NOTES ON THE FOOD HABITS OF PUNTIUS SIRANG AND GLOSSOGOBIUS GIURUS

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The endemic cyprinids of Lake Lanao have been of interest to many inland biologists, although very little is known about their ecology and biology. What is known about the lake endemic cyprinids (Table I) are found in the works of Herre (1924, 1925), Villaluz (1966), Wood and Wood (1963a, 1963b), Lewis (1974). Most of these works are taxonomic, with some distribution of lake cyprinids. The evolution of endemic cyprinids was discussed by Myer (1960). Both Herre (1933) and Myer (1960) argued that all the endemic cyprinids of Lake Lanao evolved from a single progenitor, *Barbodes* (referred to by others as *Barbus* or *Puntius) binotatus* (See Frey, 1974). Preliminary work on the biology of some endemic cyprinids was started by Scott (1964) who has not yet published his findings.

TABLE I. LIST OF ENDEMIC SPECIES OF CYPRINIDS REPORTED IN LAKE LANAO BY HERRE (Villaluz, 1966)

Scientific Name	:	Maranao Name
Mandibularca resinus	:	Bagangan sa Erungan
Cephalacamsus pachychilus	:	Bitungu
Ospatulus palaemophagus	:	Bitungu
Puntius baolan	:	Baolan
Ospatulus truncatulus	:	Bitungu
Puntius amarus	:	Pait, Dipura
Puntius binotatus	:	Pait
Puntius clemensi	:	Bagangan
Puntius diza	:	disa
Puntius flavifuscus	:	tumba
Puntius katolo	:	katolo

Puntius lanaoensis	:	kundur
Puntius lindog	:	lindog
Puntius manalak	:	manalak
Puntius sirang	:	sirang
Puntius tras	:	tras
Puntius tumba	:	tumba
Sprattllicypris palata	:	palata

Endemic cyprinids constitute the majority of native species in the lake. Herre (1924) mentioned 14 species under 3 genera; later he added 4 species under one genus (see Villaluz, 1966). Based on this report, there are then about 18 species under 4 genera—the number mentioned in the reports of Myer (1960) and Villaluz (1966). Wood and Wood (1963) mentioned 24 species under 5 genera (See Table II). Frey (1974) asserts that there may be more species. Our survey suggests that the number of species has been reduced in recent years, including the paleomonid shrimps. We attributed this population decrease to three factors: 1. the mismanagement of lake fishing; 2. deforestation of important watersheds around Lake Lanao; and 3. introduction of the white goby, *Glossogobius giurus.*

TABLE II. List of Endemic Cyprinids reported by Wood and Wood (1963).

Mandibularca resinus
Cephalakompsus pachychellus
Ospatulus palaemophagus
Ospatulus truncatulus
Hampala lopezi*
Puntius amarus
Puntius baolan
Puntius binotatus
Puntius clemensi
Puntius cataractae*

Puntius disa
Puntius flavifuscus
Puntius collingwoodi*
Puntius ivis*
Puntius herrei*
Puntius katolo
Puntius lanaoensis
Puntius lindog
Puntius manalak
Puntius sibukensis*
Puntius sirang
Puntius tras
Puntius tumba
Spratellicypris palata

*New addition of Wood and Wood.

The white goby locally called *kadurog* is one of the largest of the Family Gobildae. It thrives in rivers, lakes and the seas from the Philippines and East Indies, North to China, East to Polynesia, West to India and the East coast of Africa (Herre, 1927). Although widely distributed, it still is not considered important in many countries. In the Philippines, it is one of the six species that contribute to the commercial importance of *ipon* or *hipon* (goby fry) fisheries (Marquez, 1968).

In Lake Lanao, the white goby was accidentally introduced presumably with the milkfish fry planted by the Philippine Fisheries Commission, now the Bureau of Fisheries in 1962-64, according to Villaluz (1966). In a few years, its population rapidly grew. According to lake fishermen and to our survey, the goby now ranked second by weight among the fish landed in Marawi City market in the province of Lanao del Sur with a daily average of 700 kg.

Villaluz (1966) reported 981,120 kg. of endemic cyprinids and 127,750 kg of white goby landed in 1963-64 (See Table III). The goby ranked third among the species landed that year.

Our survey, (Aug.-Dec. 1973) showed that 302,195 kg. of cyprinids, mostly *Puntius sirang,* and 266,061.2 kg. of goby were landed

TABLE III. Volume of Indigenous and Introduced fishes caught in Lake Lanao, 1963-64 (From Villaluz, 1966).

Fishes caught	Weight (kg.)	Total catch (%)
A. Indigenous Species		
1. Cyprinids	981,120	49.39
2. Aruan	237,250	11.49
3. Katipa	20,075	1.05
4. kasili	2,920	0.14
5. odang	56,575	2.85
6. soso	200,750	10.11
B. Introduced		
1. Carp	237,250	10.11
2. tilapia	109,500	5.53
3. kadurog (white goby)	127,750	6.4
4. gorami	2,920	0.15
5. tamban	1,095	0.05

in the market. Species of great commercial value reported by Villaluz (1966) such as *Puntius lindog, P. baolan, P. clemensi, P. diza, P. palata* and *P. manalak* which in 1963-64 averaged around 3,000 kg. daily have radically decreased. In most cases (more than 50% of the time) five or six individuals of these species are landed monthly at the market.

Our present work includes studies on the biology and taxonomy of the endemic cyprinids, induced breeding of freshwater fishes (Sanguila, et. al., 1974), lake limnology, a continuing work of Frey (1974) and Lewis (1974). Part of the work is aimed at assessing the present status of lake fishes, both the endemic and introduced species.

The present report covers our initial findings on the food habits of the two most common fish in Lake Lanao, -*Puntius sirang* and *Glosso-*

TABLE IV. Volume of fishes caught in Lake Lanao Landing survey of the Marawi City market, 1973)

Fishes caught	Weight (kg.)
A. Indigenous	
1. Cyprinids	302,195
Puntius sirang	301,788
Puntius lindog	90
Puntius manalak	122
Puntius tumba	123
Puntius katolo	123.6
Bagangan	24
bitungu	48
2. Aruan	21,648
3. katipa	18,930
4. odang	41,654
B. Introduced	
1. carp	12,206.4
2. tilapia	79,454
3. kadurog (white goby)	266,061.2
4. gorami	1,014

gobius giurus. The present study started in August 1973 is a continuing work.

The fish samples were mainly purchased at the Marawi City market and from fishermen. Separate samplings were taken for the morning and afternoon landings and catch. They were weighed and measured from the tip of the head to the fleshy peduncle at the Department of Biology laboratory, Mindanao State University. They were dissected, their stomach contents examined under compound and stereo microscopes. The food items were sorted out and their frequency of occurrence was determined based on the proportion of samples in which each item is present. The food in the *Puntius sirang* were identified to genus level. The quantitative analysis of the food habits of the species studied will be reported in a forthcoming paper.

Results and discussion

The results of our examination is shown in Tables V and VI.

TABLE V. Food Items found in 235 stomachs of Puntius sirang

Food Items	No. of fish	Percentage of occurence
Tabellaria	116	49.23
Cosmarium	106	45.55
Navicula	101	42.97
Closterium	91	38.73
Synedra	75	31.90
Netrium	73	31.06
Spirogyra	58	25.13
Nitzchia	50	21.70
Zygnema	45	19.23
Unidentified zooplankton	35	14.89

TABLE VI. Food items in 431 stomachs of Glossogobius giurus

Food items	No. of fishes	Percentage of occurence
Shrimps	201	49.62
Phytoplanktons	91	22.46
Fish	41	10.12
Spirogyra	37	9.13
Mayfly nymphs	15	3.45

There were 235 *Puntius sirang* examined, their length ranging from 65 mm to 195 mm. Our data showed that it is primarily a phytoplankton feeder. The genera *Tabellaria, Cosmarium* and diatom, *Navicula,* dominated the food items found in the stomach (See Table V). About 14% of the food items were unidentified zooplanktons.

Forty-two per cent of the fish samples were gravid females; 65% of the gravid samples were collected in November. Although gravid females were collected in all monthly samplings, the data did not indicate whether the *P. sirang* breeds all the year round.

Wood and Wood (1969) asserts with no quantitative data that the *Puntius sirang* fed heavily on the paleomonid shrimps. In all fish samples examined, no shrimps were found in the stomachs.

Four hundred thirty-one gobies were examined, ranging from 85 cm to 112 cm in length. Two hundred one gobies (49.62%) contained shrimps while 91 (22.41%) had phytoplanktons in their stomachs. Marquez (1968) indicated that the white goby in Lake Laguna are primarily phytoplankton feeders. While our data showed that the goby of Lake Lanao also fed on phytoplanktons, they tend to show that the Lake Lanao gobies are primarily carnivorous, feeding heavily on shrimps. This is in agreement with Villaluz' (1966) observation. The occurrence of scales and fragments of fish body agrees with the observation of Marquez (1968). Two fish species– they were the *Puntius sirang* and the *Glossogobius giurus*– were found in the goby stomach. Mayfly nymphs (8.64%) were also found in the stomachs of 15 samples.

The decrease in the population of cyprinids and paleomonid shrimps has been observed and reported since 1966. To be able to rehabilitate the lake's fish fauna, biological understanding of these unique cyprinids is necessary. The meager data we have collected tended to show that:

1. The *Puntius sirang* is primarily phytoplankton feeders.
2. Our monthly sampling indicate that the *P. sirang* breeds throughout the year, although this observation needs further checking.
3. The white goby primarily feeds on shrimps, secondarily on phytoplanktons. Our data showed that they are also piscivorous, in agreement to the findings of Marquez (1968).
4. The white goby is a factor in the depletion of paleomonid shrimps in Lake Lanao.
5. The increase of white goby in fishermen's catch as observed in our survey might be responsible for the disappearance of valued species of endemic cyrprinids by acting as keen competitors for space in feed-

ing and breeding. This would be in consonance with Frey (1974) who says that the endemic cyprinids evolved in the absence of predators.

The white goby has been observed to be widely distributed now in Lake Lanao, including the mouth of important rivers that open into the lake.

The steady increase of the white goby cannot be checked at present. Inocencio Ronquillo, chief biologist of the Philippine Council for Agricultural Research (personal conversation with the authors), said that there is no way of controlling or eliminating the goby, either by artificial or natural methods, in order to give the endemic cyprinids, especially the valued species a chance to propagate. Our recent survey, Jan.-Feb. 1975, indicated that some valued species reported in 1973 were no longer found in the fishermen's catch.

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