

BOTTOM FAUNA OF THE STREAMS AND RIVERS OF HAZARA DISTRICT AFTER SUMMER RAINS

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The gut contents of 7 species of fishes were studied and it was found that 6 species live primarily on bottom organisms and one i.e. *Nemacheilus botia* lives on diatoms and algae.

Introduction

The purpose of the present investigation is to determine the production of bottom fauna of the streams and rivers of Hazara district by number and weight per unit area and to relate the bottom organisms with the food of fishes.

Physical Features

Hazara district lies at the base of the Himalayas in the north-east of West Pakistan between $33^{\circ}44'$ and $35^{\circ}10'$ north latitudes and $72^{\circ}3'$ and $74^{\circ}6'$ east longitudes. The district stretches 120 miles from south-west to north-east, the Kaghan Valley running up between Kashmir and mountainous region that drains into upper Indus. The space between mountain systems is occupied by even tracts of varying size and character. Pakhli plain is present in Manserah tehsil, and Rash plain on the southern end. Mangal and Rash plains are 4000 ft above sea level. Manserah is 16 miles from Abbottabad and is 3,682 ft above sea level. Dadar is situated 15 miles from Manserah at the entrance of Bhogarmang valley. The Kaghan Valley lies in the northern-most portion of the district. The average width of the valley is 15 miles. There are a number of lofty peaks: the highest Malika Parbat is 17,360 ft above sea level. Most of the forests of the district are in Kaghan.

The important rivers of the district are the Siran, the Dor, the Harroh, and the Kuhnar. The Indus river skirts it on the west for 30 miles and the Jhelum river on the east for 25 miles. The Siran rises in the north of the Bhogarmang valley, flows through western part of the Pakhali, then dives into the Tanwal hills, and after flowing through former states of Phulara and Amb States emerges in the Haripur plain and turns north-west to join the Indus at Tarbela. The Dor is shorter and more rapid. It rises in the northern end of Dungagli range, flows through Haripur plain and joins the Siran 5 miles above the Tarbella. The Harroh rises at the southern end of Dungagli and flowing through Khanpur tract enters Rawalpindi district. The Kuhnar rises from the lake

Lulu Sar at the head of Kaghan Valley and after a turbulent course of 110 miles joins the Jhelum at Pattan.

The climate of the district varies on account of its topography. In Haripur tehsil, the heat of the lower hills is very severe and the temperature often goes up to 110°F in Haripur. In Rash and Pakhli plains, the summer is generally pleasant, and the winter severe. Frost is frequent and snowfalls occur in January.

The water temperature is low in streams of Abbottabad and Manserah. During the day-time in September the water temperature varies from 55°F to 60°F , and the pH from 7.5 to 8.0.

The annual average rainfall is 30" in Haripur tehsil, 45" in Abbottabad, 32" in Manserah, and 60-70" in Dungagali range. About two-thirds rainfall is in summer from April to September and one-third is in winter from October to March.

Methods

Bottom samples collected by a surber sampler and were washed through sieves to separate silt, gravel and debris. The samples were placed in wide-mouth bottles and preserved in formalin. At least two samples were taken from each place. In the laboratory the samples were washed to remove silt and formalin. The material was then placed in petri dishes, and organisms were picked up under dissecting binocular microscope. They were identified and recorded by numbers on cards for each sample and were weighed. The identification was done up to class, order to genus. The organisms of each sample were preserved for further study of taxonomy and distribution.

In addition to bottom organisms, fishes were also collected generally from the areas from where bottom samples were taken. Fishes were preserved in formalin. In the laboratory fishes were dissected and their gut contents were studied to show the relation of bottom organisms with that of the food of fishes.

Places of Collection

For the purpose of the collection of bottom organisms, the area was divided into three regions, Haripur-Hawalian, Abbottabad, and Manserah.

Haripur-Hawalian Region.—This region is a plain and the gradient or slope is usually low or moderate. The collection was made from a stream under the Khal bridge on Hasanabdal-Haripur Road, in Haripur proper from a water channel, and in Hawalian in the Dor river.

Abbottabad Region.—A stream on Abbottabad-Manserah Road about 2 miles from Abbottabad proper, and two streams in Nawasher near Ilyasi Mosque.

Manserah Region.—A stream near Ashoka Pillars, and the Siran river and streams near Dadar Village.

Productivity of Bottom Fauna by Number (Tables 1-3)

Productivity was used by Hazzard⁷ to classify streams. His standards were: Grade I (rich streams)—more than 22 g bottom organisms m² or 2152 organisms; Grade II (average)—11–22 g or 1076 organisms; Grade III (poor)—less than 11 g or less than 1076 organisms m².

According to Usinger,¹⁶ “Riffles are more productive than pools; rubbles and gravel bottoms are more productive than bedrock, sand and plant beds in streams are very productive”. Meehan and Ali⁹ found that low gradient and polluted streams of Rawalpindi are more productive, and the moderate gradient streams of Wah show high productivity due to plant bed. The areas under investigation are generally of high gradient (slope).

In the Haripur-Hawalian region clear water organisms e.g., the ephemeropteran nymphs and trichopterous larvae are found in the stream under the Khal Bridge. The productivity of organisms is of Grade III. In the water channel of Haripur, water was polluted and fast running. Clear water organisms are absent. Oligochaetes and chironomid larvae are abundant. The productivity is of Grade I, i.e., 69,696 organisms m². This number is the highest in the streams of the district. In the Dor river clear water organisms are absent and the productivity is of Grade III.

In Abbottabad the streams are fast running. Clear water organisms are found in the stream near Abbottabad and near Ilyasi Mosque. The productivity is of Grade I. In stream No. 2 near Ilyasi Mosque the productivity is low.

In the Manserah region, the stream near Ashoka Pillars showed high productivity. Clear water organisms are entirely absent. At Dadar in stream No. 1 clear water organisms are present and the productivity is of Grade II. Stream No. 2 and the Siran river have no clear water forms and the productivity is very low.

TABLE 1.—NUMBER OF ORGANISMS Ft² IN HARIPUR—HAWALIAN REGION.

Organisms	Khal bridge	Haripur	Dor river (Hawalian)
Planarians ..	—	—	1
Oligochaetes ..	1	6112	3
Dragon fly nymphs ..	1	4	—
<i>phemeropteran nymphs</i>			
Baetis Sp ..	3	—	5
Caenis Sp ..	10	—	—
Trichopteran larvae ..	14	—	—
Coleoptera adults ..	1	—	—
Coleoptera larvae ..	2	—	—
Chironomid larvae ..	43	204	1
Chironomid pupae / ..	43	204	1
Chironomid adults ..	1	—	1
Other diptera ..	1	—	—
Fish fry ..	—	—	1
Total organisms ft ² ..	83	6336	13
Total organisms m ² ..	913	69696	143

TABLE 2.—NUMBER OF ORGANISMS Ft² ABBOTTABAD REGION.

Organisms	Abbottabad Manserah road	Ilyasi mosque stream No. 1	Ilyasi mosque stream No. 2
Planarians ..	—	7	—
Nematode ..	—	1	—
Oligochaetes ..	332	23	75
Cocoons of Oligochaetes ..	3	—	—
Leeches ..	3	4	—
<i>Ephemeropteran Nymphs.—</i>			
Baetis sp ..	2	45	1
Caenis sp ..	5	—	—
Heteroptera ..	1	—	—
Chironomid larvae ..	93	1	5
Chironomid pupae ..	16	3	—
Chironomid adults ..	1	—	—
Ceratopogonid larvae ..	1	1	—
Tabanid larvae ..	1	—	—
Other diptera ..	1	1	—
Terrestrial insects ..	1	2	—
Arachnid (mites) ..	1	—	—
Gastropoda (Limnaea sp.) ..	1	2	—
Total organisms ft ² ..	471	106	82
Total organisms/m ² ..	5,181	1,166	902

TABLE 3.—NUMBER OF ORGANISMS Ft² IN MANSERAH REGION.

Organisms	Stream near Ashoka pillars	Dadar stream No. 1	Dadar stream No. 2	Dar (Siran river)
Hydra ..	10	—	—	—
Nematodes ..	—	—	1	—
Oligochaetes ..	4,520	10	3	—
Cocoons of Oligochaetes	—	1	—	—
Plecopteran nymphs ..	—	3	—	—
Heteroptera ..	—	1	—	1
Coleoptera (adult) ..	—	2	—	—
Coleoptera (larvae) ..	—	1	1	—
Neuropteran larvae ..	—	1	—	—
<i>Ephemeropteran nymphs</i>				
<i>Baetis</i> sp. ..	—	22	6	8
<i>Caenis</i> sp. ..	—	10	—	—
<i>Ecdyonurus</i> sp. ..	—	6	1	—
Trichopteran larvae ..	—	—	2	2
Chironomid larvae ..	250	6	1	—
Chironomid pupae ..	366	2	—	—
Chironomid adults ..	75	—	—	—
Simulium larvae ..	2	25	1	2
Tabanid larvae ..	4	1	—	—
Other diptera ..	4	1	—	—
Terrestrial insects ..	6	1	2	—
Fish ..	4	—	—	—
Total organisms ft ² ..	5,241	92	18	13
Total organisms m ² ..	57,651	1,012	198	143

TABLE 4.—WEIGHT OF ORGANISMS IN M².

<i>Haripur-Hawalian Region</i>			
Khal bridge (Stream) ..	..	1.155 g	
Haripur water channel ..	..	44.660 g	
Hawalian (Dor river) ..	..	2.387 g	
<i>Abbottabad Region</i>			
Abbottabad—Manserah Road ..	..	7.3598 g	
Ilyasi mosque stream No. 1 ..	..	3.4872 g	
Ilyasi mosque stream No. 2 ..	..	0.5487 g	
<i>Manserah Region</i>			
Stream near Ashoka pillar (Manserah)	19.5832 g		
Dadar (Stream No. 1.) ..	..	0.6456 g	
Dadar (Stream No. 2) ..	..	0.9114 g	
Dadar (Siran river) ..	..	0.11 g	

Productivity of Bottom Fauna by Weight.

The productivity of the bottom fauna is generally low in all the regions. In the Haripur-Hawalian region it is highest in the water channel at Haripur.

In Abbottabad the productivity is of Grade III in all the streams. In Manserah region it is of Grade II in the stream near Ashoka Pillars while at other places it is of Grade III.

TABLE 5.—FOOD OF FISHES.

Fish	Local Name	Gut contents
<i>Puntius ticto</i> (Ham.)	Chiddu	Filamentous algae Chironomid larvae
<i>Tor putitora</i> (Ham.)	Mahseer	Oligochaetes Cyclops Chironomid larvae
<i>Barilus vagra</i> (Ham.)	Chal	Ephemeropteran Nymphs Bugs Mosquito Larvae Chironomid Larvae
<i>Schizothorax plagiostomus</i> (Heckel) (Snow head trout)		Spirogyra Corixid bugs Sponges Debris
<i>Schizothorachthys labiatus</i> (Mc Clell.) (Snow head trout)		Spirogyra Sponge Corixid bugs Chironomid larvae
<i>Nemacheilus botia</i> (Ham.)	Chitala	Diatoms Filamentous algae Debris
<i>Channa guacha</i> (Bloch)	Daul	Chironomid Larvae Fishes

Bottom Organisms used by Fishes.

The following fishes were collected and their gut-contents were studied: *Puntius ticto* (Ham.); *Tor putitora* (Ham.); *Barilus vagra* (Ham.); *Schizothorax plagiostomus* (Heckel); *Schizothorachthys labiatus* (Mc Clell.); *Nemacheilus botia* (Ham.); *Channa guacha* (Bloch).

Out of the seven species of fishes, six live on bottom organisms, one fish (*Nemacheilus botia*) is herbivorous and lives on filamentous algae. *Channa guacha* also consumes small fishes in addition to insects.

Discussion

The bottom fauna of the streams of Hazara district consists of typical aquatic organisms. The streams of higher altitudes have varied organisms. The highest number of the organisms at certain stations were oligochaetes and chironomids (Diptera), gastropods were rarely found. The author in his paper Effects of rains on the bottom fauna of the stream of Rawalpindi and Wah (1967)¹⁷

found that the streams were affected by summer rains and there was considerable fall in number and weight of organisms. But in the streams of Hazara the average productivity in each region is of Grade I (rich) by number while in weight it is Grade II (average) in Haripur Region and poor in the other two regions. The streams of District Hazara are sufficiently productive for the fish fauna. By the study of the gut-contents of fishes, it is found that the most of the fishes live on bottom organisms. This shows the importance of the study of bottom fauna.

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References

1. N. Ahmad, *Fauna of Lahore*, Bull. Deptt. Zool. Panjab Univ., 2533-37 (1943).
2. N. Ahmad, Fish, *Fauna of West Pakistan*, Dir. Fish. West Pakistan, pp. 1-5 (1963).
3. N. Ahmad, Fisheries Gazettee of West Pakistan, Dir. Fish., West Pakistan, pp. 1-111 (1963).
4. N. Annandale, *The Fauna of Certain Streams in Bombay Presidency*, Rec. Ind. Mus., **16**, pp. 109-161 (1919).
5. S.R. Ali, *Productivity of the Bottom Fauna of a pond in New Gordon College Campus, Rawalpindi*, Pakistan J. Sci., **18**, 202-204 (1966).
6. F. Day, *Fishes of India* (2 vols), (William Dawson & Sons, London, 1958).
7. A.S. Hazzard, and H.S. Davis, *Instructions for Conducting Stream and Lake Survey* (U.S. Bureau of Fisheries, Cir. No. 26, pp. 1-55 1938).
8. O.L. Meehan, *Food of Certain Fishes from Streams near Rawalpindi*, Pakistan J. Sci. Ind. Research **10**, 42-45 (1967).
9. O.L. Meehan and S.R. Ali, *Bottom Fauna of Streams in Vicinity of Rawalpindi as Related to the Utilization by Fishes*, of Pakistan J. Sci. Ind. Research, **10**, 46-53 (1967).
10. T.T. Maccan, *Fresh Water Ecology* (Longmans, Green & Co., London, 1963).
11. I.G. Needhan, *A Guide to the Study of Fresh-Water Biology* (Charles G. Thomas, Springfield, Illinois, 1930).
12. I.U. Naik and S.R. Ali, *A Catalogue of Fresh-Water Fishes, Rawalpindi Distt.* (in press).
13. A. Rashid, Population Census of Pakistan 1961. District Census Report, Hazara, pp. 1-37 Parts I-V, (Ilmi Printing Press, Lahore, 1961).
14. D.S. Rawason, J. Fish. Res. Bd. Can., **10**(8), 486-320 (1953).
15. Wards and Whipple, *Fresh Water Biology*, edited by H.T. Edmondson (1959).
16. R.L. Usinger, *Aquatic Insects of California* (Univ. Calif. Press, Berkley and Los Angles, 1956).
17. S.R. Ali, *Effect of Rains on the Bottom Fauna of the Streams of Rawalpindi and Wah*, Abstract Pak. Sci. Conf., Section Biology (1967).