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OBSERVATIONS ON EXTERNAL GILLS OF JUVENILE OF *ICHTHYOPHIS BOMBAYENSIS* (AMPHIBIA- ICHTHYOPHIIDAE)

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ABSTRACT – Study on role of external gills in just hatched juvenile were least studied form Western Ghats of India. Here we describe the structure of external gills, its role in locomotion towards water body and in free swimming stage. The just hatched juvenile were three pairs of external gills at lateral side of collar region; firstly gills were dark red while after 15 to 20 hours they were fade whitish and then detached. Gills were succeedingly detached after 15 to 20 hours and got completely detached from body about 30 to 35 hours. The free swimming juvenile possesses gills for showed path towards water and respiration on land and partly in water. After detachment of gills juvenile showed aerial respiration.

Key words: *Ichthyophis*, juvenile, external gills, Western Ghats.

INTRODUCTION

Caecilians, one of the three extant orders of class Amphibia, comprise a group of limbless, girdleless, burrowing amphibians with an elongated body (Pillai and Ramachandran, 1999). Their subterranean habits make them difficult to find and as a result, general information like the reproductive mode remains unknown for many caecilian species (Gower and Wilkinson, 2005). Information on caecilian life history is important not only for improving understanding of amphibian life history evolution, but also for developing management strategies for conservation

The reproductive biology of Indian caecilians have little bit studied in *I. glutinosus* (Seshachar, 1933), *I. beddomei* (Bhatta, 1999) and *I. malabarensis* (Seshachar, 1933; Bhatta, 1999; Balakrishna *et al,* 1983). In *I. bombayensis* described egg morphology, hatching of eggs and early development of embryo from Koyana region in northern Western Ghats where a single female 590 mm length with 144 eggs were observed in captivity (Jadhav *et al,* 2007a). However, all these studies report on their observations based on the collected females with eggs and none of have reported spawning behavior in *Ichthyophis*. As par as reproductive biology of Indian caecilian is concerned one investigator reported the prespawning and spawning behaviour in *I. bombayensis* from Koyana region in northern WesternGhats (Jadhav *et al,* 2007 b).

The reproductive biology of Indian caecilians yet not properly studied due to burrowing nature, rarely observed and restricted distribution due to environmental degradation. In Western ghats of India as per my knowledge first time described the hatching and behaviour of just hatched juvenile. Here I described the structure of external gills, their role in journey towards water body and its importance in free swimming stage.

MATERIALS AND METHODS

Female *Ichthyophis* along with egg cluster was collected near rivulet in the burrow of wet soil. The egg cluster along with the adult was brought to the laboratory and was kept in artificial tank.

Newly hatched larvae were kept in five plastic round tubs, each possesses fifteen juveniles and it contains water upto 3 to 4 cm in depth. Food in the form of finely chopped liver, heart and meat of goat were provided once in a day and the water of the tubs were changed after every two days up to a month. Just after 20 to 30 hrs of hatching observed the external gills at the bottom of tub. Collected external gills and put it into bottle for further study.

After one month of hatching same juveniles were released into two artificial tanks which contain little bit depth of water about 3 to 4 cm and provide them artificial hiding places. The length, width and height of tanks were 3, 2 and 2 feet respectively. Always supply fresh water to the tanks to avoid decomposition of provided artificial food. The water from tanks changes after a week. Photographic and live video recordings of the entire event were made available.

RESULTS AND DISCUSSION

Juvenile of *Ichthyophis bombayensis* shows three pairs of external gills present on lateral side of nuchal collar (Fig. 1). Gills were reddish and lamellate with central axis. Blood vessels were clearly visible and

innervated to the gills of just hatched juvenile. Gills were three paired, median pair was long about 24.3 mm length; outer pair was medium 13.4 mm and inner pair was short 10.5 mm length. Just hatched juvenile, gills were dark red while after 15 to 20 hours they were fade and whitish. After 20 hrs gills were appeared fade and weak and then detached. We observed the posterior two third parts of gills detached from nuchal collar up to 15- 20 hrs and anterior one third parts of gills up to next 8 to 12 hrs. The previous investigators said that gills were absorbed by juvenile (Pillai and Ravichandra, 1999; Seshachar, 1942) but that opinion was wage we found that entire gills were detached from the nuchal collar and they were collected in large numbers from bottom of tub (Jadhav *et al,* 2007a).

Each gill shown central long axis which is broad at the base and tapered at apex. Either side of central axis shown lateral comb like lamellae. The length of lamellae was even at base and middle while reduced towards apex. Just hatched juvenile found that lamellae also dark red due to blood capillaries. After 15 to 20 hrs became fade white. Microscopic observations found that entire axis and lamellae of gills were covered with minute oval suckers like depressions.

The egg of *Ichthyophis* was cream coloured filled with white yolk in mass and egg covered with transparent, elastic and gelatinous membrane, which was continuous with cords at both ends. Both cords were straight, thin, hollow, untwisted and elastic and their tips coiled together to from hooks for firm attachment to median cord during the early stage of embryonic development. After embryonic development, one end of cord was detached from median cord due to increase in size of the eggs, while the other side remained attached to the median cord until the eggs hatched. In early stage eggs were cream coloured and during development of embryo in eggs became faint black and finally blackish coloured.

During embryonic development found that gills were visible externally after two week in embryo, further development of gills takes place vice versa yolk was decreased due to consumed by embryo up to 6^{th} week (Alexander *et al,* 2004) . Gills were clearly visible and entirely spread over the inner surface of egg and yolk only concentrated at ventral side near the vent (Fig. 3). The eyes were clearly seen. In last stage of embryo yolk was totally consumed by larva and entire egg look like black. Hence, in last stage diameter and weight of egg was reduced. The gills were well developed in late embryo than in early developed embryo. It indicates that gills play an important role in respiration during embryonic development.

The oviposition site of female *Ichthyophis* was near the water in the hole of moist soil or under the fallen leaves of trees. Hatching of juvenile were takes place at night about 9 to 11 p. m. Just after hatched, juvenile migrate to the direction of water bodies. During migration gills were attached to body due to sticky fluid and were observed barrier for journey of juvenile. The external gills remain in juvenile till journey on land to water then they were detached after 25 to 30 hrs. It indicates that external gills of juveniles were important in embryonic period and just hatched stage only for respiration. Apart from that in captivity we observed that the external gills of juveniles might be useful for showed shortest way towards water body. We couldn't observed wrong path to reach towards water body. It indicates that gills might be played role to shown shortest way towards water body (Fig. 4)

In captivity, Juvenile started moving towards water at very slow and became conscious. It took 15-20 minutes to travel 10-12 cm distance and then enter in water. It indicates that approximately 3 to 5 hours may be required for juvenile to reach in aquatic media in the field. Hence, hatching took place at 9 to 11 pm at night and up to 2 to 3 am juvenile was reached in aquatic media. The environments of late night may be favorable for journey of juvenile towards water and it may be free from predators.

Once juvenile entered in water, the free floating gills up to 15- 25 hours. Just up to 5 to 10 hrs the juvenile couldn't came to surface of water it indicates that when juvenile entered in water respiration by gills. Later on external gills were fading white and have no more roles for respiration. Hence, the longest middle gills got detached after 15 hours and the other inner and outer gills were detached within the next 20 hours. When the gills were still with the nuchal collar of juvenile, create barrier for locomotion and hiding under the stones and fallen leaves in water. Hence, external gills might be have no more roles in juvenile and hence got detached from nuchal collar after 15- 25 hrs.

After detachment of external gills the juvenile came to the surface of water for respiration. Previous studies have mentioned that the gills of the larvae were absorbed into the body (Pillai and Ramachandran, 1999), however, I think it could be erroneous as we could clearly observed the shedding off the gills during larval development. Once after detachment of external gills, gill slits were seen at lateral side of nuchal collar. Juvenile came to the surface of water every two minutes for getting oxygen from air and goes in water then immediately air bubbles came out from gill slits. Due to aerial respiration juvenile were prepared to live in shallow and stagnant water contains number of hiding places.

Fig.1 : Juvenile with well developed external gills

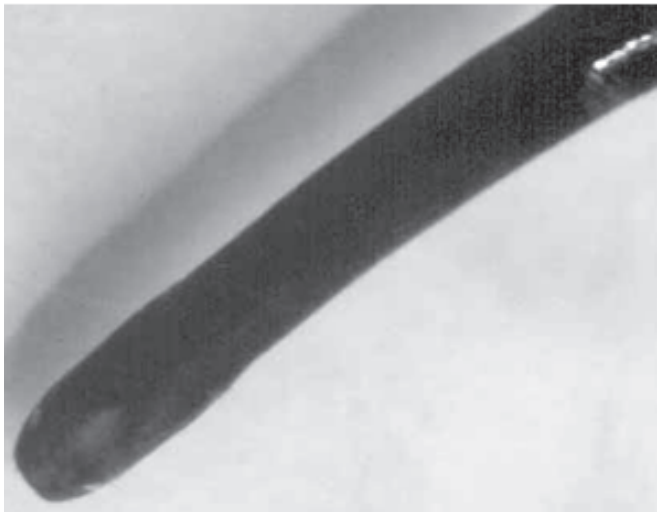

Fig. 2 : Juvenile without external gills.

Fig. 3 : Early hatched larva with yolk and external gills.

Fig. 4 : Gills help detect way towards water body.

Juvenile with external gills found that, they were restless and wandering in water, due to gills struck with the objects and one another. While after the detachment of gills the larvae became very sluggish in locomotion and prepare to live in hiding places such as stones, bricks and fallen leaves in the tub and only came to surface of water for respiration. More than five to seven larvae came together and stayed coiled around each other, like a bundle, in shadow places or under crevices. They mostly prepared to live in shadow places contain partly decomposed fallen leaves and hiding places.

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