

## CHAPTER III

GENERAL MORPHOLOGY OF OPHICEPHALUS PUNCTATUS

Fish are aquatic animals that embrace 42.6% of the numbers of living vertebrate species (Klontz & Smith, 1968). Only a few species of fish evolved into terrestrial forms and approximately 15,000 species of fish have been categorized morphologically into three classes: Agnatha or jawless fishes (hag-fishes & lampreys), the chondrichthyes or cartilaginous fishes (shark rays & chimeras) and osteichthyes or bony fishes (trout, carp & perch).

The teleost fishes, e.g., salmon (clupeids), gold fish, carps (cyprinids), are commonly utilised for physiological experimental work, because some of them can be reared in the laboratory aquarium. It may appear plausible to ask why amongst so many varieties of fishes the *Ophicephalus punctatus* has been chosen for the present study.

It may be mentioned that from the preliminary observation on the action of acetylcholine and serotonin on the contraction of the gut of *Ophicephalus punctatus*, the unequivocal and reproducible responses obtained provoked us to investigate elaborately in designing the suitable model for the bio-assay of acetylcholine and serotonin with this particular gut. Curiously enough the gut of this fish appeared to be most suitable for the bio-assay of acetylcholine and serotonin. This fish also appeared to be most suitable because of its easy and wide availability, particularly in tropical countries. It is available more or less in all ponds and marshy lands and its longevity is high enough to swim under ordinary laboratory condition at the temperature range from 15°C to 38°C.

In the aquarium containing fresh pond water with dry food at room temperature a large number of this fish can be maintained for more than a month. It can easily be anaesthetised with clove oil (1 ml/litre of water) within 15 minutes.

Although the morphology, habitat and life-history of *Ophicephalus punctatus* have been reported by Shaw & Shebbeare (1937) in the article on "The Fishes of Northern Bengal", as a prerequisite of the present investigation, a brief note on morphological characteristics of this fish is appended :

Systemic Position :

According to the general classification of fishes adapted by Berg (1947) *Ophicephalus punctatus* may be classified as follows:

Phylum	-	Chordata
Sub-phylum	-	Craniata
Superclass	-	Gnathostomata
Class	-	Teleostomi
Sub-class	-	Actinopterigii
Order	-	Ophicephaliformes
Family	-	Ophicephalidae
Genus	-	Ophicephalus
Species	-	Punctatus

The *Ophicephalus* is a snake-headed fish often classified under the group of murrel (Shaw & Shebbeare, 1937). *Ophicephalus marulius*, one of this sporting member also known to anglers as murrel. Most of the species in this genus have cavities in their head which act as a primitive lung to live for a long time out of water.

According to Day (1878) there are nine different species of this genus available in India, but Shaw and Shebbeare (1937) recorded six different species of this genus from Northern Bengal. On the basis of differentiating characters both of them provided the synopsis of the species of this genus *Ophicephalus* which are described below.

(a) Nine species as recorded by Day (1878) are :

1. *Ophicephalus marulius* - The body is orange, banded, having white spots and black light-edged ocellus at the root of the caudal fin.  
Distribution - throughout India and China.

2. *Ophiocephalus leucopunctatus* - The body is orange, banded, having white spots and no caudal ocellus.

Distribution - Deccan and sea-coast of India to China.

3. *Ophiocephalus pseudomarius* - The body is orange, banded, having black spots at the base of the caudal fin.

Distribution - India only.

4. *Ophiocephalus barca* - Body is dark violet, spots are present both on body and fins.

Distribution - Large rivers of Bengal.

5. *Ophiocephalus micropetals* - Young is scarlet with two black bands and adult is grey, spotted with black.

Distribution - Western Coast of India, Siam and Malay.

6. *Ophiocephalus striatus* - Dark grey stripes passing into white in the abdomen.

Distribution - India to China.

7. *Ophiocephalus stewartii* - Purplish body spotted with black.

Distribution - Cachar and Assam (India).

8. *Ophiocephalus gachua* - Pectoral fins are banded and vertical fins are edged with red.

Distribution - India, Burma and Andamans.

9. *Ophiocephalus punctatus* - Body is spotted or banded with dark light edges and vertical fins are dark with light edge.

Distribution - India and Burma.



(b). Shaw and Shebbeare (1937) described six species of this genus from Northern Bengal. The synoptic table provided by the same author is based on different morphological features including colouration (Table-I).

The colour of these six species varied and Shaw and Shebbeare (1937) grouped them accordingly.

1. *Ophicephalus marulius* - Ocelli with centre darker and margin lighter than ground colour.
2. *Ophicephalus amphibius* - The belly is blue or green, orange bars on flanks.
3. *Ophicephalus striatus* - The dorsal portion is blackish and ventral portion is yellow, lateral line with peninsulas of darker colour extending into yellow.
4. *Ophicephalus punctatus* - Dark and light patches alternate above and below the lateral line. Chin is not marbelled.
5. *Ophicephalus stewartii* - Circular back spots are present, each occupying the part of scale, and the base of dorsal part is iridescent blue, when alive.
6. *Ophicephalus gachua* - There is no black spot.

In the first four species the pectorals are plain but in the last two species, the pectorals are spotted in zones, darker and lighter patches are continuous above and below the lateral line. Chin is marbelled.

The genus *Ophicephalus* was proposed by Bloch in 1794 and his type specimen of this genus happened to be *Ophicephalus punctatus*. But the genus *Channa* which included the same species was introduced by Gronow in 1763. However, he did not mention any specimen for this genus. Scopoli in 1777 introduced the genus *Channa* in the Linnaen system of nomenclature. According to the rule of priority the name *Channa punctatus* has been

Table - I

Synoptic table provided by Shaw and Shebbeare (1937) describing six species of the genus *Ophicephalus*.

	1	2	3	4	5	6
	<i>Ophicephalus marulius</i>	<i>Ophicephalus amphibius</i>	<i>Ophicephalus striatus</i>	<i>Ophicephalus stewartii</i>	<i>Ophicephalus gachua</i>	<i>Ophicephalus punctatus</i>
Number of:						
Dorsal Rays	45-55	51	37-45	32-40	32-37	29-32
Anal Rays	28-36	34	23-26	26	21-23	21-23
Scales from pre-opercle to orbit	9-10	10	9	5	4-5	5
Scales from snout to dorsal fin	15-16	16	18-20	13	12	12
Ratio length over 1/2 -pelvis to pectorals		2/3	2/3	1/3	2/3	3/4

declared valid by ruling of International Commission on Zoological Nomenclature (Opinion and Declaration of International Commission, 1955, 9(23), 309). Despite the above facts the widely used name *Ophicephalus punctatus* has been used in this treatise.

Availability :

*Ophicephalus punctatus* is found in the eastern and south eastern Asia and tropical Africa (Day, 1878). It is found generally in the plains of India, particularly in the tropical regions (Shaw & Shebbeare, 1937), all over West Bengal, Punjab and Pakistan, usually in the pond and tank waters. It prefers to live in muddy water and lies at the bottom. It is largely available in living condition in the local markets of Calcutta and suburbs all throughout the year and its supply reaches maximum prior to the rainy season.

Habitat :

The general biology, breeding, development and habitat of *O. punctatus* and allied species have been studied and reported by Mookerjee, Ganguly and Bhattacharya (1948) and Mookerjee, Ganguly and Mallick (1950). With our limited knowledge in Zoology the general information as collected from the restricted studies on this fish, both in the laboratory aquarium and pond appears to corroborate fully the reported works.

This fish is very tenacious for living and owing to the presence of accessory air-breathing apparatus it can live for a long time outside the water; it can pass away the drought by burrowing itself under the muddy ponds or ditches or any waterways that dries up in summer. During the rains it releases itself from captivity. It is carnivorous in habit and destroys the eggs and fry of other fishes. The fish can endure extreme change of temperature from 10°C to 38°C. and it is well known that it can migrate by land route during heavy showers. It is monogamous

and builds nest during breeding season. According to Khan (1934) it breeds once in a year from April to June. The eggs are laid on hollows along the banks and both nest and fry are regularly guarded by parents. The female contains small ova numbering about 4,700 during the month of February (Day, 1878).

Distinctive characters of *Ophicephalus punctatus*.

This particular fish has the following characteristics : It is fusiform or sub-cylindrical in shape, tapering from the flattened snake-like head to the rounded caudal end. The colour is mostly black with slight brownish tint. A series of different vertical darker bands (approximately nine in number) above and below the lateral line can be easily visualised. The colour of the fish is very often changed by removing it out of water when the bands of the body tend to merge with the ground colour but on replacing in water the dark bands become again prominent. The ventral aspect of the fish is much lighter and free from dark pigmentary patches. The colour varies with water in which they reside. The black greenish specimen may become yellow on the side of the abdomen and along the side of the head. Several bands pass downwards to the middle of the body. The caudal and ventral fins are spotted with a narrow light edge and dark basal bands. Some get scattered blackspots over the body and head.

Descriptions :

The weight of the adult fishes varies from 60 to 150 gms and the size from 15 to 22cm. The body is covered with shield-like scales and the trunk and the tail with cycloid scales. Eyes are situated in the anterior one-third of the head and possess free orbital margin. Each eye is provided with movable nictitating membrane. Two pairs of nostrils are situated on the antero-superior angle of the eyes. The mouth is wide while the lower jaw appears slightly protruding. Conical teeth are arranged in

the posterior rows of the lower jaw. Operculum consists of branchiostegial membrane. While the gills open widely the gill membranes are united with each other and are free from isthmus. The fusiform shape of the body which is moderately elliptical in cross section, seems to provide efficient means for its rapid progression through semi-liquid muddy environment where they frequently live.

The *Ophicephalus*, like other ophicephaliformes, is provided with two sets of fins, one is flattened expansion of the skin supported by cartilaginous rods and the other is composed of horny fin-rays; the median fins are unpaired and the lateral ones are paired fins. The median fins comprise of one dorsal, a caudal and a ventral one.

The side and ventral views of *Ophicephalus punctatus* showing the arrangement of fins, body and mouth is given in Figures 1a, 1b respectively and a schematic diagram in Figure 2.

The dorsal fin is approximately rectangular in shape and is situated along the middle of the body. Its length varies from 8 - 12 cm. against the entire length of 18 - 25 cm. from head to tail end. The height of the dorsal fin roughly measures 1.5 - 1.8 cm. and consists of 30 - 35 fin rays. The caudal fin measures 2.5 cm. x 3.5 cm. (l x b) and consists of 12 to 13 fin rays. It extends along both the dorsal and ventral surface of the tail. At the root of the tail there is a narrow black curved band. The fin rays are bifurcated into several small strands. The ventral fin is rectangular in shape and extends from the anal end to end abruptly near the posterior aspect in the same line where the dorsal fin terminates. The length of the ventral fin is 6 - 8 cm, height varying from 1.2 to 1.5 cm. and there are 18 - 22 fin rays. Both dorsal and ventral fins are marked by patchy colours. In the lateral fins there are two pectoral and two pelvic fins. The large pectorals originate from the ventrolateral margin of the body immediately behind the gill clefts and spread out horizontally as triangular.



expansion having length of 2.2 - 2.5 cm. and breadth of 1.5 - 1.8 cm. and consist of approximately 12 to 14 fin rays. The pelvic fins are much smaller (1.8 - 2 cm. x 1 cm.) and consist of 5 fin rays which are bifurcated terminally. All the fins are directed backwards, a feature which provides the advantage for forward progression.

The cloacal aperture is a small opening anterior to the ventral fin, 7.5 to 8.5 cm. away from the anterior margin of the mouth.

A faint line as a lateral line on both sides extending from the postero-superior angle of the gill cleft runs backwards along the middle of the body to end near the arch of the tail end. The lateral line denotes the position of an underlying canal which runs along each side of the body and contains receptor organs. The lateral line canal extends anteriorly on to the head and is branched into several canals which open exteriorly through minute pores. Beside these pores of the lateral canals there are numerous groups of small openings on the head and snout situated bilaterally and these are often called as the ampullary pores. Below the lateral line, four lines not so prominent run parallelly from the gill cleft to the tail end of the fish.

The specimens required were collected from the market and from tanks of the suburbs of Calcutta and were identified as per features noted above by Shaw and Shebbeare (1937) and further confirmed by the Zoology Department of Calcutta University before the actual experimental work was started.