

## Bottom Fauna of Streams in Spring Season in Relation to Food of Fishes

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The purpose of the present investigation is to determine the productivity of the bottom organisms of streams of Rawalpindi, Wah, Kohat, Thal, Parachinar and Kotli (Azad Kashmir) by number and weight per unit area in spring season and correlate these organisms with food of fishes.

### METHODS

Samples were collected with the help of Surber One-square-foot sampler in riffle and Ekman Dredge in pool area. Samples were washed in sieves, placed in wide mouth bottles and preserved in formalin. In laboratory the samples were again washed to get rid of formalin, sand, silt and debris. Samples were placed in petri dishes. The animals of each sample were identified and counted with the help of dissecting binocular microscope and weighed after drying on blotting-paper.

The fishes were caught by drag net in the streams from where bottom organisms were collected. Small fishes up to 4" were directly placed in formalin while the bigger ones were injected with formalin to preserve the food-contents. In laboratory, fishes were dissected and their gut-contents were studied under dissecting binocular microscope.

### PLACES OF COLLECTION

1. The Korang stream on Murree Road 16 miles from Rawalpindi.

2. The Nurpur stream 10 miles from Rawalpindi.
3. Wah streams 27 miles from Rawalpindi.
4. Kohat streams.
5. Thal.
6. Parachinar.
7. A tributary of the Poonch River, Kotli (Azad Kashmir).

### Productivity of Bottom Fauna (Table 1)

Hazzard (1938) classified streams according to the productivity of bottom fauna. His standards were: grade I (rich) stream—more than 22 grams by weight or 2,152 organisms per sq. metre; grade II (average)—II-22 grams or 1,072 to 2,152 organisms; grade III (poor)—less than 11 grams or less than 1,072 organisms.

According to the slope (gradient), the streams under investigation are of three types—Low, moderate and high gradients. The Nurpur stream and the streams of Thal are of low gradient. Wah streams are of moderate gradient and the Korang, the streams of Kohat, Parachinar, and Poonch River tributary are of high gradient.

Typical freshwater fauna was found in the streams. Planarians (*Dugesia lindbergi*) were found in Wah, Kohat, Thal and *Dugesia bactrians* in Parachinar; Oligochates (*Limonodrilus ude Kemianus*, *Limonodrilus hoffmeisteri*, *Tubifex tubifex* and *Nais* sp.

TABLE I—Bottom Fauna in the Streams per Square Foot.

Organisms	Korang Stream	Nurpur Rawalpindi	Wah	Kohat	Thal	Para-chinar	Kotli (A.K.)*
Planarians	... ..	2	40	63	4	3	...
Nematodes	... ..	...	...	...	1	2	...
Oligochaetes	... 41	2	15306	33	635	596	2
Leeches	... ..	...	11	34	...	...	...
Shrimps	... ..	...	...	2	...	...	...
Gammari	... ..	...	...	4	...	...	...
Collembola	... ..	...	...	...	...	3	...
Ephemeropteran nymphs	... 58	765	130	...	4	1	48
Heteroptera (Bugs)	... ..	...	7	19	3	...	...
Trichopteran larvae	... 5	55	27	2	...	...	12
Trichopteran pupae	... ..	...	...	...	...	...	5
Trichopteran adults	... ..	...	...	...	...	...	2
Chironomid larvae	... 26	51	219	176	35	62	14
Chironomid larvae pupae	... ..	...	...	3	...	16	2
Chironomid larvae adults	... ..	...	...	...	...	1	...
Ceratopogonid larvae	... ..	...	30	...	...	...	...
Simulium sp. larvae	... ..	...	20	...	...	1	...
Tabanid larvae	... ..	4	10	...	1	1	12
Tabanid pupae	... ..	...	...	...	...	1	...
Coleopteran larvae	... 7	...	24	1	...	...	...
Gastropods (snails)	... ..	...	308	18	...	...	...
Pelecypods mussels	... ..	...	106	17	34	...	...
Total Organisms. Ft. 2	... 137	879	162,38	392	767	~687	97
Total Organisms M. 2	... 1507	9679	178,618	4312	8437	7557	1067
Weight of Organisms in gram M. 2	5.0766	32.0382	330.403	10.0423	75.622	6.793	28.03

A.K.=Azad Kashmir.

TABLE 2—Food of Fishes.

Scientific Name	Vernacular Name	Size	Gut-Contents
1. <i>Aspidoparia morar</i> (Ham.)	.. Chilwa	2½"—4"	Euglena, Rotifers
2. <i>Puntius ticto</i> (Ham.)	.. Chiddu	1"—3½"	Spirogyra Diaptomus Trichopteran larvae Chironomid larvae Gastropods
3. <i>Tor putitora</i> (Ham.)	.. Mahseer	3"—6"	Ulothrix Spirogyra and other Filamentous algae Planarians Oligochaetes Diaptomus Daphnia Damselfly nymphs Corixid bugs Caddis fly larvae Ceratopogmid Chironomid larvae Mites Spiders Gastropods Fish eggs
4. <i>Puntius sophore</i> (Ham.)	.. Chiddu	1"—3"	Diatoms Unicellular & filamentous algae Diaptomus Chironomid larvae
5. <i>Barilius vagra</i> (Ham.)	.. Chal	1½"—3½"	Oligochaetes Dragonfly nymphs Damselfly nymphs Mayfly nymphs Notonecta Caddisfly larvae Chironomid larvae Dipteran pupae
6. <i>Chela cachius</i> (Ham.)	.. Moriah	1½"—2"	Terrestrial insects Chironomid larvae
7. <i>Cyprinion watsoni</i> (Day)	..	2"—2½"	Diatoms Spirogyra Debris

Scientific Name	Vernacular Name	Size	Gut-Contents
8. <i>Schizothorax plagiostomus</i> (Heckel)	.. Gulguli	1"—3½"	Filamentous algae Sponge Oligochaetes Bugs Chironomid larvae Debris
9. <i>Schizocypris brucei</i> (Regan)	..	5"—6½"	Filamentous algae Debris
10. <i>Nemacheilus botia</i> (Ham.)	.. Chitila	1"—1½"	Mayfly nymphs Chironomid larvae Ceratopogonid larvae Dipteran pupae
11. <i>Nemacheilus</i> sp.	..	3"—4½"	Oligochaetes Mayfly nymphs Caddisfly larvae
12. <i>Glyptothorax cavia</i> (Ham.)	..	1"—2½"	Bugs Chironomid larvae Debris
15. <i>Mastacembelus armatus</i> (Ham.)	.. Bam	6"—9"	Mayfly nymphs Bugs

were found at all stations; highest in Wah, i.e. 1.5306, low in Kotli and Nurpur; leeches in Wah and Kohat; prawns and *gammar* in Kohat; Collembola in Parachinar; ephemeropteran nymphs (*Baetis*, *Caenis*, *Choroterpes*, *Ecdyonurus*) were found nearly at all stations but in Kotli genera *Ephemera*, *Ephemerella* and *Oligoneura* were found in addition. The highest number of ephemeropteran nymphs were found in Nurpur i.e. .765 per sq. foot in Wah and Kohat and Thal, trichopteran larvae at all stations, pupae and adults in Kotli; ceratopogonid larvae in Wah; tabanid larvae at all stations, pupae in Kohat, Parachinar and Kotli; beetle larvae in Korang, Wah and Kohat; gastropods (*Limnaea* sp., *Planorbis* sp.) in Wah and Kohat; mussels (*Corbicula* sp.) in Wah and Kohat and Thal.

According to the standard of Hazzard (1938) the streams of Nurpur, Wah Kohat. Thal and Parachinar showed very high productivity by number, i.e., 9.669, 16.238, 4.091, 8437 and 7768 organisms per sq. metre respectively; the Korang had 1617 and the Poonch River Tributary, i.e., 32.0382, 330.403, 75.622 and 28.03 grams per sq. metre respectively and poor in the Korang, Kohat and Parachinar, i.e., 5.0766, 10.0423 and 6.793 grams per sq. metre respectively.

#### FOOD OF FISHES

13 different species of fishes were collected. *Cyprinion watsoni* (Day) and *Schizocypris brucei* (Regan) are purely herbivorous and live on algae, diatoms and debris, *Puntius ticto* (Ham.), *Tor putitora* (Ham.), *Puntius*

*sophore* (Ham.) and *Schisothorax plagiostomus* (Heckel) are omnivorous that is they live on algae as well as animals, but greater part of their food consists of bottom organisms. 7 species i.e., *Aspidoparia morar* (Ham.), *Barilius vagra* (Ham.), *Chela cachius* (Ham.), *Nemacheilus botia* (Ham.), *Nemacheilus sp.*, *Glyptothorax cavia* (Ham.) and *Mastacembelus armatus* (Ham.) are carnivorous. *Aspidoparia morar* is carnivorous but does not feed on bottom organisms, *Tor putitora* is voracious and eats every kind of bottom and floating animals. Mayfly nymphs and chironomid larvae were eaten by most of the fishes.

### DISCUSSION

Low and moderate gradient streams were highly productive by number and weight, while the high gradient streams, i.e. the Korang, the streams of Kohat, Parachinar and the Poonch River Tributary are less productive, especially by weight, with the exception of the Poonch River Tributary in which bottom organisms were 28.03 grams per sq. metre. In the Poonch River Tributary the water was clear and bottom contains vegetation. Out of 13 species of fishes, 12 lived on aquatic organisms, especially bottom organisms. *Tor putitora*, *Schizocypris brucei*, and *Mastacembelus armatus* are of suitable size.

There are many streams and small rivers in the Punjab, N.W.F.P. and Azad Kashmir. Bottom organisms which constitute the food of fish are sufficient in number. If these

streams are properly managed, can produce large number of fishes and to some extent can help in the supply of protein food.

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