

MORPHOMETRIC AND MERISTIC ANALYSIS OF *COILIA RAMCARATI* (HAMILTON, 1822) FOR RACIAL INVESTIGATION FROM CHITTAGONG AND COX'S BAZAR COASTS

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ABSTRACT

Morphometric measurements and meristic counts of *Coilia ramcarati* (Hamilton, 1822) were analysed statistically to ascertain the possible racial difference in the species from Chittagong and Cox's Bazar coasts of the Bay of Bengal. Some variations were found (insignificant, $p > 0.05$), indicating that the populations of *C. ramcarati* from Chittagong and Cox's Bazar coasts are not racially differentiated.

Key words: *Coilia*, Morphometric analysis, Correlation matrix

INTRODUCTION

The *Coilia ramcarati* (Hamilton, 1822) is a member of the family Engraulidae (Anchovies), commonly known as "Tapper tail anchovy" or "Frill-tailed golden anchovy" locally called "Olua" in Bangladesh (Rahman and Akhter 2009). It is a schooling species distributed in the Indian Ocean, Arabian sea and South China sea (Whitehead *et al.* 1968), with a tropical climate range of 25°N - 13°N, 87°E - 97°E. The species has also been reported from Ganges delta and Andaman Sea south of Rangoon (Talwar and Jhingran 1991) and Sundarbans mangrove forest (Debnath 2001). It is highly relished either as fresh or dried and commands a high market value from other species of this genus. Morphometric and meristic studies have provided useful results for identification of marine fish stocks describing their spatial distribution (Ihsen *et al.* 1981) and is the first step in investigating the stock structure of species with large population sizes (Motomura *et al.* 2007). Species identification and population discrimination are important in the conservation of biodiversity, natural resources and fisheries management (Ibañez *et al.* 2007). Identifying intraspecific units or stocks of a species with unique morphological characters enables a better management of these subunits of species and ensures perpetuations of the resources (Jaferian *et al.* 2010). Information on morphometric and meristic features as well as length-weight patterns is necessary for assessment of the fishery to ensure sustainability and for their inclusion in a regional food security programme (Akin-Oriola *et al.* 2005). Though this species is contributing a notable share, about 0.12 to 2.25% of in the artisanal fishery of Bangladesh (Nabi 2007), a very few reports are available on the taxonomy and biology of the *C.*

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ramcarati. Hence, the present study was carried out to observe the racial differentiation of the species through the analysis of morphometric and meristic characteristics.

MATERIALS AND METHOD

Collia ramcarati is available in the entire coast of Bangladesh from southwestern Khulna region to southeastern Cox's bazar region with fluctuating distribution (Rahman and Akhter 2009, Kamal and Khan 2009). From the initial field survey it was found that the maximum catch of *C. ramcarati* is landed in Chittagong and Cox's Bazar regions of Bangladesh. Fish sample was collected monthly from the landing centers and local markets of the Chittagong and Cox's Bazar coast of the Bay of Bengal during January to December, 2010. Samples were transported to the laboratory and thawed in a bucket of cold water. After complete thawing linear measurements and counts of different variables were taken turning the head left with a measuring scale and calipers to the nearest centimeter (0.00 cm). The gill rakers of the anterior gill arch were counted using magnifying glass after removal of the anterior gill arch from the fish. All the morphometric measurements were transformed to \log_{10} because linearity and normality are usually more closely approximated by logarithms than by original variables (Hair *et al.* 1998). Log transformed measurements were tested using the one-way ANOVA to observe the differences in allometric relationships among the samples both within and between these two stations.

RESULTS AND DISCUSSION

The morphometric measurements included total length (TL), standard length (SL), pre-dorsal length (PDL), head length (HL), eye diameter (ED), post-orbital length of head (POLH), inter orbital width (IOW), snout length (SNL) and body depth (BD) of the specimens. Morphometric measurements are given in Table 1.

Table 1. Morphometric measurements of *C. ramcarati* from Chittagong and Cox's Bazar.

Parameters	Chittagong, (N = 24)				Cox's Bazar, (N = 24)			
	Range		Mean \pm Std. error	Percentage of TL	Range		Mean \pm Std. error	Percentage of TL
	Min.	Max.			Min.	Max.		
TL	13.70	18.70	16.48 \pm 0.24	-----	13.82	19.64	17.20 \pm 0.26	-----
SL	13.00	18.10	15.34 \pm 0.26	93.08	12.84	18.82	15.86 \pm 0.26	92.21
PDL	3.80	5.50	4.47 \pm 0.09	27.12	3.77	5.61	4.55 \pm 0.09	26.45
HL	2.00	3.50	2.82 \pm 0.06	17.11	2.50	3.54	2.90 \pm 0.04	16.86
ED	0.50	0.60	0.55 \pm 0.01	3.34	0.49	0.60	0.56 \pm 0.01	3.26
POLH	1.60	3.00	1.89 \pm 0.05	11.47	1.62	3.01	1.91 \pm 0.05	11.10
IOW	0.80	1.10	0.93 \pm 0.02	5.64	0.78	1.10	0.95 \pm 0.02	5.52
SNL	0.50	1.10	0.69 \pm 0.03	4.19	0.50	1.11	0.70 \pm 0.03	4.07
BD	1.50	3.50	2.58 \pm 0.10	15.66	1.53	3.55	2.59 \pm 0.09	15.06

The meristic counts were done for branchiostegal rays (Br), dorsal fin (D) spines and rays, pectoral fin (P) filaments, spines and rays, pelvic fin (V) spines, anal fin (A) spine

and rays, gill rakers (Gr), lateral transverse (L.tr.), and scutes were recorded for the specimens. The meristic characters of the species showed approximately the same results for each specimen except in some minor cases, from the present study from which the taxonomic formula obtained is: *Br xii; D iii.13-14; P 6+5-7; V i.8-10; A ii.90; L.tr.10; Scutes 10+5; Gr.30.*

Each of the other 8 morphometric characters showed a linear relationship with the TL when analysed by sample (all regressions were significant at $p < 0.01$). The other 6 morphometric characters showed a linear relationship with SL except BD. There was significant linear relationship of PDL with HL, IOW, SNL and BD. Both the IOW and SNL are correlated with HL. No other morphometric characters were found correlated with ED, POLH and IOW except that with the TL only BD correlated with SNL.

In Chittagong region no significant differences were observed ($p > 0.05$) for the TL, SL, PDL, HL, ED, POLH, IOW and SNL except for the BD ($p < 0.05$) from the analysed fish samples. While in Cox's Bazar region significant differences were observed ($p < 0.05$) for the SNL and BD of the analysed specimens and all the other morphometric variables showed no significant differences ($p > 0.05$). Moreover, when all the morphometric characters were tested between two regions no significant differences were observed ($p > 0.05$). The morphometric measurements among the populations of *C. ramcarati* from Chittagong and Cox's Bazar coasts showed some variations within samples. Cheng *et al.* (2005) also detected morphometric distinctness among the genus *Coilia* samples and suggested that a direct relationship between the extent of morphometric divergence and geographic separation. However, the variations observed in the present study were not significantly different ($p < 0.05$). The significance of the difference is appraised by means of statistical procedures based on the theory of probability, it is usually extremely difficult to determine whether differences are phenotypic or genotypic, yet knowledge of the causes of the differences is essential to understand the significance. The geographical locations of the experimental stations and the different environmental conditions between them are not same. Habitat, temperature, elevation, slope gradient, stream velocity, productivity, sex and age exerted profound impact on these characters (Hubbs 1926, Barlow 1961, Hempel and Blexter 1963, Hopkirk 1973, Kirka 1974). Hence, the observed differences within stations, in this investigation are probably due to the variations in geography, ecology and human activities in the regions. These suggest that the fish populations of *C. ramcarati* from the experimental stations were not separable taxonomically. They may not be genetically separable populations but statistically separable.

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