CHAPTER 4

BEHAVIOURAL PERSPECTIVES

Among the fishes, a remarkably wide range of biological adaptation to diverse habit has evolved. Fundamental work on fish behaviour has been a rapidly moving field. The behaviour of fishes intimately unique and efficient solutions to the problems raised by their three dimensional environment. A newly fertilized egg does not behave but on adult fish responds to its environment with repertoire of complex, adaptive behaviour pattern.

The two different aspects of ethological perspectives of *Esomus danricus* (Hamilton-Buchanan, 1822) and *Puntius conchonius* (Hamilton-Buchanan, 1822) are ingestive conation and procreatic demeanor and the laboratory observations are conducted after Harris (1936), Bainbridge (1958), Brawn (1961), O’Brien (1990), Hart (1993), Riehl and Baensch(1996), Marshall (1999) and Sarmah (2002).

The feeding behaviour of the test species is also precisely investigated in the aquaria. Reaction and responses of the fishes under study towards their food elements introduced into the eco-system are visually analyzed. With a patient manoeuvre to deduce the modus operandi of food capture, period of quiescence, change of equilibrium, operculum and fin movement, surfacing behaviour, postures of feeding actual mode of movement and other related changes of the
fish. The test fishes of each species investigated in the present analysis exhibit remarkable variations in their morphology and behaviour with artificial feed application.

A schematic diagram showing the overall trend of feed etiology of the test fish species is depicted below:

![Schematic diagram](image)

**Figure 10: Feeding trend in the test fishes**

In general, the first noticeable reaction immediate to the application of food is an initial state of excitation, sometimes to the state of hyperactivity of the fishes. This is followed by a period of quiescence with well co-ordinated body movements. Initially the fish never responds immediately to the presence of food. The fishes are found to aggregate or disperse for a while. Only after a few
seconds they are found to surface to the upper level for the food. Generally after acclimatizing them, the time gap do lessen appreciably and the fishes starts feeding immediately after the feed is administered.

Fin reciprocation and the opercular movement of the test species are critically studied. The data expressed as frequency/sec are presented below in respect of both the species.

The Procreatic demeanor of both *Esomus danricus* (Hamilton-Buchanan, 1822) and *Puntius conchonius* (Hamilton-Buchanan, 1822) are visually observed and the courtship behaviour is deduced schematically.

*Esomus danricus* (Hamilton – Buchanan, 1822)

4.1. **Ingestive behavior** (Figure 11& 15)

The feeding activities commences with the fish surfacing frequently and gulping the food elements. The species is found to feed in the surface zone but does not respond straight away after the feed is administered. While feeding at the surface area, the fish moves forward and then turns downwards to the column zone making an angle of 40°. The fish rests at the column zone for few seconds with the beating of the pectoral fin, the dorsal fins are kept erect and the rays beat slowly. After gulping the fish quickly returns to its initial position and conveniently swallows the gulp with slow opercular movements and with rhythmic beating of the pectoral fin. On the other hand, the fish moves down for bottom feeding from the column at an angle of 35° and returning back to its
FIGURE 11: Schematic diagram showing lineament of feeding in *Esomus danricus* (Hamilton-Buchanan, 1822)
FIGURE 12: Schematic diagram showing courtship behaviour in *Esomus danricus* (Hamilton-Buchanan, 1822)
initial position. Such feeding cycle is repeated and in this process the consumption of food gets depleted.

I. Fin reciprocation

Dorsal : 0.80 – 1.30 (± 1.0 ± 0.179)

Pectoral : 0.50 – 1.20 (± 1.0 ± 0.249)

Pelvic : 0.80 – 1.40 (± 1.0 ± 0.213)

Anal : 0.40 – 1.20 (± 1.0 ± 0.280)

Caudal : 1.10 – 2.10 (± 2.0 ± 0.344)

II. Opercular movement – 1.20 – 2.40 (± 2.0 ± 0.531)

4.2 Procreatic demeanor (Figure 12 & 16)

Both male and female exhibit courtship display by exhibiting restlessness and moving frequently at the aquarium base. The display of courtship starts after about 8 hrs after setting the pair. They move parallel to each other with the male frequently nudging and butting the female with their snout in the abdominal region at regular intervals of 2-3 minutes. The male also hits the vent region of the female while moving along the sides of the aquarium. The courtship continues for 2-4 hours after which the female releases the eggs in batches and the male moves along over the eggs, fertilizing it with their milt. After
spawning, both the male and female settles at the bottom of the aquarium with increased opercular movement.

No parental care is shown by any of the parents towards the fertilized eggs.

**Puntius conchonius** (Hamilton – Buchanan, 1822)

### 4.1. Ingestive behavior (Figure 13 & 15)

This species immediately starts feeding after the application of food and is found to feed in the column zone. The fish executes a swift upward movement to the surface, rapidly gulping the food at an angle of 45° before returning back to the column. Once they retreat to the column, the gulped food is conveniently swallowed with slow operculum movement. Rhythmic beating of the pectoral fin helps in maintaining the resting posture in the column zone. On the other hand, the fish also occasionally moves down for bottom feeding from the column at an angle of 80° maintaining it’s to and fro movement.

I. **Fin reciprocation**

Dorsal : 0.40 – 1.80 (â 1.0 ± 0.458)

Pectoral : 0.60 – 1.90 (â 1.0 ± 0.492)

Pelvic : 0.90 – 1.70 (â 1.0 ± 0.319)
Anal : 0.60 – 1.70 (â 1.0 ± 0.459)

Caudal : 1.30 – 1.80 (â 1.20 ± 0.319)

II. Opercular movement – 1.40 – 2.30 (â 2.0 ± 0.325)

4.2 Procreatic demeanor (Figure 14 & 16)

The male and female both shows courtship display by folding and expanding their paired and unpaired fins. The male chases the female but the female keeps away and retreats to the corner of the aquarium. The male tries to nudge rub the caudal peduncle and belly area of the female continuously moving in a horizontal and zigzag manner. This is found to continue for 3 to 5 hours. The female then moves to the corner of the previously selected spawning area and releases its eggs on the glass aquaria fanning it with its caudal and anal fin after which the male moves in and fertilizes the eggs by quickly releasing its milt over the eggs.

No parental care is shown by any of the parents towards the fertilized eggs.
FIGURE 13: Schematic diagram showing lineament of feeding in *Puntius conchonius* (Hamilton-Buchanan, 1822)
FIGURE 14: Schematic diagram showing courtship behaviour in *Puntius conchnius* (Hamilton-Buchanan, 1822)
FIGURE 15: INGESTIVE BEHAVIOUR OF THE TEST FISH SPECIES;
Surface feeding in (1) *P. conchonius* (Hamilton-Buchanan,1822); (4) *E. danricus* (Hamilton-Buchanan,1822); Column feeding (2) *P. conchonius* (Hamilton-Buchanan,1822); (5) *E. danricus* (Hamilton-Buchanan,1822); and Bottom feeding (3) *P. conchonius* (Hamilton-Buchanan,1822); and (6) *E. danricus* (Hamilton-Buchanan,1822).
FIGURE 16: PROCREATIC DEMEANOR IN TWO TEST FISH SPECIES; Courtship in (1 & 2) *P. conchonius* (Hamilton-Buchanan, 1822); (5 & 6) *E. danricus* (Hamilton-Buchanan, 1822); Spawning in (3 & 4) *P. conchonius* (Hamilton-Buchanan, 1822); and (7 & 8) *E. danricus* (Hamilton-Buchanan, 1822);