Population Parameters of 'Corvina' (*Plagioscion squamosissimus*) in the Barra Bonita Reservoir, Brazil

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Abstract

Estimates of the growth parameters (L_∞ and K), mortality coefficients (Z, M and F) and exploitation rate (E) for the sciaenid *Plagioscion squamosissimus* are presented. The following results were obtained: 1) for males: L_∞ = 44.2 cm, K = 0.30 yr^{-1}, Z = 0.82 yr^{-1}, M = 0.66 yr^{-1}, F = 0.16 yr^{-1}, and E = 0.20; and 2) for females: L_∞ = 68.4 cm, K = 0.22 yr^{-1}, Z = 0.91 yr^{-1}, M=0.47 yr^{-1}, F=0.44 yr^{-1} and E = 0.49. Females are more heavily fished than males. Artisanal fishing, carried out with gillnets, is mainly directed toward the young section of the population and individuals reproducing for the first time.

Introduction

The freshwater 'corvina', *P. squamosissimus*, is a sciaenid which has its natural occurrence in Brazil in the rivers of the Amazon region. In the early 1950s, this species was introduced into ponds in the northeastern region of Brazil and later into rivers of the Parana Basin in the southern regions (CESP 1993a). The 'corvina' rapidly adapted and multiplied in these lentic environments. At present, it comprises a major portion of the catch of artisanal fishers who operate in embanked rivers of the Parana Basin in the State of São Paulo (CESP 1993b).

The Barra Bonita Dam was formed in mid-1962 and is located at 20°31'S and 48°32'W (Fig. 1). Its reservoir has a total area of 310 km^2, a volume of 2.6 $\times 10^6$ m^3 and a perimeter of 788 km. It shows high pollution levels as it is formed by rivers which drain the most urbanized and industrialized areas of the country.

Materials and Methods

Samples of *P. squamosissimus* were collected monthly, from March 1991 until February 1992, from the artisanal gillnet fishing occurring in the reservoir (Fig. 1). As visualization of growth rings in scales or otoliths was not possible, the length growth curve was evaluated using the average lengths at which spawning takes place (by examining 'pulses' in mean ovary and testes weight with length). These lengths were considered to be representative of relative ages (Santos 1972), as spawning and the egg batch of this species occurs in only one period of the year

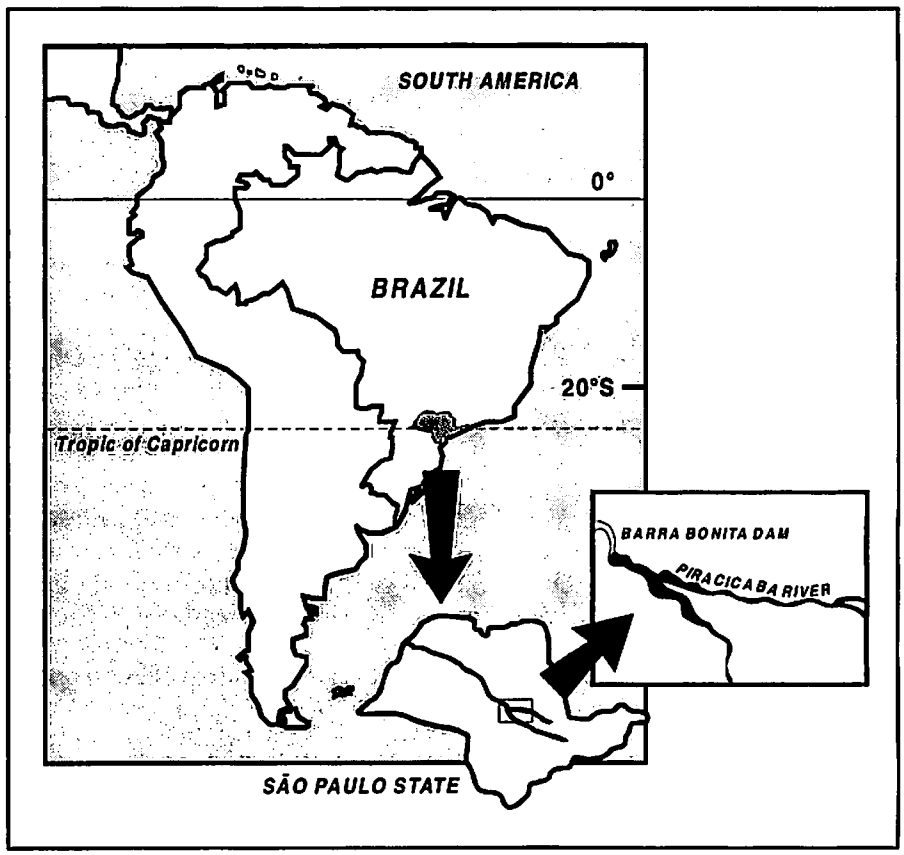

Fig. 1. Map showing location of the study site, Barra Bonita Reservoir, in São Paulo State, Brazil.

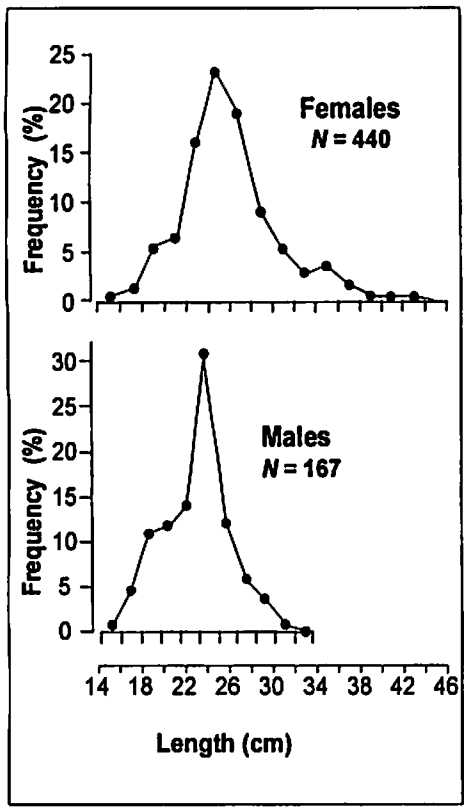

Fig. 2. Size distribution of P. squamosissimus *caught by gillnet which were used in the study.*

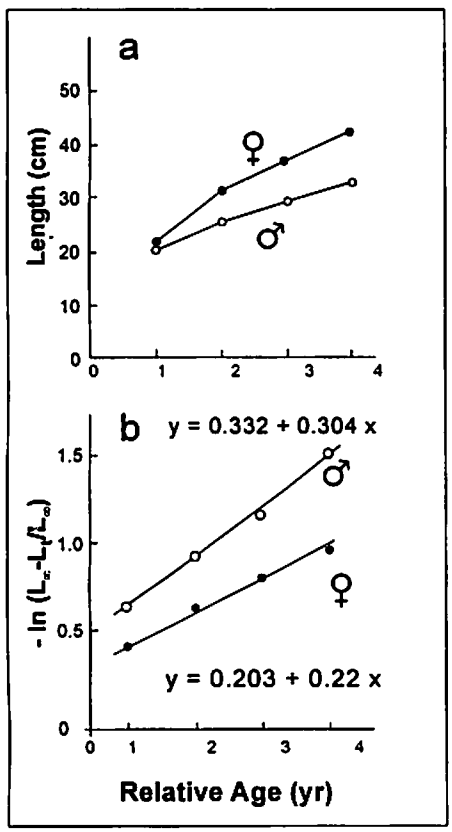

Fig. 3. The (a) mean length at spawning and (b) Beverton and Holt plot obtained for P. squamosissimus.

(Braga 1995).

The asymptotic length (L_∞) was estimated considering the largest fish captured over the course of various years (L_{max}), using the empirical relation $L_\infty = L_{max}/0.95$ (Pauly 1983). The growth rate (K) was estimated separately for males and females using Beverton and Holt plots (Ricker 1975). The instantaneous rate of mortality (Z) as well as its variance were estimated according to the method of Ssentongo and Larkin (1973). The instantaneous rate of natural mortality was estimated according to Pauly (1980), *viz.*: log M = 0.0066 - 0.279 log L_∞ + 0.6543 log K + 0.4634 log T, with T as the mean environmental temperature (°C). The fishing mortality rate (F) was obtained by subtraction of M from Z. The exploitation rate (E) was computed as follows: E=F/Z.

Results

The size distribution of fishes caught for this study is given in Fig. 2. The size range of females is greater than that of males. The average length attributed to each age of the females was: 23 cm, 33 cm, 39 cm and 45 cm corresponding to the relative ages 1, 2, 3 and 4 years, respectively (Fig. 3a). For males, the lengths were 21 cm, 27 cm, 31 cm and 37 cm.

Table 1 gives a summary of parameter estimates obtained for this study. The asymptotic length estimated for females was 68.4 cm and for males was 44.2 cm. The Beverton and Holt plots resulting from the data in Fig. 3a are illustrated in Fig. 3b. The growth rates (K) estimated for females and males were 0.22 yr^{-1} and 0.30 yr^{-1}, respectively. After checking variance homo- geneity ($p>0.05$), a t-test applied to the slope of the regression lines showed that the growth rates are significantly different ($p<0.01$).

Table 1. Summary of population parameters for Plagioscion squamosissimus *from the Barra Bonita Reservoir, Brazil.*

Parameter	Male	Female
L_∞	44.2	68.4
K (yr^{-1})	0.30	0.22
Z (yr^{-1})	0.82	0.91
M (yr^{-1})	0.66	0.47
F (yr^{-1})	0.16	0.44
E (= F/Z)	0.20	0.49

The total mortality rate (Z) for females was 0.91 yr-1 with a variance of 0.039 and for males it was 0.82 yr-1, with a variance of 0.044. The estimated variances were homogenous ($f>0.01$). The natural mortality rate (M) for males and females (with T = 22.1°C) were 0.66 and 0.47 yr-1, respectively. The fishing mortality rates (F) for males and females were 0.66 and 0.47 yr-1, respectively. The E values obtained for males and females were 0.20 and 0.49, respectively, indicating the males to be underfished and the females to be fully exploited. It is noted that a considerable portion of *P. squamosissimus* caught by artisanal gillnetters are small-sized fishes and the use of fine-mesh nets may be resulting in growth overfishing (Braga 1995).

References

Braga, F.M. de S. 1995. Biologia e pesca de corvina *Plagioscion squamosissimus* (Teleostei, Sciaenidae) na represa de Barra Bonita, rio Piracicaba, SP. Tese de Livre Docência. Instituto de Biociências, UNESP, R. Claro, 128 p.

CESP. 1993a. A pescada-do-piaui *Plagioscion squamosissimus* (Heckel, 1840) (Osteichthyes,

Perciformes) nos reservatórios da Companhia Energética de São Paulo. CESP/CESP; C.E.C. Torloni; J.J. dos Santos; A.A. de Carvalho Jr.; A.R.A. Correa. Série Pesquisa e Desenvolvimento, 084: 23 p.

CESP. 1993b. Produção pesqueira e composição das capturas em reservatórios sob concessão de CESP nos rios Tietê, Paraná e Grande, no período de 1986 a 1991. CESP; C.E.C. Torloni et al. Série Produção Pesqueira 001. 73 p.

Pauly, D. 1980. On the interrelationships between natural mortality, growth parameters, and environmental temperature in 175 fish stocks. J. Cons. CIEM 39(2):175-192.

Pauly, D. 1983. Some simple methods for the assessment of tropical fish stocks. FAO Fish. Tech. Pap. (234):175-192.

Ricker, W.E. 1975. Computation and interpretation of biological statistics of fish populations. Bull. Fish. Res. Board Can. (191). 382 p.

Santos, E.P. dos. 1972. Sobre a análise da curva de maturação. Bol. Inst. Pesca, S. Paulo 1(7): 55-62.

Ssentongo, G.W. and P.A. Larkin. 1973. Some simple methods of estimating mortality rates of exploited fish populations. J. Fish. Res. Board. Can. 30:695-698.

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FISHBYTE NEWS

Angola, Namibia and South Africa Announce BENEFIT: A collaborative research/training program for the Benguela Current

Dr. C.H. Hocutt of the University System of Maryland has been designated as the Executive Officer of Benguela Environment Fisheries Interaction and Training Programme (BENEFIT). On 16 February 1998, Dr. Hocutt arrived in Namibia, which will be the administrative home for BENEFIT. This is a major regional initiative which also involves Angola and South Africa. BENEFIT's primary objectives are to: 1) conduct research on the dynamics of the fishery resources of the Benguela Current upwelling ecosystem along the southwest coast of Africa, and the environmental processes which interact with those resources; and 2) provide capacity building for local marine laboratories and training opportunities for marine scientists and technicians from the region. Dr. Hocutt can be contacted through the Ministry of Fisheries and Marine Resources, Swakopmund, Namibia, or by e-mail (BENEFIT @fisheries. gov.na).

The Linnean Society of London and the Trewavas-Greenwood Fund

The Linnean Society of London has established a new fund, in honor of its two most distinguished member ichthyologists, to support research on the systematics of African freshwater fishes. The fund is called the Trewavas-Greenwood Fund.

Ethelwynn Trewavas (1900-1993) and Humphry Greenwood (1927-1995) were ichthyologists whose service in the British Museum (Natural History), now the Natural History Museum, spanned most of this century. Both were best known for their research on African freshwater fishes, cichlids in particular; and for the help that they gave to generations of students and colleagues.

Awards will be made to individuals from the Fund, on the advice of a specialist panel set up by the Society's Council, and may be used for travel or for the purchase of equipment or books. Preference will be given to researchers early in their careers, or proposing new projects. Applications are invited from all countries, but preference may be given to Africans.

The Society is appealing for contributions to this fund and ICLARM, because of its long associations with Ethelwynn Trewavas and Humphry Greenwood, is encouraging such donations by publishing this notice. Cheques, drafts etc., should be made payable to the 'Linnean Society of London' and marked "Trewavas - Greenwood Fund." The Linnean Society of London's address is Burlington House, Piccadilly, London, W1V 0LQ, U.K. Phone (0) 171 434 4479; Fax (0) 171 287 9364. Further information may be obtained from the Society's Executive Secretary, Dr. John Marsden, whose e-mail is john@linnean.demon.co.uk.