SOME CONSIDERATIONS ABOUT THE BREEDING OF Oreochromis (Oreochromis) niloticus (**Linnaeus**)*

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RESUMO

O número efetivo de desova é um dos mais importantes parâmetros em cultivo porque dá uma indicação acerca da estabilidade genética da população.

A proporção sexual foi testada 50 vezes a fim de investigar a eficiência da desova em termos do número de peixes produzidos por desova. A proporção variou de um a três machos para uma a quatro fêmeas (1-3: 1-4). O teste de Tuckey foi aplicado para analisar os resultados (HDS = 16,6).

A efetiva eficiência de desova foi estimada para uma simples geração numa população fechada. O desvio genético também foi estimado nas diferentes proporções sexuais.

A análise da variância demonstrou uma alta significância (F = 159,54 + +) como resultado de uma produção em diferentes proporções de machos e fêmeas. A proporção um macho para três fêmeas demonstrou ser o mais eficiente em maximizar a efetiva eficiência de desova (Nb = 0,997) e um desvio genético mínimo (f = 0,0012) para a espécie em estudo.

SUMMARY

CONSIDERAÇÕES SOBRE A GERAÇÃO DE **Oreochromis (Oreochromis) niloticus** (Linnaeus)

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SUMMARY

The effective breeding number, wich is a function of the breeding population, sex ratio, breeding program, and variance of family size, is one of the most important concepts in animal husbandry because it gives an indication about the genetic stability of a population (TAVE[4]).

Sex ratio were tested fifty times in order to investigate the spawning efficiency in terms of the number of brood fish to maximize the fingerling production. Tested sex ratio varied from one-three male to one-four females (1-3: 1-4). Tuckey teste were aplaied to analyses the results (HDS = 16.6).

Effective breeding efficiency was estimated by a single generation in a closed population. The inbreeding was also determinated at different sexual proportion.

Analyses of variance demonstated a high significant difference (F = 159.54 ++) in fingerling production as a result of different proportions of males and females. The proportion one male to three females is the more efficient in maximizing the effective breeding efficiency (Nb = 0.997), and the minimum inbreeding (f = 0.0012) for **Oreochromis (Oreochromis) niloticus** (Linnaeus).

Keywords — tilapia, breeding population, effective breeding.

INTRODUCTION

A efficiency of reproduction in **Tilapia** and **Sarotherodon** has paradoxical consequences: on one hand, this aptitude which allows easy and rapid propagation in various tropical and subtropical environments, partially explains the economic interest in these species for fish culture; on the order hand this reproductive efficiency can be a source of problems because incontrolled multiplication is liable to produce dwarf fish populations, of little value (JALABERT & ZOHAR[3]).

The behavioral patterns which occur after spawning and which characterize substrate — spawners (Tilapia) and mouth brooders (Sarotherodon) have been described and discussed by numerous authors (LOVE-McCORNELL, 1959; PERRONE & ZARET, 1979), in JALABERT & ZOHAR[3]. Whatever the role of each sex in brood care, which differs among species, this care provides an efficient protection for eggs and fry against predators, and contributes greatly to the reproductive efficiency of the species. However, the phisiological mechanisms which control parental care behaviour are poorly understood.

In the present paper the effective breeding number of **Oreochromis (Oreochromis) niloticus** Linnaeus is determined. The effective breeding number, which is a function of the breeding population, sex ratio, breeding program, and variance of family size, is one of the most important concepts in animal husbandry because it gives an indication about the genetic stability of a population (TAVE[4]).

MATERIAL AND METHODS

The studied material is comprised of 315 specimens belonging to specie **Oreochromis (Oreochromis) niloticus** (Linnaeus) in Ceará State, Brazil.

The specimens caught with a traw were placed in ponds (3 x 1 x 1 m) and left for experience. Oats were used as food supply in a 4 percent proportion of the live weight.

Sex rations were tested fifty times, in order to investigate the spawning efficiency in terms of the number of brood fish to maximize the fingerling production. Tested sex ratio varied from one three males to one-four females (1-3: 1-4). Tukey teste was aplaied to analyses the results.

Falconer index was also used, F = 1/2 Ne, were **F** is inbreeding per generation and measures the percentage increase in homozygozity as a result of inbreeding and **Ne** is the effective breeding number.

Effective breeding efficiency was estimated by a single generation in a closed population.

RESULTS AND DISCUSSION

Analyses of variance demonstrated a high significant difference (F = 159.54**) in the fingerling production as a result of different proportions of females and males. The proportion of 1 male: 3 females will give the highest production and the proportion of 1 male: 1 female will result is the lowest production (Tables 1 and 2).

Tuckey test results (HSD = 16,6) showed that there is not a significant difference (μ = 0.01) between the proportions of 1 male: 2 females and 1 male: 4 females. The same was observed between the proportions of 2 males: 1 female and 3 males: 1 female. And none of these combinations results is as increase of the fingerling production.

Effective breeding efficiency allows a manager to determine the efficiency of this breeding population in achieving maximum effective breeding number relative to other breeding population of the same size (TAVE[4]).

Effective breeding efficiency quantifies the improvements that changes in sex ratio and breeding program will have on inbreeding and genetic drift and, simultaneously, allows a hatchery manager to assess the effects that proposed changes will have on fingerling production.

Effective breeding number in population with random mating is Ne = 4 (females) (males) / (females) + (males) where Ne is the effective breeding number, females is the number producing offspring, and males is the number producing offspring.

Uncontrolled inbreeding often occurs through restrictions in the effective breeding number. The inbreeding produced by a single generation of mating in a closed population is F = 1/2 Ne (FALCONER[1]).

The inadvertent loss of genetic variance by reduction in the effective breeding number is one of the more damaging changes to be made in the wrong direction because and change is very often irreversible (GALL[2]).

According to TAVE[4], the effective breeding efficiency of a population (Nb) is the ratio of the effective breeding number (Ne) to the breeding population (N). Effective breeding efficiency for **Oreochromis (Oreochromis) niloticus** seems to be obtained by one male to three female with random mating (Table 3, Fig. 1).

The inbreeding was determinated by **Oreochromis (Oreochromis) niloticus** at different sex ratio (Table 4, Fig. 2).

TABLE 1

Breeding Number of **O. (Oreochromis) niloticus** (Linnaeus) Obtained by Different Proportions.

Statistical parameters	Frequence (f)	Proportion					
		1 male 1 female	1 male 2 females	1 male 3 females	1 male 4 females	2 males 1 female	3 males 1 female
$\overline{X}$	50		361	402	356		
s^2	50		1,109.89	302.22	74.00		
s	50		33.31	17.38	8.60		
C. V.	50		9.23	4.32	2.42		

TABLE 2

Analysis of Variance for Breeding Number Obtained by Different Sex Ratios of the **O. (Oreochromis) niloticus** (Linnaeus).

Source of Variation	Square Sum	df	Estimation of Variance	F
Inter groups	88.105.4	5		159.54**
Among groups	5,962.2	54	110.41	
Total		59		

** Significant at $\mu = 0.01$

TABLE 3

Effective Breeding Number (Ne) and Inbreeding (F) at Different Sex Ratios for Random Mating of the **O. (Oreochromis) niloticus** (Linnaeus).

Sex Ratio	Ne	F
	238	0.0021
	228	0.0021
	401	0.0012
	215	0.0023
	220	0.0022
	253	0.0019

TABLE 4

Effective Breeding Efficiency of **O. (Oreochromis) niloticus** (Linnaeus) in a Closed Population.

Sex Ratio	N	Nb
1 male 1 female	285	
1 male 2 females	361	
1 male 3 females	402	
1 male 4 females	356	
2 males 1 female	330	
3 males 1 female	326	

N — breeding number
Nb — effective breeding efficiency

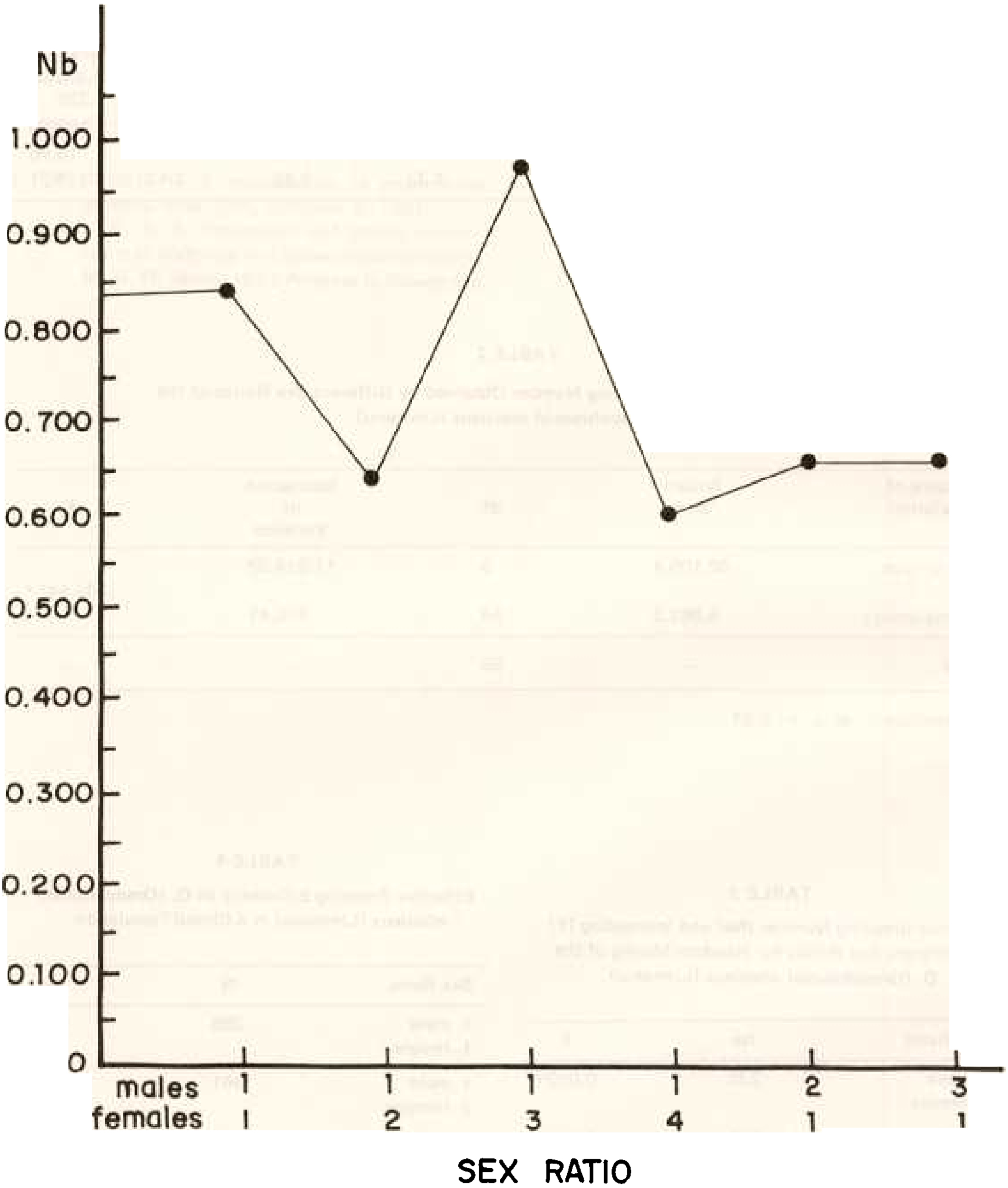

Figura 1 — Effective breeding efficiency of O. (Oreochromis) niloticus (Linnaeus) at different sex rat

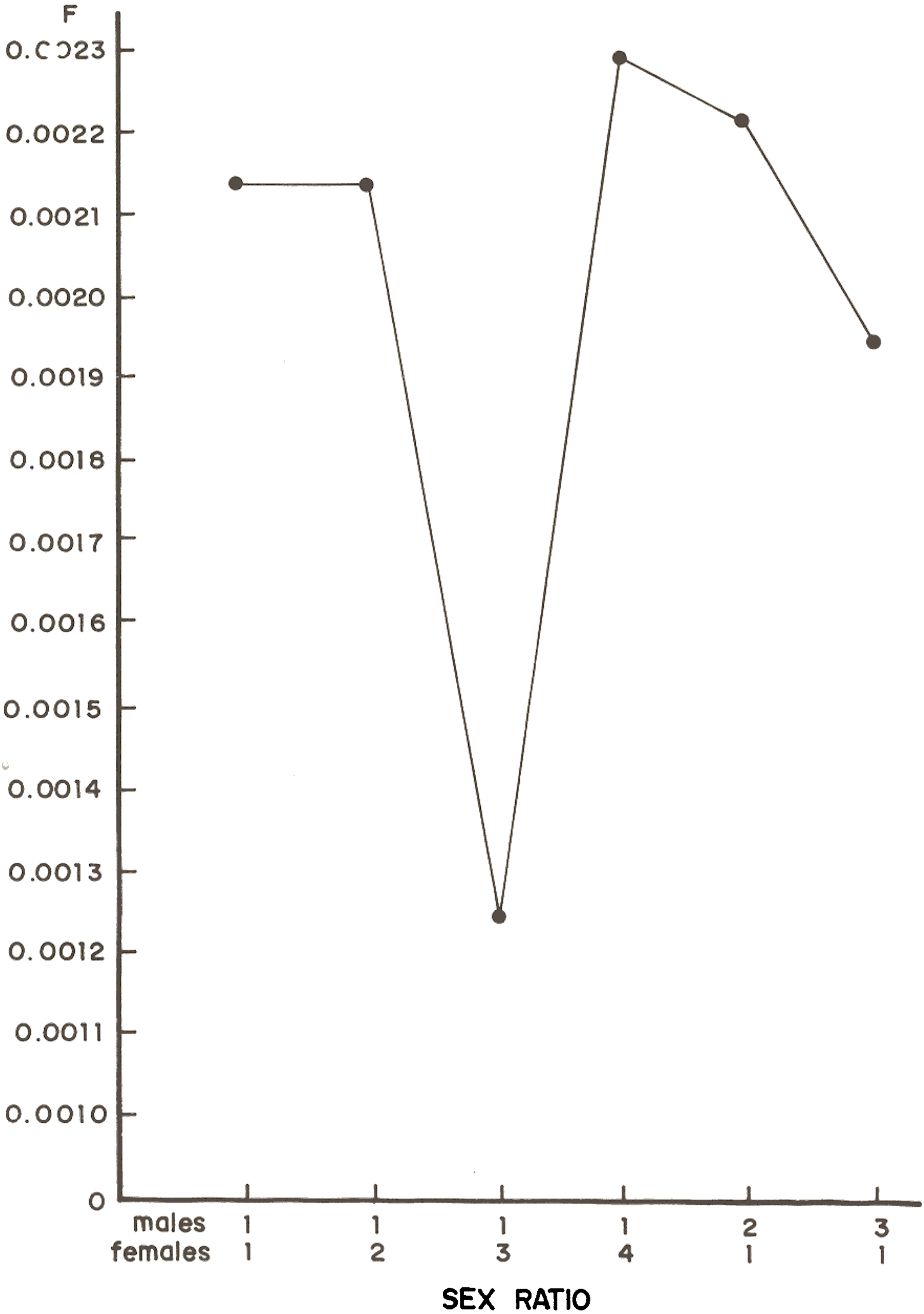

Figura 2 — Inbreeding (F) at different sex ratios for random mating of the O. (Oreochromis) niloticus (Linnaeus).

CONCLUSION

The sex ratio one male to three females is the more efficient in maximizing the effective breeding number in a closed population, giving a better effective breeding efficiency for **Oreochromis niloticus** Linnaeus (Nb = 0,997) and the minimum inbreeding (f = 0.0012).

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