AN ACCOUNT OF FISHES OF CAMPBELLPUR DISTRICT, WEST PAKISTAN

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No systematic study of the fish fauna of the Campbellpur District has so far been made. The district is rich in the fisheries resources as there are numerous streams, in addition to river Indus and other small rivers.

The major part of Campbellpur district is hilly which slopes down to small plains. It is bounded by Hazara and Peshawar districts on the north, Mianwali and Sargodha on the south, Peshawar and Kohat on the west and Rawalpindi and Jhelum on the east.

There are a number of hill ranges; in the north there is the range of Attock Hills; Kala Chitta range stretches from east to west, in the south of the Haro river; Mukhad Hills are towards north of the Soan river and along the southern boundary of the district there is the Salt Range. The Sakesar Hill is 5,000 ft high but the other ranges vary from 1,000 ft to 3,500 ft in height.

There are three rivers, the Indus, the Haro and the Soan and a number of springs and streams. The main streams are Sil, Nandana, Chablat and Ghabir which discharge into these rivers, at various places.

The climate is very severe. The minimum temperature drops to 26°F in cold months. The maximum temperature in summer rises to 115°F. There are two rainy seasons and the average rainfall is 21.3 in. per annum.

The bulk of the collection was done from Indus, Soan and Haro rivers and Sil, Nandana and Chablat streams. The collection work was started in 1965 and completed in 1966. The cast net and dhangla were used, for the collection and the fishes were preserved in 5% Formalin. The fishes of 8 families, 16 genera and 25 species were collected.

FAMILY: CYPRINIDAE

1. *Barbus* (*Puntius*) *ticto* (Ham.). Local names: Chiddu, Pandra.

2. *Barbus* (*Tor*) *putitora* (Ham). Local name: Mahseer.

3. *Barbus* (*Tor*) *tor* (Ham.). Local name: Mahseer.

4. *Barbus* (*Puntius*) *sarana* (Ham.). Local name: Kharni Khangni.

5. *Barilius vagra* (Ham.). Local names: Chilwa, Chal.

6. *Cirrhina reba* (Ham.). Local name: Sunni.

7. *Cirrhina latia* (Ham.). Local name: Sunni.

8. *Chela bacaila* (Ham.). Local names: Chal, Chilwa.

9. *Carassius carassius* (Linn.). Local name: Lal Machali.

10. *Labeo dyocheilus* (McClell.). Local name: Butal.

11. *Discognathus jerdoni* (Day). Local name: Paba.

12. *Garra gotyla* (Gray). Local names: Putter, Chettah.

FAMILY: COBITIDAE

13. *Nemacheilus botia* (Ham.). Local names: Chitala, Sundal.

FAMILY: SILURIDAE

14. *Callichrous bimaculatus* (Hora). Local name: Pullu.

15. *Callihrous pabda* (Ham.). Local names: Gookwah and Pullu.

16. *Wallago attu* (Bloch & Schn.). Local name: Mullee.

FAMILY: SCHILBEIDAE

17. *Cluspisoma garua* (Ham.). Local name: Bachwa.

FAMILY: SISORIDAE

18. *Glyptosternum cavia* (Ham.). Local name: Tengara.

FAMILY: BAGRIDAE

19. *Rita rita* (Ham.). Local name: Khagga.

20. *Mystus aor* (Ham.). Local name: Singharee.

FAMILY: OPHICEPHALIDAE

21. *Ophicephalus marulius* (Ham.). Local name: Saul.

22. *Ophicephalus straitus* (Bloch.) Local names: Saul, Daula and Chotta Saul.

23. *Ophicephalus punctatus* (Bloch.) Local name: Daula.

24. *Ophicephalus gachwa* (Ham.) Local name: Daula.

FAMILY: MASTACEMBELIDAE

25. *Mastacembelus armatus* (Lacep.). Local names: Bam, Groj. Samp Machli

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A NOTE ON ARGULUS SPECIES WHICH CAUSED MORTALITY IN CARPS IN THE EXPERIMENTAL CISTERN OF THE FRESH WATER RESEARCH STATION, CHANDPUR, EAST PAKISTAN

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Fish mortality due to Argulus infection is a common occurrence in East Pakistan particularly in pond fisheries, and most of the cases go unreported. Such mortality take a heavy toll of fish life resulting in partial or complete destruction of fish in the infected ponds. No suitable remedial reasures for the control of Argulus has been prescribed with sufficient accuracy and favourable results.

Mortality

A heavy mortality of carps measuring about 8–10 in. in length occurred in an experimental cistern of the Freshwater Research Station at Chandpur, Comilla, during November, 1964. The cistern measuring 14.5′ × 6.5′ × 4.5′ and containing about 5,600 l. water was stocked with fry of carps for experimental purpose. Sixteen specimens of *Labeo rohita* and 1 specimen of *Catla catla* measuring about 7 to 8 in. were liberated during September, 1964. The first victim—a 10-in. long *Labeo rohita*—was found dead on 9.11.1964. On examination of the dead specimen, a large number of Argulus species of sizes varying from 1.5 to 5 mm in length were found attached to the skin, fins, eyes and the rest of the external surface of the body of the fish. The flesh on both sides of the vertebral column was found remarkably shrunk. The gills were very pale, obviously due to heavy loss of blood. The fins were all badly damaged and the scales particularly in the region of the head had become loose and some had already detached from the skin. The parasites were found adhering firmly to the external surface of the victim. All the other fishes in the cistern on examination were found to be similarly infected with large number of these organisms. The heavily infected fishes were found hovering near the surface of water in a sluggish manner. All the fishes seemed exhausted and ulcerated. The lesions looked more or less like measle ulcers.

Rate of Mortality

The rate of mortality was studied and the percentage of mortality is recorded in Table 1.

TABLE 1.—PERCENTAGE OF MORTALITY OF *Labeo rohita* AND *Catla catla*.

Fishes surviving in the cistern	Date fish died	Name of fish dead	Fishes dead	% mortality
17	9.11.64	L. rohita	1	5.9
16	10.11.64		2	12.6
14	11.11.64		2	14.3
12	12.11.64		6	50.0
6	13.11.64		3	50.0
3	14.11.64		2	66.6
1	15.11.64	C. catla	1	100.0

A second lot of 8 specimens of *Catla catla* measuring 9-10 in. and in perfectly healthy condition were liberated on 15.11.64 in the same cistern. Immediately after introduction, the fishes were infected by a large number of Argulus specimens. Mortality started a after 3 days in this case and showed the following pattern (Table 2).

TABLE 2.—PERCENTAGE OF MORTALITY OF *Catla catla* IN CISTERN.

Fishes surviving in the cistern	Date fish died	Fishes dead	% mortality
8	18.11.64	1	12.5
7	19.11.64	1	14.3
6	20.11.64	2	33.3
4	21.11.64	2	50.0
2	22.11.64	1	50.0
1	23.11.64	1	100.0

Intensity of Argulus Infection

The highest number of Argulus collected from a 10-in. long *L. rohita* was 826.5. Three infected *L. rohita* and 2 *C. catla* were examined for this purpose. The parasites varied in length from 1.0–1.5 mm to 4.5-5.5 mm in each victim. Table 3 shows the number of parasites collected from the infected individuals of fish.

TABLE 3.—INTENTSTY OF ARGULUS INFECTIONS IN CARPS.

Fishes examined	Approximate length (in.)	Fishes examined	Argulus collected
Labeo rohita	8	1	429
	10	1	826
	9	1	681
Catla catla	10	2	1,451

Extent of Damage Caused by Argulu Infection

In a 10-gallon glass aquarium, about 300–400 Argulus specimens of different sizes were introduced. 1 *Tilapia mossambica* measuring 3 in., 1 *Notopterus notopterus* measuring 5 in., 1 *Colisa fasciata* measuring 2.9 in. and 1 *Heteropneustes fossilis* measuring about 6 in. were introduced in this aquarium. Immediately after introduction, Argulus infected all the fishes, but the infection was severe in *Tilapia mossambica* and *Notopterus notopterus*. The number of Argulus attacking the above two fish species varied between 50 and 60. The Tilapia specimen was killed in 12 hr. whereas *N. notopterus* in 16hr after infection. About 20-25 specimens infected the *Colisa fasciata* (weighing 10 g) and in about 7 days' time the weight of the fish was reduced by 10 g. A large sized healthy *Catla catla* measuring about 10 in. was killed by Argulus in 3 days.

Curative Measures and Control of Argulus Infection by Chemical Treatments

Experiments were conducted in the laboratory to control Argulus infection by treating the infected fishes with different chemicals in glass aquarium.

(*a*) *Treatment with Common Salt.*—Tilapia were infected with a number of Argulus specimens in an aquarium containing 5 gallons of pond warer. The infected fishes were then treated on the first day with 1/2 oz salt per one U.S. gallon water, on the second dzy half the water was replaced by a salt solution aontaining 1-1/2 oz salt per one U.S. gallon wacer, and on the third day half the water was agaitn replaced by a salt solution containing 1-3/4 salt per one U.S. gallon water.

The application of common salt stopped the activity of the parasites and further infection did not occur. At the end of the third day all the Argulus were found dead. No damage was done to fish which were kept in that water for over a month.

(*b*) *Treatment with Permanganate.*—Five *Tilapia mossambica* were infected with Argulus in a 10-gallon glass aquarium containing pond water. Potassium permanganate was applied in solution at the rate of 1 g. per 50 gallon water. The Argulus specimens died in 3 days. The fish were cured of the infection but the caudal fins of 2 of the 5 fishes were damaged. The fishes were kept in that water for a fortnight.

(*c*) *Treatment with DDT.*—An infected cistern containing 56 lac cc. of water approximately was treated with DDT powder in emulsion at the rate of 1 g. per 100 l. water. Argulus as well as the heavily infected carps died within 24 hr. of the application. After a fortnight a lot of 5 carp fingerlings (10-12 in.) were introduced into the cistern, and this time also all the fishes died within 24 hr.

(*d*) *Treatment with Lime.*—Calcium oxide was applied in emulsion in another infected cistern at the rate of 0.1 g. salt per liter. Argulus died within 24 hr. The infected carps including all the Tilapia of the cistern came to the surface immediately after the application of the chemical and showed signs of distress and most of them died within 24 hr.

Morphological Features of Argulus

Carapace orbicular, preoral sheathed sting (poison spine) present and is situated in between the pair of lateral eyes. pairs of antennae (called antennule and antenna by some) present. Second maxillae (1st Maxillipeds) transformed into sucking discs. The basal plate of the second maxillipeds is armed with trilobed teeth. 4 pairs of biramose swimming legs with flagella present. The urosome (tail) is bilobed posteriorly and bears a pair of caudal rami.[1]

The female (Fig. 1) is larger in size than the male. The carapace is nearly circular, length slightly greater than the breadth (length 16/13th of the breadth). The tail is also shorter than that of the male and is nearly circular. The ovary is situated in the posterior mestasome. A pair of spermathecae is found in the bilobed tail. The basal segment of the 4th swimming appendages of the female is provided with a strong curved hook.

In a sexually mature, well-fed female of 4-5 mm, the various organs have the following measurements: diameter of the lateral eyes, 0.15 mm; diameter of the median eye, 0.12 mm; diameter of the suckers, 0.53 mm; length of the tail, 1.00 mm; breadth of the tail, 0.80 mm; diameter of the spermathecae, 0.09 mm.

The male (Fig. 2) is smaller than the female. Length of carapace is 16/11th of the breadth. General shape longer and narrower than that of the female. The tail is deeply bilobed and narrower and longer than that of the female and contains the testes arranged longitudinally in each lobe.

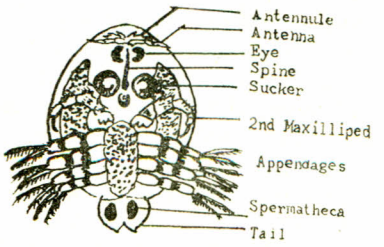

Fig. 1.

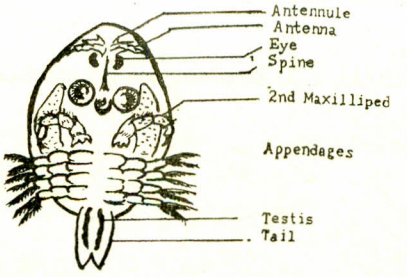

Fig. 2.

Fig. 1.—Ventral view of Argulus (Female).

Fig. 2.—Ventral view of Argulus (Male).

Discussion

Yamaguti[1] provides diagonoses and identification keys for the known families and genera of the Branchiura of fishes and according to him the copepod was classified up to genus. Bauer[2] observed the development of Argulus, but his information is not comprehensive. Temperature plays an important role in the embroyonic development of the parasite. It has been observed that the development of this particular species stops at 22°C or below. At 25°C or above the development proceeds and the higher the temperature the quicker is the development. This was established by a simple experiment in the laboratory. Two aquaria with parasite larvae were kept at a temperature of 22°C. One of the aquaria was then placed under the sun whereupon the temperature of water in the container gradually increased up to 30°C, when 95% of the larvae hatched out in the aquarium. None of the larvae in the other aquarium, however, hatched during that period. The use of 0.1% DDT emulsion as suggested by Rybalko and Woynarovich, (cited by Bauer[2]) killed the Argulus as well as the infected fishes in about 1 hr. The use of this emulsion, although effective for killing Argulus, is not therefore, suitable for the treatment of an infected pond or tank. Even the concentration of 1 g. powder in 100 l.

water is lethal to fish. Common salt is effective, but the quantity of salt required is so high that it does not justify its use commercially. The use of permanganate often produces further complications by damaging the fins and gills of fishes under treatment. The application of calcium oxide (0.1 g. per litre of water), as suggested by Sachlan for an infected pond, has been found lethal to both parasites and their host. The lethal action of this salt, however, disappears after a fortnight.

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Corrigendum

Studies on Fungitoxicity of Copper Based Compound S-3 S. SHAHID HUSSAIN, S. ASJAD HASAN, M. YOUSUF and G. MUSTAFA ALI, Pakistan J. Sci. Ind. Res., 10(3), 197 (1967).

In the list of contents, one of the authors' name, G. Mustafa Ali, was inadvertently omitted.