FOOD OF CERTAIN FISHES FROM STREAMS NEAR RAWALPINDI

O. Lloyd Meehean

Zoology Department, Gordon College, Rawalpindi

(Received November 26, 1965)

The purpose of this report is to correlate the food taken by fishes to organisms available in the area and to find out the frequency of food.

Out of 13 species studied, 6 had considerable debris in the gut, 7 consumed insects primarily, only *Ompok* bimaculatus lived on small fishes.

The population of fishes feeding on debris was nearly equal to those insect feeders. The stricking features of the streams of this area is that piscivorous fishes are very rare, only one species *Ompok bimaculatus* was found. A well balanced population of piscivorous fishes plays a key role and the ratio between them and smaller species which are of no commercial value may be maintained 1:3 or 1:4.

Introduction

As a part of an investigation into the productivity of streams in the Rawalpindi area, a study was made of the gut contents of fishes collected in the same vicinity, where samples of bottom dwelling organisms were collected. The purpose was to try to correlate the foods taken by fishes to the organisms available in the area. The basic idea of this report is to present information as to the frequency and the kinds of food taken by the fishes collected.

Materials and Methods

Fishes were collected from stations in the vicinity of Rawalpindi. Those from the Korang Nullah were located 16 miles above the city, below Rawal Dam, at Lethrar Road, and at Nurpur which is at the headwaters of one of the branches of the Korang Nullah. A collection was also made from the Gumrah Nullah at Lethrar Road. In the Leh Nullah fishes were taken at the headwaters of one branch at Saidpur, and in the city limits near the Holy Family Hospital. Collections from the Soan River were collected from the Wah Stream, one at the bridge on Peshawar Road above the springs, and one below the springs from the main stream.

The fishes were collected by fishermen with cast nets, and by the author with a drag seine. The author wishes to thank the U.S. National Museum in Washington, D.C. for the use of equipment, and Dr. Nazir Ahmed, Director of Fisheries, West Pakistan, for identifying the fishes. The identification of two species, which were not sent to the Department, is in some doubt. They are *Barbus* (*Puntius*) *punjabensis* and *Labeo pangusia.* Professor Rashid Ali and Professor Khadim Hussain assisted in the collection.

All the fishes were preserved in formaldehyde immediately after the catch. The body cavity of larger ones was injected to stop the digestive processes.

In the laboratory the gut was removed and both the stomach and intestine were examined. A record was made of the foods according to whether they were predominant, abundant, common, or present. From those fishes eating algae or bottom debris no attempt was made to develop an exhaustive list of all the varieties. This would require special study. Only enough of the gut contents were examined to obtain an accurate picture of the order of predominance of various food items and their significance in the diet. Each fish was recorded separately.

Foods Eaten by Fishes

Thirteen species of fishes were collected in the sampling. At least six species had eaten considerable debris. The debris consists of organic matter which collects on the bottom from material brought into the water as leaves, grass, decaying algae, etc. These species include (Chiddu), *Barbus* (*Puntius Sophore Garra jordoni*, (Baunchee) *Chela, sp.* (Rohu) *Labeo rohita, Barbus* (*Puntius*) *punjabensis,* and *Labeo pangusia.* The Debris usually included some clay silt brought down by the rain and lodged in the foods consumed. In close relationship to the bottom deposits was a rich culture of diatoms and some macro-crustacea and insect larvae. (*Puntius*) *punjabensis* fed almost entirely on Diatoma with trichoptera and Chironomidae found in one specimen.

Seven species consumed insects primarily. These include *Barilius vagra, Barbus* (*Tor*) *putitora, Barbus* (*Puntius*) *ticto, Nemachilus botia, and Mystus sp.* A number of them consumed filamentous algae incidental to the capture of insect larvae. Of all the species taken, only Palla, *Ompok bimaculatus,* had eaten fish. At the same time the predominant food was Ephemeridae. *Labeo boga* consumed insect food primarily, but a few stomachs contained debris.

In Tables 1–3 there are three columns (the last three) to show the kinds of food taken. Frequency is the percentage of the total number of fish in which a food appears. It demonstrates the favoured or the preferred foods of the various species of fish. It may or may not be the predominant food in individual stomachs.

The column headed as "predominance" shows the order in which a food occurred in the largest amount in different species. The food must be significant in amount to be recorded as predominant.

The last column contains a list of organisms that occur in the gut. They usually are not

TABLE 1.—GUT CONTENTS OF FISHES.

Species	Length inches	Frequency percentage		Predominance	Present
Barbus (Puntius) Sophore	$\frac{9}{16}$ — $4\frac{3}{8}$	Diatoma	.. 58.0	Diatoma	Fragillaria
		Navicula	.. 54.0	Osdillatoria	Coelastrum
		Epithema	.. 33.0	Hormidium	Geminella
		Spirogyra	.. 25.0	Spirogyra	Surirella
		Meridon	.. 19.0	Chironomidae	Ulothrix
				Cyclops	Eurastrum
		Cladocera	.. 19.00	Meridon	Ephemerida
		Coccochloris	.. 19.0	Cocochloris	Cladocera
		Surirella	.. 19.0	Melosira	Gomphonema
		Chironomidae	.. 17.0	Debris	Microspora
Total specimens—48		Microcrustacia	.. 17.00	Epithemia	
		Tabellaria	.. 12.0	Tabellaria	
		Fragillaria	.. 12.00	Cladophora	
		Gomphonema	.. 7.0	Navicula	
		Microspora			
Garra jerdoni	$1\frac{1}{2}$ – $5\frac{3}{8}$	Navicula	.. 51.0	Debris	Merismopedia
		Diatoma	.. 47.0	Amphora	Cosmarium
		Epithema	.. 24.00	Navicula	Volvox
		Closterium	.. 21.0	Oscillatoria	Synedra
		Spirogyra	.. 19.0	Fragillaria	Euglena
		Oscillatoria	.. 14.0	Closterium	Surirella
		Surirella	.. 14.0	Sigmoida	Cymbella
		Fragillaria	.. 14.0	Diatoma	
		Cosmarium	.. 14.0	Epithema	Nitzchia
		Merismopedia	.. 13.0	Ulothrix	Sygnema
		Sporangia	.. 11.0	Rivullaria	Sponge Spicules
		Amphora	.. 11.0	Spirogyra	Bacillaria
		Microspora	.. 11.0	Surirella	Chironomidae
		Rivularia	.. 10.0	Mastoglia	Sporangia
		Meridon	.. 8.0	Gyrosigma	Meridon
Total Specimens—90		Ulothrix	.. 8.0	Microspora	
				Microcrustacea	
				Limnodrilus	
Chela sp.	$1\frac{3}{4}$ – $4\frac{3}{4}$	Epithema	.. 45.0	Debris and clay	Surirella
		Navicula	.. 45.0		Meridon
		Surirella	.. 40.0	Oscillatoria	Sporangia
		Fragillaria	.. 34.0	Coccochloris	Diatoma
		Merismopedia	.. 29.0	Epithema	Rotifera
		Cosmarium	.. 23.0	Merismopedia	Anabaena
		Diatoma	.. 23.0	Fragillaria	Gomphonema
		Rotifera	.. 11.0	Surirella	Euglena
		Spirogyra	.. 11.0	Navicula	Protozoa
		Meridon	.. 9.0		Cosmarium
					Scenedesmus
					Gyrosigma
					Spirogyra
					Chaetogaster

TABLE 2.—GUT CONTENTS OF FISHES.

Species	Length inches	Frequency percentage		Predominance	Present
Barilius vagra	$1\frac{1}{2}$–$3\frac{3}{8}$	Diptera pup	34.5	Diptera pupue	
		Ephemerida	24.5	Ephemerida	
		Chironomidae	13.3		
		Coleoptera	10.00	Trichoptera	
Total number		Ceratopogoninae		Chironomidae	
Examined 90			3.3	Anisoptera	
		Zygoptera	2.2	Zygoptera	
				Ceratopogoninae	
				Notonecta	
Labeo boga	$1\frac{15}{16}$–$4\frac{1}{8}$	Diptera	47.00	Diptera pup	Diatoma
		Ephemerida	17.0	Ephemerida	Ulothrix
		Chironomidae	13.0	Spirogyra	Tabellaria
		Spirogyra	13.0	Debris	Pinnularia
		Tabellaria	13.0	Copepods	Navicula
Total examined 23		Debris	8.7		
		Mougotia	8.7		
		Copepoda	8.7		
Barbus	$\frac{1}{8}$–$4\frac{1}{4}$	Ephemerida	44.4	Copepoda	
(*Puntius*)		Trichoptera	27.7	Cladophora	
ticto 1		Spirogyra	22.7	Trichoptera	
		Ostraooda	11.1	Spirogyra	
		Copepods	11.1	Schizogoneum	
Total examined 18				Diptera pup	
				Ephemerida	
Barbus (*Tor*)	$1\frac{1}{4}$–$\frac{7}{8}$	Ephemerida	44.0	Chironomidae	Planaria
putitora		Trichoptera	29.00	Trichoptera	Spirogyra
		Spirogyra	22.0	Ephemerida	Navicula
		Ostracods	11.0	Ceratopogoninae	Daphnia
		Copepods	11.0	Diptera Pupae	Alonella
		Diptera	11.0	Empty	Ulothrix
		Algae Uniden	11.0	Paleamon	Ephippial eggs
		Cladocera	5.0	Lmnodrilus	Cyclops
		Ceratopogoninae	5.00		Ostracoda
		Fish eggs	5.0		G stropoda
					Zygoptera
					Arachnida

TABLE 3.—GUT CONTENT OF FISHES.

Labeo rohita 5-7-9				Bottom debris and clay	Diatoma
					Navicula
					Oscillatoria
Total specimens 3					Fragillaria
					Epithema
					Geminella
Barbus	1 – $\frac{7}{8}$	Diatoms ..	100	Diatoms	Chironomidae
		Chironomids ..	9		Trichoptera
Punjabensis		Trichoptera ..	9		
Labeo pangusia	$6\frac{1}{2}$ – $8\frac{3}{4}$	Debris and silt ..	100	Debris and silt	Amphora
		Amphora ..	100		Mastoglia
		Cosmarium ..	60		Microspora
		Navicula ..	60		Oscillatoria
					Surirella
					Cosmarium
					Sporangia
					Spirogyra
					Epithema

Table Continued:—

				Navicula
				Coelastrum
				Closterium
				Pediastrum
Total specimens 5				Diatoma
Memachilus	$1\frac{3}{4}$–$2\frac{1}{8}$	5 specimens	Chironomidae	Trichoptera
			Ephemerida	Diptera pupae
Ompok	$2\frac{3}{4}$	2 specimens	Fish and	
bimaculatus	$5\frac{5}{8}$		Ephemerida	
Mystus sp.	$2\frac{7}{8}$–$5\frac{1}{2}$	3 specimens	Chironomidae	Trichoptera
				Cules
				Zygoptera
				Ceratopogoninae
				Tabanidae
				Diptera pupae

significant in volume, but may occur commonly, or abundantly, or occasionally. No attempt was made to compile an exhaustive list of unicelluar or other algae, since it would require time consuming efforts. The significant fact is the determination of the typical foods of different species.

Discussion

One of the striking characteristics of the fishes collected is the absence of piscivorous species. Only one species consumed fishes. In a well-balanced population piscivorous varieties play a key role. For example, Meehean found, in Florida Lakes with balanced populations, that the ratio of predators (piscivorous) to supporting populations (omnivorous or other varieties) was in the ratio of 1 to approximately 2.5. The author does not have his references at hand, but H.S. Swingle* of Auburn University, in balanced farm ponds has maintained a ratio of 1 to 4 lb. That is 1 lb. piscivorous to 4 lb. of supporting species. Minor† Clark in studies of streams of Kentaucky found a ratio of approximately 1 to 3. The piscivorous varieties are usually abundant enough to keep the smaller varieties under control so that the highest productivity of food fishes is obtained.

The populations were about equally divided between fishes utilizing bottom debris and those consuming insects. The number of specimens examined in each case roughly represents the abundance in the habitat. The populations were made up primarily of small noncommercial varieties, with a few which grow to commercial size. For example, *Masheer*, *Barbus* (*Tor*) *putitora* may reach nine feet, *Lebeo boga* one foot or more, and Rohu, *Labeo rohita* 3 feet. The number of species consuming bottom debris and its related flora is much larger than that found in fish populations of western countries. It may be significant that ten of the species taken were Cyprinidae.

CHLOROPHYTES AND PLANKTON ANIMALS TAKEN AS FOOD BY FISHES.

Phycomycetes	*Bacillariophyceae* (cont.)	*Chlorophyceae* (filamentous)	
Fungus	Gyrosigma	Microspora	
Sporangia	Cyclotella	Schizogomium	
	Navicula	Spirogyra	
Myxophyceae	Gomphnema	Zygnema	
Merismopedia	Amphora	Mougotia	
Coccochloneis	Opiphora	Ulothrix	
Rivularia	Melosira	Hormidium	
Oscillatoria	Sigmoidia	Oedogenium	
Phormidium	Frustulia	Pithophora	
Anabaena	Bacillaria	Cladophora	
	Nitzchia	Tribonema	
Bacillariophyceae	Pinnularia	Chaetophora	
Fragillaria		Stigeoclonium	
Tabellaria	*Desmidaceae*		
Synedra	Closterium	*Protozoa*	*Cladocera*
Meriden	Cosmarium	Volvox	Daphnia
Diatoma	Coelastrum	Euglena	Macrothrix
Diatomella	Pediastrum	Unidentified	Bosmina
Cocconeis			Chydorus
Surirella	*Chlorophyceae*	*Rotitaris*	*Copepoda*
Caloneis	Ankistrodesmus	Rotifera	Cyclops
Epithema	Scenedesmus		Diaptomus
Rhopolodia	Coccomysa	*Oligocheata*	
Mastogloia	*Porifera*	Tubifex	Cantho-camptus
Cymbella	Spong spicules	Chaetogaster	Nauplii
			Ostracoda

References

1. Nazir Ahmad, *Fishes of Lahore* (Bull Dept. of Zoology, 1943), vol. 1, pp. 253—374.
2. Day Francis, *The Fishes of India* (Dawson and Sons, Ltd., 1959).
3. *Meehean, O. Lloyd, *Fish Population of Five Florida Lakes.*
4. Meehean, O. Lloyd, Trans. Am. Fisheries Soc., **71** 184-194 (1952).
5. O. Lloyd Meehean and Rashid Ali, Pakistan J. Sci. Ind. Research, 46 (1967).

* Swingle and Smith at Auburn University have conducted extensive experiments to develop populations and species balance in ponds for the maximum production of fish.

†Minor Clark removed the whole population from certain sections of rivers in Kentuckp for the determination of their composition.