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**Hypophysation of the anostomid fish white-piau *Schizodon knerii*
from the Rio São Francisco basin**

(Hipofisacão do peixe anostomídeo piau-branco *Schizodon knerii* da bacia do
Rio São Francisco)

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SUMMARY

Schizodon knerii is an important fish in the professional fisheries at Três Marias Reservoir where it can reach about 1.2 kg of body weight (BW). Fourteen females and 14 males were hypophysed using crude carp pituitary extract (CCPE). The females received 2 doses of CCPE (1st. dose = 0.7 ± 0.2 mg of CCPE/kg of BW; 2nd. dose = 5.6 ± 0.5 mg of CCPE/ kg of BW; interval between doses = 18.6 ± 0.5 h) and the males received a single dose of CCPE (2.6 ± 0.2 mg of CCPE/kg of BW). Nine females produced liable eggs under abdominal massage 210 ± 7.9 degree-hours after the 2nd dose, at the water temperature of $23.9 \pm 1^\circ\text{C}$. The eggs were opaque, gray or light brown, and adhesives. They measured 1.1 ± 0.1 mm before hydration and 1.3 ± 0.1 mm after hydration. The ova weight:body weight ratio (%) = 8.5 ± 1.4 , the number of egg/g of ova = 2448 ± 59 and the fertilization rate (estimated at blastopore closure, in %) = 69 ± 9.4 . Initial fertility (i.e. the number of stripped eggs $\times 10^3$) = 118.9 ± 33.5 whereas final fertility (i.e. the number of liable eggs at blastopore closure $\times 10^3$) = 82.8 ± 28.6 . The relationships between BW and initial (IF) and final (FF) fertility were expressed, respectively, by: IF = $-72010 + 340$ BW ($r^2 = .88$; n = 9) and FF = $-71442 + 274$ BW ($r^2 = .79$; n = 9).

KEY WORDS: Hypophysation, anostomid fish, *Schizodon knerii*, Rio São Francisco, Brazil.

RESUMO

Schizodon knerii é um peixe importante na pesca profissional na represa de Três Marias onde ele pode atingir cerca de 1,2kg de peso corporal (PC). Quatorze fêmeas e 14 machos

foram hipofisados com extrato bruto de hipófise de carpa (EBHC). As fêmeas receberam 2 doses de EBHC (1a. dose = $0,7 \pm 0,2$ mg de EBHC/kg de PC; segunda dose = $5,6 \pm 0,5$ mg de EBHC/kg de PC; intervalo entre doses = $18,6 \pm 0,5$ h) e os machos receberam dose única de EBHC ($2,6 \pm 0,2$ mg de EBHC/kg de PC). Nove fêmeas produziram ovos viáveis sob massagem abdominal $210 \pm 7,9$ horas-grau após a 2a. dose, estando a temperatura da água a $23,9 \pm 1^{\circ}\text{C}$. Os ovos eram opacos, cinza ou marron-claro e adesivos. Eles mediram $1,1 \pm 0,1$ mm antes de se hidratarem e $1,3 \pm 0,1$ mm após hidratação. A razão peso da ova: peso corporal (%) = $8,5 \pm 1,4$, o número de ovos/g de ova = 2448 ± 59 e a taxa de fertilização (estimada por ocasião do fechamento do blastóporo, em %) = $69 \pm 9,4$. Fertilidade inicial (i.e., o número de ovos extruídos $\times 10^3$) = $118,9 \pm 33,5$ enquanto que fertilidade final (i.e., o número de ovos viáveis por ocasião do fechamento do blastóporo $\times 10^3$) = $82,8 \pm 28,6$. As relações entre PC e fertilidades inicial (FI) e final (FF) foram expressas, respectivamente, por: $FI = -72010 + 340 PC$ ($r^2 = .88$; $n = 9$) e $FF = -71442 + 274 PC$ ($r^2 = .79$; $n = 9$).

PALAVRAS-CHAVE: Hipofisação, peixe anostomídeo, *Schizodon knerii*, Rio São Francisco.

INTRODUCTION

The anostomid fish *Schizodon knerii* occurs only in the São Francisco River basin (Fowler, 1950). It receives several other common names besides "piau-branco", such as "piau-canudo", "piau-campineiro" and "piau-de-cheiro". This fish is one of the most important in the professional fisheries at Três Marias Reservoir (Sato & Barbieri, 1983; Sato & Osório, 1988) where the males reach 0.8 kg and the females 1.2 kg of body weight. Algae and macrophytes constitute its main feed items (Botelho & Torres, 1984). At Três Marias Reservoir it reproduces from November to March being a fractional spawner (Ferreira & Godinho, 1990).

Although *Schizodon* encompasses species potentially useful in aquaculture only a few references are found regarding the manipulation of its reproduction: *Schizodon* sp (Canale & França, 1936 in Menezes, 1954), *S. fasciatus* (Sales et al., 1984) and *S. borelli* (Gonçalves Pinto & Novelli, 1986).

In the present work, it was presented data on the hypophysation of the white-piau during the reproductive period of 1985-1986. Preliminary informations on the hypophysation of this species were reported by Sato et al. (1985) and Ferreira & Godinho (1990).

MATERIAL AND METHODS

We used 14 females and 14 males of *S. knerii* from Três Marias Hydrobiological and Fishculture Station, CODEVASF, at Três Marias, MG, Brazil (Lat. $18^{\circ} 11'$

S, Long. $45^{\circ} 13' W$), during the reproductive period. The brooders were maintained in deep ponds, at 1 kg of fish per liter of water, on a 2% commercial feed which contained

Hypophysation followed the procedure described by Woynarovich & Horváth (1979) using carp pituitary extract (CCPE) maintained apart in nylon cloth of 100 μm in size during treatment. The rate of egg fertilization and rate of egg fertilization were estimated based on the work of Woynarovich & Horváth (1979) using semen of one male for

The fertilized eggs from each incubator with 60 liter capacity were transferred to another incubator to which the eggs were subjected to the blastopore closure and hatching.

The body weight (g), the weight of eggs/g of ova and the egg fertilization rate were obtained.

Initial fertility (the number of eggs/g of ova) and final fertility (the number of eggs/g of ova) were obtained in 9 females. Relationships were estimated based on body weight.

The rate of mortality during the experiment was estimated.

RES

The brood stock, collected from the São Francisco River, was ready for hypophysation during the reproductive period. They successfully reproduced in a 21 x 109 m³ of water (Godinho & Ferreira, 1990) naturally spawn in the ponds of the Fishculture Station.

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Três Marias Hydrobiological
as, MG, Brazil (Lat. 18° 11'

S, Long. 45° 13' W), during the period of December, 1985 to January, 1986. The brooders were maintained, together with other anostomid fish, in 200 m², 1 m deep ponds, at 1 kg of fish/5 m² of pond. They received, 5 days a week, 1.5-2% commercial feed which contained a minimum of 19% crude protein.

Hypophysation followed the method of Ihering (1937), using injections of crude carp pituitary extract (CCPE) in the celomic cavity. Males and females were maintained apart in nylon closed cages within concrete tanks of 3.0 x 1.0 x 0.8 m in size during treatment. The males received one dose and the females two doses of CCPE. Estimation of the time for egg stripping and hatching (in degree-hour) and rate of egg fertilization (in %, estimated after blastopore closure) followed Woynarovich & Horváth (1980). The 'dry' method was used to fertilize the eggs, using semen of one male for the eggs of one female.

The fertilized eggs from each female were placed in a funnel-type fiberglass incubator with 60 liter capacity. A branch of *Cupressus* sp. was placed in the incubator to which the eggs attached. The water flow was at 2 liters/min up until the blastopore closure and then raised to and maintained at 5 liters/min until hatching.

The body weight (g), the weight (g) of ova (= extruded eggs), the number of eggs/g of ova and the egg diameter (mm) before and after hydration and egg fertility rate were obtained.

Initial fertility (the number of extruded eggs obtained at stripping) and final fertility (the number of liable eggs counted after blastopore closure) were obtained in 9 females. Relative initial fertility and relative final fertility were estimated based on body weight.

The rate of mortality during hypophysation and within the following week was estimated.

RESULTS AND DISCUSSION

The brood stock, collected from the São Francisco river and kept in ponds, was ready for hypophysation during the months of December and January. Although they successfully reproduce at the Três Marias reservoir (circa 100,050 ha and 21 x 109m³ of water) (Godinho, 1984; Ferreira & Godinho, 1990), they did not naturally spawn in the ponds of the Três Marias Hydrobiological and Fischculture Station.

At the time of hypophysation, females showed reddish and swollen genital papilla. The males snored and oozed semen under light abdominal massage. The males were smaller and slimer than the females. The females remained quiet during treatment, except at the moment of ovulation when they moved about in the nylon cages thus helping to identify this moment.

The results are summarized in Tab. 1 and Fig. 1, 2 and 3. Nine females (i.e., 64.3% of the hypophysed females) responded positively to the treatment with the production of liable eggs. The females when maintained at 25°C had smaller values of degree-hours at stripping than those at 23 °C (Fig 1), similarly to the findings on several species of carp (Horváth, 1978), *Rhamdia sapo* (Espinach Ros et al., 1984) and *Prochilodus marginatus* (Sato et al., 1996).

The eggs of *S. knerii* are opaque, gray or light brown and adhesive. The eggs of *Schizodon fasciatus*, which belongs to the same genus of *S. knerii*, are free (Sales et al., 1984). The *S. knerii* eggs experienced small volume increase during hydration, not exceeding 1.8 times the pre-hydration condition.

Changes in the water temperature induced variations in the duration of the embryogenesis of *S. knerii* similarly to those at stripping, i.e., at 25°C the degree-hours at hatching was lower than that at 23°C (Fig. 2). Hatching in *S. fasciatus* occurred at 13-24 h after fertilization being the water temperature at 26-28°C (Sales et al., 1984). As observed in *Prochilodus marginatus* (Sato et al., 1996), the values of final fertility were smaller than those of initial fertility (Fig. 3).

S. knerii females were more sensitive to hypophysation than the males since 35.7% of them died in consequence of the treatment while in the males the percentage of death reached 14.3%.

In summary, wild brood stocks of *S. knerii* were maintained in ponds and successfully hypophysed in December and January, when a single 'total' spawn was obtained; the establishment of the adequate moment for female stripping was facilitated by its moving about in the tanks; they produced large number of small liable adhesive eggs; egg hydration was small and the embryogenesis was short.

Table 1 - Hypophysation da Três Marias Hydrobiologica during the reproductive cycle

Parameter
Females
Body weight (g)
Doses (pituitary dry weight in mg/kg of body weight)
first dose
second dose
Interval between doses (h)
Water temperature at stripping
Degree-hours at stripping
Ova weight (g)
Ova weight:body weight (%)
Eggs/g of ova (n)
Egg diameter (mm)
Pre-hydration
Pos-hydration
Egg fertility rate (%)
Initial fertility (n x 10 ³)
Final fertility (n x 10 ³)
Relative initial fertility (n x kg of body weight)
Relative final fertility (n x kg of body weight)
Water temperature at hatching
Degree-hours at hatching
Males
Body weight (g)
Dose (pituitary dry weight, in mg/kg of body weight)

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Table 1 - Hypophysation data of *S. knerii* using crude carp pituitary extract, at Três Marias Hydrobiological and Fisheulture Station, Três Marias, MG, Brazil, during the reproductive cycle of 1985/1986.

Parameter	N	Mean ± SD	Range
Females			
Body weight (g)	14	564 ± 78	450 - 730
Doses (pituitary dry weight, in mg/kg of body weight)			
first dose	14	0.7 ± 0.2	0.5 - 0.1
second dose	14	5.6 ± 0.5	5.0 - 6.0
Interval between doses (h)	14	18.6 ± 0.5	18.0 - 19.0
Water temperature at stripping (°C)	14	23.9 ± 1.0	23.0 - 25.0
Degree-hours at stripping	9	210.0 ± 7.9	200 - 220
Ova weight (g)	9	48.4 ± 13.1	30 - 72
Ova weight:body weight (%)	9	8.5 ± 1.4	6.2 - 10.9
Eggs/g of ova (n)	9	2448 ± 59	2378 - 2522
Egg diameter (mm)			
Pre-hydration	9	1.1 ± 0.1	0.9-1.2
Pos-hydration	9	1.3 ± 0.1	1.2-1.4
Egg fertility rate (%)	9	69.0 ± 9.4	52.7 - 88.1
Initial fertility (n x 10 ³)	9	118.9 ± 33.5	71.4 - 181.2
Final fertility (n x 10 ³)	9	82.8 ± 28.6	49.2 - 131.8
Relative initial fertility (n x 10 ³ / kg of body weight)	9	208.7 ± 30.0	147.2 - 248.2
Relative final fertility (n x 10 ³ / kg of body weight)	9	144.4 ± 32.0	107.8 - 198.2
Water temperature at hatching (°C)	9	23.9 ± 1.1	23.0 - 25.0
Degree-hours at hatching	9	502.2 ± 17.2	480 - 520
Males			
Body weight (g)	14	374 ± 50	300 - 450
Dose (pituitary dry weight, in mg/kg of body weight)	14	2.6 ± 0.2	2.5 - 3.0

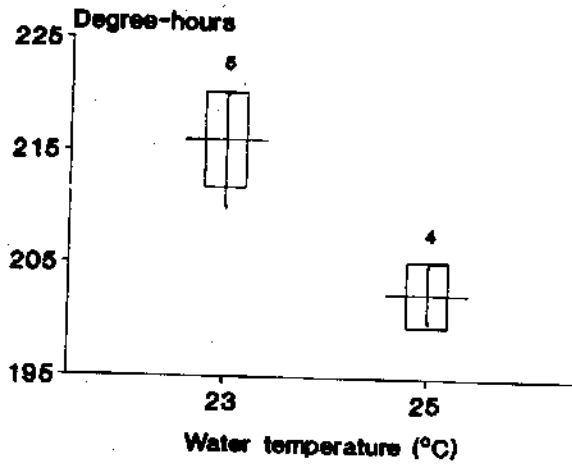


Figure 1. Degree-hours at stripping at water temperature of 23 °C and 25 °C of *S. knerii* hypophysed at Três Marias Hydrobiological and Fishculture Station, in the reproductive period of 1985-1986. Mean (horizontal line), standard deviation (vertical box) and range (vertical line) are presented; numerals above bars = number of females.

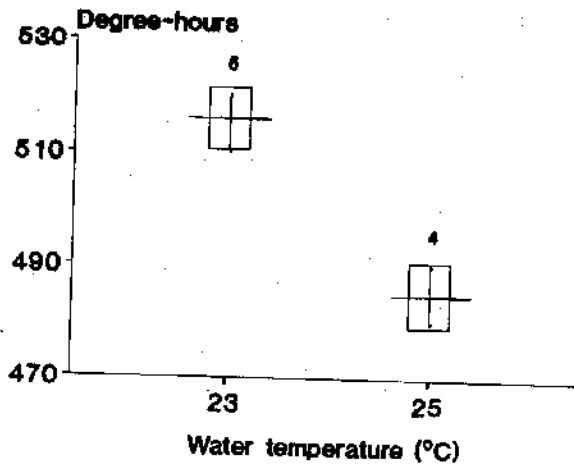


Figure 2. Degree-hours at hatching at water temperature of 23 °C and 25 °C of *S. knerii* hypophysed at Três Marias Hydrobiological and Fishculture Station, in the reproductive period of 1985-1986. Mean (horizontal line), standard deviation (vertical box) and range (vertical line) are presented; numerals above bars = number of females.

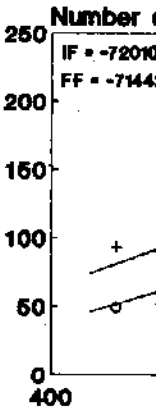


Figure 3. Initial fertility (IF) and final fertility (FF) simultaneously from 9 female *S. knerii* hypophysed at Três Marias Hydrobiological and Fishculture Station, in the reproductive period of 1985-1986.

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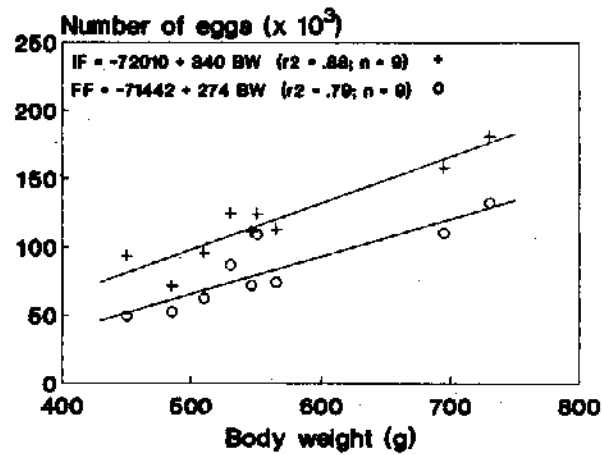


Figure 3. Initial fertility (o) and final fertility (+) on body weight, obtained simultaneously from 9 females *S. knerii* hypophysectomized at Três Marias Hydrobiological and Fishculture Station, in the reproductive period of 1985-1986. IF = initial fertility; FF = final fertility.

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Aspectos reprodutivos
(Characiformes), esp[Reproductive aspects of
native species]

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30

Estação de Hidrobiol

Analisaram-se histologicamente gonádios de 305 espécimes de *Piranga* capturados no reservatório de Três Marias. Determinaram-se os estádios de desenvolvimento dos gonádios em uma parcela, aparentemente essa espécie parece reproduzir-se durante os meses de janeiro a março. Há indicações que os machos acasalados foram observados machos esgotados.

PALAVRAS-CHAVE: Piranha, *Pygocentrus nattereri*, represa de Três Marias

Gonads of 305 specimens of *Piranga* from July/85 to June/86, were analyzed histologically. The stages of development of the gonads and of the oocytes and of the gonads were determined in a parcel, apparently this species seems to reproduce in Três Marias during the months of January to March. There are indications that mated males were exhausted.

KEY-WORDS: Piranha, *Pygocentrus nattereri*, reservoir

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