Preliminary examination on hormone-induced breeding of kabyabya *Opsaridium tweddleorum* (Pisces: Cyprinidae) (Skelton, 1996) and morphology of newly hatched larvae

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Abstract

Hormone-induced breeding of kabyabya *Opsaridium tweddleorum*, a Malawian endemic cyprinid, was attempted using carp pituitary gland hormone and morphology of newly hatched larvae was observed. After administering pituitary gland hormone injections twice, spawning of kabyabya was observed in glass fiber tank (3 *l*) and 49 fertilized eggs were obtained. The eggs hatched approximately 60 hours after spawning. A total of 21 newly hatched larvae were consecutively collected from 0 hour (at hatching) up to 139 hours after hatching. Using these larvae, morphological development of newly hatched larvae was described.

Key words: *Opsaridium tweddleorum*, hormone induced spawning, morphology of newly hatched larvae

Introduction

Opsaridium tweddleorum (Skelton 1996), locally known as "kabyabya", distributes in Malawian waters and grows to 15 – 20 cm in total length (TL). This species mainly inhabits in rivers and ponds in plateau areas of the country. Although the biology of this species is not well known at present, it is known that the species breeds during spring – summer (Skelton 1993) with appearance of sexual dimorphism (S. Morioka, unpubl. data). This species has so far not been important commercially due to the small size of catch. However, general total fish catches in Malawi have tended to decline since 1970's (Bulirani *et al.* 1999). It is, therefore, expected that the species that are commercially invaluable at present, such as *O. tweddleorum*, may be of more commercial value in future. Hence, information needed for aquaculture and stock assessment, and in particular, information on reproduction and early developmental stages of such species is needed. In this study, attempts were made to breed kabyabya that was caught from the wild indoors using hormones. Secondly, morphological descriptions of the newly hatched kabyabya were made.

Materials and Methods

Broodstock (8 males and 6 females) of *O. tweddleorum* (Fig. 1) was collected from Malingunde

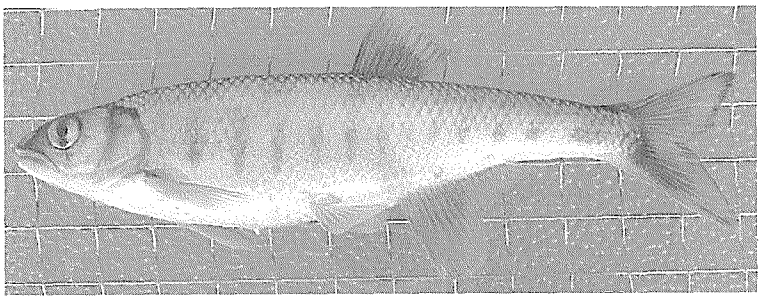

Fig. 1. Mature male *Opsaridium tweddleorum* (157 mm TL).

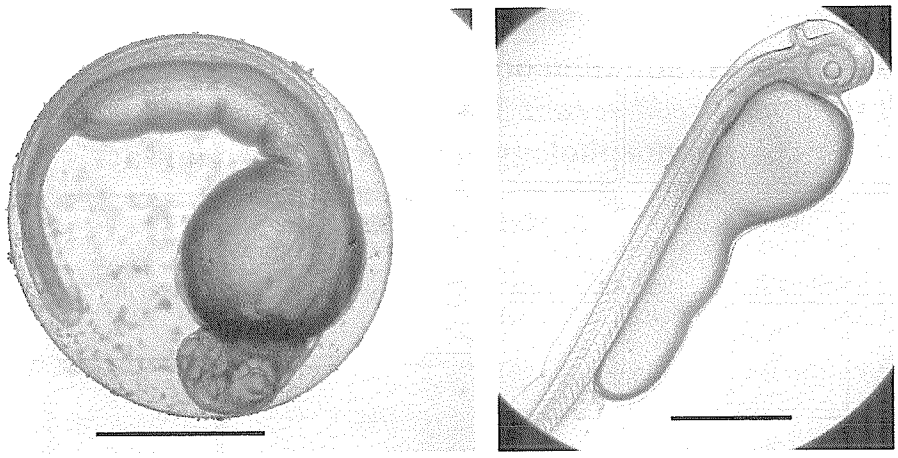

Fig. 2. Embryo (59 hours after spawning, left) and larva just after hatching (right). Bars indicate 1 mm.

reservoir, 25 km southwest off Lilongwe, Malawi, by lure fishing during September - October 2001.

Fish were stocked in 3 *t* tank in a water circulating / filtering system and were fed artificial diets (pellet and flake type) twice a day. Since 3 females and all males were observed sexually mature on 20 September 2002, pituitary gland hormone was administered (20 mg /kg wet weight) at 18:00 of the day. As spawning was not observed on the following day, another injection of pituitary gland hormone was attempted (5 mg / kg wet weight) at 15:00 on 21 September.

Time (in hours) from spawning to hatching and yolk volume (mm^3) was recorded, and morphological development of newly hatched larvae was described. Larvae were not fed until they were sacrificed.

Results

Forty-nine fertilized eggs were obtained at 11:30 on 22 September 2002. Eggs were incubated in 30 *l* fiber tank and hatching started at 19:30 on 24 September after approximately 60 hours of incubation (Fig. 2). A total of 21 newly hatched larvae were collected from 0 hour after hatching (HAH) until all larvae were sacrificed (139 HAH). Water temperature was 20.5-24.5 °C.

Morphological descriptions were as follows:

- 0 hour after hatching (HAH)(5.17 ± 0.36 mm TL, n = 3) (Fig. 3A): Eyes not pigmented (Figure 4, A).
- 19 HAH (6.09 ± 0.03 mm TL, n = 4)(Fig. 3A): Eyes started pigmentation. Body segmented and anus opened (Fig. 4, B).
- 43 HAH (6.82 ± 0.03 mm TL, n = 3)(Fig. 3A): Eye pigmentation mostly completed. Body pigmentation not appeared. Pectoral fin bud ap-

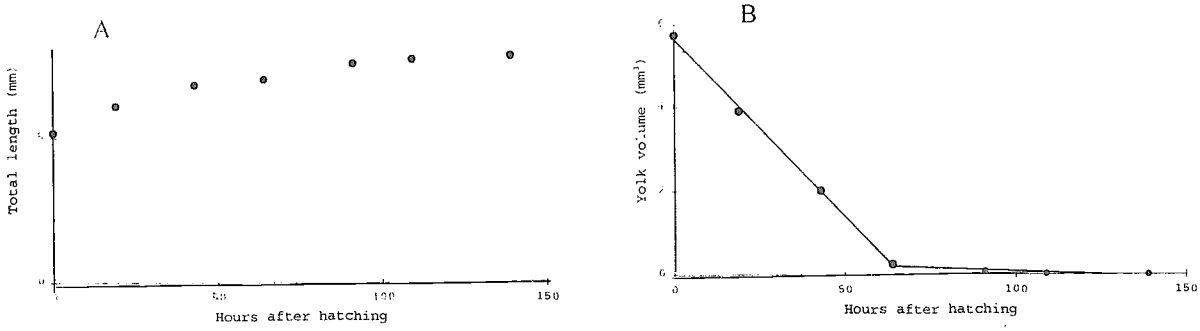

Fig. 3. Relationship between hours after hatching and total length (mm)(A) and yolk volume (mm^3)(B) in newly hatched larvae of *Opsaridium tweddleorum*.

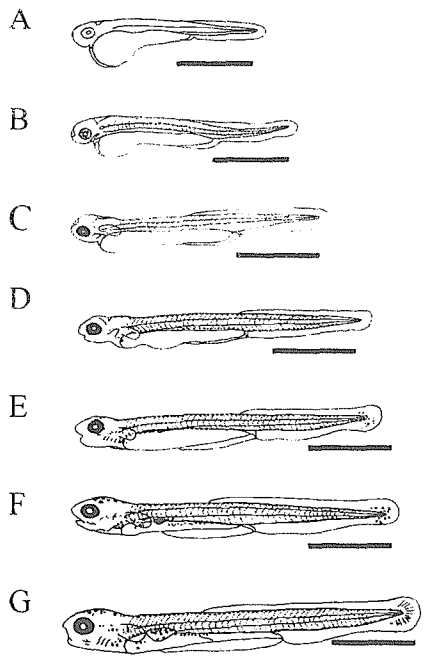

Fig. 4. Illustrations of newly hatched *Opsaridium tweddleorum* larvae. A: larva at hatching (0 HAH, 4.75 mm TL), B: 19 HAH (6.10 mm TL), C: 43 HAH (6.75 mm TL), D: 64 HAH (7.00 mm TL), E: 91 HAH (7.50 mm TL), F: 109 HAH (7.70 mm TL), G: 139 HAH (7.85 mm TL). Bars indicate 2 mm.

peared and mouth opened (Fig. 4, C).

- 64 HAH (7.02 ± 0.06 mm TL, n = 3)(Fig. 3A): Eye pigmentation completed. Melanophores started developing on head, dorsal edge of body and dorsal side of abdominal cavity (Fig. 4, D).
- 91 HAH (7.58 ± 0.07 mm TL, n = 4)(Fig. 3A): Body pigmentation developed to posterior notochord edge. Pigmentation appeared on caudal fin fold. Gill started being developed (Fig. 4, E).
- 109 HAH (6.72 ± 0.12 mm TL, n = 3)(Fig. 3A): Body pigmentation further expanded toward ventral portion. Swimming bladder started being developed with pigmentation (Fig. 4, F).
- 139 HAH (7.85 mm TL, n = 1)(Fig. 3A): Swimming bladder further developed. Caudal fin rays started being developed (Fig. 4, G). Yolk was not completely exhausted at this stage.

Yolk volume (V, mm^3) showed a drastic decrease from 0 to 64 HAH (T) as expressed by a linear regression $V = -0.085 \cdot T + 5.658$ ($r = 0.999$) (Fig. 3B). It, thereafter, decreased gradually from 64 to 139 HAH as expressed by a linear regression $V = -0.003 \cdot T + 0.412$ ($r = 0.911$) (Fig. 3).

Discussion

Although mpasa *O. microlepis*, the congener of kabyabya, is known to breed during autumn to spring (May – September)(Tweddle 1983; S. Morioka, unpubl. data), Skelton (1993) noted that kabyabya breeds during spring – summer. This coincided with the period of sexual maturation observed in this study, being close to the breeding period of sanjika, *O. microcephalum* in Lake Malawi (Morioka 2002).

Yolk of kabyabya larvae decreased drastically from 0 to 64 HAH, the mouth and anus opening by 43 HAH (Figs. 3 & 4), being similar to *Chanos chanos* (Kohno *et al.* 1990), *Psetta maxima* (Moteki *et al.* 2001), *Pagrus major* (Moteki *et al.* 2001). Matsumoto *et al.* (2001) reported that *Clarias gariepinus* yolk-sac larva has two successive phases, the one being the period only relying on yolk as energy supply and another being the period relying both on retained yolk and exogenous energy after onset of feeding. Considering this observation and morphological description of this study, kabyabya is considered to start feeding between 43 and 64 HAH (Figs. 3 & 4), although the timing of onset of feeding was not clarified in this study.

This study has just presented the possibility of reproducing *O. tweddleorum* by artificial means in a laboratory and the fundamental morphological development of the newly hatched larvae have been described. For future studies information on feeding biology and growth pattern of both wild and laboratory hatched larvae should be obtained.

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