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Taxonomic comparison of the populations of climbing perch, *Anabas testudineus* (Bloch) in Bangladesh

M.M. Hassan[1], M.G.Q. Khan[1] and M.A. Hasanat[2]
[1]Department of Fisheries Biology and Genetics, Bangladesh Agricultural University Mymensingh-2202
[2]Fish Hatchery and Training Centre, Raipur, Laxmipur

Abstract

A study on the taxonomic comparison of five populations of the climbing perch, koi, *Anabas testudineus* was conducted from five regions of Bangladesh viz. Chittagong, Dhaka, Khulna, Rajshahi and Sylhet. The comparison was based on the morphometric and meristic data of the populations collected over a period of 4 months from July to October 2003. The average total length, standard length, post orbital length, eye diameter, length of base of the dorsal and anal fin of the population of Khulna region were higher than those of the other four populations. All the population characteristics of Chittagong region revealed significant difference ($P<0.05$) than those in Khulna.

Average meristic characters showed no difference ($P>0.05$) in all five populations in dorsal fin rays, pelvic fin rays, anal fin rays, and number of scale below and above lateral line. However, number of dorsal spine was found to be significantly higher ($P<0.05$) in Dhaka region than those in other regions. Number of caudal fin rays was also higher in Dhaka region. Five different body proportions viz., Standard Length: Head Length; Standard Length: Body Depth; Head Length: Eye Diameter; Head Length: Pre-orbital; and Head Length: Post orbital were recorded and significant differences at 5% level were obtained.

Keywords: *Anabas,* Morphometric & Meristic character, Monotypic, Taxonomic variability

Introduction

Research on fish systematics started in Bangladesh a few decades ago. Some mentionable workers in this field are Rahman (1991), Shafi and Quddus (1977, 1983), Amin (1980), Khan *et al.* (1980), Ahmed *et al.* (1979), Hossain (1971), and FAO (1963). About 475 species of 138 families have been taxonomically identified from the fresh, brackish and marine water in Bangladesh (FAO, 1972). Besides, Bhuiyan (1964) and Doha (1973) provided a taxonomic account of 71 species from Dhaka district, 106 species from Mymensingh and Tangail districts and 47 species of 16 families from Sylhet and Mymensingh districts.

Anabas testudineus, commonly known as climbing perch is a highly esteemed food fish. The fish can walk on land with the help of fin spines and opercular spines and possesses an accessory air-breathing organ (Eschmeyer, 1998). These fish are commonly seen at between 10 and 23cm, but can grow up to 25cm in total length. Males and females look similar, but can be distinguished as the male has a longer anal fin than that of the female. The distinguishing characteristics of *Anabas* have also been provided by Sterba (1973) and Kottelat *et al.* (1993).

Researches on taxonomic identification and culture of Indian major carps and Chinese carps are being performed in our country. However, taxonomic delimitation of the populations of Koi, climbing perch is lacking. The purpose of the study was to identify the morphological variation of this particular species in five divisional regions, viz., Dhaka, Rajshahi, Khulna, Chittagong and Sylhet in Bangladesh.

Materials and Methods

Collection of sample

Samples were collected from the local markets of Sonargoan upazila (Dhaka division), Shetakondo upazila (Chittagong division), Botiaghata upazila (Khulna division), Shibgonj upazila (Rajshahi division) and Nobigonj upazila (Sylhet division) during the months of July to October 2003 that represented five distinctive populations. A total of 50 specimens were collected from each locality.

Preservation of sample

The fishes were washed with water and preserved in 10% formalin. The jars were labeled containing information such as place and date of collection and name of the specimens.

Morphometric and meristic data collection

The morphometric data were recorded using normal centimeter scale, divider and forceps, recorded to the nearest cm. The morphometric characters viz., total length, standard length, head length, body depth, pre- and postorbital length, eye diameter, length of pectoral fin base, length of base of dorsal fin, length of base of pelvic fin and anal fin were recorded separately. The standard length was measured from tip of the snout to the base of the caudal fin. The total length was measured from the tip of the snout to the longest ray of the caudal fin. Meristic characters with respect to fin rays were counted including the smallest anterior rudiments. The countable characteristics such as no. of dorsal fin rays, no. of pectoral fin rays, no. of pelvic fin rays, anal fin rays and caudal fin rays, no. of lateral line scale, no. of scales above and below lateral line were recorded.

Data analysis

All the measured data were accumulated and analyzed by Analysis of variance (ANOVA) for test of significance.

Results and Discussion

Populations collected from five different zones revealed variation in different morphometric and meristic characteristics.

The highest total length was obtained in the populations of Sylhet and the lowest in Chittagong region with the values of 14.2 and 10.8cm respectively. The standard length were found to be higher in samples of Khulna and Sylhet without any significant difference ($P<0.05$) among the populations followed by Dhaka and Rajshahi. The head length of the koi populations of Sylhet was significantly higher than those in other regions. However, Dhaka, Khulna and Rajshahi populations showed insignificant difference in the head length values. The body depth was higher in populations of Sylhet and Rajshahi divisions (3.78 and 3.40cm respectively). Dhaka, Sylhet and Khulna regions gave populations of greater dorsal fin base than those in others. Anal fin base was longer in two regions namely Khulna and Dhaka regions (4 and 3.9cm) followed by Sylhet region (3.67cm). The average morphometric and meristic characteristics of the populations of Koi of five different regions have been shown in Table 1 and Table 2 respectively. No. of dorsal fin rays and pelvic fin rays showed no variation among the populations tested. However dorsal and anal fin spines varied among different regions. Scale no. above and below the lateral line did not show any significant difference ($P>0.05$).

Table 1. Average morphometric characteristics of Koi populations in five regions

Region	Total length (cm)	Standard length (cm)	Head length (cm)	Depth of body (cm)	Pre orbital length (cm)	Post orbital length (cm)	Eye diameter (cm)	Length of pectoral fin base (cm)	Length of base of Dorsal fin (cm)	Length of caudal peduncle (cm)	Length of base of anal fin (cm)
Chittagong	10.8±0.67	7.71±0.59	2.71±0.23	3.26±0.24	0.75±0.07	1.61±0.12	0.69±0.02	1.63±0.15	4.90±0.33	1.29±0.09	3.25±0.15
Dhaka	12.8±0.68	8.67±0.66	3.06±0.28	3.06±0.28	0.85±0.08	1.81±0.13	0.68±0.04	1.84±0.18	5.87±0.38	1.46±0.11	3.90±0.25
Khulna	13.7±0.47	9.14±0.80	3.05±0.41	3.15±0.22	0.82±0.15	1.92±0.51	0.73±0.32	1.81±0.70	5.60±0.66	1.45±0.49	4.00±0.42
Rajshahi	12.6±0.76	8.35±0.64	3.05±0.25	3.40±0.34	0.83±0.09	1.81±0.18	0.70±0.02	1.84±0.13	5.29±0.47	1.41±0.13	3.54±0.22
Sylhet	14.2±1.08	8.86±0.85	3.21±0.24	3.78±0.40	0.85±0.09	1.90±0.18	0.71±0.03	1.95±0.21	5.67±0.54	1.48±0.15	3.67±0.11

Table 2. Average meristic characteristics of Koi populations in five regions

Region	No. of dorsal fin rays	No. of dorsal fin spines	No. of pectoral fin rays	No. of pelvic fin rays	No. of anal fin rays	No. of anal fin spines	No. of Caudal fin rays	No. of lateral line scale	No. of scale above lateral line	No. of scale below lateral line
Chittagong	10±0.48	9±0.76	14±1.03	6±0.0	10±0.45	10±0.77	17±1.27	28±1.30	5±0.44	10±0.68
Dhaka	10±0.47	10±0.81	14±1.14	6±0.0	10±0.51	11±0.95	18±1.33	30±1.60	5±0.49	10±0.69
Khulna	10±0.65	9±0.74	15±1.13	6±0.0	10±0.51	10±0.72	17±0.72	28±1.37	5±0.77	10±0.88
Rajshahi	10±0.51	9±0.61	15±0.96	6±0.0	10±0.67	10±0.67	17±0.67	27±1.11	5±0.19	10±0.47
Sylhet	10±0.55	9±0.61	15±0.69	6±0.0	10±0.57	10±0.56	17±0.57	26±1.19	5±0.30	10±0.44

Different proportions of morphometric characteristics are given in Table 3. There was significant difference between the standard length and head length proportion in populations of Khulna region when compared with those of other four distinct populations. The head length and eye diameter proportions revealed significant difference ($P<0.05$) in populations of Chittagong region from other populations. Populations of Dhaka region also showed difference, compared with those of Chittagong or Khulna in the same morphometric character. Head length and pre-orbital length proportions showed insignificant difference ($P>0.05$) in case of populations other than Sylhet. The proportion of standard length and body depth significantly differed ($P<0.05$) in Khulna region over other populations.

Table 3. Different morphometric proportion of *Anabas testudineus* of five regions

Region	Proportion of SL:HL	Proportion of HL:ED	Proportion of HL:Preorbital	Proportion of HL:Postorbital	Proportion of SL:BD
Chittagong	2.841^{a}	3.913^{a}	3.621^{a}	1.684^{a}	2.361^{a}
Dhaka	2.836^{ab}	4.471^{b}	3.581^{a}	1.686^{a}	2.578^{b}
Khulna	2.997^{c}	4.187^{c}	3.726^{a}	1.591^{b}	2.902^{c}
Rajshahi	2.739^{ab}	4.376^{bc}	3.657^{ab}	1.685^{a}	2.454^{ab}
Sylhet	2.760^{ab}	4.540^{bc}	3.772^{bc}	1.686^{a}	2.343^{a}

(Differences in superscript letter denote significant variation ($P<0.05$) in means)

The variation of the maximum length (total length) of the species recorded as 14.2cm in Sylhet, 13.7cm in Khulna, 12.8cm in Dhaka, 12.6cm in Rajshahi and 10.8cm in Chittagong region may be explained with the environmental effects. Mookerjee and Mazumder (1946) stated that the growth of the species could be influenced by the environmental factors that in turn, reflect the reproductive activity of that very specimen. Hora and Pillay (1962) observed that climbing perch might attain a length of 12cm in first year and 20cm at the end of the second year. Mookerjee and Mazumder (1946) mentioned the weight of 13 to 28.2g in one year and 31.2 to 40.6g in second year. The availability of food, the fecundity of the species along with the culture area may have particular effect on the growth variation in *Anabas*. The lower growth of *Anabas* in Chittagong region could be due to the effect of soil parameters and water chemistry. The salinity may have influenced on the growth variation of the particular area. The species is a plankton feeder in its larval and fry stages but soon becomes insectivorous and voracious feeder (Singh and Samuel, 1981). Any variation in water P^{H} and salinity could be a reason behind morphometric variability. Beside there higher fecundity in confined cultured area might be a cause of this variation.

The family of Climbing perches, Anabantidae possesses a number of morphometric and meristic characters: Dorsal fin with 16 to 18 strong spines and 8 to 10 soft rays, inserted over or slightly in advance of pectoral fins; anal fin with 8 to 11 spines and 9 to 11 soft rays. Pelvic fins each with one spine and five soft rays (Talwar and Jhingran 1990). Two species have so far been identified according to them as *Anabas testudineus* and *A. cobojius* with characteristic features of body depth 3 to 3.5 times in standard length and snout length 13 to 17.5 times in standard length in the former and body depth 2.2 to 2.8 times in standard length

and snout length 10.5 to 12.5 times in standard length in the latter. The taxonomic identity of *A. testudineus* established by them was D XVI-XVIII 8-10; A VIII-XI 9-11; Pi 13-14; V i 5. In the present study it has been found that the standard length of *Anabas* is 2.34 times of head length in Sylhet region whereas in Khulna region the value was 2.902 which does not match with that of *A. testudineus* or with *A. cobojius*. Furthermore, the no. of dorsal fin rays and pectoral fin rays varied from those stated by Talwar and Jhingran (1990). The pectoral fin rays exceeded in the three populations out of five resulting the no. of 15 whereas the dorsal fin spine number also varied from the value cited by Talwar and Jhingran (1990).

There has been a considerable controversy whether the genus *Anabas* is monotypic or comprises more than one species. Rao (1968) showed that there are two distinct species and gave the name *A. oligolepis* to the second species. The variation of different characters particularly the meristic ones need to be justified for actual taxonomic identity of this species. Research on genetic variability of the koi populations of these five distinct regions may be carried out to locate their genetic distance. Different molecular marker technology may provide valuable information on the genetic status of these species.

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