

MORPHOLOGY AND ANATOMY OF THE OLFACTORY ORGANS OF A HILL-STREAM FISH, SISOR RHABDOPHORUS (HAM.)

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This paper describes the anatomy and morphology of the olfactory organs of the hill stream fish *Sisor rhabdophorus* (Ham.).

The morphology and anatomy of a hill-stream fish, *Sisor rhabdophorus* (Ham.) has been studied. The paired olfactory chambers are dorso-laterally situated, each communicating by a circular anterior inlet and an oval posterior outlet. The olfactory rosette is elongated in shape and can be placed under Burne's³ rosette column II or with Bateson's¹ rosette type². The number of lamellae in the rosette increases with the growth of the fish and new lamellae are always added at its anterior end. The total olfactory area in this fish is considerably greater than the total retinal area. This entitles it to belong to Teichmann's²⁴ group of nose-fishes comprising of solitary, twilight and nocturnal predators. The olfactory organs of the fishes are distinctly well developed. They are of great biological significance since they play an important role in behaviour such as procurement of food, recognition of sex, defence against the predators, paternal behaviour and orientation.¹⁻²⁴ Uptill now the hill stream fish *S. rhabdophorus* has not been studied by any author. Due to the above fact the morphology and anatomy of the olfactory organs of this fish has been studied.

MATERIALS AND METHODS

Heads of adult specimens of *S. rhabdophorus* were fixed in Bouins fluid and 10% formalin. They were dissected from the dorsal side under a stereoscopic binocular microscope for examination of the olfactory organs and for studying their relationship with the brain. Dried preparations of skulls of adult fishes were made to study the skull bones with the olfactory chambers. The total areas of the olfactory and retinal surfaces of the fish were calculated after the method adopted by Teimann²⁴.

OBSERVATIONS

The olfactory organs in *S. rhabdophorus* are paired situated on the dorsal surface of the head, far forward to the eyes. Each olfactory organ is provided with circular

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anterior inlet and oral pit like posterior outlet. (Fig. 1). The diameter of posterior outlet is greater than anterior inlet.

The olfactory organ is lodged in a fossa in the ethmoid region of the skull (Fig. 2) It is attached to the surrounding bones by fibrous connective tissues. The olfactory organ is bounded dorsally by the long, narrow and tubular nasal bone, while posterodorsally by the frontal and ventrolaterally by lachrymal bones.

The olfactory rosette is laterally compressed and elongated with a narrow raphe (Fig. 3) on either side of the raphe are arranged a large number of olfactory lamellae which were counted in specimens of different length (Table 1). Their total number in the two rosettes increases with a corresponding increase in the length of the fish.

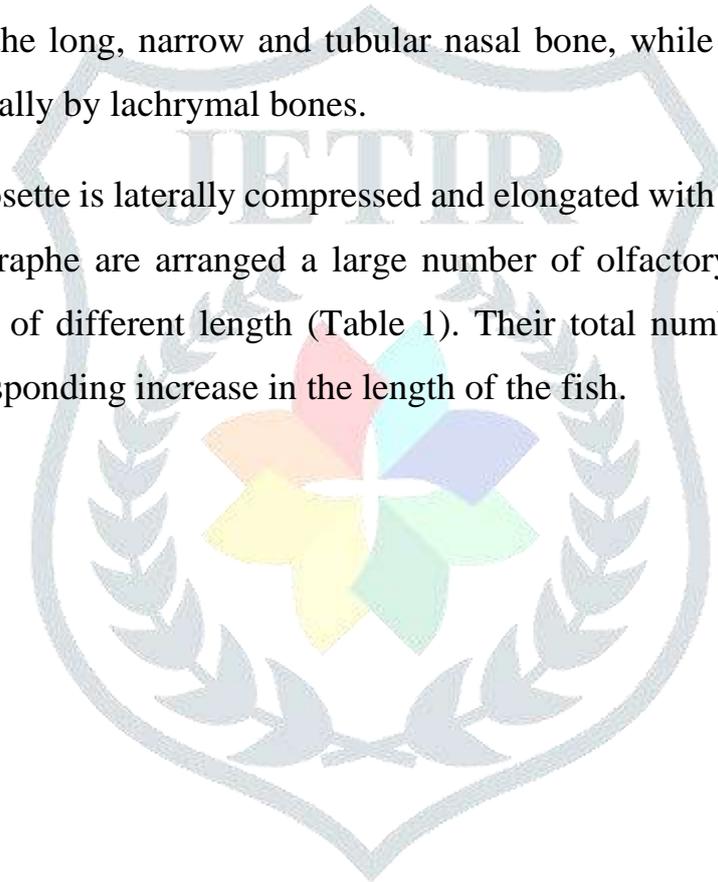


Table 1 : Morphology and anatomy of the olfactory organs of *Sisor rhabdophorus*

Sl. No.	Total length of fish (mm.)	Standard length of fish (mm.)	No. of olfactory lamellae		Total no. of lamellae in both rosette
			Left	Right rosette	
1.	30	20	28	30	58
2.	50	40	51	53	104
3.	67	55	70	71	141
4.	84	72	73	72	145
5.	99	84	75	78	153

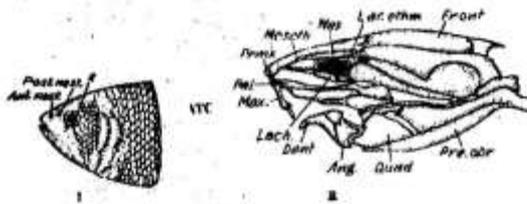


Fig.1. Lateral view of the head of *Sisor rhabdophorus* (Ham.) showing position of anterior inlet and posterior outlet.

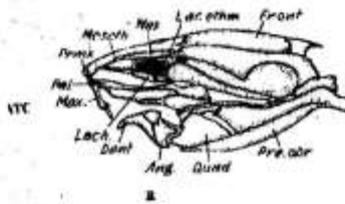


Fig.2. Lateral view of the skull of *S. rhabdophorus* showing skeletal support to the olfactory organ.

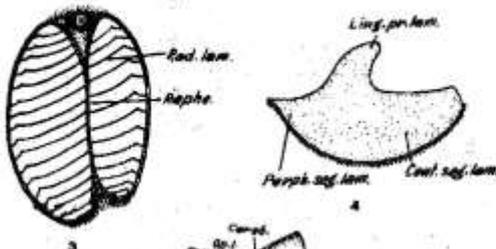


Fig.3. Structure of the olfactory rosette of *S. rhabdophorus*.

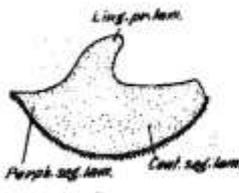


Fig.4. Structure of a single olfactory lamella with its two prominent process.

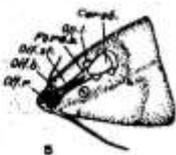


Fig.5. Anterodorsal view of the head of *S. rhabdophorus* showing the olfactory organs and their relationship with the brain.

ABBREVIATIONS

Ant. nost	-	Anterior nostril
Ang	-	Angular
Cent. Seg. Lam.	-	Central segment of lamella
Cereb	-	Cerebellum
Dent	-	Dentary
E	-	Eye
Fore. b.	-	Fore brain
Front	-	Frontal
Lach	-	Lachrymal
Lat.ethm	-	Lateral ethmoid

Ling.pr.lam.	-	Linguiform process of lamella
Max	-	Maxilla
Meseth	-	Mesethmoid
Nas	-	Nasal
Olf. b	-	Olfactory bulb
Olf. r	-	Olfactory rosette
Olf. I	-	Optic lobe
Olf. St	-	Olfactory stalk
Pal	-	Palatine
Post. nost	-	Posterior nostril
Pre max	-	Premaxilla
Perph. Seg. Lam	-	Peripheral segment of lamella
Quad	-	Quadrangle
Rad. Lam	-	Radial lamella
Raphe	-	Raphe

A single lamella is flattened and claw shaped (Fig. 4). Their outer concave margins bear linguiform process which are well developed. The lamellae are attached to the olfactory chamber by their convex inner margins and to the raphe by the proximal ends.

The surface area of lamellae in both rosettes of the two retinae were calculated individually in five specimens measuring between 30mm to 90mm. (S.L. 20 mm to 84 mm). On an average the surface area of the lamellae in two rosettes was found to be roughly 220% of the surface area of two retinae. The forebrain is well developed. The olfactory stalk runs up to the forebrain by means of olfactory stalk which extends upto the base of olfactory rosette and forms olfactory bulb at its end. (Fig. 5.)

DISCUSSION

In *S. rhabdophorus* the anterior inlet is circular where as the posterior outlet is oval in the form of pit the olfactory rosette is laterally compressed and elongated. Such type of olfactory rosette has also been observed by Sinha¹⁰⁻¹¹ and Ojha and Kapoor⁵ in *Ompok pabda*, *Gagata cenia*, *Glyptothorax pectinopterus*, *Ailia coila*, *Pangasius pangasis* and *Anguilla bengalensis*. The elongated rosette of *S. rhabdophorus* with its two rows of lamellae arranged on either side of the long and narrow raphe, can be classified, with Bateson' rosette type 2 or under Burn³ rosette column II. The number of lamellae in the rosette increases with the age and size of the fish and new lamellae are added at the anterior extremity of the rosette. It is however, not known if the acuity and discrimination of odours in a fish are directly proportional to an increase in the area of its olfactory surface.

Further, the total olfactory area in this fish is considerably greater than the total retinal area. This entitled it to belong to Teichmann²⁴ group of nose fishes comprising of solitary, twilight and nocturnal predators.

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