

## Studies on the Biology of *Synodontis victoriae* in the Nyanza Gulf of Lake Victoria, Kenya

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### Abstract

Fish samples (401) were collected weekly between May to July 2015 from commercial catches in the Nyanza Gulf of Lake Victoria, Kenya. The Fork length (cm FL), weight (g) and sex were determined. A total of 288 (71.8%) were female while 107 (26.7%) were males, sex ratio; 1.0:2.7 (male: female). Size of females ranged from 9.0 cm to 17.6 cm FL, mean ( $\pm$  SD) 13.6 cm  $\pm$  1.3 cm FL and weighed between 13.0 g and 99.0 g, mean 47.5 g  $\pm$  13.9 g. Length of males ranged from 7.0 cm to 15.6 cm FL, mean 12.8 cm  $\pm$  1.3 cm FL and weighed between 7.0 and 62.0 g, mean 36.2 g  $\pm$  9.9 g. Sex dimorphism was observed as female fish were significantly larger than males ( $p < 0.05$ ). The length frequency showed a unimodal distribution with modal class at 13 cm FL. Male, female and both sexes showed negative allometric growth pattern ( $b < 3$ ). The fish had a good condition with values equal to 1. The smallest mature male and female fish were 11.2 cm and 11.3 cm FL, respectively. The length at 50% maturity was estimated at 13.0 cm FL for male and 12.0 cm FL for female fish. The study has thus provided baseline information on some aspects of the biology of *Synodontis victoriae* that are limited in the lake.

**Keywords:** *Synodontis Victoriae*; Maturity; Condition; Length-Weight

### Introduction

*Synodontis victoriae* is a species in the order Siluriformes (Catfish) of Mochokidae family. They are also known as squeakers due to their ability to make stridulatory sounds through their pectoral fin spines when handled or disturbed [1]. They have 1 dorsal spine, 6-7 dorsal soft rays, 16-21 mandibular teeth, maxillary barbels, dark spots and spotted caudal fin. The fish is common in Africa, occurring mostly in Lakes Kyoga and Victoria, Victoria Nile, lower Kagera River and Malagarasi drainage [2]. *S. victoriae* inhabits lakes at depths of more than 20 m over soft bottoms although they also occur over hard substrates in waters above 13 m deep. They are found in creeks, ponds, streams, lakes and rivers [1]. The fish can tolerate low levels of dissolved oxygen [3]. They mature at about 8 cm to 10 cm FL and grow to attain a maximum length of 35 cm FL [4]. *S. victoriae* are oviparous reproducing with the flooding period of the rainy season and are found at temperatures of between 23°C to 27°C [5]. They are omnivorous feeding on a wide spectrum of different foods [1]. Wanyanga et al. [6] reported that the diet of *S. victoriae* primarily comprise of molluscs, crustaceans, insects, detritus and fish scales.

*S. victoriae* are prized ornamental because of their striking pigmentation body patterns and display unusual behaviors such as upside down swimming. Furthermore like any other fish they play an important role by providing food for human consumption and employment opportunities. They are potamodromous and their

decline in Lake Victoria has been attributed to intensive fishing using small mesh gillnets and traps at the river mouths where ripe females and males congregate on their way to spawn in the riverine environment. Apart from over fishing, most of these species are threatened by modification of riverine regimes by human activities such as farming, settlement, urban and industrial effluents and the introduction of alien species. This study determined some aspects of the biology of *S. victoriae* in Lake Victoria.

### Materials and Methods

This study was conducted in the Nyanza Gulf of Lake Victoria, Kenya (56°17'43.008"N 30°58'57.32"E; 0°08'40.7"S, 34°44'12.4"E). The fishery of *S. victoriae* within the gulf is mainly by gillnetting (2.0 inches to 4.0 inches mesh-size). Samples (401) of *S. victoriae* were collected weekly from commercial catches between May to July 2015. The fish were measured Fork length (cm FL) and weighed (0.1 g) using an electronic balance. Sex for the fish was determined using the keys of Lagler (Table 1) [7]. Length at 50% maturity was estimated by fitting frequency data of mature individuals by lengths to a logistic curve.

The length-weight relationship was estimated using the formula:

$$W = a \times TL^b$$

The relative condition factor was calculated as follows:

$$K = \frac{W}{(a \times TL^b)}$$

| Maturity stage    | Male              | Female                      |
|-------------------|-------------------|-----------------------------|
| Stage I: Immature | Testes colourless | Eggs invisible to naked eye |

|                      |  |  |
|----------------------|--|--|
| Stage II: Developing | Testes translucent   | Small eggs seen using magnifying glass   |
| Stage III: Mature    | Anterior testis whitish with short finger-like processes                 | Eggs clearly discernible to eye; ovaries orange-reddish  |
| Stage IV: Ripe       | Testes large and produces milt drops under slight pressure;              | Ovaries fill ventral cavity; eggs light green, completely round and fall from ovary with little pressure |
| Stage VI: Spent      | Testes thread-like with no granules and are pink-white shrivelled bodies | No opaque eggs left in ovaries; ovaries large but flabby   |

**Table 1:** Maturity stages of *S. victoriae* according to Lagler [7].

| Length (cm FL) | Males (M) | Females (F) | $\chi^2$ | p     |
|----------------|-----------|-------------|----------|-------|
| <10            | 1         | 2           | 0.33     | 0.564 |
| 10-12          | 23        | 19          | 0.38     | 0.537 |
| 12-14          | 60        | 143         | 33.94    | 0     |
| 14-16          | 23        | 114         | 60.45    | 0     |
| 16-18          | 0         | 10          | 10       | 0.002 |
| Total          | 107       | 288         | 82.94    | 0     |

**Table 2:** Ratio of male (M) to female (F) of *S. victoriae* from the Nyanza Gulf by length group.

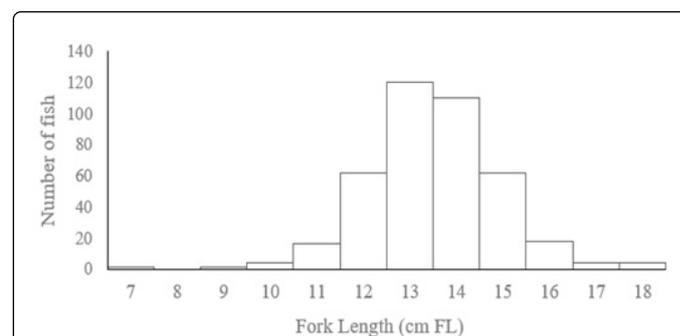
| Category   | n   | Mean $\pm$ SD     | Range       |
|------------|-----|-------------------|-------------|
| Males      | 107 | 1.006 $\pm$ 0.106 | 0.792-1.237 |
| Females    | 288 | 1.007 $\pm$ 0.106 | 0.710-1.311 |
| Both sexes | 401 | 1.006 $\pm$ 0.117 | 0.693-1.329 |

**Table 3:** Relative condition factor of *S. victoriae* from the Nyanza Gulf of Lake Victoria.

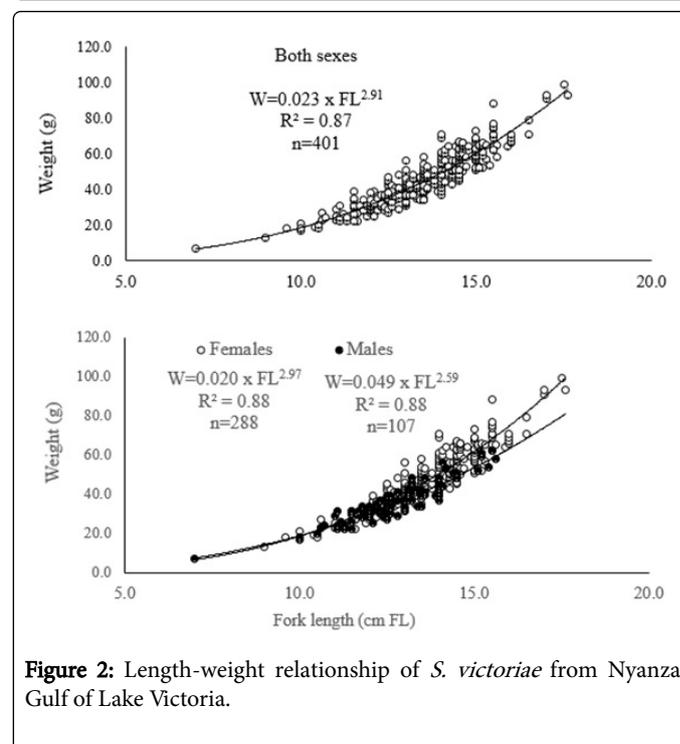
## Results

The length of fish sampled ranged from 7.0 cm to 18.0 cm FL. The size frequency showed a unimodal distribution with modal class at 13 cm FL (Figure 1). Out of 401 fish, 288 (71.8%) were females while 107 (26.7%) were males, giving an overall sex ratio of 1.0:2.7 (male: female). Chi-square test showed that females were significantly more than males and deviated from the expected 1:1 ratio ( $\chi^2 = 82.94$ ,  $p < 0.05$ ). However, females were not more than males for the fish below 12 cm FL (Table 2,  $p > 0.05$ ). The size of female fish ranged from 9 cm to 17.6 cm FL, mean ( $\pm$  SD) 13.6 cm  $\pm$  1.3 cm FL and weighed between 13 g and 99.0 g, mean 47.5 g  $\pm$  13.9 g. The length of male fish ranged from 7.0 cm to 15.6 cm FL, mean 12.8 cm  $\pm$  1.3 cm FL and weighed between 7.0 g and 62 g, mean 36.2 g  $\pm$  9.9 g. Sex dimorphism was observed with female fish being significantly larger ( $F = 31.58$ ,  $p < 0.05$ ) and heavier ( $F = 59.72$ ,  $p < 0.05$ ) than males. Male, female and both sexes of *S. victoriae* showed negative allometric growth with values of regression slope  $b$  being 2.59, 2.97 and 2.91 (Figure 2,  $b < 3$ ). The 95% confidence intervals (CI) of the slopes were 2.33-2.84, 2.82-3.12, 2.78-3.04 for males, females and both sexes. Males, females and both sexes recorded mean ( $\pm$  SD) condition factor above 1 (Table 3). The smallest mature male and female fish were 11.2 cm and 11.3 cm FL,

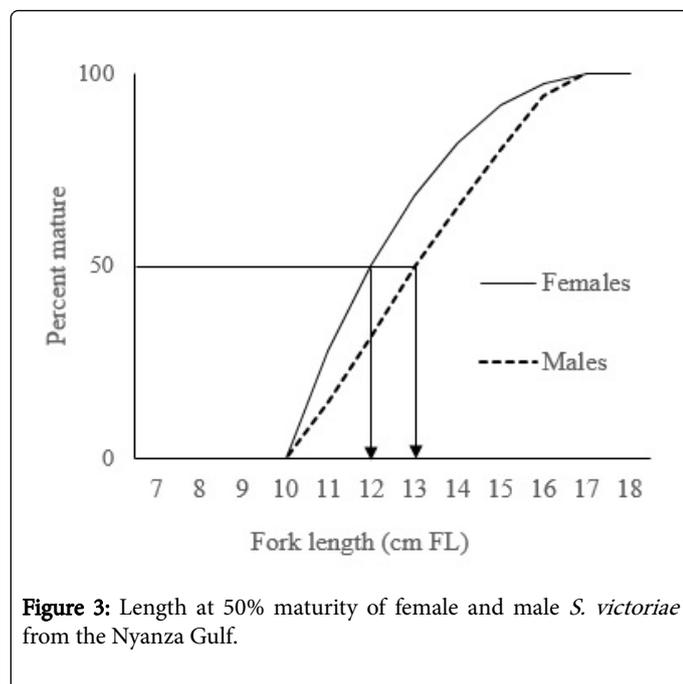
respectively. The length at 50% maturity was estimated at 13.0 cm FL for male and 12.0 cm FL for female fish (Figure 3).



**Figure 1:** Size frequency distribution of *S. victoriae* from the Nyanza Gulf of Lake Victoria.



**Figure 2:** Length-weight relationship of *S. victoriae* from Nyanza Gulf of Lake Victoria.



**Figure 3:** Length at 50% maturity of female and male *S. victoriae* from the Nyanza Gulf.

## Discussion

This study showed that females of *S. victoriae* were significantly more than males with an overall ratio of 1.00:2.70 (Male: Female). This is in agreement with Oboh et al. [8] reporting a sex ratio of 1.00:1.35 (Male: Female) for *Synodontis schall* from Jamieson River in Nigeria. Similarly, Adeyemi [9] reported a ratio of 1.00:1.53 (Male: Female) for *Synodontis robbianus* from River Niger in Nigeria. However, for *S. schall* from River Nile in Egypt, Imam et al. [10] reported no difference in the sex ratio 1.00:1.04 (Male: Female). Akombo et al [11] found a ratio of 1.00:1.08 (Male: Female) for *S. schall* from River Benue in Nigeria. Olele et al. [12] reported a sex ratio of 1.00:1.30 (Male: Female) for *Synodontis nigrita* from Onah Lake in Nigeria. The length at 50% maturity in males and females of *S. victoriae* were 13.0 cm and 12.0 cm FL, respectively. However, females and males of *S. schall* reached maturation at 28.2 cm and 29.4 cm, respectively [10]. The size at maturity of *Synodontis eupterus* from River Rima in Nigeria were 7.2 cm TL (Female) and 7.0 cm TL (Male) [13]. Knowledge on size at maturity guides to set mesh sizes that protects spawning fish and juveniles. The fish showed a slightly negative allometric growth pattern ( $b < 3$ ) with condition values equal to 1. Similar findings have been reported for *Rastrineobola argentea* and *Lates niloticus* in the same lake. The  $b$  value can be used as an indicator of food intake and may differ according to biotic and abiotic factors, food availability and habitat type. Changes in the zooplankton communities in Lake Victoria [14] may affect the food items for *S. victoriae* thus influencing its condition. The fish condition also depends on season, sex and life stages [15-18]. This study has provided baseline information on the biology of *S. victoriae* that are limited in the lake. However, there is still need for further research on other aspects.

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