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RESEARCH ARTICLE

SEX DETERMINATION OF *ANABAS TESTUDINEUS* DURING NON-BREEDING SEASON ON THE BASIS OF EXTERNAL MORPHOLOGICAL CHARACTERS

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ABSTRACT

The study was conducted during September to February months in the laboratory to study the external morphological characters for identifying the sex of *Anabas testudineus* during non-breeding season. Monthly sampling was done from the rearing stock for the study. For the identification of sex two methods were adopted. First one was observation of sex through external morphology and second one was confirmation of gonad through dissection. The seasonal development of the gonads was also studied morphologically. In the present study a trial was done to identify the sex through external observation on the basis the colour of the body, belly structure and vent. During the study it was found that all the above criteria were not sufficient to identify the sex of *A. testudineus* during non-breeding season, because no remarkable difference in the above morphological characters was noticed in male or female fish. Therefore, it is concluded that during non-breeding season the identification of sex in *A. testudineus* is quite difficult on the basis of external morphology, which needs further investigation.

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INTRODUCTION

Anabas testudineus is found in waterlogged paddy fields, canals, tanks, etc., throughout India, Ceylon, Nepal, Pakistan, Bangladesh, Myanmar, Thailand, Cambodia, South China, Malay (Menon, 1974, 1994; Jhingran, 1975). But it is native to India (Bardach *et al.,* 1972). However, the number of these species are gradually decreasing in the natural habitat and becoming threatened (Mookerjee and Majumdar, 1946) due to conversion of 90% agriculture fields into aquaculture tanks (Rao *et al.,* 1994), indiscriminate application of insecticides and pesticides in the agriculture fields, pollution and over exploitation during breeding season (Chandra *et al.,* 1970). The state of West Bengal has about 8% of India's population, less than 3% land mass. It is situated at 21°38' to 27° 10' North latitude and 85° 50' to 89° 50' East longitude of the Indian sub continent. In West Bengal *Anabas* is considered as a lucrative fishery due to its high and regular market demand (Dhote, 1994; Roy, 1994). According to Saha (1970), this fish contains high values of physiologically available iron and copper, which are essentially needed for haemoglobin synthesis. In addition, it also contains easily digestible fat of very low melting point and good amount of essential amino acids. So anabas is considered as a valuable item of diet for sick and convalescent with high market demand (Dhote, 1994; Roy, 1994). Current investigation was carried out to determination the sex of *Anabas testudineus* during non-breeding season on the basis of external morphological characters to understand the features of the reproductive biology which is required for proper management of the fishery.

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MATERIALS AND METHODS

The study was confined to the laboratory investigation and was conducted during September, to February months in the Department of Fisheries Resource management, West Bengal University of Animal and Fishery Sciences.

Collection and acclimatization of fish species

Adults of *Anabas testudineus* were collected from nearby local fish market of Mohanpur, Nadia, and West Bengal. They were transported to the laboratory by plastic buckets with manual aeration. No mortality occurred during transportation. In the laboratory, fishes were given a short bath- treatment with 2% potassium permanganate (KMnO4) solution for 3 to 5 minutes as a prophylactic measure. Subsequently, they were transferred carefully to an aquarium (30x30x60 cm) containing iron free tap water with a stocking density of 1 fish per three litre of water for acclimatization to laboratory conditions. They were kept in the above condition for six months. Freshly prepared artificial feed was given at a rate of 2 to 3% of their body weight during morning and evening hours. Adults fed actively, soon after the feed was provided to them. Unutilized feed and accumulated faecal materials were siphoned out daily in order to maintain good water quality. The water level was maintained with fresh iron free tap water. Surfacing had observed during the whole period of acclimatization. The acclimatized fishes were quite active, healthy and normal in the body colour as well as behaviour. The fishes stocked were reared. From the reared stock, monthly samplings were done for the further study.

Sampling: Every month fifteen numbers of samples were drawn randomly from the stocking specimen and observed.

Morphological study of specimen: Live fishes were taken in the dissection tray and observed thoroughly. The weight (w/w) and length (both total and standard length) of fishes were measured by balance and centimetre scale respectively. The external features viz, the colour of body, fins, vent as well as the structure of belly and shape of the black spots (at the tail and opercular region) were thoroughly observed. On the basis of keen observations on the external secondary sexual characteristics, the male and female fishes were segregated. The fishes were dissected and the gonads were removed out to confirm the sex as per the observations of external morphology.

RESULTS AND DISCUSSION

External Morphology

Colour: In the present study not much remarkable changes in colour of *A.testudineus* was observed. During non-breeding season, the normal colour of *A. testudineus* was greenish black (rifle green) along dorsal side and yellowish-white on ventral side up to anal fin. Four numbers of bands on either side with purple green colouration were found along the body depth. In the juveniles, two pairs of black spots were observed, one pair at the posterior end of each percale and another pair on both the sides of caudal fin. During the study no difference in colour of the fishes was seen (Tables 1 and 2). There were four numbers

Table 1. External morphology of male *Abanabus testudineus* during non breeding season

Month	Colour of Body	Size of Belly	Colour of vent	Black spot at caudal region	Black spot at opercular region
September	Body is less green ,ventral yellowish stipes on the body depth is less prominent	Slightly bulging	Reddish pink	Less prominent	No change
October	/body rifle green, darker to lighter below, ventral yellowish, white stripe on body depth is more prominent	Not bulging	Reddish pink	Less prominent	No change
November	Body rifle green, darker ventral yellowish, white stripe on body depth is more prominet	Not bulging	Reddish pink	Diffused	No change
December	Body rifle green, darker ventral yellowish, white stripe on body depth is more prominent	Not bulging	Slightly reddish	Diffused	No change
Januaray	Body whitish ventral, reddish yellow	Not bulging	Reddish	Slightly bright	No change
Febuary	Body whitish ventral, reddish yellow	Little bulging	Reddish	Bright	No change

Table 2. External morphology of female *Anabus testudineus* during non-breeding season

Month	Colour of Body	Size of belly	Colour of vent	Black spot at caudal region	Black spot at opercular region
September	Body is less green, ventral yellowish, stripes on body depth is less prominent	Less buldging	Reddish pink	Less prominent	No change
October	Body rifle green and darker to light below, ventral side yellowish, white stripe on body depth is prominent	Bulging	Reddish pink	Diffused	No change
November	Body rifle green and darker to light below, ventral side yellowish, white stripe on body depth is more prominent	Not bulging	Reddish pink	Diffused	No change
December	Body rifle green, darker ventral yellowish, white stripe on body depth is more prominent	Not bulging	Slightly reddish	Diffused	No change
January	Body rifle green, darker ventral yellowish red	Slightly bulging	Reddish	Slightly bright	No change
February	Body whitish ventral, reddish yellow	Slightly buldging	Reddish	Slightly bright	No change

of colour bands along the body depth. The colour of the band was purple green. The indifference of colour was observed from October to February. During late February the male of *Anabas* was found with little dominance in colouration i.e. reddish-yellow on ventral side and paired fins. Therefore, in the present study, the anabas could not be identified sexually, particularly during non-breeding season. The similar observation was made by Banerjee and Prasad (1974).

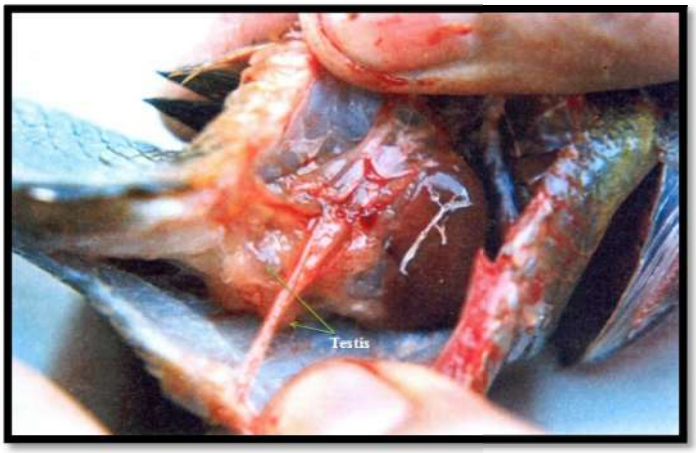

Plate 1. Photograph showing the testis in the coelomic cavity

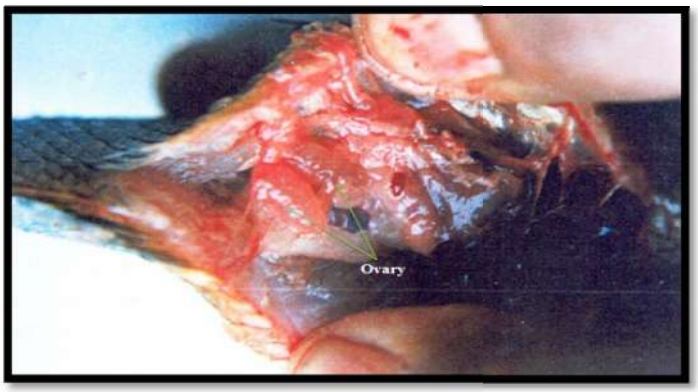

Plate 2. Photograph showing the ovary in the coelomic cavity

Belly structure During non-breeding season the belly of *Anabas testudineus* was found indifferent in both the sexes. The belly size was found almost same with no bulginess (Tables 1 and 2). It is because the male and female were in the post spawning and preparatory phase where the testis and ovary were found with less volume, GnSI and weight. So, it is clearly understood that the genital material (sperm and ova) was less in number. However, the volume of the gonad was found less and influenced the belly to be bulgeless. It is confirmed with the observation of Das (2002). Where he has plotted a very good relationship between the belly bulging and gonadal volume during breeding season. Therefore in the present study the belly size of *Anabas* was found almost similar in both the sexes during non-breeding season and the sexes could not be identified.

Vent During non-breeding season no remarkable change of vent was noticed in both the sexes. No such structure like genital papilla was seen. The vents of the fish were reddish pink to reddish in colour, with less brightness (Tables 1 and 2). Vent of *Anabas* plays an important role for the identification of sex during breeding season (Khan, 1972a; Dehadrai *et al.,* 1973; Banerjee and Prasad, 1974; Das, 2002). During this period the females of *Anabas* exhibits a bright red vent with a prominent outgrowth resembling the genital papilla. In the present study, this outgrowth was gradually reduced during September and October and finally reached to a rudimentary stage during December and January. So, during non-breeding season this outgrowth was so small that it is very difficult to observe the sex properly. Again towards the end February this rudimentary outgrowth again started to increase in size for identification of sex. The red colour of the vent was also found with less brightness during non-breeding season.

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