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Incidence of ambicolouration in the Malabar tonguesole, *Cynoglossus macrostomus* (Norman, 1928) collected off Chapora, Goa, central west coast of India

S.V. Sanaye, R.A. Sreepada* & A.P. Pawar

Aquaculture Laboratory, Biological Oceanography Division, CSIR-National Institute of Oceanography, Dona Paula-403004, Goa, India

*[Email: sreepada@nio.org]

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The present report describes the incidence of ambicolouration in the Malabar tonguesole, *Cynoglossus macrostomus* (Norman, 1928) collected at a depth of 20 m off Chapora, Goa, central west coast of India. The ambicolourate specimen was 130 mm in total length and appeared to be normal on the ocular side except ambicolouration (~65%) on the blind side of the body. Radiographs revealed no skeletal and scaling anomalies between normal and ambicolourate specimens.

[**Keywords:** ambicolouration, Malabar tonguesole, *Cynoglossus macrostomus*, Goa

Introduction

Flatfishes belonging to the order Pleuronectiformes comprise 11 families occur worldwide[1], out of which five families (Bothidae, Cynoglossidae, Paralichthyidae, Psettodidae, Soleidae) are most common in Indian coastal waters. Eleven genera and 25 species of flatfishes contribute to minor or major fishery along the Indian coast[2]. Due to their complex behavior and life pattern, flatfishes have attracted the attention of many fishery biologists for more than a century[3]. Flatfishes have asymmetrical external pigmentation[4]. The ocular side of the fish is coloured or pigmented, while the blind side is completely white[5]. Ambicolouration is an abnormality described in flatfishes, in which pigment is also developed on the blind side of the body[6–10]. The occurrence of such abnormalities is relatively common in hatchery reared individuals of flatfishes[11]. Nevertheless, there are few reports of ambicolouration in flatfishes from different parts of the world both in natural habitat as well as in hatchery reared individuals[6–9, 12] and in India[13–17].

The majority of flatfish species caught off Goa coast (local name, *Lep*) belong to *Cynoglossus arel, C. macrostomus, C. macrolepidotus, C. puncticeps, Psettodes erumei*, *Synaptura albomaculata* and *Brachirus orientalis*. Occurring mostly in the shallow muddy and sandy bottoms in coastal waters up to 25 m depth[18]. This group contributes to about 5% of the total marine fish landings in Goa and mostly taken by trawlers (95%). Amongst flatfish species, the Malabar tonguesole, *C. macrostomus* is commercially important.

Materials and Methods

As a part of fish biodiversity assessment programme, an experimental trawling was conducted at depth of 20 m off Chapora (15°37'38.11"N; 73°39'27.11"E to 15°35'05.08"N; 73°40'13.81"E), central west coast of India during March, 2017. Out of 290 flatfish individuals, 254 belonged to *C. macrostomus* (Norman, 1928) and the remainder 36 individuals belonged to Kaup's sole, *Synaptura albomaculata* (Kaup, 1858). A single specimen of *C. macrostomus* (total length, 130 mm) showed ~65% ambicolouration with excess pigmentation covered all the areas of the body except head and part of abdomen on the blind side (Fig. 1).

Comparative morphometric measurements and meristic counts of normal and ambicolourate specimens are presented in Table 1. Except ambicolouration, neither morphological deformity nor significant

Fig. 1. — A Ambicoloured Malabar sole, *C. macrostomus* B) Typical white blind side in *C. macrostomus*

variation in meristic counts was noticeable in ambicolourate specimen (Table 1). Anteriorly from the tip of snout, body colour is white up to a length of 49 mm as found in normal specimens and ambicolouration starts from this point to the base of caudal fin. Ambicolouration starts from the 19th dorsal and 6th anal fin rays. Radiograph of ambicolourate specimen (Fig. 2) did not reveal any skeletal and scalation anomalies.

Results and Discussion

Generally, in flatfishes, two main pigmentation anomalies are observed: a deficiency or absence of pigment cells on ocular side is called as albinism and the excess pigmentation on the blind side called as ambicoloration[11]. Most of the abnormalities encountered in Pleuronectiform fishes are known to occur during larval development due to eye migration[5] and have been attributed many factors (environmental, nutritional, genetical and neurological). During the larval development, when eye gradually migrates to the one of the side causing stem cells on the ocular side differentiate into black pigment cells, whereas chromatoblasts on the blind side slowly shrink and break down into white[19]. Factors such as light intensity, feeding (feed type and nutritional quality) during larval stages, stocking density, hormones and genes involved in body colouration, neurological aspects and water quality conditions have been attributed for ambicolouration in hatchery reared flatfishes[5, 11–12]. On the other hand, in natural habitats, environmental contamination of sediments originated in anthropogenic and industrial activities could also contribute to ambicolouration[20].

Table 1 — Comparative morphometric measures and meristic counts of normal (n = 30) and amibcolourate specimen of *C. macrostomus*

Morphometric measures and meristic counts	Ambicolourate specimen (n = 1)	Normal specimens (n = 30)
Wet weight (gm)	14.20	8.6 – 16.98
Total length (mm)	130	60 – 164
Head length (% TL)	19.23	18.84 – 19.70
Dorsal Fin Rays	91	89 – 95
Anal Fin Rays	78	76 – 79
Caudal Fin Rays	10	10-12
Scale rows between lateral lines	14	14 –16

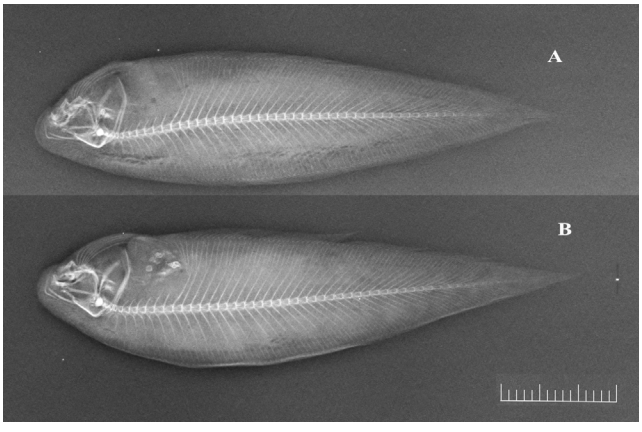

Fig 2. — Full body radiograph in *C. macrostomus* A) ambicoloured specimen B) Normal specimen

Relatively, there are few incidence of ambicolouration in flatfishes earlier reported from Indian coastal waters. First record of ambicolouration has been reported by Jones & Menon[13] in pan sole, *Brachirus pan* from Hooghly river. Ambicolouration in *B. orientalis* from Mumbai coastal waters has also been reported by Pradhan & Pradhan[14]; report of ambicolouration in two flatfishes (*Bothus ovalis* and *Cynoglossus lida*), by Sivaprakasam[15] was based on collections from Chennai fish market; Seshappa[16–17] reported ambicolouration in the two species (*C. dubius* and *C. macrostomus*) from coastal waters of Calicut.

A record of any type of abnormality, particularly colour anomalies in fishes is important and useful in assessing environmental impact and background studies. As diffuse pigmentation may indicate a recent parasitic infestation--probably from localised sources, records of incidence of this anomaly may be useful in determining a population's residence time at a specific location[21]. Since the present report of ambicolouration in *C. macrostomus* is based on a single specimen and thus warrants confirmation. Further studies on frequency of occurrence such abnormalities in flatfish populations would be useful in understanding the possible causes.

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