

**Age, growth and reproductive biology of *Lethrinops gossei* burgess & axelrod-  
(Teleostei: cichlidae) in the south east arm of Lake Malawi**

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**Abstract**

Life history traits of *Lethrinops gossei* from south east arm of Lake Malawi were studied. Validation of age was done by using analysis of marginal increment and length frequency distribution. It was assumed that a single opaque ring was laid down annually in the otoliths. The greatest age estimated was 6+ years ( $175 \pm 1.14$  mm total mean length (TL). Growth was best described by the von Bertalanffy growth model as  $L_t = 150.06(1 - e^{-0.27(t + 1.94)})$   $r^2 = 0.95$ . The mean size at maturity for females was 135.95mm TL and 104.05 mm standard length (SL). Age at-50% maturity was estimated at 2.14 years. The mean value for total mortality (Z) from the catch curve analysis was estimated at 0.63 year<sup>-1</sup>, natural mortality (M) was 0.38 year<sup>-1</sup>, fishing mortality (F) calculated ( $F = Z - M$ ) was 0.25 year<sup>-1</sup> and the exploitation rate was 0.40.

Key words: Lake Malawi, *Lethrinops gossei*, life history, otolith

**Résumé**

Les traits d'histoire de la vie de *Lethrinops gossei* du bras Sud-Est du lac Malawi ont été étudiés. La validation d'âge a été faite en utilisant l'analyse de l'accroissement marginal et de la distribution des fréquences de longueur. On a supposé qu'un anneau opaque unique a été fixé chaque année dans les otolithes. Le plus grand âge estimé est de 6 ans ( $175 \pm 1,14$  mm de longueur totale moyenne (TL). La croissance a été mieux décrite par le modèle de croissance de von Bertalanffy  $L_t = 150.06(1 - e^{-0.27(t + 1.94)})$   $r^2 = 0.95$ . La taille moyenne à la maturité pour les femelles a été 135.95mm de TL et 104,05 mm de longueur standard (SL). L'âge à 50% de maturité a été estimé à 2,14 ans. La valeur moyenne de la mortalité totale (Z) à partir de l'analyse de la courbe de capture a été estimée à 0,63 par an. La mortalité naturelle (M) était de 0,38 par an. La mortalité due à la pêche (F), calculée comme  $F = Z - M$ , était de 0,25 par an et le taux d'exploitation était de 0,40.

Mots clés: Lac Malawi, *Lethrinops gossei*, histoire de la vie, otolithes

## Background

*Lethrinops gossei* is one of the principal targets of the multispecies artisanal fishery in Malawi (Duponchelle *et al.*, 2000a); but until recently there have been no scientific studies on the age, growth and population dynamics of this species in Lake Malawi using hard parts. The study was undertaken to estimate the age and growth of *Lethrinops gossei* from the south east arm of Lake Malawi using otolith in order to establish records that would be included in stock assessment programmes and fisheries management.

## Literature Summary

In cichlids from tropical and subtropical areas, growth zone formation has been linked to temporal variation in feeding intensity and reproductive periodicity (Weyl and Hecht, 1998). Opaque growth ring formation in otoliths has been attributed to one or more environmental variables which reduce metabolic rate, resulting in a slowing of the growth rate. Environmental variables such as temperature, salinity, food and light have the potential to influence otolith increment deposition (Campana, 2001).

## Study Description

A total of 1208 male and female *Lethrinops gossei* (58 – 146 mm SL and 73 – 200 mm TL) were collected for length frequency distribution analysis during the ongoing fishing trials of *R.V. Ndunduma* at depth of more than 75 m on monthly basis.

Fish were measured for total length and standard length. The gonads weighed to the nearest 0.1g and categorized according to six developmental stages. Left or right sagitta otolith from each fish was selected for ageing. To enhance otolith growth zones visibility, a technique used by Kanyerere (2003) was employed. The Von Bertalanffy growth model (VBGF) was used for estimation of growth parameters. The non-parametric one-sample runs test for randomness and the Bartlett's test for homoscedascity (Hughes 1986) were applied. Variance estimates were calculated using the conditioned parametric bootstrap resampling method (Efron 1982), with 500 bootstrap iterations. Standard errors and 95% confidence intervals were constructed from the bootstrap data using the percentile method described by Buckland (1984). PC-YIELD 2.2 was used to execute the above procedure.

## Research Application

Age, growth and reproductive biology of *Lethrinops gossei* Burgess & Axelrod– (Teleostei: Cichlidae) in the south east arm of Lake Malawi has contributed towards the development

of a management plan for *Lethrinops gossei* using the per recruit analysis. Biological reference points for yield per recruit and spawner biomass per recruit have been established based on age, growth, mortality and reproductive biology information that were obtained from this study.

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