out by the difference in number of pectoral rays.

3 examples (150-158 mm.)—2½ miles off East head of Purari River, 4¾ fathoms.

1 example (146 mm.)—Off Kerema Bay, 5½ fathoms.

Holotype—An example measuring 154 mm. from the above series from off the Purari River (C.S.I.R.O. Marine Biological Laboratory Reg. No. A 1828), illustrated in figure 4.

Type Locality—2½ miles off east head of Purari River, Gulf of Papua.

Family MELANOTAENIIDAE

Gensus MELANOTAENIA Gill

(Figure 5 A, 5 D)

Melanotaenia Gill, Proc. Acad. Nat. Sci. Philad., 1862 (1863), p. 280. (Orthotype—*Atherina nigrans* Richardson 1843.)

Rhombosoma Regan, Trans. Zool. Soc. London, xx (6), 1914, pp. 278, 279, 283. (Logotype—*Nematocentris novae-guineae* Ramsay and Ogilby 1886.)

Rhombatractus Weber, Nova Guinea, v (2), 1908, p. 233; Weber and De Beaufort, Fishes Indo-Aust. Archipel., iv, 1922, p. 296. (*non* Gill 1879.)

Intermaxilla horizontal anteriorly but oblique laterally, the two parts marked by an abrupt bend. Lips thick. In upper jaw teeth unequal, arranged in numerous rows anteriorly and in two or more rows postero-laterally; some of these extend outside the mouth and cover the exterior of the lower half of the lip; outer postero-lateral ones flare outwards and backwards along the lower edge of the maxilla. Teeth in lower jaw subequal in size, the outer rows not separated from the principal band, but left and right-hand bands are separated at the symphysis by an edentulous suture. Scales large with hind margin entire or very slightly crenulated. Scales arranged in regular rows, there being 32-40 in longitudinal series, 9-14 in transverse series, and 13-19 predorsally. D. I, 3-6; I, 9-21. A. I, 17-26. Body with a broad horizontal black band from eye to base of caudal fin.

Type species: *M. nigrans* (Richardson 1843)

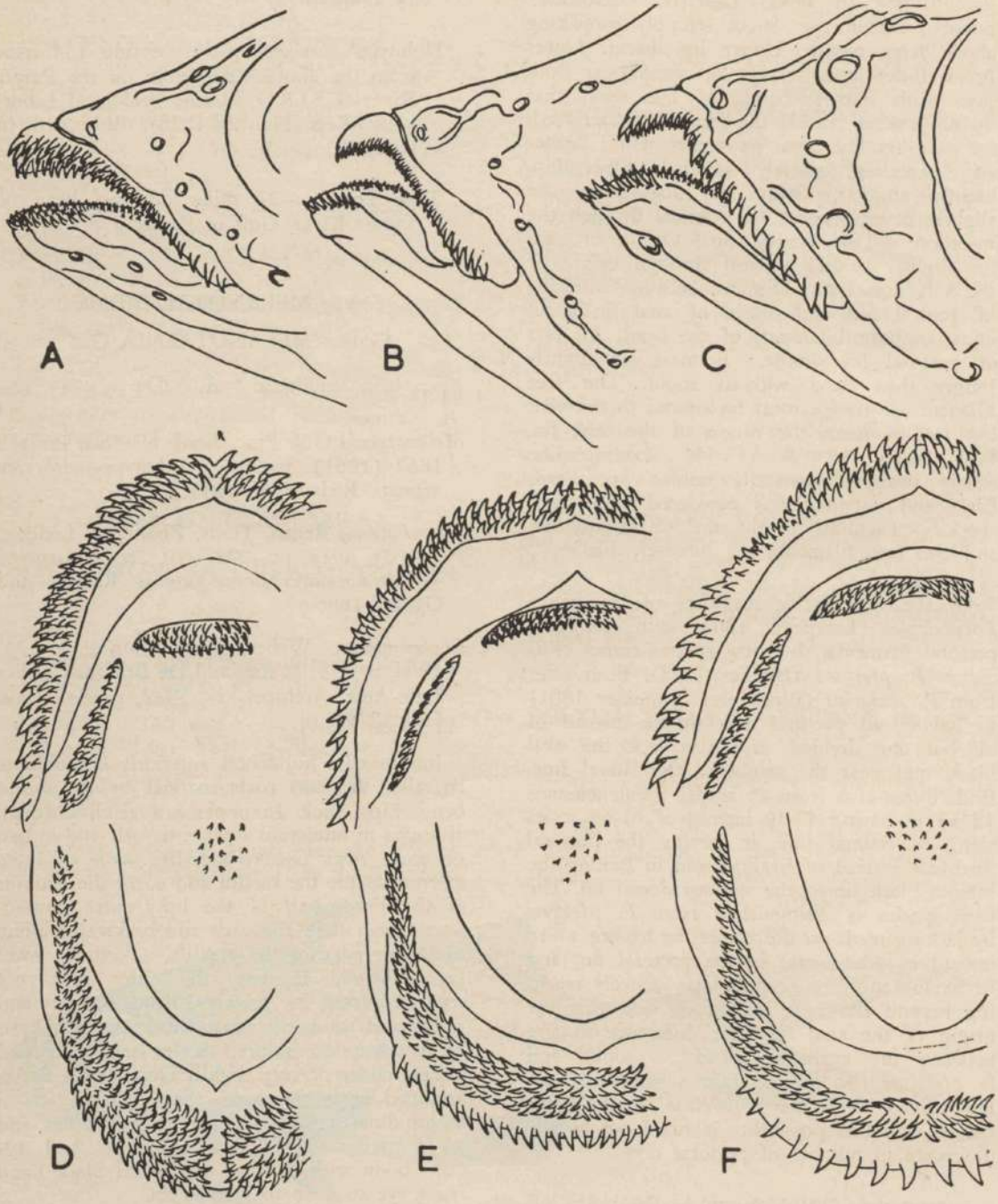
A
B
C
D
E
F

Figure 5. Dentition of the gevera *Melanotaenia* Gill and *Nematocentris* Peters.

A. Mouth profile of *Melanotaenia affinis* (Weber) based on an example 98 mm. from Bonanga Creek, Jimmi River, New Guinea.

B. Mouth profile of *Nematocentris rubrostriatus* (Ramsay and Ogilby) based on an example 142 mm. from Fly River, Papua. (Australian Museum Reg. No. IA7231.)

C. Mouth profile of *Nematocentris maculata* (Weber) based on an example 96 mm. from Gilbert River, Queensland. (C.S.I.R.O. Marine Biological Laboratory Reg. No. A1951.)

D. Plan of dentition in upper and lower jaws of *Melanotaenia affinis* (Weber).

E. Plan of dentition in upper and lower jaws of *Nematocentris rubrostriatus* (Ramsay and Ogilby).

F. Plan of dentition in upper and lower jaws of *Nematocentris maculata* (Weber).

(syn.: *Rhombosoma trifasciata* Rendahl 1922, *Rhombatractus archboldi* Nichols and Raven 1934).

Other species: *M. goldiei* (Macleay 1883) (syn.: *Nematocentris novae-guineae* Ramsay and Ogilby 1886, *Rhombatractus kochii* Weber 1908, *R. weberi* Regan 1908, *R. senckenbergianus* Weber 1911); *M. affinis* (Weber 1908) (syn.: *Rhombosoma sepikensis* Herre 1935); *M. catherinae* (De Beaufort 1910); *M. vanheurni* (Weber and De Beaufort 1922); *M. lacustris* sp. nov.

Revised diagnoses of several genera of the Family Melanotaeniidae are presented to clear up several peculiar misinterpretations of nomenclature that have been perpetuated through the literature. Weber (1908, p. 233) used *Rhombatractus* Gill for a group of species which conform with the diagnosis given above, that is species which have teeth extending outside the mouth on to the lips (see figs. 5A, 5D). Regan (1914, p. 283) substituted *Rhombosoma* for the same group. Both authors used *Melanotaenia* Gill for another group of species which have no teeth externally on the lips (see figs. 5B, 5C, 5E, 5F).

The misuse stems from confusion over the identity of *Atherina nigrans* Richardson, the orthotype of *Melanotaenia* Gill. Ichthyologists and aquarists have for many years identified a common species occurring in the Darling River system and the coastal rivers of southern Queensland and northern New South Wales with *M. nigrans*. This species is actually *Nematocentris fluviatilis* (Castelnau 1878). It has not got the well-defined broad lateral band characteristic of *M. nigrans* and its distribution does not extend into the Leichhardtian fluvifaunal area which includes Port Essington, type locality of *M. nigrans*. A few years ago some live specimens of a Melanotaeniid with a prominent broad black lateral band and teeth externally on the lips were obtained from Prince of Wales Island, Torres Strait and from a stream near Darwin. At the time it was thought that these could be conspecific with true *M. nigrans*, and a request was made to Dr. Ethelwyn Trewavas to re-examine Richardson's type specimen in the British Museum. She kindly forwarded a photograph of the dried skin and a sketch of the dentition. This evidence confirmed that my specimens were really conspecific with *M. nigrans* Richardson, and that this species belonged to the genus *Rhombosoma* Regan. It follows that Regan's genus becomes a synonym of *Melanotaenia* Gill 1863. Also another name must be found for the group of species without external teeth on the lips and that have been regarded hitherto as belonging to *Melanotaenia*.

Weber and De Beaufort (1922, p. 297) discuss reasons for adoption of *Rhombatractus* Gill 1879 (emend. Weber 1908) for this genus. Quite independent of what characters were given as diagnosis by Gill, the important fact is that Gill (1879, p. 709) introduced *Rhombatractus* as a substitute for *Aristeus* Castelnau 1878 which is preoccupied by *Aristeus* Duvernoy 1840, a genus of crustacea. The haplotype of *Aristeus* Castelnau is *A. fitzroyonsis* Castelnau 1878, a synonym of N. *splendida* Peters 1867, and this is one of the group of species lacking external teeth on the lips. *Rhombatractus* rightly belongs in the synonymy of *Nematocentris* Peters 1867, the type of which is *N. splendida* Peters.

MELANOTAENIA LACUSTRIS sp. nov.
(Figure 6)

D. I, 3-4; I, 11-13. A. I, 18-19. Sc. 35-36. Tr. 11-12.

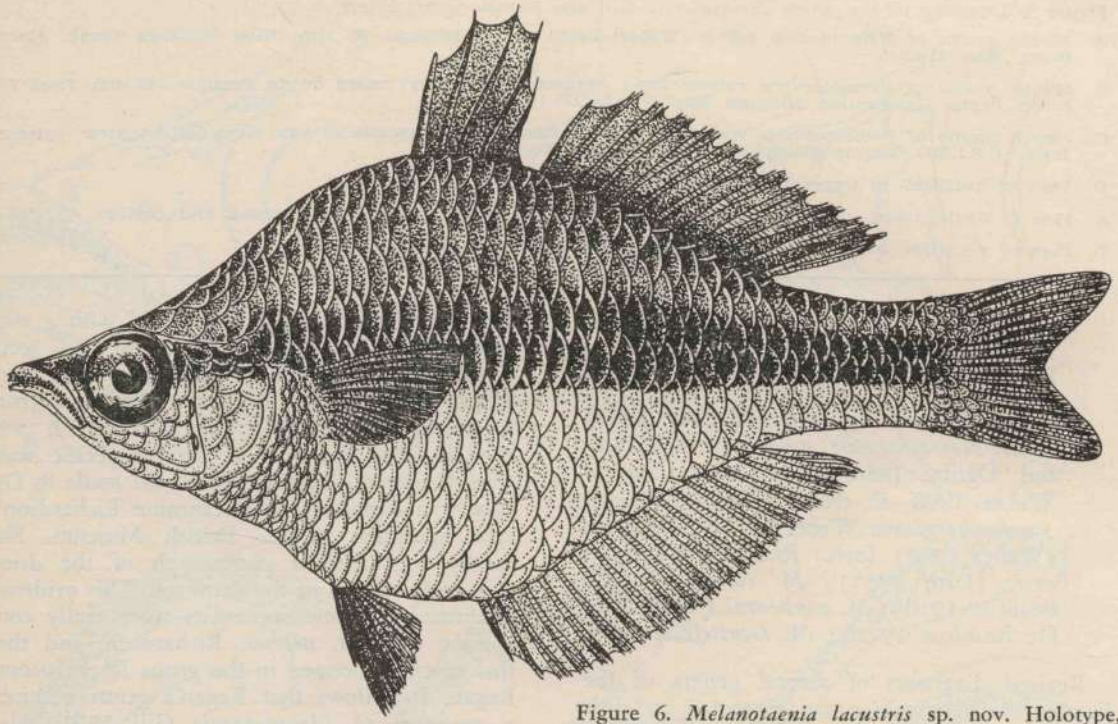

Figure 6. *Melanotaenia lacustris* sp. nov. Holotype, 92 mm. Lake Kutubu. (C.S.I.R.O. Marine Biological Laboratory Reg. No. A2132.)

Strongly compressed and elevated oval, rather rhomboidal in outline. With age the convexity of the dorsal and ventral profiles increase and deep concavities develop anterior to the nape and breast. Depth 2.1-2.6, head 3.6-3.7 in standard length. Eye 2.6-2.8 in head, slightly greater than snout. Jaws equal or lower protrudes. Maxilla reaches front border of eye. Intermaxilla horizontal anteriorly and oblique posteriorly, the parts marked by an abrupt bend. Teeth conical. In the upper jaw the rows of teeth are more numerous anteriorly but reduced to 2 or 3 series postero-laterally where they are enlarged and flare outwards and backwards ; some rows extend outside the mouth and cover the external surface of the lower half of the thick upper lip. In the lower jaw the teeth are subequal in size and the outer rows are not distinguishable from the principal band but broadly cover the external surface of the thick lower lip. The left and right-hand bands are separated at the symphysis by an endentulous suture. Origin of the first dorsal fin is noticeably in advance of the vertical through the origin of the anal fin. No lateral line. 14-15 predorsal scales. Gill rakers 2 + 14. Body black above and brilliant silvery below. There is a black mid-lateral horizontal band as wide as two scale rows from the eye to the base of the tail. Fins are plain blackish.

Indigenous name : Tatobu (Lake Kutubu).

This new species is similar to *M. vanheurni* (Weber and De Beaufort 1922) in having the origin of the first dorsal fin noticably in advance of the vertical through the origin of the anal fin. In all other species the dorsal fin origin is either on, slightly in advance of, or somewhat behind the vertical through the origin of the anal fin. It differs from *M. vanheurni* in having 11-13 instead of 18-21 branched

rays in the second dorsal fin, 18-19 instead of 23-26 branched rays in the anal fin, and 35-36 instead of 38-40 scales in longitudinal series. Body depth is 2.1-2.6 instead of 2.7-3.5 in standard length. Also the species differs from all others in the genus by its plain black and silver coloration, and in this respect resembles *Glossolepis incisus* Weber 1908 from Sentani Lake, West New Guinea.

3 examples (88-93 mm.)—Lake Kutubu (col. : March 1955 by Patrol Officer C. E. T. Terrell). (C.S.I.R.O. Marine Biological Laboratory Reg. Nos. A 2131, A 2132, A 2133.)

Holotype: An example measuring 92 mm. from the above series (C.S.I.R.O. Marine Biological Laboratory Reg. No. A. 2132), illustrated in Figure 6.

Type Locality : Lake Kutubu.

Genus NEMATOCENTRIS Peters

(Figures 5B, 5C, 5E, 5F)

Nematocentris Peters, Monatsb. Akad. Wiss. Berlin, 1866 (1867), p. 516. (Haplotype—*N. splendida* Peters 1867).

(?) *Strabo* Kner and Steindachner, Sitzb. Akad. Wiss. Wien, liv, 1866 (1867), p. 372. (Haplotype—*S. nigrofasciatus* Kner and Steindachner 1867.)

(?) *Zantecla* Castelnau, Proc. Zool. Acclim. Soc. Vict., ii, 1873, p. 88. (Haplotype— Z. *pusilla* Castelnau 1873.)

(?) *Aida* Castelnau, Res. Fish. Austr. (Vict. Offic. Rec. Philad. Exhib.), 1875, p. 10. (Haplotype—*A. inornata* Castelnau 1875.)

Neoatherina Castelnau, Res. Fish. Austr. (Vict. Offic. Rec. Philad. Exhib.), 1875, p. 31. (Haplotype—*N. australis* Castelnau 1875.)

Aristeus Castelnau, Proc. Linn. Soc. N.S.W., iii, 1878, p. 141. (Haplotype—*A. fiztroyensis* Castelnau 1878). (Preocc. by *Aristeus* Duvernoy 1840 in Crustacea.)

Rhombatractus Gill, Amer. Nat., xxviii, 1879, p. 709. (Nom. nov. pro *Aristeus* Castelnau 1878.)

Anisocentrus Regan, Trans. Zool. Soc. London, xx (6), 1914, pp. 278, 279, 281. (Haplotype—*Nematocentris rubrostriatus* Ramsay and Ogilby 1886.)

Amneris Whitley, Austr. Aquatic Life, i (1), 1935, p. 37 ; Rec. Aust. Mus., xix (4), 1935, p. 225. (Orthotype—*Nematocentris rubrostriatus* Ramsay and Ogilby 1886.)

Aidaprora Whitley, Rec. Aust. Mus., xix (4), 1935, p. 224. (Orthotype—*A. carteri* Whitley 1935.)

Lomanetia Whitley, Mem. Q'land. Mus., xi (1), 1936, p. 25. (Orthotype—*Melanotaenia multisquamata* Weber and De Beaufort 1922.)

Melanotaenia Weber, Nova Guinea, v (2), 1908, p. 238; Regan, Trans. Zool. Soc. London, xx (6), 1914, pp. 278, 279 ; Weber and De Beaufort, Fish. Indo-Aust. Archipel., iv, 1922, p. 287. (*non* Gill 1863.)

Intermaxilla horizontal anteriorly but oblique laterally, the two parts marked by an abrupt bend. Lips not thickened. In upper jaw teeth unequal, arranged in 2 to 4 rows anteriorly and in a single row postero-laterally, and only the postero-lateral ones which are enla ged and flare outwards and backwards are external to the mouth. Teeth in the outer one or two rows in the lower jaw are implanted horizontally and are larger than those in the inner band from which they are separated usually by a distinct edentulous interspace ; left and right-hand bands are continuous across the symphysis. Scales large with hind margin entire or very slightly crenulated. Scales arranged in regular rows, there being 28-40 in longitudinal series, 9-15 in transve se series, and 14-31 predorsally. D. I, 3-6; I, 8-14. A. I, 14-22. Body with narrow longitudinal orange, red or black streaks at junctions of horizontal scale rows.

Type species: *N. splendida* Peters 1876 (syn.: (?) *Strabo nigrofasciatus* Kner and Steindachner 1867, (?) *Nematocentris nigricans* Steindachner 1876, *Aristeus fitzroyensis* Castelnau 1878, *A. rufescens* Macleay 1881).

Other species : *N. australis* (Castelnau 1875); *N. fluviatilis* (Castelnau 1878) (syn. : (?) *Atherinichthys duboulayi* Castelnau 1878, *Aristeus lineatus* Macleay 1881, *A. perporosus* DeVis 1884, (?) *N. tatei* Zeitz 1896, (?) *N. winneckii* Zeitz 1896,

Melanotaenia neglecta Rendahl 1922); *N. rubrostriatus* Ramsay and Ogilby 1886 (syn.: *Aristeus loriae* Perugia 1894, *Rhombatractus patoti* Weber 1907, *Melanotaenia dumasi* Weber 1908); *N. maculata* (Weber 1908) (syn.: (?) *Zantecla pusilla* Castlenau 1873, (?) *Aida inornata* Castelnau 1875, *Aristeus cavifrons* Macleay 1882, *Aidaprora carteri* Whitley 1935); *N. ogilbyi* (Weber 1911); *N. maccullochi* (Ogilby 1915); *N. praecox* (Weber and De Beaufort 1922); *N. multisquamata* (Weber and De Beaufort 1922) syn.: *Melanotaenia rosacea* Herre 1935, *M. kabia* Herre 1935); *N. sexlineatus* sp. nov.

This group of Melanotaeniids which have no teeth extending outside the mouth on to the lips has hitherto been identified with the genus *Melanotaenia* Gill 1863. However, it is shown on p. 159 that, because of the characters of *Atherina nigrans* Richardson which is orthotype of *Melanotaenia,* this name must be transferred to that group of species which have teeth externally on the lips. Another name is required for the genus now under discussion and the earliest associated with a species in this group is *Nematocentris* Peters 1867. Its haplotype *N. splendida* Peters 1867 was based on examples from the Fitzroy River, Queensland, and is a species occurring in coastal rivers between the Fitzroy watershed and Cape York. It is closely allied to *N. rubrostriatus* (Ramsay and Ogilby) from the southern slopes of New Guinea and Torres Strait Islands, and to *N. maculata* (Weber) from the rivers draining into the Gulf of Carpentaria, the coastal streams of Northern Territory and the Merauke River, West New Guinea. The three species can be identified with certainty only from their colours during life.

The incorrect usage of the generic name *Rhombatractus* Gill has been discussed under the genus *Melanotaenia* on p. 159. Also under status of *Anisocentrus* Regan, admitted here as a synonym of *Nematocentris,* is discussed under *Chilatherina* on p. 165.

NEMATOCENTRIS SEXLINEATUS sp. nov.

(Figure 7)

Melanotaenia nigrans Whitley *(non* Richardson 1843), Rec. Aust. Mus., xx (3), 1938,

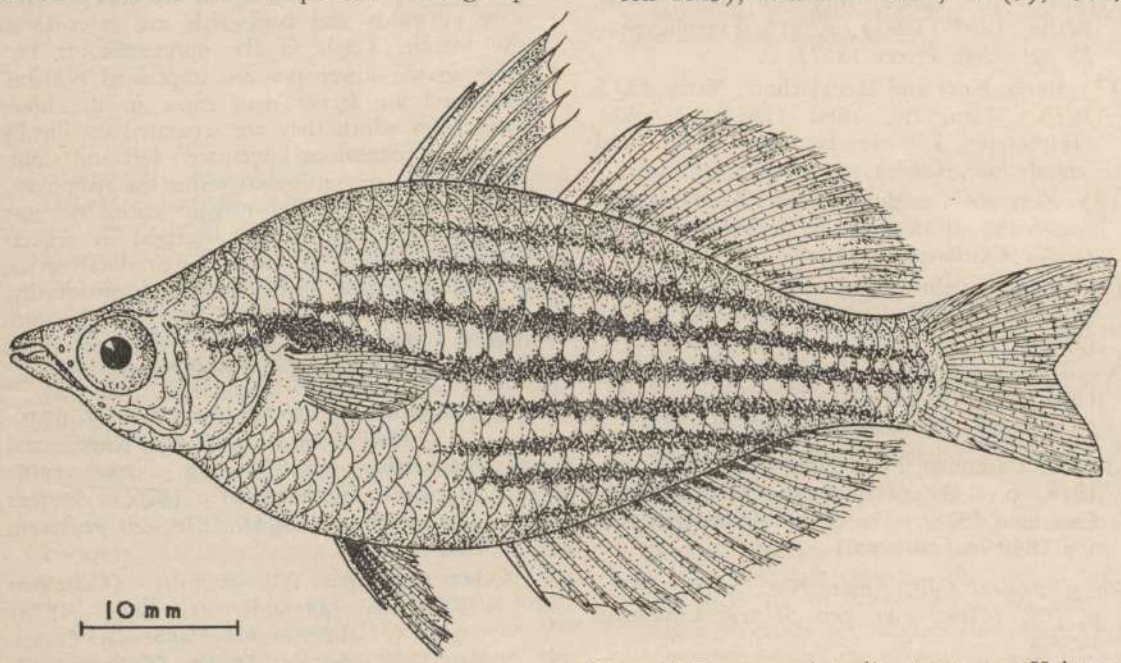

Figure 7. *Nematocentris sexlineatus* sp. nov. Holotype, 71 mm. Upper Fly River, Papua. (Australian Museum Reg. No. IA7248.)

p. 226. (upper Fly River.)

Melanotaenia maccullochi Munro (*non* Ogilby 1915), Papua and New Guinea Agric. J., x (4), 1956 (1958), p. 153. (Laloki River.)

D. I, 4-6; I, 9-12. A. I, 16-17. Sc. 31-33. Tr. 9-12.

Moderately compressed, elongate-oval but becoming more elevated with age, more convex below than above, and with deep concavities in profile anterior to nape and breast. Depth 2.6-3, head 3.5-3.8 in standard length. Eye 2.8-3.2 in head, greater than snout. Jaws equal. Maxilla reaches to or nearly to front of eye. Intermaxilla horizontal anteriorly and oblique posteriorly, the parts marked by an abrupt bend. Lips not thick. Teeth conical. In upper jaw teeth are arranged in 2-3 rows anteriorly and in one row postero-laterally; those in outer row enlarged, and postero-laterally they flare outwards and backwards externally along the maxilla. Lower jaw with teeth in outer one or two rows enlarged, implanted horizontally, and separated from the inner band by a narrow edentulous groove. First dorsal fin originates in advance of the vertical through the origin of the anal fin. Posterior rays of soft dorsal and anal fins elongated and reaching caudal base in males, but forming rounded lobes in females. Scale margins almost entire. No lateral ine. 14-16 predorsal scales. Gill rakers 2+12. Body with six well-defined longitudinal black stripes overlaying the junctions of the horizontal scale rows. These persist on preservation. The one along the junction of the 4th and 5th scale rows although terminating mid-laterally on the caudal base, does not continue forward to the upper corner of the operculum. The black stripe below it along the junction of the 5th and 6th scale rows is thickened anteriorly and deflected upwards to its origin at the upper corner of the operculum; during life it is bright vermilion posteriorly. The junctions of the scale rows above and below the mid-lateral pair of stripes are also marked by well defined black stripes, the uppermost ones often dusky orange during life. Ground colour is mauve, and there is a vermilion spot on the operculum. Fins are plain yellowish.

This species is apparently allied to *N. australis* (Castelnau) from north-west Western Australia, *N. ogilbyi* (Weber) from the Merauke River and King Edward River, north-west Western Australia, and *N. maccullochi* (Ogilby) from the coastal plain of Queensland north of Cairns. All have well-defined black stripes along the junctions of the horizontal scale rows and lack chequer-like markings on the unpaired fins. The first two species have no black lines above the mid-lateral pair, and the last named has less distinct blackish lines interspaced between the principal ones. In *N. ogilbyi* the mid-lateral pair of stripes fuse together around the margins of the scales of the 5th row forming a broad ho izontal blackish band broken only by pale scale centres, suggesting perhaps that *N. ogilbyi* is only a melanistic variety of *N. australis*. None of these three allied species possesses the vermilion posterior part of the lower of the mid-lateral pair of stripes.

1 example (41 mm.—Laloki River (col.: 31. v. 54, Dr. A. M. Rapson).

6 examples (33-57 mm.)—25 miles inland from Port Moresby (col.: Mr. W. Giblin, 1933) (Australian Museum Reg. No. IA 5876).

8 examples (55-73 mm.)—Upper Fly River, 30 miles above D'Albertis Junction (col.: Fl. Lt. Stuart Campbell, 1937). (Australian Museum Reg. Nos. IA 7246, IA 7247, IA 7248 (3), IA 7249 (3).)

Living material:—At the time of writing the author has about 30 live aquariam specimens, obtained from the Laloki River by Dr. A. M. Rapson, during April, 1961.

Holotype—Australian Museum Reg. No. IA 7248, largest of 3 specimens and illustrated in Figure 7.

Type Locality—Upper Fly River.

Genus CHILATHERINA Regan
(Figures 8 A-C, 8 E-G)

Chilatherina Regan, Trans. Zool. Soc. London, xx (6), 1914, pp. 278, 279, 282. (Logotype —*Rhombatractus fasciatus* Weber 1913.)

Intermaxilla oblique, gently arched or almost straight. Upper lip thickened. In upper jaw teeth rather large and subequal in size, the rows much more numerous anteriorly and antero-laterally and extend outside the mouth and broadly cover the exterior surface of the lip. Lower jaw with one or two rows of horizontally implanted teeth anteriorly; these may be subequal to or conspicuously larger than those in the principal band, and may be either indistinguishable from those of the inner

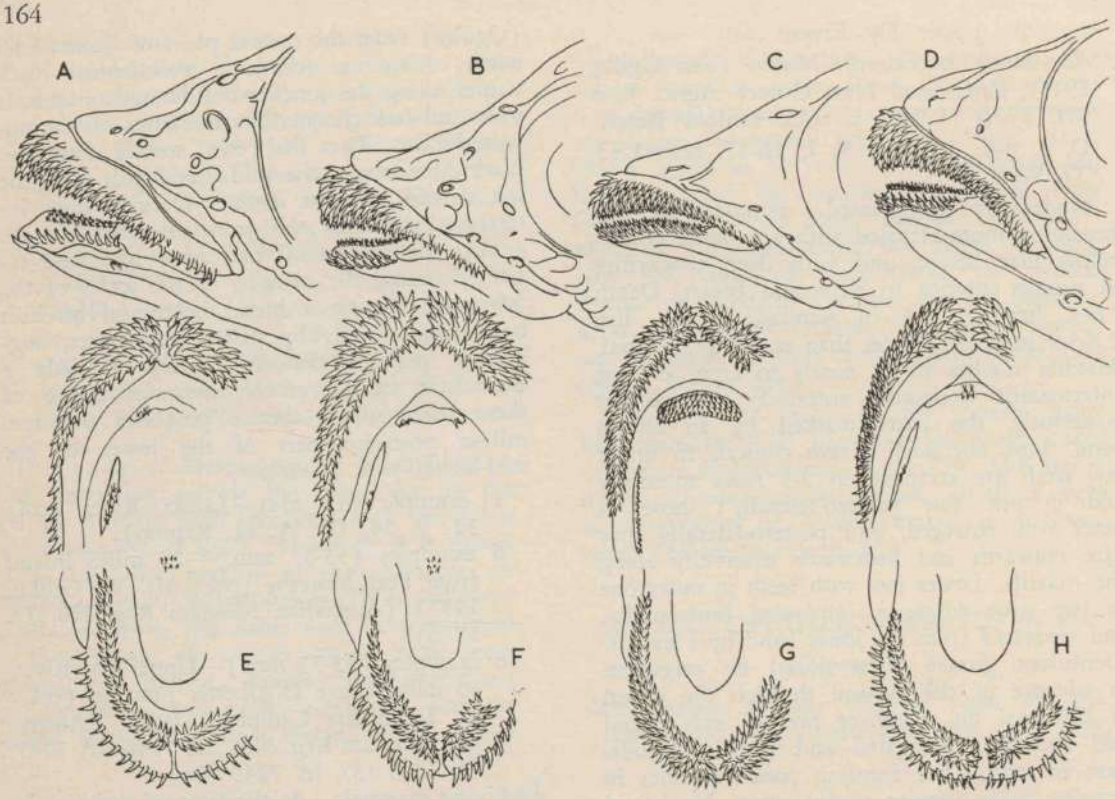

Figure 8. Dentition of the genera *Chilatherina* Regan and *Centratherina* Regan.
A. Mouth profile of *Chilatherina campsi* (Whitley) based on an example 88 mm. from Bonanga Creek, Jimmi River, New Guinea.
B. Mouth profile of *Chilatherina fasciata* (Weber) based on a co-type 135 mm. (ex Zoological Museum Amsterdam, Reg. No. 103097).
C. Mouth profile of *Chilatherina sentaniensis* (Weber) based on a co-type 95 mm. (ex-Zoological Museum Amsterdam, Reg. No. 103093).
D. Mouth profile of *Centratherina crassispinosa* (Weber) based on an example 100 mm. from Talo Creek, Jimmi River, New Guinea.
E. Plan of dentition in upper and lower jaws of *Chilatherina campsi* (Whitley).
F. Plan of dentition in upper and lower jaws of *Chilatherina fasciata* (Weber).
G. Plan of dentition in upper and lower jaws of *Chilatherina sentaniensis* (Weber).
H. Plan of dentition in upper and lower jaws of *Centratherina crassispinosa* (Weber).

band or separated from this band by a narrow or wide edentulous groove. Left and right-hand bands in both paws separated at the symphysis by an edentulous groove. Scales large, with hind margin entire or slightly crenulated. Scales arranged in regular rows, there being 35-42 in longitudinal series, 10-15 in transverse series, and 15-27 predorsally. D. I, 3-6; I, 9-17, A. I, 20-30. Body with a blackish mid-lateral band not more than 2 scales wide.

Type species: *C. lorentzi* (Weber 1908) (syn.: *Rhombatractus fasciata* Weber 1913).

Other species: *C. sentaniensis* (Weber 1908); *C. campsi* (Whitley 1956) (syn.: *Centratherina tenuis* Nichols 1956).

The short almost straight mouth and form of dentition is very similar to *Centratherina* Regan 1914 (see Figures 8D and 8H). Regan (1914, pp. 282, 283) separates *Centratherina* from *Chilatherina* mainly because the first named has all the rays in the first dorsal fin very stiff and pungent. A co-type of *Centratherina crassispinosa* (Weber 1913) from the British Museum has 4 pungent spines as figured by Regan (1914, pl. xxxi, fig. 2) but others received from the Amsterdam Zoological Museum and examples collected in the Parchee and Jimmi Rivers have 1-2 pungent spines and 3-4 slender stiff rays. Although most examples of *Chilatherina* have one pungent spine and 3-6

flexible rays some variations have been noted. A co-type of *Rhombatractus fasciatus* Weber from the British Museum has 2 pungent spines and 3 flexible rays, while co-types of *C. sentaniensis* (Weber) from the Amsterdam Zoological Museum have one pungent spine and 3-4 very stiff slender rays. Re-examination of the holotype of *Centratherina tenuis* Nichols from the American Museum of Natural History reveals one pungent spine and 3 stiff rays rather than 4 spines as described by the author. Possibly *Centratherina* cannot be retained as a separate genus.

The general pattern of dentition of *Chilatherina* approaches that of *Melanotaenia* Gill 1863 in that teeth extend externally on to the lips of the upper jaw; it approaches *Nematocentris* Peters 1867 in having rows of enlarged teeth horizontally implanted anteriorly in the lower jaw. The mouth lacks the abrupt bend characteristic of these genera. The left and right-hand bands of teeth in both jaws are separated by an endentulous symphysial suture as in *Centratherina* but this condition is found elsewhere only in the lower jaw of *Melanotaenia.* Prominent bands of teeth occur on the vomer and palatines in *Melanotaenia* and *Nematocentris* and this condition persists in *Chilatherina sentaniensis* and females of *C. lorentzi.* There is considerable reduction in the number of teeth on both bones in males of *C. lorentzi* and in *Centratherina crassispinosa.* In *Chilatherina campsi* there are few or no teeth on the vomer. In *C .campsi* there is a wide edentuous groove between the outer horizontally implanted teeth and the inner band in the lower jaw; this groove is narrower in *C. lorentzi* and completely absent in *C. sentaniensis.* In *C. campsi* the horizontal outer teeth are conspicuously larger than the others but in *C. sentaniensis* they are similar to the inner ones. These features are illustrated in Figures 5 and 8.

I have seen the example of *Anisocentrus rubrostriatus* illustrated by Regan (1914, pl. xxxi, fig. 3) and find that its mouth and dentition is that of the genus *Nematocentris* and have no doubt that the example is conspecific with *N. rubrostriatus* Ramsay and Ogilby 1886. Consequently *Anisocentrus* Regan 1914 is a synonym of *Nematocentris* Peters 1867. Whitley (1956, p. 27) considered that Regan's example was conspecific with *Melanotaenia dumasi* Weber 1908 and generically distinct from *N. rubrostriatus* Ramsay and Ogilby. Re-examination of the holotype of *N. rubrostriatus* in the Australian Museum and co-types of *N. dumasi* from the British Museum and Amsterdam Zoological Museum demonstrated that they were conspecific. *Anisocentrus campsi* Whitley 1956 falls within the genus *Chilatherina* as defined in the above diagnosis.

CHILATHERINA CAMPSI (Whitley)
(Figure 9)

Anisocentrus campsi Whitley Rec. Aust. Mus., xxiv (3), 1956, p. 26, fig. 1. (Jimmi River.)

Centratherina tenuis Nichols, Amer. Mus. Novitates, 1802, 1956, pp. 1-2, fig. 1. (Kondiu, Wahgi Valley.)

17 examples (33-115 mm.)—Jimmi River at Rink Bridge.

6 examples (35-54 mm.)—Yin River, a tributary of Jimmi River.

3 examples (101-114 mm.)—Talo Creek, a tributary of Jimmi River.

7 examples (50-87 mm.)—Runyip Village, Bonanga Creek, a tributary of Jimmi River.

2 examples (40-48 mm.)—Wahgi Valley at Korn Farm (col.: N. Blood, 28. ix. 55).

Besides demonstrating that *Anisocentrus campsi* is a species of *Chilatherina* (see discussion under that genus), it is mentioned here to confirm synonymy and draw attention to unusual distribution. A juvenile slightly smaller than the holotype of *Centratherina tenuis* is illustrated in Figure 9 to provide detail missing in Nichols' original sketch.

The holotype of *Centratherina tenuis* Nichols, kindly loaned by the American Museum of Natural History (Reg. No. A.M.N.H. 20211), was compared with two smaller topotypical examples from Korn Farm (largest illustrated in Figure 9) and with examples of equivalent size from the series collected in the Jimmi River basin. No difference could be detected, thus establishing that Whitley (1958, p. 33) was correct in considering *C. tenuis* to be a synonym of *Chilatherina campsi.*

The holotype and paratype of *C. campsi* was collected by the Australian Museum Expedition in July 1954 in a creek flowing into the Jimmi River. The 33 examples quoted above were collected in December 1955, from the Jimmi River and its tributaries. The Jimmi River has its source

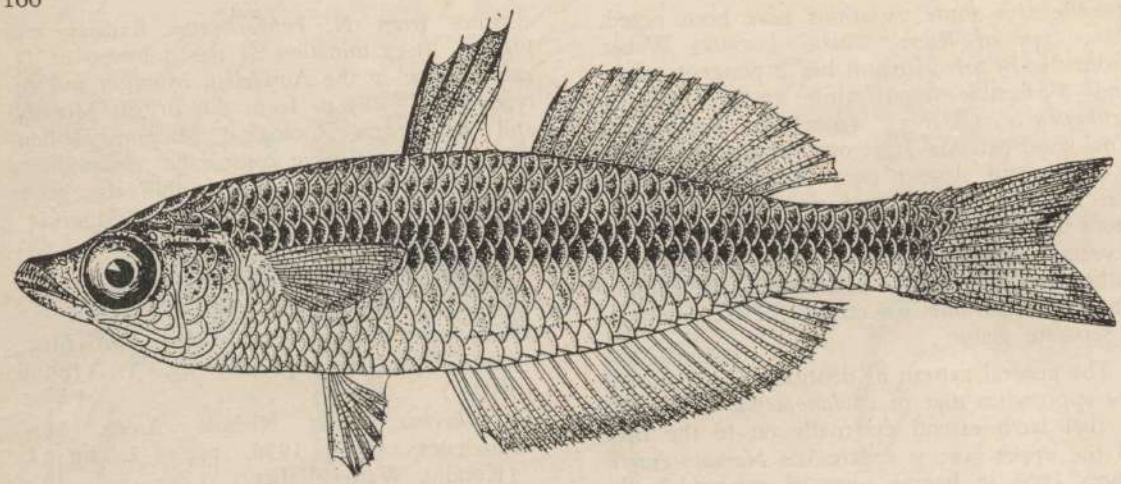

Figure 9. *Chilatherina campsi* (Whitley). Example 48 mm. from Korn Farm, Wahgi Valley.

on the northern slopes of the Sepik-Wahgi Divide and flows into the Sepik River. The remaining two examples are from Korn Farm on the Wahgi River. The holotype of *C. tenuis* came from Kondiu about 40 miles downstream from Korn Farm on the Wahgi River. The Wahgi River originates on the southern slopes of the Sepik-Wahgi Divide and eventually joins the Purari River. This appears to be the only known Melanotaeniid which occurs on both sides of the central dividing range. In the genera *Melanotaenia* and *Nematocentris* different species occur in the river basins of the northern and southern slopes, some of those of the southern rivers being identical with those of northern Australia. The specialized genera *Chilatherina, Centratherina* and *Glossolepis* are confined to the northern slopes. Although *C. campsi* has managed to cross the zoogeographical barrier of this central mountain ridge, it appears to be restricted to the head waters of the streams flowing through the valleys on either side of it.

Family ATHERINIDAE

CRATEROCEPHALUS LACUSTRIS Trewavas (Figure 10)

Craterocephalus lacustris Trewavas, Ann. Mag. Nat. Hist., (11), vi (33), 1940, p. 286. (Lake Kutubu).

D. VI-VIII, I,i, 6-8. A. I,i, 7-9. P. I,i, 15, Sc. 36-38. Tr. 7-8.

Body robust. Depth 4-4.5, head 3.5-3.7 in standard length. Eye 3.6-4.5, snout 3.5-4, interorbital 2.5 in head. Head flat above but becoming concave before the eyes with age. Mouth terminal in juveniles but lower lip may project considerably beyond upper lip causing mouth to be superior in old examples. Protractile maxilla with a long anterior median process about equal to eye diameter, and a low broad-based lateral process. Maxilla does not reach front border of eye. Mandible without an elevated process behind the toothed area. Both jaws with several rows of fine teeth. Vomer and palatines apparently edentulous. First dorsal fin originates midway between snout tip and tail base or slightly nearer the former in juveniles; also midway between hind border of the operculum and origin of second dorsal fin. Anal fin originates slightly in advance of the vertical through the origin of the second dorsal fin. Pectoral fin slightly longer than postorbital part of head. Ventral fins inserted nearer vertical through origin of first dorsal fin than hind border of operculum. Vent situated between or slightly behind the tips of the ventral rays. Predorsal scales 15-18. Interdorsal scales 7-8. Gill rakers 7 + 11, rakers short and tuberculate. Brownish above and yellowish-white below. Scales on back with

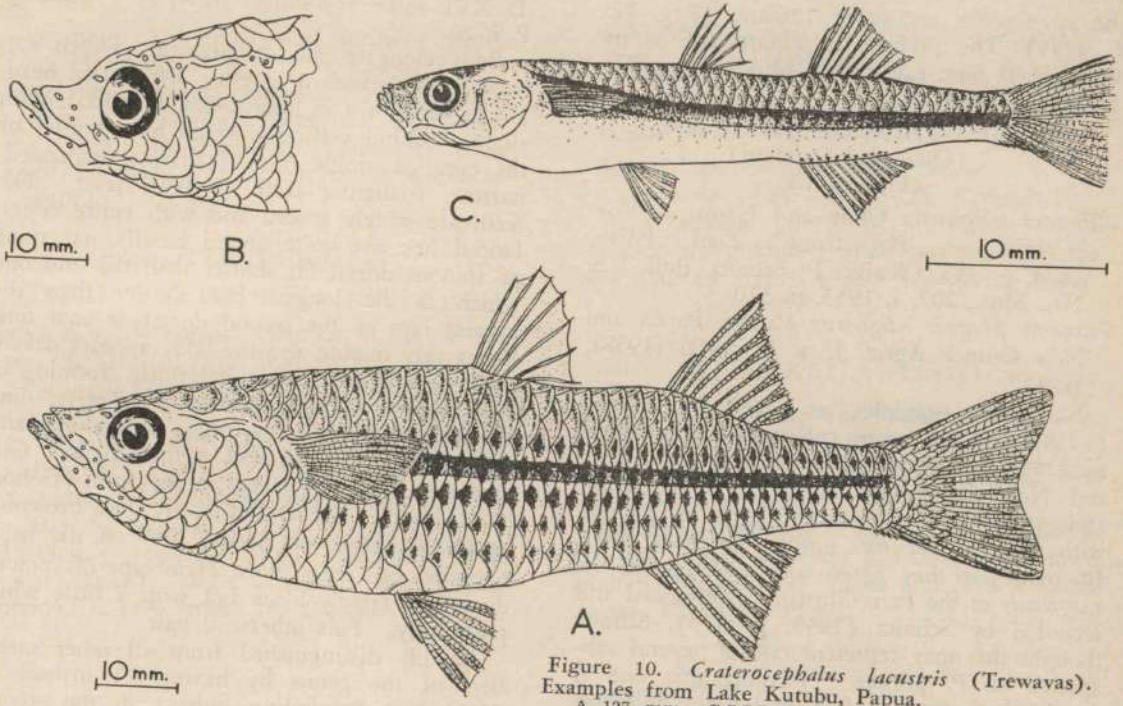

Figure 10. *Craterocephalus lacustris* (Trewavas). Examples from Lake Kutubu, Papua.
A. 127 mm., C.S.I.R.O. Marine Biological Laboratory Reg. No. C 2244.
B. 126 mm., C.S.I.R.O. Marine Biological Laboratory Reg. No. C 2245.
C. 41 mm., Australian Museum Reg. No. IA8087.

narrow dark margins. A narrow mid-lateral black band overlaid with silver, its width 5-6 in postorbital part of head. A blackish dot on each scale in one row above and 3 rows below the lateral band. Indigenous name: Borokau (Lake Kutubu).

4 examples (126-131 mm.)—Lake Kutubu (col.: March 1955 by Patrol Officer C. E. T. Terrell). (C.S.I.R.O. Marine Biological Laboratory Reg. Nos. C 2244, C2245, C 3173, C 3174.)

1 example (41 mm.)—Lake Kutubu. (Australian Museum Reg. No. IA 8087.)

The species is here redescribed from topotypical examples and is illustrated for the first time (Figure 10). The fish depicted in Figure 10A is an example 127 mm. (C.S.I.R.O. Marine Biological Laboratory Reg. No. C 2244) and the head shown in Figure 10B is from one in

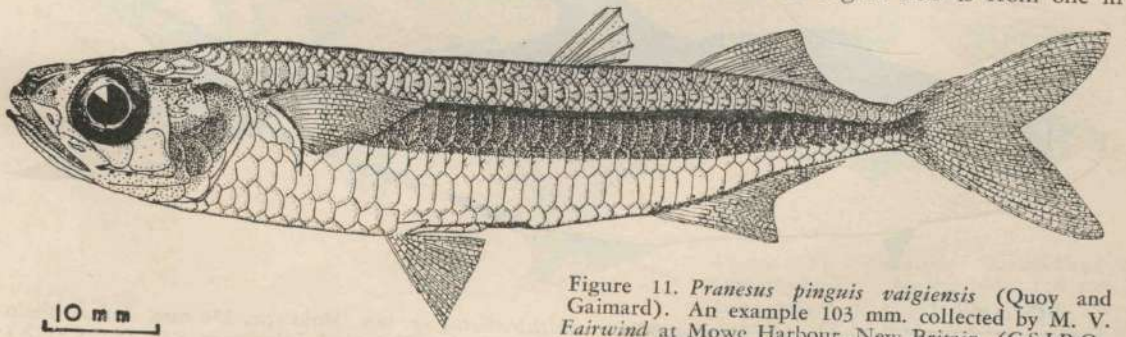

Figure 11. *Pranesus pinguis vaigiensis* (Quoy and Gaimard). An example 103 mm. collected by M. V. *Fairwind* at Mowe Harbour, New Britain. (C.S.I.R.O. Marine Biological Laboratory Reg. No. A2130.)

the same series measuring 126mm. (Reg. No. C 2245). The juvenile in Figure 10C is the example 41 mm. (Australian Museum Reg. No. IA 8087).

PRANESUS PINGUIS VAIGIENSIS
(Quoy and Gaimard).
(Figure 11)

Atherina vaigiensis Quoy and Gaimard, Voy. "Uranie" et "Physicienne", Zool., Poiss., 1824, p. 335. (Waigeu.) ; Schultz, Bull. U.S. Nat. Mus., 202, i, 1953, p. 310.

Pranesus pinguis vaigiensis Munro, Papua and New Guinea Agric. J., x (4, 1956 (1958), p. 157.

Numerous examples as listed by Munro (1958, p. 157) were collected from various localities throughout the Territory of Papua and New Guinea by M.V. *Fairwind* during 1948-1950. Their characters agree in general with those of *Atherina pinguis* Lacepede 1803. In particular they agree with the type of *A. vaigiensis* in the Paris Museum investigated and recorded by Schultz (1953, p. 310). Schultz thought this may represent one of several subspecies of *P. pinguis*. Possibly this one is restricted to waters of New Guinea and surrounding islands.

The species is here illustrated for the first time. Figure 11 is based on an example 103mm. collected by M.V. *Fairwind* at Mowe Harbour, New Britain, January 1950. (C.S.I.R.O. Marine Biological Laboratory Reg. No. A 2130.)

Family SCOMBEROMORIDAE

SCOMBEROMORUS MULTIRADIATUS
sp. nov.
(Figure 12)

D. XVI; v, 18 + 8 finlets. A. iv, 24 + 6 finlets. P. i, 20.

Body elongate and compressed. Depth 4.3, head 5.1 in standard length. Eye 5.0 in head, 1.7 in snout, 1.8 in interorbital. Maxilla reaches slightly behind vertical through hind border of the eye. A single row of sharp, compressed, narrow, triangular teeth in both jaws. The teeth are widely spaced and with entire edges. Dorsal fins not quite united basally. 1st spine of spinous dorsal fin shorter than the 2nd one which is the longest but shorter than the longest rays of the second dorsal or anal fins. Scales very minute and the body appears naked. A few enlarged scales anteriorly forming a rudimentary pectoral corselet. Lateral line straight except for a few slight undulations, and terminates in a broad keel at the tail base. Gill rakers 8 + 14, the rakers in the form of short blunt knobs. Generally silvery but brownish (possibly blue-green during life) on the back. No spots or vertical bars. Membrane of spinous dorsal fin largely black but with a little white posteriorly. Fins otherwise pale.

Readily distinguished from all other members of the genus by having 23 instead of 15-21 rays (excluding finlets) in the second dorsal fin, 28 instead of 14-22 rays (excluding finlets) in the anal fin. The high count of 8 rakers on the upper limb of the first gill arch falls within the range of *S. concolor* (Lockington 1880) with 5-9, and exceeds the range of 0-4 in all other species ; the count of 14 on the lower limb falls within the range of 3-14 of the other species but is less than the 15-20 of *S. concolor*. The new species agrees with *S. concolor* in lacking spots, blotches or bars, but differs from it in the higher fin

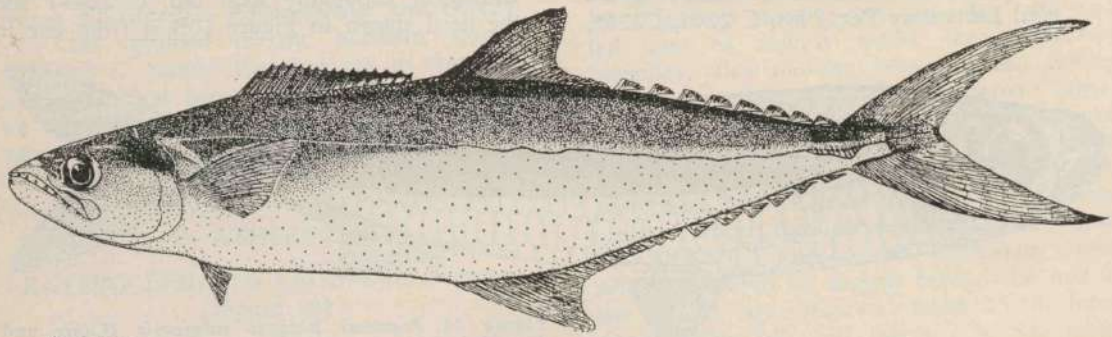

Figure 12. *Scomberomorus multitiradiatus* sp. nov. Holotype, 274 mm. Off northern mouth of Fly River. (C.S.I.R.O. Marine Biological Laboratory Reg. No. C3172.)

counts and in having broader-based triangular teeth.

1 example (274 mm.)—Off northern mouth of Fly River.

Holotype: Specimen quoted above (C.S.I.R.O. Marine Biological Laboratory Reg. No. C 3172), illustrated in Figure 12.

Type Locality: Fly River mouth, Gulf of Papua.

Family TRICHIURIDAE

TRICHIURUS HAUMELA (Forskal)

Clupea haumela Forskal, Descript. Anim., 1775, pp. 13, 71. (Moccha, Red Sea.)

1 example (460 mm.)—Caution Bay, 7-9 fathoms.

1 example (430 mm.)—Off Jokea, 5-9 fathoms.

2 examples (320-360 mm.)—Off Kerema Bay, 5½ fathoms.

Previously recorded from Merauke (West New Guinea) and Jacquinot Bay (New Britain). A new record for Papua.

Family CARANGIDAE

CARANX BUCCULENTUS Alleyne and Macleay.

Caranx bucculentus Alleyne and Macleay, Proc. Linn. Soc. N.S.W., i (4), 1877, p 326. (Cape Grenville, Queensland.)

1 example (104 mm.)—Off Kerema Bay, 5½ fathoms.

Previously unknown from any part of the New Guinea area. A new record for Papua.

ALEPES KALLA (Cuvier)

Caranx kalla Cuvier and Valenciennes, Hist. Nat. Poiss., ix, 1833, p. 49. (Pondicherry).

2 examples (80-83 mm.)—2½ miles off east head of Purari River, 4¾ fathoms.

Previously recorded from West New Guinea and the British Solomon Islands but unknown from the Territory of Papua and New Guinea. A new record for Papua.

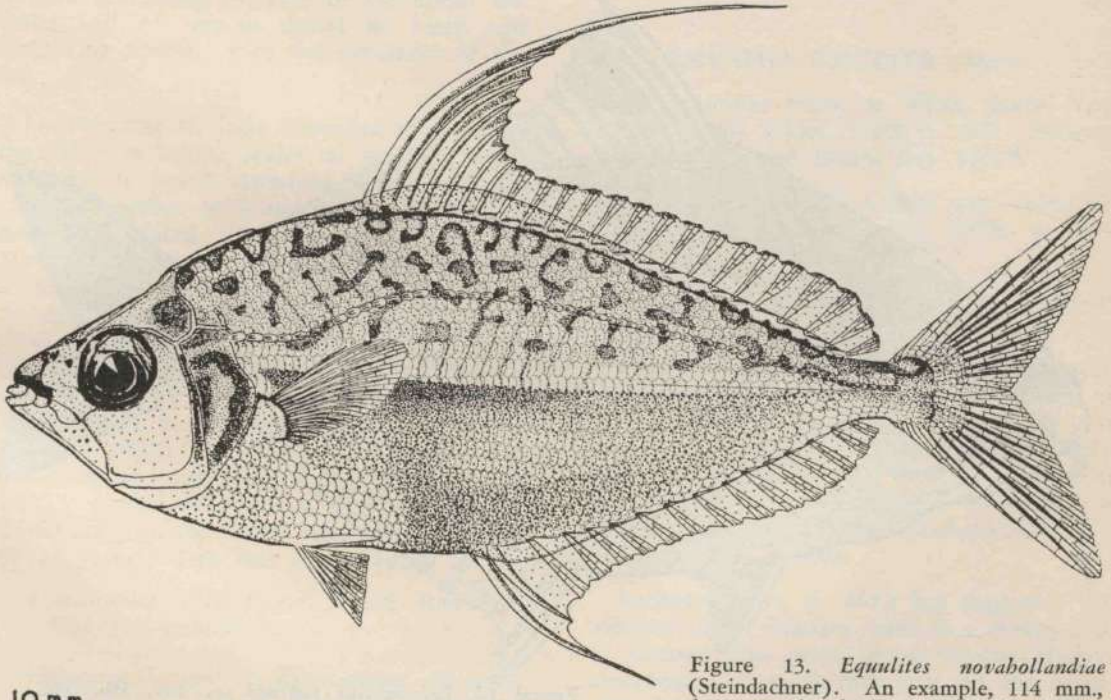

Figure 13. *Equulites novahollandiae* (Steindachner). An example, 114 mm., from mouth of Henry Reid River, New Britain. (C.S.I.R.O. Marine Biological Laboratory Reg. No. C1500.)

Family LEIOGNATHIDAE

EQUULITES BINDUS (Valenciennes)

Equula bindus Cuvier and Valenciennes, Hist. Nat. Poiss., x, 1835, p. 78. (Vizagapatam.)

1 example (87 mm.)—Off Red Scar Bay, 6-8 fathoms.

Previously unknown from any part of the New Guinea area. A new record for Papua.

EQUULITES NOVAEHOLLANDIAE

(Steindachner)

(Figure 13)

Equula novae-hollandiae Steindachner, Denschr. Akad. Wiss. Wien, xli (1), 1879, p. 11. (Cleveland Bay, Queensland.)

Equulites novaehollandiae Munro, Papua and New Guinea Agric. J., x (4), 1956 (1958), p. 197 ; Fish. Newsletter, xix (6), 1960, p. 20.

2 examples (95-97 mm.)—Matanalau River, New Hanover.

3 examples (103-114 mm.)—Mouth of Henry Reid River, New Britain.

2 examples (93-97 mm.)—Jacquinot Bay, New Britain.

1 example (106 mm.)—Oro Bay, Papua.

The majority of these examples collected by M.V. *Fairwind* between 1948 and 1950 were listed by Munro (1958, p. 197) either under this name or under *Leiognathus lineolatus* (Valenciennes 1835). The same specimens were used in conjunction with Steindachner's original description for the diagnosis given by Munro (1960, p. 20). In identifying these examples use was made also of a sketch of Steindachner's type made by Mr. G. P. Whitley in the Stuttgart Museum. It is quite likely that this species is synonymous with *Equula lineolata* Cuvier and Valenciennes 1835.

The example illustrated in Figure 13 is one of the above series and measures 114 mm. It is from the mouth of the Henry Reid River, New Britain. (C.S.I.R.O. Marine Biological Laboratory Reg. No. C 1500.)

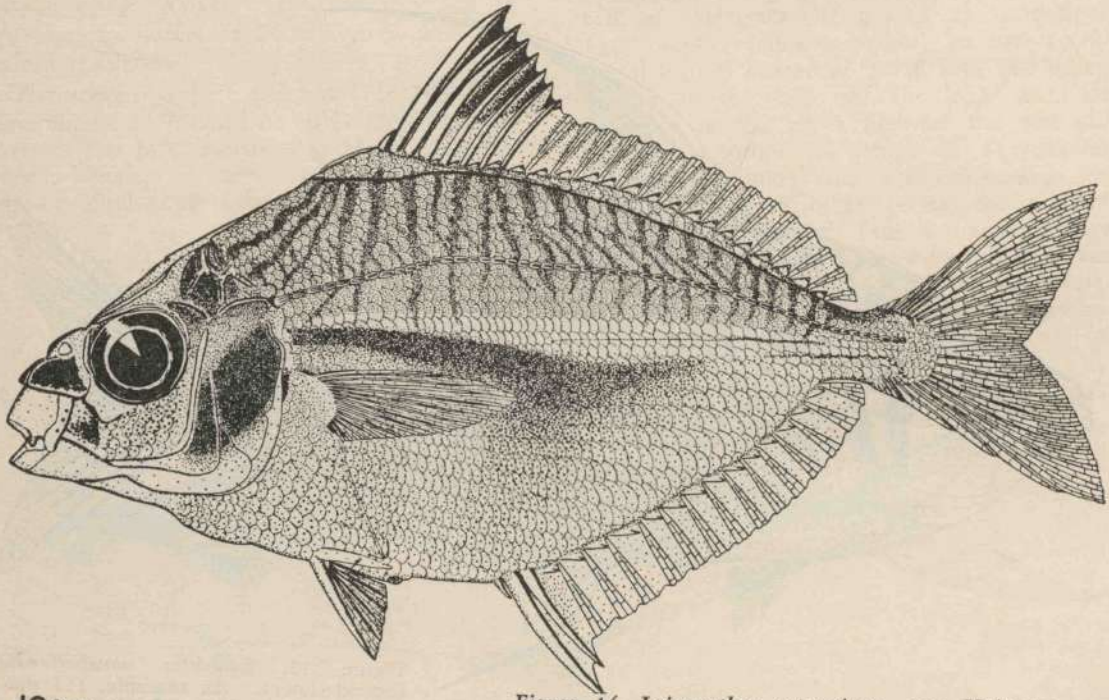

Figure 14. *Leiognathus rapsoni* sp. nov. Holotype, 90 mm. Red Scar Bay, Gulf of Papua. (C.S.I.R.O. Marine Biological Laboratory Reg. No. A2137.)

LEIOGNATHUS RAPSONI sp. nov.

(Figure 14)

D. VIII, 16-17 A. III, 14. P. I, 16. L. lat. 51-55. Tr. 8 + 20.

Body oval and compressed, slightly more convex above than below. Head profile slightly concave between eye and nape. Depth 1.9-2.1, head 3-3.3 in standard length. Eye 2.5-2.9 in head, greater than snout and interorbital. Mouth protractile into a downward directed tube, its gape almost horizontal when the mouth is closed. Maxilla reaches the vertical through the front edge of the eye. Chin slightly concave. A single row of fine teeth in both jaws. Supraorbital margin and lower edge of preoperculum serrated. Second spines of dorsal and anal fins longer than the others, 2.1-2.4 and 2.7-2.9 respectively in body depth. Breast scaly. Preoperculum with 5 rows of scales. Lateral line continued on to base of the tail. Gill rakers (3-5) + (21-23). Generally silvery but darker with about 20 narrow wavy dark vertical bars on upper half. Dark areas present on snout, operculum and along middle of sides. A dark line along the base of the dorsal fin. Outer half of spinous dorsal fin black and contrasting strongly with the remainder of the fins.

Differs from all Indo-Australian members of the genus in having scales on its cheek. This condition is found elsewhere only in *Equula elongata* Gunther 1874 and its congeners which have been placed in *Macilentichthys* Whitley 1932. The new species differs from this group in having the body depth 1.9-2.1 instead of 3 or more. In common with other species of *Leiognathus* Lacepede 1802, it has a scaly breast, complete lateral line, serrated supraorbital and moderate dentition. Amongst Indo-Pacific series it comes closest to *L. splendens* (Cuvier 1829) but differs in having the preoperculum scaly instead of naked, depth 1.9-2.1 instead of 1.75-1.8, 51-55 instead of 55-60 scales in the lateral line, and 20 instead of 12 vertical dark bars on its back.

4 examples (78-90 mm.)—Off Red Scar Bay, 6-8 fathoms.

Holotype: Largest of above series (90 mm.) (C.S.I.R.O. Marine Biological Laboratory Reg. No. A 2137), illustrated in Figure 14.

Type Locality: Red Scar Bay, Gulf of Papua.

SECUTOR RUCONIUS (Hamilton-Buchanan)

Chanda ruconius Hamilton-Buchanan, Fishes of Ganges, 1822, pp. 106, 371, pl. xii, fig. 35. (Ganges River.)

3 examples (57-84 mm.)—Off Red Scar Bay, 6-8 fathoms.

Previously unknown from any part of the New Guinea area. A new record for Papua.

Family APOGONIDAE

APOGONICHTHYS POECILOPTERUS

(Cuvier)

Apogon poecilopterus Cuvier and Valenciennes, Hist. Nat. Poiss., ii, 1828, p. 154. (Java).

3 examples (53-74 mm.)—Off Jokea, 5-9 fathoms.

Previously recorded from Madang but a new record for Papua.

LOVAMIA FASCIATA (Shaw)

Mullus fasciatus Shaw, *in* White, Journ. Voy. New South Wales, 1790, p. 268. (Between Broken Bay and Botany Bay, N.S.W.)

Apogon quadrifasciatus Cuvier and Valenciennes, Hist. Nat. Poiss., ii, 1828, p. 153. (Pondicherry.)

3 examples (78-85 mm.)—Hood Lagoon, 1½-9 fathoms.

These examples agree in all details with description of tropical specimens attributed to *Apogon quadrifasciatus* Cuvier 1828. They have been compared also with topotypical examples of *L. fasciata* (Shaw 1790) from the environs of Sydney and no differences can be found. It is thus concluded that *A. quadrifasciatus* is a synonym of *L. fasciata.*

Lachner (1935, p. 463) has suggested that *Apogon cookii* Macleay 1881 is a synonym of *L. fasciata.* This cannot be so because Macleay described a rounded dark spot on the caudal base but this is characteristic of *Amia robusta* Smith and Radcliffe 1911 and absent in *L.*

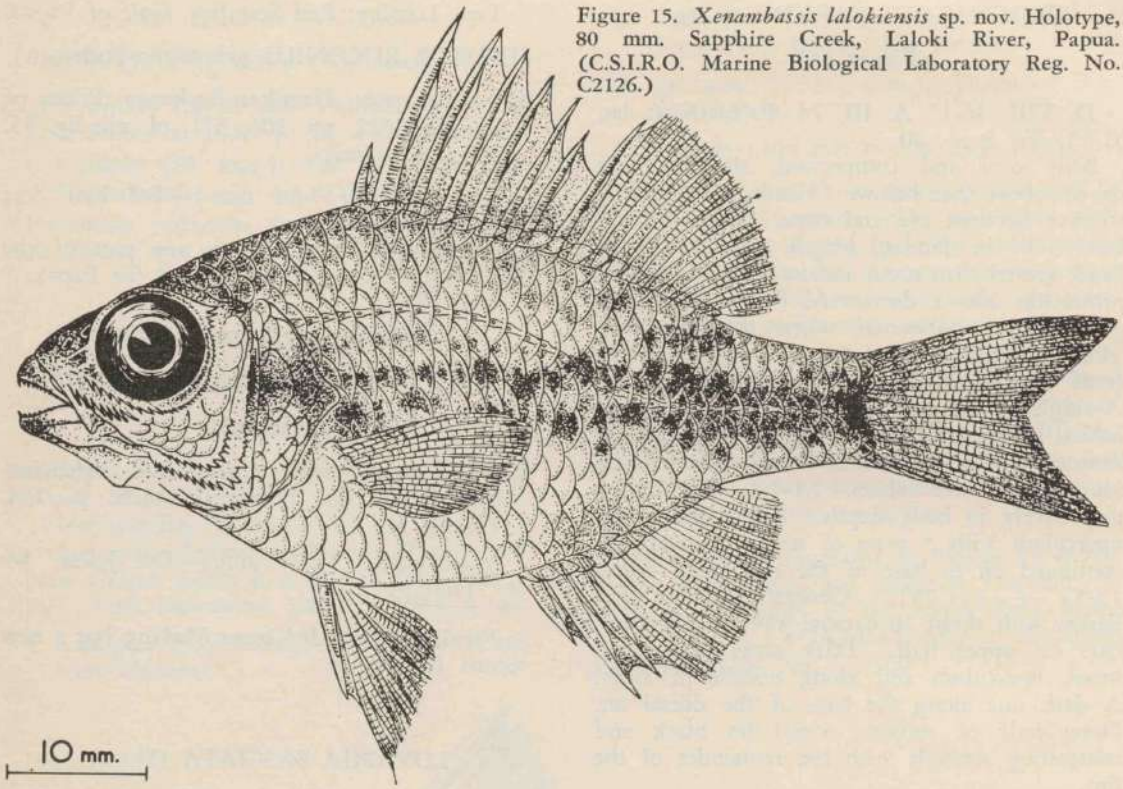

Figure 15. *Xenambassis lalokiensis* sp. nov. Holotype, 80 mm. Sapphire Creek, Laloki River, Papua. (C.S.I.R.O. Marine Biological Laboratory Reg. No. C2126.)

fasciata. Thus it would appear that *A. robusta* in a synonym of *L. cooki* (Macleay.)

Doubtfully recorded from Dorper Point and South East Bay, Australian Trust Territory of New Guinea. A new record for Papua.

APOGONICHTHYS ELLIOTI (Day)

Apogon ellioti Day, Fishes of India, 1875-78, p. 63, pl. xvii, fig. 1. (India.)

1 example (73 mm.)—Off Jokea, 5-9 fathoms.

Previously unknown from any part of the New Guinea area. A new record for Papua.

Munro (1960, p. 20) placed this species in the synonymy of *Apogon australis* Steindachner 1867. This action resulted from the observation of some note in the literature but such authority can no longer be traced. As pointed out by Smith (1961, p. 392) there is nothing in Steindachner's description to suggest such synonymy.

Family CHANDIDAE

XENAMBASSIS LALOKIENSIS sp. nov.

(Figure 15)

D. I, VIII, 11. A. III, 10. P. ii, 13. V. I, 5. L. lat. 31. Tr. 4 + 8.

Elongate-oval and compressed. Dorsal profile slightly concave above eye but not rising steeply at nape. Depth 2.2, head 2.6 in standard length. Eye 2.9 in head, 1.3 in postorbital part of head, 1.3 times snout, and 1.5 times interorbital. Maxilla slender, dilated posteriorly and with its hind edge slightly emarginate. It is partly concealed by the preorbital when the mouth is closed and reaches nearly to front edge of the pupil. Supraorbital ridge ends in 4 spines, the uppermost largest. Preorbital margin coarsely serrated. Preorbital ridge also coarsely serrated and confluent around lower part of eye with the suborbital which is very finely serrated. Preopercular ridge coarsely serrated at angle, the serrae extending for some distance along the inferior and posterior limbs. Pre-

opercular margin serrated throughout its length, the coarsest serrae being at the angle and along the inferior margin. Interoperculum with 5 serrae. Operculum with its margin entire but ending posteriorly in a produced angular flap. Teeth small and conical, arranged in several rows in both jaws; anteriorly the rows are more numerous and the outer row of teeth are larger and curved. A small patch of teeth on vomer and a single series along each palatine. Dorsal fin continuous, preceded by a small hidden procumbent spine, its 2nd spine longest and strongest but only slightly longer than the 3rd, its ultimate spine 1.2 times the penultimate and connected by membrane to above the middle of its length. Anal fin inserted on vertical through the last dorsal spine, its 2nd spine longest and strongest. Anterior rays of dorsal and anal fins longer than the posterior ones. Pectoral fin reaches beyond origin of anal fin. First ray of the ventral fin ends in a short filament. Scales cycloid. About 14 irregular predorsal scales. Three rows of scales on the cheek. Dorsal and anal fins with a basal sheath formed from one row of scales. Pectoral and caudal bases scaly. Lateral line gently arched but becomes straight and mid-lateral below the rayed part of the dorsal fin; each scale provided with a tubule. Gill rakers 5 + 13. Rakers spinose, the ones at the angle longest but shorter than the pupil diameter. Yellowish with upper parts of head and body brownish-olive. Some scales have darker centres and along the middle of the sides form 2-4 irregular series of dark brown spots which unite posteriorly as a broad mid-lateral band, becoming more intense in colour at the caudal base. A dark brown patch in the middle of the operculum and a faint dusky patch on the flanks above the base of the anal fin. Rayed part of dorsal, anal and caudal fins brownish.

Closely allied to *Xenambassis honessi* Schultz 1945 and X. *simoni* Schultz 1945 from Girua River or Samboga Creek in the Buna district. It agrees with X. *honessi* but differs from X. *simoni* in having 8 instead of 9 spines in the dorsal fin and in that the black mid-lateral band extends forward from the caudal peduncle and posteriorly terminates on the caudal base in a black blotch. It differs from both species in having the 2nd instead of the 3rd spine in dorsal and anal fins longest and strongest, the eye 2.9 instead of 3.1-3.3 in the head, and from X. *honessi* in that the black mid-lateral band is broad posteriorly and broken into several irregular horizontal series of spots anteriorly instead of being narrower and continued forward to the operculum. It agrees with *Synechopterus caudovittatus* Norman 1935 from Kokoda in having a large eye, slight head concavity, and the mid-lateral band broken into spots anteriorly. In common with the other species of *Xenambassis* it differs from *S. caudovittatus* in having 13 instead of 14 rakers on the lower limb of the gill arch, the suborbital ridge and interoperculum serrated instead of entire, and the preopercular ridge serrated behind and below instead of being entire except for 2 small spines at its angle. Also it agrees with *Tetracentrum apogonoides* Macleay 1883 in that the 2nd spines of thedo rsal and anal fins are longest and strongest. Macleay's species is place in a different genus mainly because there are 4 instead of 3 spines in the anal fin. Its type locality is the Goldie River but other examples have been obtained from the Laloki Lagoon at Bomana and these agree with the type in having 4 anal spines. This group of species from fresh water is unique amongst the Chandidae in lacking the deep notch between the ultimate and penultimate spines of the dorsal fin. They are confined to the eastern end of the New Guinea mainland.

1 example (80 mm.)—Sapphire Creek, a tributary of Laloki River. (C.S.I.R.O. Marine Biological Laboratory Reg. No. C 2126.)

Holotype : The unique example quoted above and illustrated in Figure 15.

Type Locality : Sapphire Creek, Laloki River, Papua.

AMBASSIS NALAU (Hamilton-Buchanan)

Chanda nalau Hamilton-Buchanan, Fishes of Ganges, 1822, p. 107. (Ganges River.)

6 examples (52-75 mm.)—Near mouth of Panaroa River, 1½-5 fathoms.

Previously recorded from Klipong River (West New Guinea) but unknown from the Territory of Papua and New Guinea. A new record for Papua.

Family PRIACANTHIDAE

PRIACANTHUS MACRACANTHUS Cuvier

Priacanthus macracanthus Cuvier and Valenciennes, Hist. Nat. Poiss., iii, 1829, p. 108. (Amboina.)

1 example (125 mm.)—Off Caution Bay, 7-9 fathoms.

Munro (1958, p. 173) recorded this species from Linden Haven (New Britain) and Kieta (Bougainville). These records were based on extremely juvenile examples that have subsequently been re-identified as *P. cruentatus* Lacepede 1802. The present example confirms occurrence of this species in the New Guinea area and represents a new record for Papua.

PRIACANTHUS TAYENUS Richardson

Priacanthus tayenus Richardson, Rept. Brit. Assoc. Adv. Sci. 15th Meet., 1846, p. 237. (Canton, China.)

1 example (172 mm.)—Off Gamadodo, Milne Bay, 7 fathoms.

Previously recorded from Kieta, Bougainville. A new record for Papua.

Family POMADASYIDAE

POMADASYS ARGYREUS (Valenciennes)

Pristipoma argyreum Cuvier and Valenciennes, Hist. Nat. Poiss., ix, 1833, p. 485. (Coromandel Coast.)

1 example (108 mm.)—Off Jokea, 5-9 fathoms.

Previously recorded from New Britain, New Hanover and Admiralty Islands. A new record for Papua.

Family NEMIPTERIDAE

ODONTOGLYPHIS TOLU (Valenciennes)

Dentex tolu Cuvier and Valenciennes, Hist. Nat. Poiss., vi, 1830, p. 248. (Pondicherry.)

1 example (155 mm.)—Hood Lagoon, 1½-9 fathoms.

Previously recorded from West New Guinea but unknown from the Territory of Papua and New Guinea. A new record for Papua.

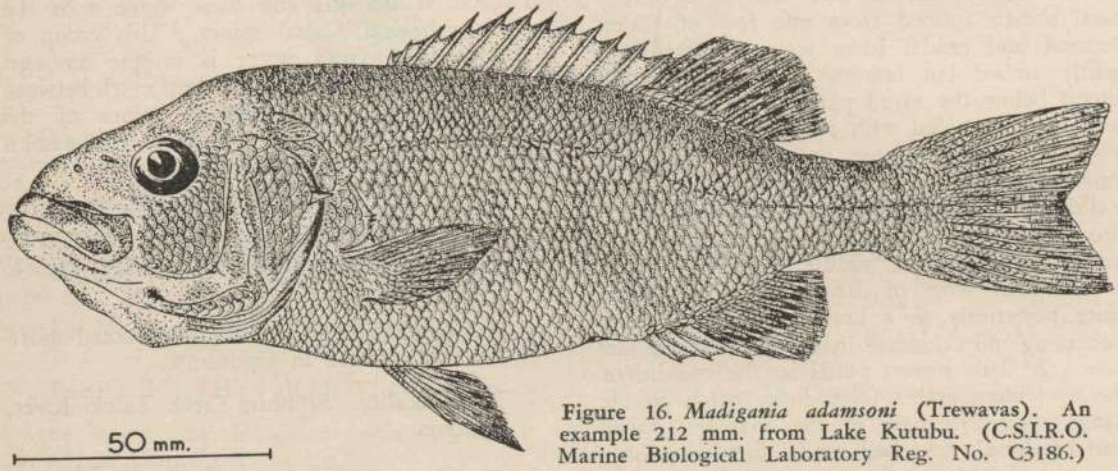

Figure 16. *Madigania adamsoni* (Trewavas). An example 212 mm. from Lake Kutubu. (C.S.I.R.O. Marine Biological Laboratory Reg. No. C3186.)

Family THERAPONIDAE

MADIGANIA ADAMSONI (Trewavas)

(Figure 16)

Therapon adamsoni Trewavas, Ann. Mag. Nat. Hist., (11), vi (25), 1940, p. 248. (Lake Kutubu.)

2 examples (204-212 mm.)—Lake Kutubu (col.: Patrol Officer C. E. T. Terrell, March 1955). (C.S.I.R.O. Marine Biological Laboratory Reg. Nos. C 3186, C 3187.)

Apparently this species is restricted in distribution to Lake Kutubu. In common with *M. unicolor* (Gunther 1859), a fresh water species from tropical Australia, it has the suprascapular bone hidden beneath scales and skin, 12 spines in the dorsal fin, and plain body colouration. For this reason it is placed in the genus *Madigania* Whitley 1945. Its nearest relatives in New Guinea are *Amphitherapon habbemai* (Weber 1910) and *A. caudavittatus* (Richardson 1845) but these have

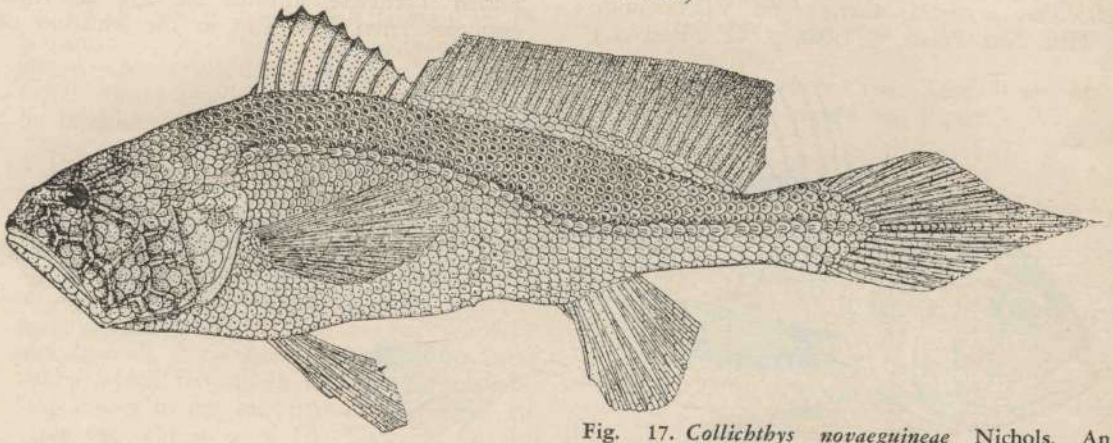

Fig. 17. *Collichthys novaeguineae* Nichols. An example 126 mm., from near mouth of Panaroa River, Papua. (C.S.I.R.O. Marine Biological Laboratory Reg. No. A1836.)

larger of the two examples quoted above (C.S.I.R.O. Marine Biological Laboratory Reg. No. C 3186).

MESOPRISTES CANCELLATUS (Cuvier)

Datnia cancellata Cuvier and Valenciennes, Hist. Nat. Poiss., iii, 1829, p. 144. (? Java.)

Therapon interruptus Macleay, Proc. Linn. Soc. N.S.W., viii, 1883, p. 258. (Normanby Island.

2 examples (200-203 mm.)—Warangoi River, New Britain (col.: G. Morris). (C.S.I.R.O. Marine Biological Laboratory Reg. Nos. C 3238, C 3239.)

Previously recorded from Normanby Island, Hansa Bay and Mambare Bay (Australian Trust Territory of New Guinea) and Auki (British Solomons). A new record for New Britain. There appears to be no good reason for maintaining *M. interruptus* (Macleay) as a separate species.

Family SCIAENIDAE

COLLICHTHYS NOVAEGUINEAE Nichols

(Figure 17)

Collichthys novaeguineae Nichols, Amer. Mus. Novitates, 1445, 1952, pp. 2-3. (Merauke River.)

2 examples (123-126 mm.)—Near mouth of Panaroa River, 1½ fathoms.

3 examples (114-133 mm.)—2½ miles off east head of Purari River, 4¾ fathoms.

Originally described from the Merauke River (West New Guinea) but unknown from the Territory of Papua and New Guinea. A new record for Papua. Illustrated for the first time in Figure 17 which is based on an example 126 mm. from the Panaroa River. (C.S.I.R.O. Marine Biological Laboratory Reg. No. A 1836.)

JOHNIUS DUSSUMIERI (Cuvier).

Corvina dussumieri Cuvier and Valenciennes, Hist. Nat. Poiss., v, 1830, p. 119. (Malabar.)

1 example (102 mm.)—Off mouth of Fly River.

1 example (154 mm.)—2½ miles off east head of Purari River, 4¾ fathoms.

2 examples (135-139 mm.)—Near mouth of Panaroa River, 1½ fathoms.

Previously unknown from any part of New Guinea. A new record for Papua. Professor Enrico Tortonese informs me (*in litt.*) of examples from Papua in the Museum of Natural History, Genoa, that were collected late last century.

OTOLITHES ARGENTEUS (Cuvier)

Otolithus argenteus Cuvier and Valenciennes, Hist. Nat. Poiss., v, 1830, p. 62. (Batavia.)

3 examples (115-133 mm.)—2½ miles off east head of Purari River, 4¾ fathoms.

Previously unknown from any part of New Guinea. A new record for Papua.

PSEUDOSCIAENA GOLDMANNI

(Bleeker)

Corvina goldmanni Bleeker, Nat. Tijds. Ned. Ind., vii, 1854, p. 371. (Soengi Puan, Batjan.)

1 example (130 mm.)—Off Jokea, 5-9 fathoms.

4 examples (80-140mm.)—Near mouth of Panaroa River, 1½ fathoms.

1 example (83 mm.)—Off Kerema Bay, 5½ fathoms.

Previously recorded from Peoli Adi (West New Guinea) but unknown from the Territory of Papua and New Guinea. A new record for Papua.

PSEUDOSCIAENA SINA (Cuvier)

Corvina sina Cuvier and Valenciennes, Hist. Nat. Poiss., v, 1830, p. 122. (Pondicherry.)

1 example (150 mm.)—Near mouth of Panaroa River, 1½ fathoms.

4 examples (86-118 mm.)—2½ miles off east head of Purari River, 4¾ fathoms.

Previously unknown from any part of New Guinea. A new record for Papua. Professor Enrico Tortonese informs me (*in litt.*) of examples from Lina Bay in the Museum of Natural History, Genoa, that were collected late last century.

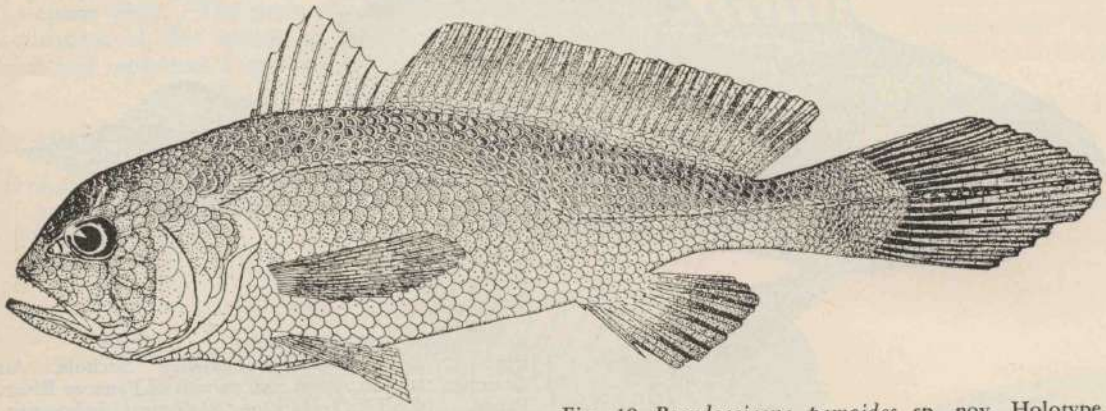

Fig. 18. *Pseudosciaena pamoides* sp. nov. Holotype, 113 mm. Mouth of Fly River, Gulf of Papua. (C.S.I.R.O. Marine Biological Laboratory Reg. No. A1838.)

PSEUDOSCIAENA PAMOIDES sp. nov.

(Figure 18)

D. IX, I, 36. A. II, 7. P. ii, 13. L.lat. 49 Tr. 8 + 13.

Body oblong and moderately compressed. Depth 3.4, head 3.5 in standard length. Eye 4.8 in head, equal to snout, 1.5 in interorbital. Snout short and bluntly rounded, not overhanging the mouth; its free edge slightly crenulated and with 3 pores, and above these 3 smaller pores. Chin with 4 pores near the symphysis of the ower jaws. Both jaws with bands of villiform teeth; those in the outer row of the upper jaw and those in the inner row in the lower jaw enlarged and conical. Margin of preoperculum finely serrated. All

scales cycloid, those on cheeks and operculum slightly enlarged. All of head except snout tip covered with scales. Predorsal scales 26. Lateral line gently curved to below middle of the base of the soft part of the dorsal fin, and thence continued in a straight line mid-laterally to the tip of the caudal fin. 2nd spine of anal fin slender, its length 1.5 times eye diameter. Length of base of the anal fin about 4.5 times in that of the soft dorsal fin. Origin of anal fin opposite 13th ray of soft dorsal fin. Caudal wedge-shaped. Gill rakers 9 + 18. Brownish, paler below, and covered everywhere with small dusky speckles. Operculum with a dusky blotch. Outer half of the caudal fin blackish.

This species is readily distinguished from all others in the genus *Pseudosciaena* (*sensu* Weber and De Beaufort) by having 36 instead of 22-34 rays in the soft part of the dorsal fin. No species occurring in the central part of the Indo-Pacific area has more than 30 such rays. This high count suggests convergence towards *Pama pama* (Hamilton-Buchanan 1822) which has 40-45 rays and a relatively longer base to the soft part of the dorsal fin.

On the suggestion of Dr. Trewavas (British Museum) the body wall was opened to determine the structure of the air-bladder. This has numerous aborescent appendages along each side (Tribe Otolithini) as in the species herein attributed to the genera *Collichthys*, *Johnius* and *Pseudosciaena*. Such arrangement suggests no affinity to *Pama* Fowler 1933 which has a single long appendage along each side of the sac arising from near its posterior end. Dr. Trewavas further suggested that the new species might be *Collichthys crocea* (Richardson (= *C. lucida* Gunther *non* Richardson) or a closely related form, namely a member of the genus *Pseudosciaena* (*sensu* Fowler). However this species has 31-34 and 8-10 branched rays respectively in the dorsal and anal fins, 51-59 scales in the lateral line, 35 predorsal scales, ventrally disposed dermal glands, and has the unpaired fins densely scaly.

1 example (113 mm.)—Mouth of Fly River.

Holotype: The above mentioned example (C.S.I.R.O. Marine Biological Laboratory Reg. No. A 1838), as illustrated in Figure 18.

Type Locality: Mouth of Fly River, Gulf of Papua.

SCIAENA DUSSUMIERI (Valenciennes)

Umbrina dussumieri Cuvier and Valenciennes, Hist. Nat. Poiss., ix, 1833, p. 481. (Coromandel.)

1 example (120 mm.)—Off Red Scar Bay, 6-8 fathoms.

1 example (138 mm.)—Caution Bay, 7-9 fathoms.

Previously recorded from Lehei River, Manus Island. A new record for Papua.

SCIAENA MACROPTERA (Bleeker)

Umbrina macropterus Bleeker, Nat. Tijds. Ned. Ind., iv, 1853, p. 254. (Priaman, Sumatra.)

2 examples (80-102 mm.) — Off Kerema Bay, 5½ fathoms.

Previously recorded from Busama, New Guinea. A new record for Papua.

Family RHINOPRENIDAE nov.

Body deep, rather quadrangular in lateral profile, and strongly compressed. Scales small, cycloid and adherent, becoming elongate and more numerous on breast and hard and spiny along the ventral mid-line. Scales extend broadly over soft dorsal, anal and caudal fins. A single lateral line with an abrupt bend anterior to the dorsal fin and with the tubules branched along the anterior third of its length. Head small and naked. Snout blunt and strongly projecting above a small inferior mouth. Preorbital narrow but concealing the maxilla. Cheek and operculum naked and with entire margins. Gill openings moderately wide but entirely lateral. Gill membranes broadly connected to the isthmus. Teeth setiform in upper jaw but tricuspid in lower jaw. Palate edentulous. One dorsal fin preceded by a small T-shaped recumbent-procumbent spine. 1st dorsal radial is a long free filament capable of independent movement. The 6-7 radials that follow are moderately short spines connected by low membranes and scarcely graduating posteriorly into the rayed portion. Soft part

consists of 18-19 branched rays preceded by a simple ray. Anal fin similar to soft portion of dorsal and composed of 3 graduated spines, one simple ray and 15-16 branched rays. Soft dorsal and anal fins elevated anteriorly and with their origins about opposite. Fin spines homocanth. 4th ray of pectoral fin produced into a long free filament. Ventral fins thoracic, inserted far forward below hind border of the preoperculum, and with a small axillary process. The spine and 1st ray are fused and produced into a long free filament.

This family is proposed for a new genus with only one species, and falls within the Superfamily Percoidae (Berg's classification) or the Series Ephippiformes (Jordan's classification). It appears to be fairly closely allied to the Family Scatophagidae, but differs from this family in having 3 instead of 4 spines in the anal fin, and in this respect agrees with the Families Ephippidae, Drepanidae, Platacidae and some Chaetodontidae. The embedded procumbent spine is shared with the Families Scatophagidae, Ephippidae and Drepanidae. The tricuspid teeth are shared only with the Scatophagidae and Drepanidae. It differs from all these families by virtue of its bluntly rounded projecting snout, the extreme filamentous prolongations of dorsal, pectoral and ventral fin rays, and the forward insertion of the ventral fins.

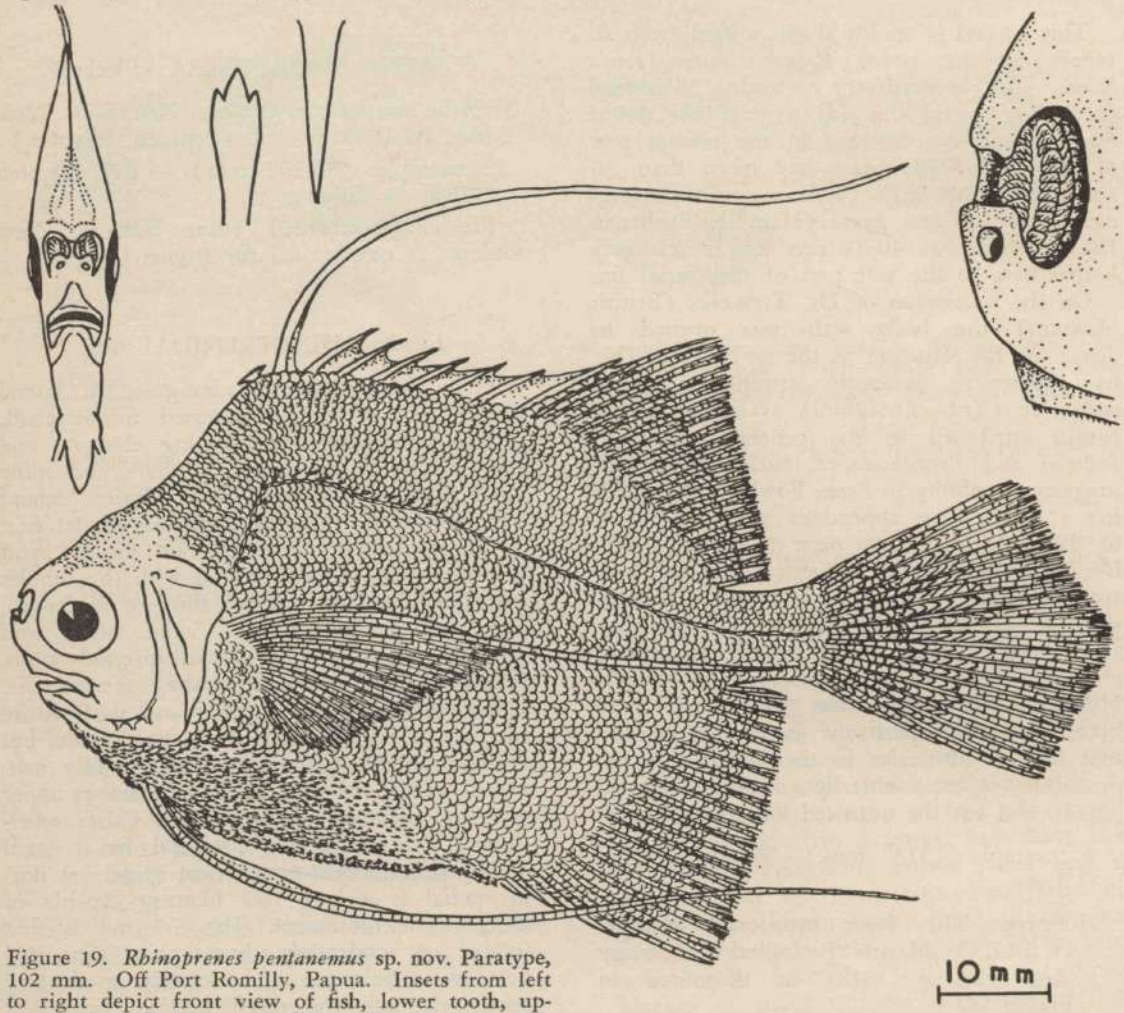

Figure 19. *Rhinoprenes pentanemus* sp. nov. Paratype, 102 mm. Off Port Romilly, Papua. Insets from left to right depict front view of fish, lower tooth, upper tooth, and aberrant condition of posterior nostril.

Genus RHINOPRENES nov.

Characters of this new genus are identical with those given above for the Family Rhinoprenidae. It is based on a single species.

Orthotype: *Rhinoprenes pentanemus* sp. nov.

RHINOPRENES PENTANEMUS sp. nov. (Figure 19)

D. I; i; VI-VII, 19-20. A. III, 16-17. p. iv, 16. L. lat. 46-50. Sc. 80-85. Tr. (10-13) + (37-42).

General facies as described above under the Family Rhinoprenidae. Depth 1.6-1.8, head 3.7-4.3 in standard length. Eye 2.6-3.0 in head, 1.3-1.6 times snout, and 1.2-1.4 in interorbital. Snout swollen, bluntly rounded and strongly projective beyond mouth. Mid-dorsal line of nape forming a steeply ascending carinate ridge. Anterior nostril round but posterior one much larger and forming a wide vertical slit (see inset, Figure 19)*. 1st spine of dorsal fin, 4th ray of pectoral fins, and 1st ray of ventral fins produced into long free filaments which reach to the tail base o· beyond. A ridge of keeled scales along ventral mid-line of breast from insertion of ventral fins to origin of anal fin. Pinkish-grey with back darker. Scales and fins densely speckled with black. Filamentous first spine of dorsal fin blackish.

2 examples (80-122 mm.)—2½ miles off east head of Purari River, 4¾ fathoms (C.S.I.R.O. Marine Biological Laboratory Reg. Nos. A 1634, A 1635.)

2 examples (135-146 mm.—Off Kerema Bay, 5½ fathoms. (C.S.I.R.O. Marine Biological Labo atory Reg. Nos. A 1825, A 1826.)

1 example (102 mm.—Off Port Romilly (Lat. 7° 55' S. Long. 144° 48' E.), 7 fathoms.

1 example (113 mm.)—Off Fly River mouth.

Holotype: Largest of the above series measuring 146 mm. from Kerema Bay, Gulf of Papua (C.S.I.R.O. Marine Biological Laboratory Reg. No. A 1826).

Illustrated in Figure 19 from an example 102 mm. from off Port Romilly.

Type Locality: Kerema Bay, Gulf of Papua.

Family POMACENTRIDAE.

POMACENTRUS CHRYSOPOECILUS Schlegel and Muller.

Pomacentrus chrysopoecilus Schlegel and Muller, Verh. Natuur, Gesch. Leiden, 1839-44, p. 21, pl. v, fig. 3. (Java.)

1 example (146 mm.)—Swimming pool, Samarai.

Previously unknown from any part of New Guinea. A new record for Papua.

Family GOBIIDAE

CTENOGOBIUS CRINIGER (Valenciennes)

Gobius criniger Cuvier and Valenciennes, Hist. Nat. Poiss., xii, 1837, p. 82. (Doreh Harbour, New Guinea.)

1 example (90 mm.)—Hood Lagoon, 1½-9 fathoms.

Previously recorded from Doreh (Manokwari) Harbour (West New Guinea) but unknown from the Territory of Papua and New Guinea. A new record for Papua.

Genus ALORICATOGOBIUS nov.

Body elongate, subcylindrical anteriorly and compressed posteriorly. Head depressed. Body scales ctenoid posteriorly, cyclyoid anteriorly, beginning on nape at ve tical through hind margin of the preoperculum. Scales on nape and pectoral region smaller than those posteriorly. Head, cheek and operculum naked. Breast naked. Rows of small raised pores behind eye, in 5 or more longitudinal series across cheek, in a vertical and curved series on operculum, and along lower edge of mandible. Gill opening extends forward to level of preopercular margin. Gill membranes united with isthmus below. Jaws equal; lower sometimes shorter. Tongue truncate. Teeth in 4 rows, inner and outer rows slightly enlarged. Inner edge of shoulder girdle without fleshy flaps. Dorsal fins separate, 1st with 6 spines, and 2nd with one spine and 9-10 rays. Anal fin with one spine and 7-8 rays. Pectoral fins

* In the paratype illustrated in Figure 19 (see top right hand inset) the posterior nostrils are joined across the snout. In all other examples including the holotype the nostrils were separated.

without free silk-like rays, the base naked. Caudal fin rounded. Ventral fins united and oblong.

Orthotype: *Glossogobius asaro* Whitley 1959.

The most important character which distinguishes this genus from all others represented in the Indo-Pacific is the naked area on the breast to behind the insertion of the ventral fins and around the bases of the pectoral fins. In addition to this it differs from *Glossogobius* Gill 1862 in having a truncate instead of bilobate tongue, equal jaws instead of a strongly protruding lower jaw, a rounded instead of pointed caudal fin, and a comparatively smaller disc formed by the ventral fins.

ALORICATOGOBIUS ASARO (Whitley)
(Figure 20)

Glossogobius asaro Whitley, Aust. Zoologist, xii (4), 1959, p. 318. (Asaro River near Goroka, New Guinea.)

4 examples (63-82 mm.)—Korn Farm, Wahgi River (col.: N. Blood, 28.ix.55).

These four examples appear to be conspecific with *Glossogobius asaro* Whitley 1959 and come from the same watershed as that of the type specimens. The Wahgi River flows into the Asaro River which eventually flows into the headwaters of the Purari River. The characters of this species do not conform with those of *Glossogobius* Gill which is represented by two species in the mountain torrents of the central highlands.

The species is illustrated here for the first time in Figure 20 which is based on an example from the above series measuring 82 mm. (C.S.I.R.O. Marine Biological Laboratory Reg. No. A 2145).

GLOSSOGOBIUS BRUNNOIDES (Nichols)

Gobius (Glossogobius) brunnoides Nichols, Amer. Mus. Novitates, 1539, 1951, pp. 6-8, fig. 4. (Nondugl, Wahgi Valley, New Guinea.)

12 examples (70-114 mm.)—Aiena and Tebi Rivers at Tari.

6 examples (81-137 mm.)—Tebi River at Tari.

1 example (117 mm.)—Aiena River. (Australian Museum Reg. No. IB 3319.)

1 example (102 mm.)—Nondugl (col.: N. Blood).

The last example quoted is topotypical. The remainder come from tributaries of the Tari River which forms part of the headwaters of the Kikori River. Examples (Australian Museum Reg. Nos. IB 3336, IB 3339, IB 3341) from the Jimmi River (a tributary of the Sepik River) quoted by Whitley (1956, p. 29) under this name have been re-examined and found to be conspecific with *G. celebius* (Valenciennes

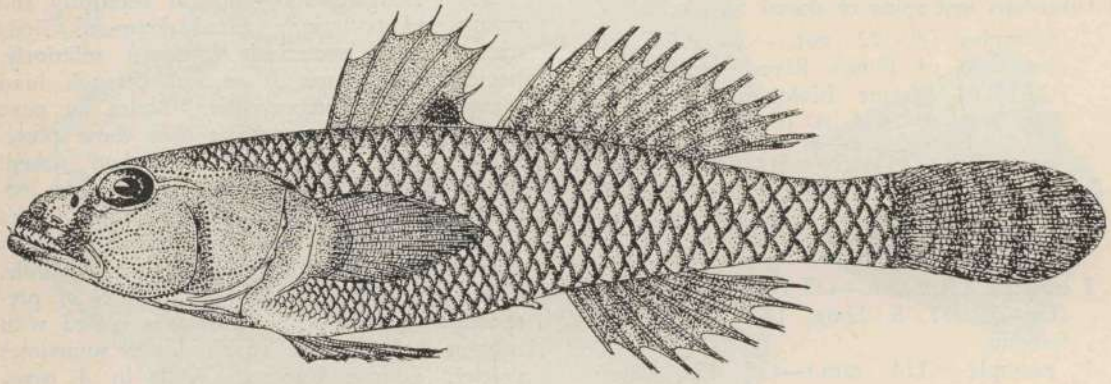

Figure 20. *Aloricatogobius asaro* (Whitley). An example 82 mm. from Korn Farm, Wahgi River. (C.S.I.R.O. Marine Biological Laboratory Reg. No. A2145.)

1837). The C.S.I.R.O. Marine Biological Laboratory has other examples of *G. celebius* from the Jimmi River system (Rink Bridge, Yin River, Bonanga Creek, Ganz River). Both species inhabit mountain torrents and are adapted for life in swiftly flowing waters in having the ventral fins expanded into a large disc-like sucker. Apparently *G. brunnoides* occurs only on the southern slopes of the central dividing range and *G. celebius,* which has a much wider geographical distribution, occurs on the northern slopes of the same range.

Family ELEOTRIDAE

MOGURNDA VARIEGATA Nichols

(Figure 21 A-E)

Mogurnda variegata Nichols, Amer. Mus. Novitates, 1539, 1951, pp. 1-3, fig. 1. (Lake Katubu = Lake Kutubu, Papua.)

3 examples (116-117 mm.)—Lake Kutubu. (C.S.I.R.O. Marine Biological Laboratory Reg. Nos. C 2249, C 3189, C 3190.)

2 examples (198-120 mm.)—Lake Kutubu. (C.S.I.R.O. Marine Biological Laboratory Reg. Nos. C 2247, C 3188.)

1 example (140 mm.)—Lake Kutubu. (C.S.I.R.O. Marine Biological Laboratory Reg. No. C 2246.)

3 examples (117-154 mm.)—Lake Kutubu (C.S.I.R.O. Marine Biological Laboratory Reg. Nos. C 2248, C 3184, C 3185.)

1 example (138 mm.)—Lake Kutubu (C.S.I.R.O. Marine Biological Laboratory Reg. No. C 2250.)

1 example (134 mm.)—Lake Kutubu (C.S.I.R.O. Marine Biological Laboratory Reg. No. C 2251.)

2 examples (154-155 mm.)—Lake Kutubu. (C.S.I.R.O. Marine Biological Laboratory Reg. Nos. C 3175, C 3176.)

2 examples (92-95 mm.)—Lake Kutubu. (C.S.I.R.O. Marine Biological Laboratory Reg. Nos. A 2134, A 2135.)

This series of topotypical examples warrants special mention and illustration because of the remarkable variation exhibited in body shape and colour pattern. The series was collected by Patrol Officer C. E. T. Terrell in March 1955.

The varieties were separated and given different vernacular names in the dialect of the inhabitants of the Lake Kutubu district. Mr. Terrell informs me that "The fish all come from the waters of Lake Kutubu itself, and the names applied are used by all natives in the area.

Each species of fish is not confined to any particular part of the lake, though generally speaking the shallow areas along the shores provide the best fishing grounds.

I am informed that the natives are aware that many of the species are similar, but the various characteristics of the fish are considered sufficiently diverse to warrant individual names

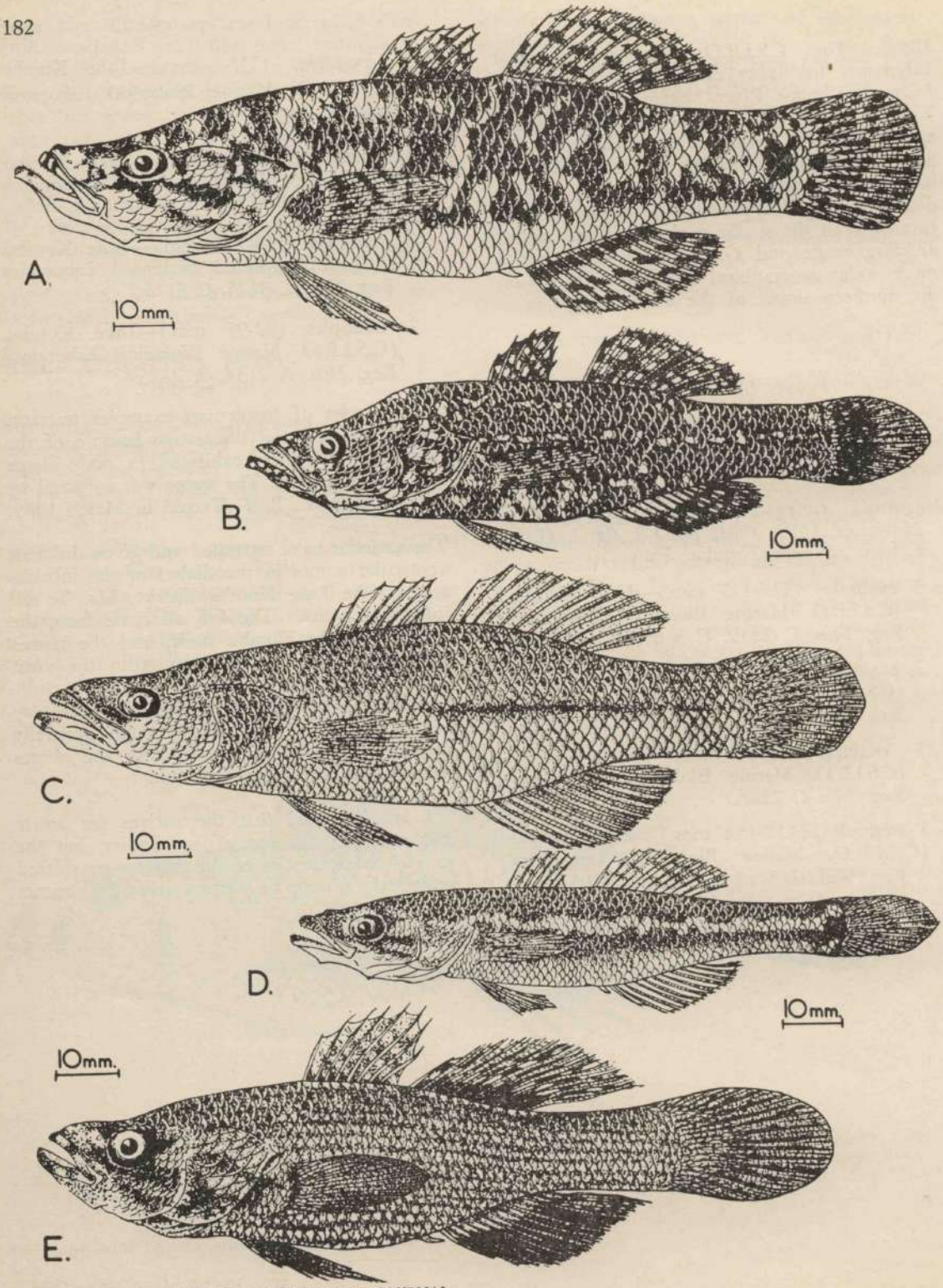
A.
10mm.
B.
10mm.
C.
10mm.
D.
10mm.
10mm.
E.

Figure 21. *Mogurnda variegata* (Nichols). Examples from Lake Kutubu. Papua.
A. 154 mm., C.S.I.R.O. Marine Biological Laboratory Reg. No. C2248.
B. 116 mm., C.S.I.R.O. Marine Biological Laboratory Reg. No. C2249.
C. 140 mm., C.S.I.R. O. Marine Biological Laboratory Reg. No. C2246.
D. 108 mm., C.S.I.R.O. Marine Biological Laboratory Reg. No. C2247.
E. 134 mm., C.S.I.R.O. Marine Biological Laboratory Reg. No. C2251.

being given to each type. This accords with general practice, and an analogy may be drawn with the existence of about seventeen different names given to varieties of the sago palm growing in the area. The fact that both sago and fish play an important part in the diet of these natives may be an indication of the reason the species are so well known and identified. The names given are not capable of translation, being names only. The generic term for fish in the area is IEGI." The varieties distinguished are as follows:-

IKIGUABI (see Figure 21, A)—Examples C 2248 (illustrated), C 3184 and C 3185 (117-154 mm.). Depth 3.8-4, head 2.6-3.2 in standard length. Body yellowish with a well-developed pattern of dark irregular patches on upper two-thirds. Dark radial bars from eye across cheek well defined. Dorsal, anal, caudal and pectoral fins with rows of large dark marks forming bars.

KUKAMUGU—Example C 2250 (138 mm.). Depth 4.8, head 2.9 in standard length. Pattern generally similar to Ikiguabi but upper third of body is uniformly dark and lower two-thirds mottled with large irregular dark and silvery-white blotches.

DARE—Examples C 3175, C 3176 (154-155 mm.). Depth 3.9, head 2.8-3 in standard length. Pattern generally similar to Ikiguabi but the dark area on the sides is greater in proportion to the irregular silvery-white spots.

SERAGATE—Examples A 2134, A 2135 (92-95 mm.). Depth 4.2, head 2.8 in standard length. Pattern very similar to Ikiguabi but anal fin is uniformly pale.

FEFERIGUGISABO (see Figure 21, B)—Examples C 2249 (illustrated), C 3189, C 3190 (116-117 mm.). Depth 4.1-4.5, head 2.7-2.8 in standard length. Head and body uniformly dark except for small irregular silvery-white patches which tend to form rows. Unpaired fins dark with rows of similar silvery-white spots. Apparently a condition where dark markings largely obscure paler ground colour.

MOSA (see Figure 21, C)—Example C 2246 (illustrated) (140 mm.). Depth 3.8, head 2.7 in standard length. Head and body pale yellowish. No radial bars on cheek or spots or bars on fins. Indications of a darker mid-lateral streak along sides of body.

KAIGIBU (see Figure 21, D)—Examples C 2247 (illustrated), C 3188 (108-120 mm.). Depth 4.7-4.8, head 3.2 in standard length. Head and body yellowish, but upper third of sides are uniformly dark and this area is separated from a narrow dark longitudinal band below it by a pale band of similar width. Dark radial bars on cheek well-defined. Dorsal fins with faint oblique dark bars. Fins otherwise uniformly pale.

ANAGU (see Figure 21, E)—Examples C 2251 (illustrated) (134 mm.). Depth 4, head 2.7 in standard length. Dark yellowish-brown with indications of narrow dark lines along the horizontal scale rows. Dark radial lines on cheek well-developed. Spinous dorsal fin with dark oblique bars. Fins otherwise very dark with indications of darker and paler spots. Posterior rays of soft dorsal and anal fins relatively longer than in other examples and reach almost to the base of the caudal fin.

BELOBRANCHUS BELOBRANCHUS

(Valenciennes)

Eleotris belobrancha Cuvier and Valenciennes, Hist. Nat. Poiss., xii, 1837, p. 243. (Menado, Celebes.)

1 example (57 mm.)—Warangoi River, New Britain (col.: G. Morris). (C.S.I.R.O.

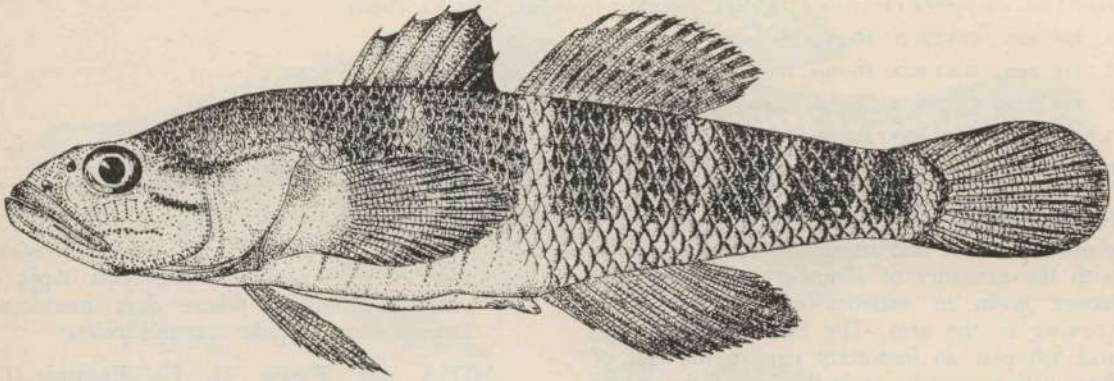

Figure 22. *Oxyeleotris fimbriatus* (Weber). A juvenile example 71 mm. from Mendi. (C.S.I.R.O. Marine Biological Laboratory Reg. No. A2146.)

Marine Biological Laboratory Reg. No. A 2142.)

Previously recorded from Salawati (West New Guinea), Wedau River (Papua) and Buin (Bougainville Island). A new record for New Britain.

OXYELEOTRIS FIMBRIATUS (Weber)
(Figure 22)

Eleotris fimbriatus Weber, Nova Guinea, v (2), 1908, p. 254. (Etna Bay, West New Guinea).

9 examples (117-168 mm.)—Lake Kutubu (col.: C. E. T. Terrell). (C.S.I.R.O. Marine Bilogical Laboratory Reg. Nos. C 3177-C 3182, C 3191, C 3192.)

15 examples (47-78 mm.)—Creeks and rivers of Mendi district.

The species has been recorded from many localities in West New Guinea and f om the Fly River, Papua. This species is apparently common in Lake Kutubu but has not been reported from there previously. In Lake Kutubu it is known by the indigenous names Nafa and Karaniwabu. The examples from Mendi are of special interest because of their juvenile characters. The strikingly different juvenile colouration and the absence of scales from the cheek, operculum, pecto al fin base and breast suggested at first that the series from Mendi represented a new species and a new genus. Comparison of characters with those of known Indo-Pacific genera indicated no differences from *Oxyeleotris* other than the absence of the scales in the areas mentioned. The meristic features agree with *O. fimbriatus* (Weber), and it was concluded that these specimens must be the young of that species. These juvenile features do not appear to have been observed by other workers. The indigenous name for these juveniles at Mendi is Korsomi.

These juveniles are creamy-pink and have about seven broad blackish cross bars on the upper two-thirds of the body. Adults are yellowish with more numerous nar ow, chevron-shaped, dark, transverse streaks.

Figure 22 illustrates an example from Mendi measuring 71 mm. (C.S.I.R.O. Marine Biological Laboratory Reg. No. A 2146.)

Family SCORPAENIDAE
APISTOPS CALOUNDRA (DeVis)

Apistus caloundra DeVis, Proc. Roy. Soc. Q'land, ii, 1886, p. 145. (Caloundra, Queensland.)

1 example (85 mm.)—2½ miles off east head of Purari River, 4¾ fathoms.

Previously unknown from any part of New Guinea. A new record for Papua.

Family APLOACTIDAE
ADVENTOR ELONGATUS Whitley

Membracidichthys (*Adventor*) *elongatus* Whitley, Rec. Aust. Mus., xxiii (1), 1952, p. 27, fig. 2. (Tiflis Passage, Moreton Bay, Queensland.)

1 example (92 mm.)—Off Jokea, 5-9

fathoms. (C.S.I.R.O. Marine Biological Laboratory Reg. No. A 1610.)

The C.S.I.R.O. Marine Biological Laboratory has another example (Reg. No. A 1321) measuring 93 mm. from Exmouth Gulf, Western Australia. These are the only specimens known other than the holotype in the Department of Harbours and Marine, Brisbane (Reg. No. 516).

Previously unknown from any part of New Guinea. A new record for Papua.

Family SYNANCEIIDAE

MINOUS VERSICOLOR Ogilby

Minous versicolor Ogilby, New Fish. Q'land coast, 1910, p. 111. (Off Cape Gloucester, Queensland.)

2 examples (52-57 mm.)—Off Kerema Bay, 5½ fathoms.

Previously unknown from any part of New Guinea. A new record for Papua.

Family PLATYCEPHALIDAE

PLATYCEPHALUS INDICUS (Linnaeus)

Callionymus indicus Linnaeus, Syst. Nat., ed. 10, 1758, p. 250. (Asia).

1 example (288 mm.)—Near mouth of Panaroa River, 1½ fathoms.

Previously recorded from West New Guinea but unknown from the Territory of Papua and New Guinea. A new record for Papua.

Family CALLIONYMIDAE

CALLIONYMUS FILAMENTOSUS Valenciennes

Callionymus filamentosus Cuvier and Valenciennes, Hist. Nat. Poiss., xii, 1837, p. 303, pl. ccclix. (Celebes.)

1 example (148 mm., male)—North of Yule Island, 6-9½ fathoms.

Previously unknown from any part of New Guinea. A new record for Papua.

Family LAGOCEPHALIDAE

GASTROPHYSUS SPADICEUS (Richardson)

Tetrodon spadiceus Richardson, Zool. Voy. "Sulphur", Ichth., 1845, p. 123, pl. lviii, figs. 4-5. (Canton.)

1 example (56 mm.)—2½ miles off east head of Purari River, 4¾ fathoms.

1 example (54 mm.)—Off Kerema Bay, 5½ fathoms.

1 example (137 mm.)—Off Jokea, 5-9 fathoms.

Previously unknown from any part of New Guinea. A new record for Papua. However, some authors consider this to be only a variant of *G. lunaris* (Bloch and Schneider 1801) which has been recorded from West New Guinea, Australian Trust Territory of New Guinea and the British Solomon Islands.

AMBLYRHYNCHOTES HYPSELOGENION (Bleeker).

Tetrodon hypselogenion Bleeker, Nat. Tijds. Ned. Ind., iii, 1852, p. 300. (Amboina.)

Munro (1958, p. 294) recorded *Torquigener pleurogramma* (Regan 1903) from Daugo Island and *T. tuberculiferus* (Ogilby 1912) from Mowe Harbour. Re-examination of the adult (C.S.I.R.O. Marine Biological Laboratory Reg. No. A 345) from Daugo Island and the juveniles from Mowe Harbour shows these specimens to be conspecific with *A. hypselogenion* (Bleeker). The two species named above should be removed from the New Guinea Checklist.

Family TETRODONTIDAE

CHELONODON PATOCA (Hamilton-Buchanan)

Tetrodon patoca Hamilton-Buchanan, Fishes of Ganges, 1822, pp. 7, 363, pl. xviii, fig. 2. (Ganges.)

Chelonodon dapsilus Whitley, Proc. Linn. Soc. N.S.W., lxviii (3-4), p. 143. (Mackenzie Island, Fitzroy River, Queensland.)

4 examples (68-123 mm.)—Near mouth of Panaroa River, 1½ fathoms.

The example from Gamadodo, Milne Bay recorded by Munro (1958, p. 294) as *Takifugu oblongus* (Bloch 1786) has been re-examined and found to be conspecific with *C. patoca*. *C. dapsilus* Whitley from Queensland differs only in having 16 instead of 18 pectoral fin rays and is apparently a synonym.

Previously recorded from Waigeu Island, but previously unrecorded from the Territory of Papua and New Guinea. A new record for Papua.

Family ANTENNARIIDAE

ANTENNARIUS HISPIDUS (Bloch and Schneider)

Lophius hispidus Bloch and Schneider, Syst. Ichth., 1801, p. 142. (Indian Ocean.)

2 examples (88-95 mm.)—Off Kerema Bay, 5½ fathoms.

Previously recorded from the British Solomon Islands but unknown from the Territory of Papua and New Guinea. A new record for Papua.

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Appraisal of Two Land Settlement Schemes in the Gazelle Peninsula—New Britain.[1]

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INTRODUCTION

Little is known of the course and methods of development associated with indigenous land settlement schemes in the Territory of Papua and New Guinea. Practically no systematic study of any of the schemes already in operation has been undertaken.[2] This has given rise to a great many opinions which are based on vague impressions and influenced by preconceived ideas on the desirability or otherwise of land settlement and of a certain size of individual holding. None has been the subject of these opinions more than the two schemes in the Gazelle Peninsula which are discussed in this article.

For this reason an examination of development that has been achieved to date was made in order to determine whether or not land settlement in these two areas might reasonably be regarded as a success or a failure. The survey necessary for this was then extended in an attempt to isolate the principal factor or factors influencing block development. At the same time the existence of future development plans and the motives for taking up settlement leases were investigated. Finally an attempt was made to compare costs of establishment in the settlement schemes up to about the end of Year 4 with those published for large-scale estate planting of cacao.

The Two Land Settlement Schemes.

The two schemes, both planted with cacao, are located in the Gazelle Peninsula of New Britain approximately 25 miles from the township of Rabaul. Land comprising them was subdivided on the basis of at least 15 acres per holding of land suitable for cacao.

The Peninsula has a good network of roads and the local indigenous people are adequately supplied with their own transport. The area is heavily populated to the extent that isolation of reasonably large areas of "village" land for cash cropping purposes by an individual is now generally impossible. With the present high rate of population increase, this situation is likely to deteriorate unless there are fairly immediate and radical changes in the present economic and social organisation of the Tolai people.

(i) *The Warangoi Land Settlement Scheme* [3]

This scheme, subsequently referred to here as the Warangoi, consists of 33 agricultural blocks of an average size of 16 acres. Individual block areas range from 15 to 18 acres. The majority of lessees moved onto their blocks during the latter half of 1959.

Data were collected from a sample of 17 settlers. Details of the sampling method are given in the Appendix. Eight of the 17 were from the same village, approximately five miles from the settlement blocks. Except for one settler from Pomio, most of the other settlers selected were from villages no more than five miles away.

(ii) *The Ilugi Land Settlement Scheme*

This scheme, called hereafter the Ilugi, contains 48 blocks having an average area of 17 acres. The individual blocks range from 15 to 23 acres. About half of the settlers moved onto their blocks during the first half of 1961.

(1) The 'Warangoi' and Ilugi' schemes.

(2) This excludes the long term study being undertaken by R. J. Cheetham, Agricultural Officer, of land settlement near Popondetta in the Northern District of Papua. The New Guinea Research Unit of the Australian National University is also examining various land settlement schemes in the Territory.

(3) The Warangoi is not to be confused with the Vunamami Local Government Plantation.

Twenty four of the settlers were selected, and the same information as for the Warangoi, collected. There was no predominant home village in this sample although two villages within ten miles of the settlement blocks were each represented by four settlers. There were also two settlers from outside New Britain, one being from Finschhafen and one from Kavieng. Of the settlers from the Gazelle Peninsula, home villages on the average were further from allocated blocks than was the case with the Warangoi.

RATES OF BLOCK DEVELOPMENT

Development on individual blocks could be traced from maps prepared at six-monthly intervals by agricultural officers associated with the schemes. Aerial photographs taken in 1961 were used to check these maps which were found to be accurate.

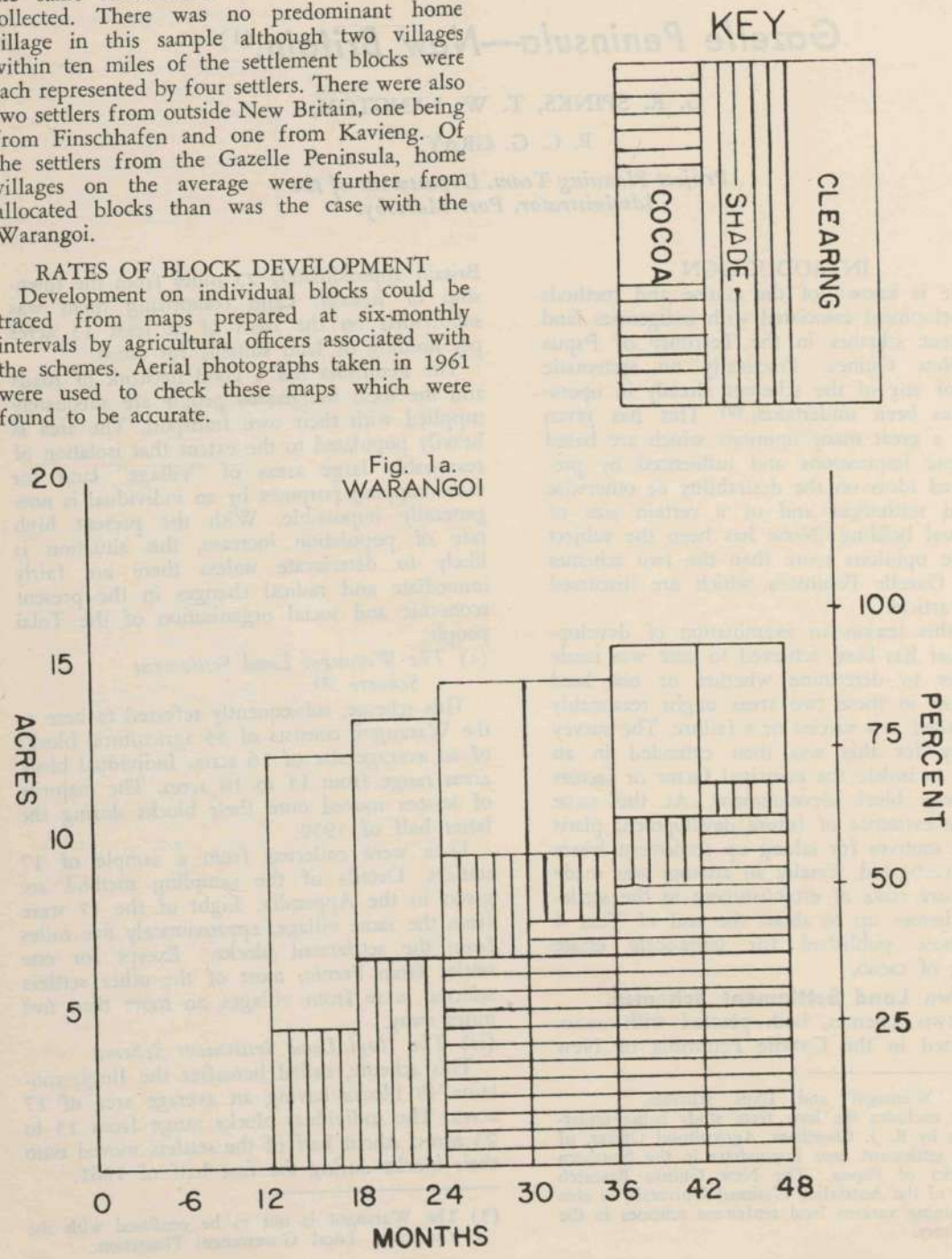
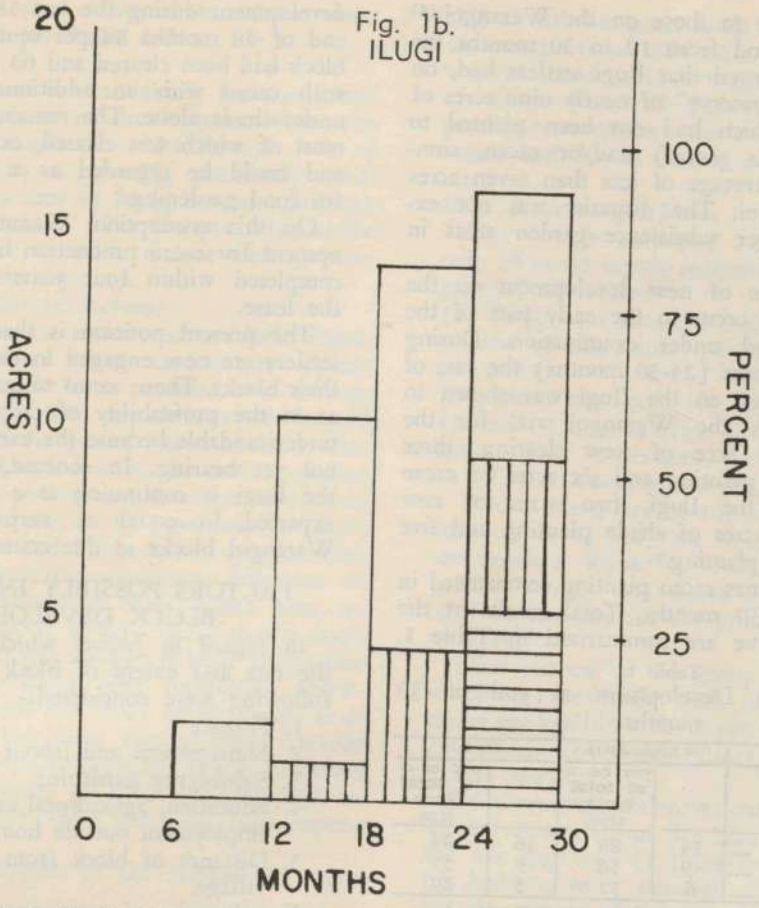


Fig. 1a.
WARANGOI



Area rates of block development are shown in Figs. 1a and 1b. The dates of block allocation have been used as histogram origins so that both settlement schemes are graphed from a similar datum for ease of comparison.

Because records for the Warangoi are inadequate for the first 12 months after block allocation, development achieved in this time has not been shown. For the Ilugi, no developmental work during the first six months after allocation was undertaken, but measurable development was evident in both schemes in the period 12-18 months.

The period following allocation during which occupancy of blocks took place varied considerably between the two schemes. In the survey sample taken of the Warangoi all settlers reported being on their blocks within six months after allocation. However, on the Ilugi, this movement was much more protracted. Only 50 per cent. of the settlers in the sample taken of this scheme were on their blocks within six months of allocation; 21 per cent. in 6-12 months, and the remaining 29 per cent. in the period 12-18 months. The slower movement could have been caused by a reduction in government encouragement to settlers and/or by the poor condition of the only access road to the Ilugi blocks. These factors might also account for the lower degree of development on the Ilugi up to about the end of the first 18 months.

Figures 1a and 1b indicate that up to 30 months after allocation (after which time comparison of the two schemes ceases) absolute levels of new development on the Ilugi blocks

were comparable to those on the Warangoi.(4) During the period from 12 to 30 months the investigation showed that Ilugi settlers had, on the average, a "reserve" of nearly nine acres of cleared land which had not been planted to shade (*Leucaena glauca*) and/or cacao, compared with an average of less than seven acres on the Warangoi. The disparity was not explained by larger subsistence garden areas in the Ilugi.

A slower rate of new development on the Ilugi tended to occur in the early part of the 30-month period under examination. During the last six months (24-30 months) the rate of new development on the Ilugi was shown to exceed that on the Warangoi viz. for the Warangoi, one acre of new clearing, three acres of shade planting and six acres of cacao planting; for the Ilugi, two acres of new clearing, four acres of shade planting and five acres of cacao planting.

In both schemes cacao planting commenced in the period 24-30 months. Total results at the end of this time are summarised in Table 1.

Table 1.
Average Block Development at end of 30 months.

SCHEME	WARANGOI		ILUGI	
Development	acs.	per cent of total block size	acs.	per cent of total block size
Clearing	14	88	16	94
Shade planting	9	56	9	53
Cacao planting	6	37	5	29

After 30 months from allocation of blocks, rates of new development assessed for six-monthly periods for the Warangoi slowed down considerably. In terms of additional clearing, shade planting and cacao planting, only one acre of cacao was planted, for instance, in the period 30-36 months; only one acre each of clearing, shade planting and cacao planting was undertaken in the next six months; and in the last six months possible in this review, only one acre of shade and two acres of cacao were planted. Of course, previous plantings required maintenance. Even with a reduced rate of new development during the last 18 months, at the end of 48 months 94 per cent. of the average block had been cleared and 63 per cent. planted with cacao with an additional six per cent. under shade alone. The remaining 31 per cent, most of which was cleared, occupied five acres and could be regarded as a reserve required for food gardening.

On this assumption, Warangoi block development for cacao production had virtually been completed within four years of allocation of the lease.

The present position is that most Warangoi settlers are now engaged in the maintenance of their blocks. There seems to be some uncertainty as to the profitability of cacao, though this is understandable because the earliest plantings are not yet bearing. In contrast, development on the Ilugi is continuing at a rapid pace. It is expected to equal or surpass that on the Warangoi blocks in due course.

FACTORS POSSIBLY INFLUENCING BLOCK DEVELOPMENT

In regard to factors which might influence the rate and extent of block development, the following were considered:-

1. Finance
2. Management and labour
3. Subsistence gardening
4. Education, agricultural experience, previous employment outside home district
5. Distance of block from the lessee's home village.

For the sake of comparison, all block devel-

Table 2.
Labour Inputs per Operation (a).

Year	Operation	Labour Inputs (man-days)	
1.	Felling and rough clearing.		60
	Lining and holing, planting shade, and clearing for one year.	30	
	Cacao planting and nursery.	20	50(b)
2.	Shade control, cacao replanting and cleaning for one year.		18
3.	Shade control, cleaning, pruning, pest and disease control.		24
4.	Shade control, cleaning, pruning, pest and disease control.		30

(a) Modified from Table No. 26, Page 35 of *'Cocoa in Papua and New Guinea,'* Department of Territories, Canberra, 1958, because of higher planting densities and by the inclusion of land clearing in Year 1.

(b) These labour inputs have been broken down into two parts corresponding to data mapped for the settlement schemes. Dissection was based on advice of experienced Agricultural Officers.

(4) While there was on the average one more acre per holding planted with cacao on the Warangoi, two additional acres had been cleared and was ready for planting on the Ilugi. On the basis of labour inputs per operation given in Table 2 actual development on the Ilugi at 30 months in fact exceeded that on the Warangoi.

opment work was converted to labour units (man-days) as per Table 2.[5]

1. Finance.

Because access to loan funds for the initial stages of this type of development where the lender runs considerable risks through lack of adequate security is generally not freely available, finance is seen as being a very significant factor for analysis.[6] For the two schemes the main sources of available finance were government loans and/or savings.

Warangoi Settlement Scheme.

For the first 12 months after block allocation, development was undertaken mainly through purchases from settlers' own savings and/or through the employment of unpaid labour. Within the period 18-24 months after allocation, all but a few of the settlers availed themselves of a government development loan of £144 which was paid in 12 equal instalments.[7]

From Fig. 1a and Table 2 it is apparent that this loan made little significant difference to the rate of development after it had been received. However, it is very likely that a large part of the loan was used to redeem obligations which had previously been contracted, particularly labour used for block development. It is also possible that some money went towards personal consumption spending or for purchases not directly related to block development as there was no prescribed check on loan expenditure.

Of the 17 settlers in the sample, 13 were able to estimate gross block expenditure for the 48 months from allocation. Modal expenditure was calculated at £340 which included the loan of £144. Nine of the 13 settlers had expenditures exceeding the mode and, of these, seven had blocks above average in development.

Ilugi Settlement Scheme.

The sample contained 24 settlers. Of these only 23 could supply information and they were grouped as follows:-

(a) those who occupied their blocks within 12 months of allocation—16 settlers or about 70 per cent.

(b) those who occupied their blocks between 12 and 18 months after allocation—seven settlers or about 30 per cent.

(a) *Those Occupying Blocks within 12 Months.*

Within the group of 16, six had received the loan of £144, and two were in recipt of ex-servicemen's loans.[8] Modal expenditure of private savings was about £35; the mode of total expenditure for the group was determined at £140.

Nine settlers of the group had expenditures exceeding the mode and, of these, five had above average block development.

(b) *Those Occupying Blocks in the period 12-18 Months.*

Of the seven settlers in the group, two had availed themselves of the loan of £144. Despite the late start one of these two had developed his holding to a standard above the average for the sample of the entire scheme whilst the other had above-average development for this particular group of seven.

The mode of private expenditure was not calculated because of the small number in this group sample, but it was considerably higher than that for group (a) above. Six of the seven had block development lower than the average for the Ilugi although rates of development were generally very high.

Data for both schemes combined.

It was possible to examine detailed written records of expenditure in two cases only in the whole survey. While these records were not complete for the whole period of block development they did indicate for the two settlers that loan funds were largely used for actual development of the holding, and that there were

(5) Development was confined to land clearing (including felling) nursery work, planting of shade and cacao, pest and disease control, pruning and other maintenance. Because labour units used in this table have been derived from data compiled for 'average' forest clearing and other conditions, and for average quality of work for each operation, labour inputs are not necessarily accurate for individual holdings. However, they are very convenient for comparison.

(6) It is not implied that adequate credit was not available for the two schemes in question. The important thing is the assessment of the possible effect on development of the levels of finance actually used by settlers in the Warangoi and Ilugi.

(7) The survey showed that of the 17 settlers selected, 16 had availed themselves of the loan granted by the Native Loans Board. The other settler had access to adequate private finance from his employer. The instalments were paid generally at monthly intervals, i.e., total loan money was received over the period of a year.

(8) At the time of the survey, one had received £72, the other £319.

comparable levels of expenditure on broad categories of purchases. Payment of wages was the largest single item in both cases. The high proportion of expenditure devoted to transport confirmed the contention of agricultural officers that this form of outlay was often excessive.

In summary, details of gross expenditure were collected from 36 of the 41 settlers sampled. Of these, 20 reported above modal expenditure for their particular settlement area. Thirteen of these had above average block development. While there is some indication of a connection between expenditure and block development, the existence of unredeemed obligations and the quality of the data were not such as to justify pursuing investigation of the relationship further.

The number of Ilugi settlers not financed by loans enabled block development achieved without loan assistance to be compared with that achieved with loans in this particular scheme. It also enabled a similar comparison to be made between Ilugi development without loans and development on the Warangoi where 16 out of the 17 settlers in the sample had received a loan of £144 and the other had access to adequate private finance.(9)

Table 3 gives the average and range of block development per £1 spent for each scheme, with and without loan finance, expressed as man-days.(10) Labour inputs were calculated from Table 2.

(9) Apart from the fact that development on the Ilugi is at an earlier stage than on the Warangoi, failure of many of the Ilugi settlers to take up loans is more likely to be explained by lesser publicity of the availability of credit rather than a reduced need for that credit. At the time of the survey a number of Ilugi settlers had applied for loans from the Native Loans Board. This type of loan is discussed by R. J. Cheetham in "The Development of Indigenous Agriculture, Land Settlement, and Rural Credit Facilities in Papua and New Guinea," *Papua and New Guinea Agric. J.*, 15 : 67-78.

(10) No attempt was made to determine the possible extent of expenditure by lessees on anything that could not be related fairly directly to block development.

Table 3.

Block Development Expressed as Man-Days per £1 Spent.

	Without Loans	With Loans	
	ILUGI	ILUGI	WARANGOI
Average	25	7	4
Range	5(b)-98(c)	5-10	3-4

(a) Recorded to the nearest whole number of units.
(b) Lessee has undertaken development solely by hiring labour.
(c) Block development undertaken largely by lessee himself. Minor wage employment in Year 1 only, for burning.

Using the average figures in Table 3 it is apparent that £1 has secured more development on the Ilugi blocks than on the Warangoi, and that in the Ilugi scheme, £1 has secured more development by those without loans compared with those who have had access to loan finance. Explanation of the difference is to be found largely in the extent to which block development has been carried out by the lessee himself, the very high figure of 98 man-days per £1 for one settler on the Ilugi serving as an indication of levels that can be achieved in cases where there is little or no wage employment. By contrast it was estimated that £1 spent on large cacao plantations secured less than two man-days of development up to the end of Year 4 of establishment.(11)

The ability to secure optimum output from labour employed is also a factor relevant to the ratio between development achieved and money outlaid. However, it is one that is likely to vary only by chance between these two schemes and between settlers who have loans and those who do not. Of greater significance to results contained in Table 3 is the existence of obligations contracted during development of blocks which normally must be redeemed in money or honoured in some other way in the future. Accurate data on obligations that have been contracted and are still outstanding are very difficult to secure, but it is thought probable that the later Ilugi settlers, particularly those without loans, would have much greater

(11) This estimate was derived from data given in '*Cocoa in Papua and New Guinea*'—Department of Territories, Canberra, 1958, Page 35, with adjustment for higher planting densities applicable to the settlement schemes. The comparison is of obvious significance where capital is in short supply and/or its cost is very high.

Table 4.

Management and Labour Employed.

SCHEME	WARANGOI				ILUGI				BOTH SCHEMES			
Management	Number of Managers	Labour			Number of Managers	Labour			Number of Managers	Labour		
		Casual	Full Time	Unpaid		Casual	Full Time	Unpaid		Casual	Full Time	Unpaid
FULL TIME ...	2	2	—	1	13	13	1	1	15	15	1	2
PART TIME ...	3	3	—	2	6	6	—	1	9	9	—	3
ABSENTEE Village ...	7	7	—	4	—	—	—	—	7	7	—	4
ABSENTEE Business or Wages	5	5	4	1	5	5	4	—	10	10	8	1
Total	17	17	4	8	24	24	4	2	41	41	8	10

future commitments in this regard. For this reason particularly, Table 3 should be used with caution.

It could be conceived that the relative 'age' of the two schemes is likely to influence development achieved for each £1 spent. As previously indicated, the Warangoi scheme is now at the maintenance stage where labour inputs per holding are on the average considerably less than on the Ilugi. On the assumption that spending to maintain a family does not change much according to the stage of block development, less development per £1 spent will occur during the maintenance stage. However, the survey found that family maintenance expenditure was generally a small proportion of total expenditure and that many of the Warangoi settlers have returned to their villages where living would normally be at the subsistence level. For these reasons 'age' is not likely to influence the figures of Table 3 to any great extent.

The Ilugi settler to which (b) of Table 3 refers, provides an interesting example of development that can be achieved without loan finance and without active participation by the lessee himself in work on his block. While the settler in question is regarded as being enterprising (he has a high earning rate in outside employment) the development he has achieved expressed as a labour input rate per £1 spent, i.e. five man-days, compares more than favourably with any settler included in the sample of the Warangoi scheme where all lessees themselves engaged in block development.(12)

It should be noted that Table 3 incorporates nothing concerning absolute levels of development reached or expenditure undertaken. This is another reason for caution being exercised in its use.

2. *Management and Labour.*

The Warangoi and Ilugi schemes are frequently criticised on the grounds that lessees are often absent from their blocks. The opinion is expressed that active participation in work being undertaken is an obvious corollary to successful development. This question is now examined.

Of the Warangoi settlers, 12 or about 70 per cent. of the sample taken were 'absentees' most of whom were residing in their villages at the time of the survey. In the Ilugi, all of the five absentee managers were in full-time wage employment or were conducting their own business.

Those lessees with residences on their holdings were classified as either 'full-time' or 'part-time' managers. (13) All settlers of both

(12) The question of unpaid obligations should also be considered, but it is thought that the Ilugi settler was virtually free of these at the time the assessment was made. In any case it is the extent of his outstanding obligations relative to the Warangoi settlers that is significant in the comparison.

(13) The basis of classification was a fairly loose assessment of 'full-time' managership, those not 'full-time' being logged as 'part-time'.

Table 5.

Management and Block Development.

SCHEME	WARANGOI		ILUGI		BOTH SCHEMES	
Management	Number in class	Development above average	Number in class	Development above average	Number in class	Development above average
FULL TIME	2(a)	—	13	7	15	7
PART TIME	3	1	6	2	9	3
ABSENTEE Village	7	3	—	—	7	3
ABSENTEE Business or Wages	5	5	5(b)	3	10	8
Total	17	9	24	12	41	21

(a) One manager in this group has a trade store on his block.
(b) One manager in this group has visited his block only twice and will probably lose his block because of lack of development.

schemes had employed casual labour to a greater or lesser degree.(14) The three main sources of this labour were nearby plantations, villages and neighbouring districts.(15)

Permanent or 'full-time' labour had also been employed, particularly by those absentee managers in full-time wage employment or in business.(16) None of the resident managers had employed permanent labour except for one full-time manager in the Ilugi.

Management and labour employed is summarized in Table 4. The data for unpaid labour refer to non-family labour and are probably very conservative estimates.

Table 5 relates types of management to block development. The data for full-time management do not indicate a connection between this and absolute levels of development. While part-time management seems to be associated with less than average block development, the number in this class is too small for any significant conclusion to be drawn.

The interesting point to emerge from Table 5 is the apparent connection in these two schemes between levels of development and lessees' full-time wage employment or involvement in some kind of business unrelated to cacao growing. For both schemes combined, eight of the ten settlers in this class achieved development above average for their particular scheme.

The inuference from the data of Table 5 is that, for the Warangoi and Ilugi schemes at least, full-time management is not a determinant of development but that development may be assisted greatly through wage employment and/or other business activity of the lessee. This assistance is most likely to act through the availability of additional finance, although some connection between outside employment and/or business and ability to manage labour efficiently, planning and decision making, enterprise and initiative etc. should not be discounted entirely. These attributes warrant further investigation as to their possible importance to successful cash-

(14) Estimates of casual labour could not be obtained.

(15) In some cases, to help develop a fellow villager's block, villagers combined, forming what is called a work "bung". Payment for work "bungs" is made not to individuals but to the village account. This type of labour is used mainly in the initial stage of bush felling and burning when large numbers are required for short periods. Labour from neighbouring districts is obtained mainly from the Bainings Census Division.

(16) Of the ten in this category, eight had employed full-time labour.

Fig. 2a
WARANGOI

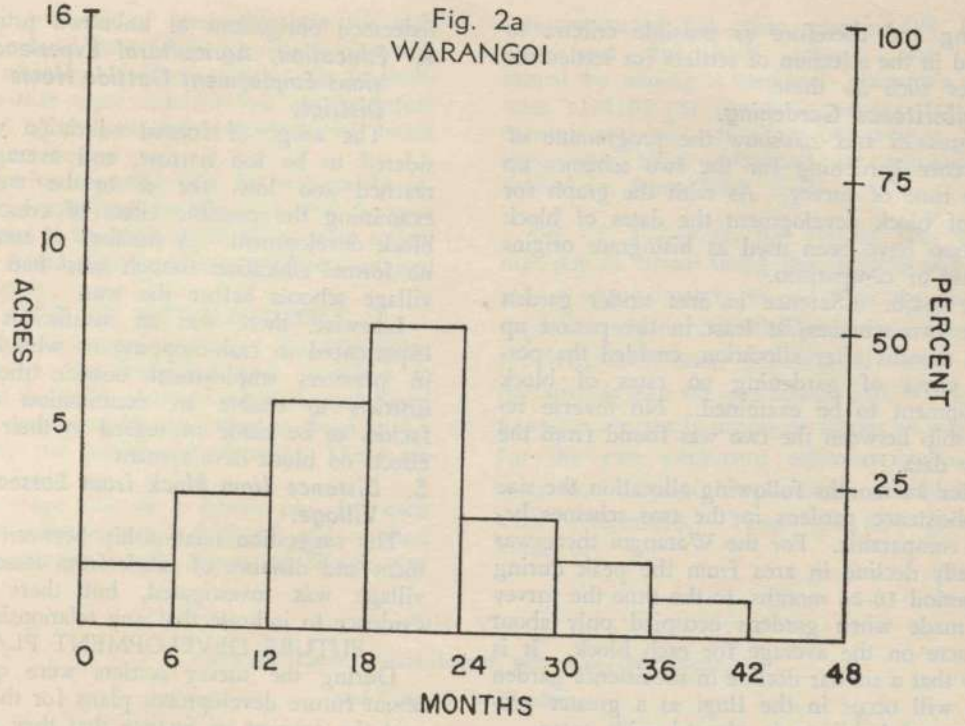
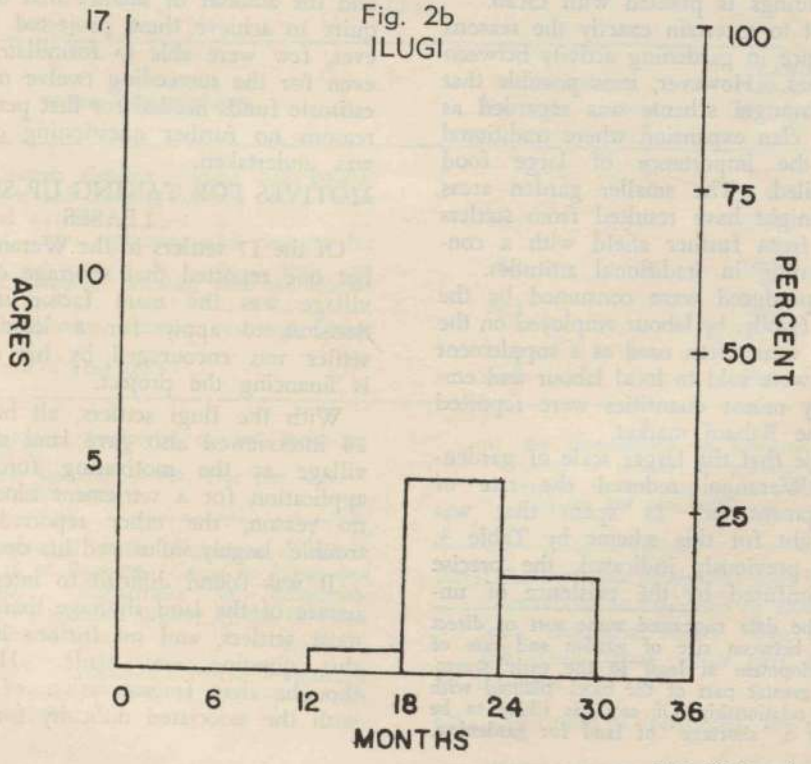


Fig. 2b
ILUGI



cropping and therefore as possible criteria to be used in the selection of settlers for settlement schemes such as these.

3. *Subsistence Gardening.*

Figures 2a and 2b show the programme of subsistence gardening for the two schemes up to the time of survey. As with the graph for rates of block development the dates of block allocation have been used as histogram origins for ease of comparison.

The major difference in area under garden in the two schemes, at least in the period up to 24 months after allocation, enabled the possible effect of gardening on rates of block development to be examined. No inverse relationship between the two was found from the survey data.(17)

After 24 months following allocation the size of subsistence gardens in the two schemes became comparable. For the Warangoi there was a steady decline in area from the peak during the period 18-24 months, to the time the survey was made when gardens occupied only about one acre on the average for each block. It is likely that a similar decline in subsistence garden areas will occur in the Ilugi as a greater proportion of holdings is planted with cacao.

It is difficult to ascertain exactly the reasons for the difference in gardening activity between the two schemes. However, it is possible that the earlier Warangoi scheme was regarded as an instance of clan expansion where traditional attitudes to the importance of large food gardens prevailed. The smaller garden areas in the Ilugi might have resulted from settlers being drawn from further afield with a consequent weakening in traditional attitudes.

Foodstuffs produced were consumed by the lessee and his family, by labour employed on the holding (they were often used as a supplement to wages) or were sold to local labour and employers. Only minor quantities were reported as sold in the Rabaul market.

It is possible that the larger scale of gardening in the Warangoi reduced the rate of block development per £1 spent that was brought to light for this scheme by Table 3. However, as previously indicated, the precise position is confused by the existence of unredeemed obligations of unknown proportions.

(17) In fact the data suggested some sort of direct connection between size of garden and rate of block development at least in the early stages. With the greater part of the block planted with cacao the relationship (if any) is likely to be affected by a 'shortage' of land for gardening.

4. *Education, Agricultural Experience, Previous Employment Outside Home District.*

The range of formal education was considered to be too narrow, and average levels reached too low, for it to be worthwhile examining the possible effect of education on block development. A number of settlers had no formal education though most had attended village schools before the war.

Likewise, there was an insufficient number experienced in cash-cropping or who had been in previous employment outside their home districts to enable an examination of these factors to be made in regard to their possible effects on block development.

5. *Distance from Block from Lessee's Home Village.*

The suggestion relationship between development and distance of block from lessee's home village was investigated, but there was no evidence to indicate that any relationship exists.

FUTURE DEVELOPMENT PLANS

During the survey settlers were questioned about future development plans for their blocks and the amount of finance that they might require to achieve these projected targets. However, few were able to formulate future plans even for the succeeding twelve months and to estimate funds needed for that period. For these reasons no further questioning of this nature was undertaken.

MOTIVES FOR TAKING UP SETTLEMENT LEASES

Of the 17 settlers in the Warangoi sample all but one reported that shortage of land in his village was the main factor influencing his decision to apply for a lease. The other settler was encouraged by his employer who is financing the project.

With the Ilugi settlers, all but two of the 24 interviewed also gave land shortage in his village as the motivating force behind his application for a settlement block. One gave no reason, the other reported that 'family trouble' largely influenced his decision to apply.

It was found difficult to interpret the exact nature of the land shortage that had motivated most settlers, and no further investigation of this question was made. However, it is thought that fragmentation of village lands with the associated difficulty for an individual

of isolating blocks of reasonable size for cash cropping would most likely describe the situation for the majority of these settlers. It is probable also that some consideration of the future livelihood of children was a contributing factor in their decision.

One settler reported that he was partly influenced in applying by the fact that he was unemployed at the time applications were called. Another stated that government officers advised him to apply.

COSTS OF ESTABLISHMENT

The technique used to derive the data given in Table 3 was extended and modified to determine the costs of cacao establishment based on work arrangements equivalent to those applying to the two settlement schemes. These are given in Table 4.

The average cost of a labour unit for each settlement scheme was calculated and applied to the successive yearly inputs of labour per acre estimated for cacao planting.[18] Labour unit cost for each scheme was determined by adding a standard 'operator's allowance' of £100 per annum to average total block expenditure, and dividing by average labour inputs per block calculated as previously described i.e. from Table 2.[19]

For the Warangoi, the average cost of one man-day of labour using this method was assessed at approximately 9s. 0d.; for the Ilugi, at approximately 6s. 0d.[20] The comparative figure for large-scale estate planting of cacao is approximately 11s. 0d. per labour unit.[21] Applied to successive yearly inputs of labour as was done for the two settlement schemes, comparative costs for large-scale plantation establishment were determined. These are also given in Table 6.

Table VI.

Costs of Cacao Establishment per Acre—Settlement and Large Scale Planting.

(£'s)

YEAR	WORK PROGRAMME	SETTLEMENT		LARGE-SCALE PLANTING (a)	
		Warangoi	Ilugi	Modified (b)	Actual (c)
1.	Felling and rough clearing; lining and holing, planting shade and cleaning for one year; cacao planting and nursery	49.5	33.0	60.0	54.3
2.	Shade control, cacao replanting and cleaning for one year	8.1	5.4	10.0	8.2
3.	Shade control, cleaning, pruning, pest and disease control	13.5	—	16.0	13.6
4.	Shade control, cleaning, pruning, pest and disease control	10.8	—	13.0	10.9
Total cost up to end of Year 4(d)		81.9	—	99.0	87.0

(a) Department of Territories, *op. cit.*, Table No. 26, P. 35.
(b) For closer spacing — 350 trees per acre.
(c) 225 trees per acre.
(d) No adjustment on account of change in value of money. If operator's allowance reduced to £50 per year, costs for Warangoi drop to £64 per acre.

(18) According to the work programme given in Table No. 26 of Page 35 '*Cocoa in Papua and New Guinea*'. Department of Territories. Canberra, 1958, modified slightly by the inclusion of land clearing in Year 1.

(19) The operator's allowance of £100 can be regarded as the 'opportunity' cost of his labour and managerial capacity.

(20) The difference in man-day costs between the two schemes can be explained by unredeemed obligations, managerial ability, stage of development and other factors which have been previously discussed.

(21) Department of Territories, *op. cit.*, Page 34.

The table suggests that cacao establishment can be undertaken more cheaply in small-scale indigenous settlement schemes than through the large-scale estate-type of planting. This contention would be reinforced if account were taken of the diminishing purchasing power of money between the (earlier) period when data were collected for the latter, and the period of development of the settlement blocks. However, the figures of Table 6 are by no means authoritative and should be used with caution. The Table also has nothing to say about other non-monetary aspects of small-scale versus large-scale type of development.

On the basis of levels of development achieved, the efficacy of every £1 spent by settlers, and the costs of establishment compared to large-scale estate planting of cacao, the Warangoi and Ilugi schemes up to their present stage of development must be regarded as successful.

APPENDIX
SAMPLING METHOD

Within each settlement scheme a 100 per cent. random sample of settlers was drawn, with the first 50 per cent. comprising the actual sample. The remaining settlers became reserves about which data were to be collected if required in the order of selection. Only where the settler settler could not be interviewed without undue delay and cost, or where his whereabouts could not be discovered after three attempts to locate him, were reserves to be used.

Only three reserves were called on. One settler was away on holiday in New Ireland, one could not be interviewed without undue delay village and block, and the third had died and his widow could not trace the development of the block.

Each settler was interviewed in relation to his place of origin, date of occupying the block, development per year, labour employed, cost of labour if any, extent of own savings invested, loans if any, type of management, future development plans, etc.

In each case, settlers were very willing to discuss their blocks and it seems that the answers were given in good faith. In fact, practically all had firm estimates of the amount of money expended on their blocks but none had any clear conception of plans for future development.

(Received March, 1964)

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