

Breeding seasonality and size at first maturity of *Synodontis njassae* of southeast arm of lake Malawi

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Abstract

Breeding seasonality and size-at-first maturity of *Synodontis njassae* in southeast arm of Lakes Malawi was studied. It was found that males mature earlier than females (10.6cm and 11cm, respectively). The size at 50% maturity for both sexes was 12-13cm. This species has small eggs, with an average fecundity of 3985 ± 39.690 . The species has two breeding seasons. The first spawning occurs in February to March (GSI falls from 4.09 to 2.37) and the second spawning occurs from September to November (GSI falling from 3.5 to 2).

Key words: Cage farming, fish breeding, fish fecundity, spawning

Résumé

La saisonnalité de reproduction et la taille à la première maturité de *Synodontis njassae* dans le bras Sud-Est du Lac Malawi ont été étudiées. Il a été constaté que les mâles mûrissent plus tôt que les femelles (10,6 cm et 11cm, respectivement). La taille à 50% de maturité pour les deux sexes était de 12-13cm. Cette espèce a de petits œufs, avec une fécondité moyenne de 3985 ± 39.690 . L'espèce a deux saisons de reproduction. La première ponte a lieu de Février à Mars (GSI chute de 4,09 à 2,37) et la seconde ponte se produit de Septembre à Novembre (GSI chutant de 3,5 à 2).

Mots clés: Elevage en cage, reproduction des poissons, fécondité des poissons, ponte

Background

The proliferation and diversity of fish species in Lake Malawi has led to a boost in Malawi's ornamental fish trade. Malawi's ornamental fish traders rely on fry collection and capture on adult species whereby divers set up traps and capture live fish for their trade. This has worked best for Mbuna cichlids which inhabit rocky habitats in the lake. *Synodontis njassae* is among the ornamental species that has received attention from fish hobbyist. This species is also a delicacy food among the the shoreline communities.

S. njassae does not inhabit a specific area in the lake, making capture by divers difficult. There is conflicting information on the breeding season of this species. While some studies indicate that this species breeds in rivers during the warm dry season, others suggest that it breeds during the rainy season. This conflict of information poses a dilemma on the best months for fry collection. This paper answers the question of when do this species spawn, the average fecundity, egg size, sex ratio and the size of the fish at first maturity. This information will allow fish hobbyist and fish scientists to know how and when the species breed and whether it is possible for it to breed in captivity.

Literature Summary

The genus *Synodontis* (Cuvier, 1816) is the most rich and widespread within the catfish family Mochokidae. Studies have shown that *Synodontis njassae* is a primarily fresh water species (Kazembe et al., 2006). In Lake Malawi, this species is also found off sandy shores down to the limits of dissolved oxygen (as deep as 220 m).

Histological criteria from ovary samples can be used to classify the maturity stage of fish based on characteristics and classification systems described by Hunter and Macewicz (1985) and Schaefer (1996). A fish life cycle is influenced by many factors but the most important is reproduction. Reproduction plays an important role in the adaptive success of a species, since it indicates the potential of a population to produce viable descendents (Vazzoler, 1996). Studies on fish reproduction may be used to support fish management and conservation programmes designed to maintain or improve fish stocks (Marques et al., 2000).

Study Description

A total of 472 fish samples were collected on board the Ndunduma fisheries research vessel over a period of twelve months in the southeast arm of Lake Malawi. Individual fish weight and total length were recorded. Fish gonads were removed using a surgical kit, weighed and stored in 10% formalin. Relative fecundity was determined by dividing the total number of the oocytes for each female fish by the total body weight) of the fish. Egg size or diameter was determined as the distance from the dorsal edge to the ventral edge across the yolk perpendicular to the egg length. At Bunda college aquaculture laboratory, fish gonads were treated in a series of histological solutions, sectioned and stained using haematoxyline and eosine solutions and viewed under a compound light

microscope at 100 × magnification. The ovaries were grouped according to maturity stage based on development and position of the nucleus.

The mean length at 50% maturity was determined by fitting the proportion of mature individuals (\emptyset) and the individual fish total length to a logistical curve; $\emptyset = 1 / (1 + e^{-(L-L_m)/\delta})$, where L_m is the length at 50% sexual maturity, L is the individual length and δ is the width of the logistic curve. All fish lengths corresponding to 50% cumulative frequency were then taken as the sizes at which 50% of the fish were mature (King and Etim 2003). Gonadosomatic index (GSI) of the fish was calculated using the formulae; $GSI = 100 \times (\text{Weight of gonad} \div \text{Weight of fish})$, (King, 1995; Limuwa, 2008). Using Genstat v12, and ANOVA the average GSI of females and males was tested to determine any significant differences at $P = 0.05$. Differences in monthly GSI was tested using least significant difference (LSD) and Duncan's multiple test ($P = 0.05$). Sex ratio was analysed and tested using chi-square.

Research Application

The study found that *S. njassae* is a synchronous spawner and has two breeding seasons in a year (Fig. 1). The first breeding season is relatively short and takes place during peak rainfall

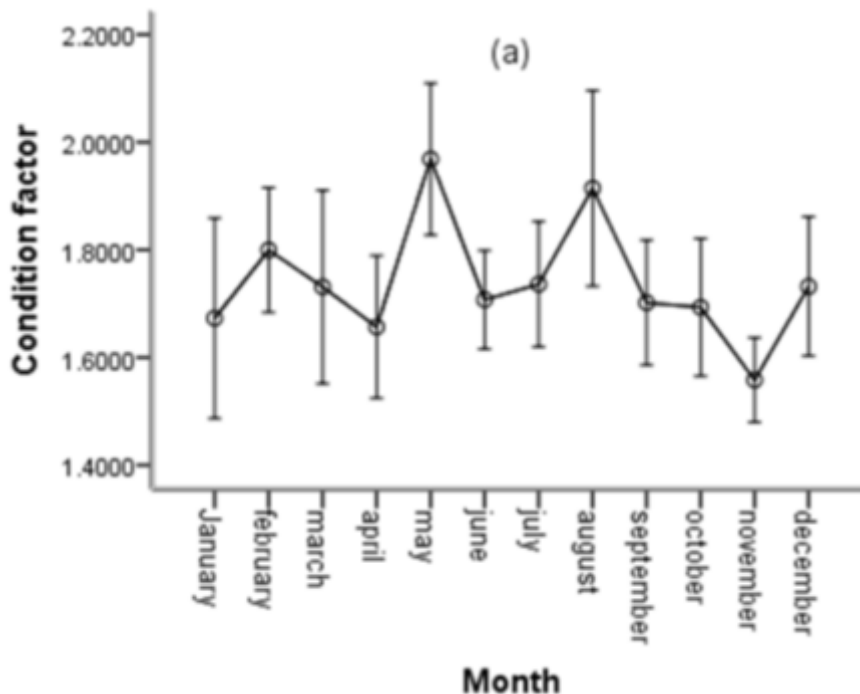


Figure 1. Monthly GSI variation.

months of February to March. The second breeding season takes place after the cold months of June and July, thus from August to November. The best time to collect fry for the ornamental fish trade is April to June and November to December.

It was also found that *S. njassae* mature early at only 12cm (Fig. 2), with males maturing earlier than females.

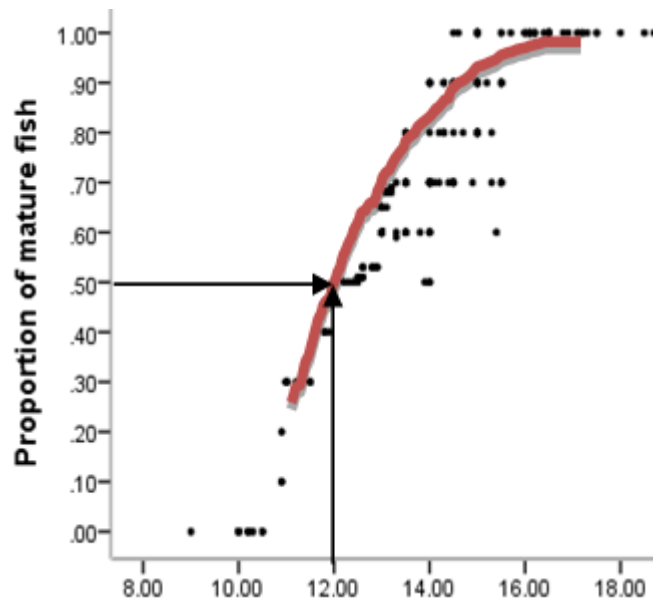


Figure 2. Logistic curve showing size at 50% maturity.

Table 1. Monthly sex ratio of *S. njassae* during the study period.

Month	Overall no. collected		Sex ratio (M:F)
	M	F	
January	18	22	1 : 1.2
February	26	23	1 : 0.9
March	18	20	1 : 1.1
April	23	25	1 : 1.1
May	15	16	1 : 1.1
June	34	39	1 : 1.1
July	18	15	1 : 0.8
August	10	18	1 : 1.8
September	15	23	1 : 1.5
October	14	17	1 : 1.2
November	22	27	1 : 1.2
December	19	25	1 : 1.3
Total	232	270	

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