Abnormality of vertebrae in hatchery-reared ntchila *Labeo mesops* (Günther, 1868) (Pisces: Cyprinidae) juveniles

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Abstract

Abnormality occurring in vertebrae of hatchery-reared ntchila *Labeo mesops* juveniles was investigated. The rate of abnormality occurring in vertebrae was found to be 60.0 % (18 of 30 specimens), and the major symptom was fusion of neighboring vertebrae (77.8 %, 14 of 18 abnormal specimens). Other symptoms included deformation of vertebrae (38.9 %, 7 of 18), abnormal bend of vertebrae (27.8 %, 5 of 18) and undeveloped (small) vertebrae (22.2 %, 4 of 18). Although factors causing abnormality in this species were unclear, an inferior egg quality due to seasonal lag from peak spawning was suggested to be one of factors.

Key words: *Labeo mesops*, vertebra abnormality, hatchery-reared specimens

Introduction

Ntchila *Labeo mesops* (Günther) is an important commercial cyprinid inhabiting in Lake Malawi and its tributaries. This species is known to breed in rainy season (Tweddle 1982) and grows to over 40 cm in total length. Stock decline of ntchila in Malawi has been observed since early 1960s (Walker 1976), leading to necessity of stock assessment and artificial seed production for both stock enhancement and aquaculture promotion of the species.

Mass production techniques of artificial seed of *L mesops* were first established in late 1990s by the project of Japan International Cooperation Agency "Aquaculture Development of Indigenous Species in Malawi" at National Aquaculture Centre, Fisheries Department, Ministry of Natural Resources and Environment, Malawi, following the preliminary attempt of Msiska (1986). However, morphological abnormality was frequently observed in hatchery-reared specimens of this species. It is well known that higher abnormality rate occur in hatchery-reared fish than the wild ones, such as in *Pagrus major* (Matsuoka 1987), *Oplegnathus fasciatus* (Shimizu & Fujita 1985), *Plecoglossus altivelis* (Takashima *et al.* 1976) etc. For aquaculture promotion as well as stock enhancement of fish species, quality control, e.g. reduction of abnormality occurrence in hatchery-reared specimens, is a crucial issue to be considered. This study aimed at identifying and describing the abnormality occurring in vertebrae of hatchery-reared *Labeo mesops* juveniles.

Materials and Methods

A total of 30 *Labeo mesops* laboratory-hatched juveniles (56 day-old) were available in this study. Total length (TL) of fish ranged from 16.00 – 26.50 mm (mean ± SD: 21.50 ± 2.76 mm TL). They were obtained from National Aquaculture Center, Fisheries Department, Domasi, Malawi. Broodstocks were captured from Shire River in Liwonde National Park, Malawi. Eggs were obtained by natural spawning after maturation by pituitary hormone injection. Hatching took place on 14 March 2002 and fish were reared in 200 *l* plastic tank. Zooplankton (rotifers, copepods etc.) collected from the earthen pond was given twice a day at the density of 5 – 10 ind. per m*l* water.

Fish samples were preserved in 5% formalin immediately after collection. After 10 days preservation in 5% formalin, fish were treated to be double stained transparent specimen, following the method described by Kawamura and Hosoya (1991)(Fig. 1). Using these specimens,

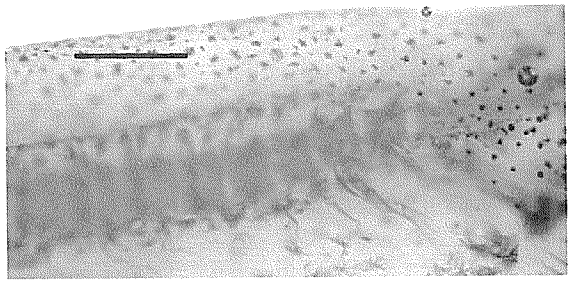

Fig. 1. Vertebrae of hatchery-reared ntchila Labeo mesops juvenile (21.05 mm TL). Bar indicates 1.00 mm.

abnormalities occurring in vertebrae were identified and described.

Results and Discussion

Number of vertebrae in *Labeo mesops* was 37 and the rate of abnormality occurrence in vertebrae was 60 % (18 of 30 fish). The following abnormal symptoms were identified;

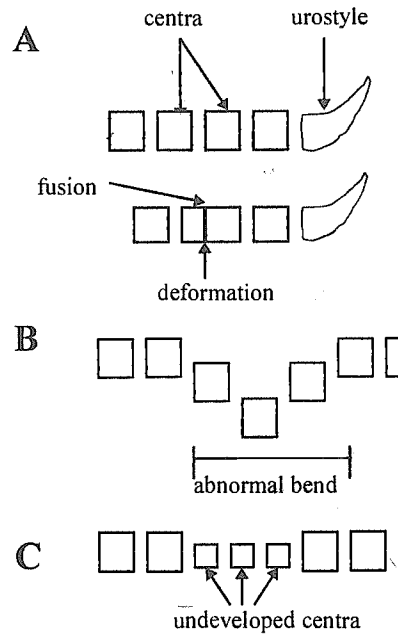

Fig. 2. Abnormality types observed in this study.

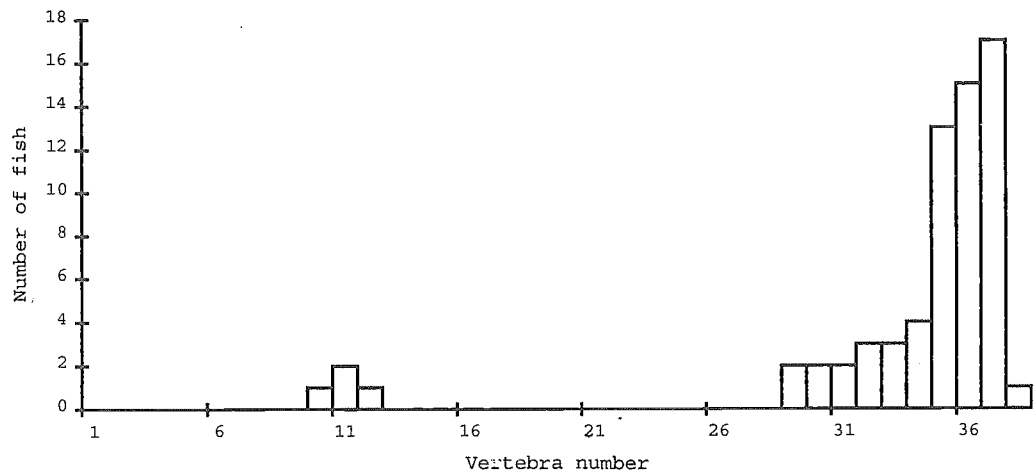

Fig. 3. Position of abnormality in vertebrae of *Labeo mesops* juveniles.

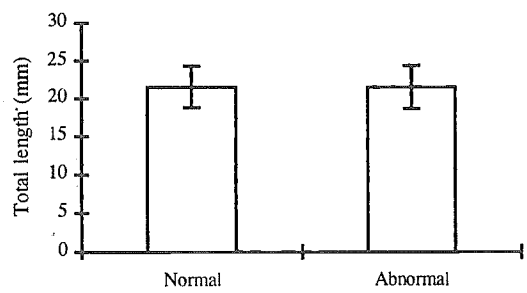

Fig. 4. Total length (mm) of fish with normal and abnormal vertebrae. Vertical bars indicate standard deviations.

- fusion of neighboring vertebrae (n = 14) (Fig. 2A),
- deformation of vertebrae (n = 7) (Fig. 2A),
- abnormal bend of vertebrae (n = 5) (Fig. 2B),
- undeveloped (small) vertebrae (n = 4) (Fig. 2C).

Fusion and deformity symptoms appeared as combined, i.e. deformed vertebrae fusing with its neighboring vertebrae (Fig. 2A). Abnormality in vertebrae mainly appeared in caudal portion around 34^{th} – 37^{th} vertebrae and urostyle (17 of 18 abnormal fish) and occasionally in abdominal portion (2 of 18)(Fig. 3). Similar symptoms and position of abnormality occurrence were reported in *Thunnus orientalis* (Shimizu & Takeuchi 2002). Total length of abnormal fish ranging between 16.00 and 26.05 mm (mean ± SD: 21.48 ± 2.86 mm) were not significantly different from fish with normal vertebrae ranging between 18.00 and 26.50 mm TL (mean ± SD: 21.53 ± 2.73 mm) ($P > 0.05$, t-test, Figure 4). This seems to indicate that there is no sizebias in abnormality occurrence. However, considering the possibility of mortality in smaller / abnormal specimens before collection, serial observations since hatching are required to clarifying size bias of abnormality occurrence and relationship between abnormality and mortality.

One of factors causing abnormality in hatchery-reared fish is considered to be unbalanced nutrition in diet, e.g. deficiency in essential amino acid (EAA), essential fatty acid (EFA) and minerals etc. In particular, deficiency of EFA in nauplii of *Artemia* spp. is known to cause high rate of abnormality occurrence in several fish species (Kanazawa 1988). In this study, fish were given natural zooplankton that are considered to have better nutritional values than *Artemia* spp. (Kanazawa 1988) in supplying EFA. However, nutritional requirements of *Labeo mesops* has never been investigated so far and this needs to be clarified. In *Pagrus major*, the relationship between undeveloped uniflated swim-bladder and lordic deformity in vertebrae was reported (Kitajima *et al.* 1981).

Peak spawning season of *L. mesops* is estimated to be during early rainy season, that is, from November to January. Broodstock used in this study was collected in March 2002, being in the last phase of rainy season. The egg size was also inconsistent. This may reveal that eggs used in this study were of lower quality than what would be obtained during peak spawning season. However, studies on egg quality in *L. mesops* have so far not been made. Thus, comparison of seasonal differences in egg quality of this species is needed.

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