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Hypophysation of the fish *Prochilodus affinis* from the Rio São Francisco basin, Brazil

(Hipofisacão do peixe *Prochilodus affinis* da bacia do Rio São Francisco)

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SUMMARY

P. affinis is a fish from the Rio São Francisco basin having importance in the commercial fisheries. It is a mud-eater, exhibiting migratory reproductive behavior and may reach 6 kg of body weight (BW). The present data refer to the hypophysation of 154 females and 225 males from the Três Marias Hydrobiological and Fishculture Station, CODEVASF, Três Marias, MG, Brazil. Two doses of crude carp pituitary extract (CCPE) were given to the females (0.8±0.2mg of CCPE/kg of BW and 5.7±0.4mg of CCPE/kg of BW), with time interval of 16.5±2.3 h between doses, and one dose for the males (2.8±0.4 mg of CCPE/kg of BW). About 76% of the females under treatment spawned liable eggs in 219 ±12 degree-hours, at water temperature of 23.9±0.8°C. The eggs were free, demersal and gray. They measured 1.4±0.1mm in diameter and increased 9.8 times their volume after hydration. The ratio between ova weight: body weight = 22.1±4.1%, the number of eggs/g of ova = 1222±119 and the fertility rate (estimated at blastopore closure) = 71±16%. The relative initial fertility (number of stripped eggs/ kg of BW) = 269.9 x 10³±53.7 x 10³ and the relative final fertility (number of liable eggs at blastopore closure/kg BW) = 201.3 x 10³±52.9 x 10³. The relationships between BW and initial fertility (IF) and final fertility (FF) were expressed, respectively, by IF = 33,085 + 227,231 BW and FF = 25,852 + 169,987 BW. When these values were cumulated (C), the equations were: CIF = 162,066 + 269,042 CBW and CFF = 95,567 + 204,173 CBW.

KEY WORDS: Hypophysation, *Prochilodus affinis*, 'curimatã-pioa', Rio São Francisco, Brazil

RESUMO

P. affinis é um peixe da bacia do Rio São Francisco de importância na pesca comercial. Ele é iliófago, de piracema e pode atingir cerca de 6 kg de peso corporal (PC). Os dados

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aqui apresentados referem-se à hipofisacção de 154 fêmeas e 225 machos na Estação de Hidrobiologia e Piscicultura de Três Marias, CODEVASF, Três Marias, MG, Brasil. Utilizou-se extrato bruto de hipófise de carpa (EBHC) em duas doses para as fêmeas ($0,8 \pm 0,2$ mg de EBHC/kg de PC e $5,7 \pm 0,4$ mg de EBHC/kg de PC), com intervalo de $16,5 \pm 2,3$ h entre doses, e uma dose para os machos ($2,8 \pm 0,4$ mg de EBHC/kg de PC). Cerca de 76% das fêmeas tratadas liberaram ovos viáveis a 219 ± 12 horas-grau, à temperatura da água de $23,9 \pm 0,8$ °C. Os ovos eram livres, demersais e de cor cinza. Eles mediram $1,4 \pm 0,1$ mm de diâmetro e aumentaram cerca 9,8 vezes seu volume após a hidratação. A razão entre peso da ova: peso corporal = $22,1 \pm 4,1\%$, o número de ovos/g de ova = 1222 ± 119 e a taxa de fertilização (estimada por ocasião do fechamento do blastóporo) = $71 \pm 16\%$. A fertilidade inicial relativa (número de ovos extruídos/kg PC) = $269,9 \times 10^3 \pm 53,7 \times 10^3$ e a fertilidade final relativa (número de ovos viáveis por ocasião do fechamento do blastóporo/kg PC) = $201,3 \times 10^3 \pm 52,9 \times 10^3$. As relações entre PC e fertilidades inicial (FI) e final (FF) foram expressas, respectivamente, por: $FI = 33.085 + 227.231 PC$ e $FF = 25.852 + 169.987 PC$. Quando estes valores de FI, FF e PC foram acumulados (a), as equações foram: $FIA = 162.066 + 269.042 PCa$ e $FFa = 95.567 + 204.173 PCa$.

PALAVRAS-CHAVE: Hipofisacção, *Prochilodus affinis*, curimatã-pioa, Rio São Francisco

INTRODUCTION

Prochilodus affinis Reinhardt, 1874 (Characiformes, Prochilodontidae), popularly known as 'curimatã-pioa', is endemic to the Rio São Francisco basin where it is of economical importance in the professional fisheries.

It reaches 6 kg of body weight, being the females larger than the males. It is mud eater, as the other Prochilodontidae fish, and performs reproductive migration up river during the rainy season. The orange color of its flesh makes it appreciated among the consumers.

In this paper it is presented the data on hypophysation of this fish obtained from the routine work at the Três Marias Hydrobiological and Fishculture Station, at Três Marias, MG, Brazil.

MATERIAL AND METHODS

The data used in the present work were gathered from the routine procedures employed at the Três Marias Hydrobiological and Fishculture Station, CODEVASF, at Três Marias, MG, during the period of 1987 to 1992, relative to 154 females and 225 males of *Prochilodus affinis*.

Part of the brood stock was raised at the station. They were raised at a rate of 1 kg of body weight per week, containing 22% of crude protein and 1.5% of their body weight of ammonium sulfate.

The hypophysations were performed with pituitary extract (CCPE). The procedure of spawning and hatching (in degree-days) followed the method of (1980). CCPE injections were made through the 'dry' method using a 1 liter funnel-type fiberglass injector.

The brooder's total length and weight (based on both ovulated and extruded eggs/g of ova, egg volume and oocytes within the ovaries) were obtained at stripping), initial and final fertility (number of eggs), fecundity and relative fertility (K) and Fulton's condition factor (K).

RESULTS

The fish were ready for hypophysation after 2 years, however, this period was extended in ponds, the earliest first maturation was observed in both males and females. Using the method selected for hypophysation the males snored and freed the females which were previously held in other of the holding tanks. The ovulation time was 12 hours.

The results are displaced in relation to the condition factor which corresponded to 76% and varied considerably, being 1.5 times their volume after hydration. The eggs of *P. affinis*, reaching almost 3 times their volume after hydration.

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Part of the brood stock was captured in the Rio São Francisco River and part was raised at the station. They were kept in 1000m², 1m deep ponds at the stocking rate of 1 kg of body weight/6m² of pond. They were fed on pelleted feed, containing 22% of crude protein (as indicated by the manufacturer), 5 days a week, 1.5% of their body weight. The ponds were fertilized twice a month with 75 kg/ha of ammonium sulfate and 19kg/ha of superphosphate.

The hypophysations were performed following Ihering (1937), using crude carp pituitary extract (CCPE). Doses (1 for males and 2 for females), time of stripping and hatching (in degree-hours) and rate of fertilization (estimated after blastopore closure) followed the methods described in Woynarovich & Horváth (1980). CCPE injections were done in the celomic cavity and egg fertilization was made through the 'dry' method. The fertilized eggs were placed in 60 or 200 liter funnel-type fiberglass incubators.

The brooder's total length and body weight were registered as well as the ovarian weight (based on both ovaries), ova (= extruded eggs) weight, number of extruded eggs/g of ova, egg diameter, fecundity (= number of remaining vitelline oocytes within the ovaries after stripping plus the number of extruded eggs obtained at stripping), initial fertility (= number of eggs obtained at stripping) and final fertility (number of viable eggs after blastopore closure). Relative fecundity and relative fertilities were estimated basing on the body weight. The Fulton's condition factor (K) was obtained following Ricker (1975).

RESULTS AND DISCUSSION

The fish were ready for hypophysation from November to February. In some years, however, this period extended from October to April. When raised in ponds, the earliest first maturity observed occurred at the age of one year for both males and females. Usually, it was reached at two years of age. The females selected for hypophysation had swollen abdomen and reddish genital papilla and the males snored and freed semen under abdominal massage. At ovulation, the females which were previously quiet, started to move about from one side to the other of the holding tank. This behavior favored the identification of the ovulation time.

The results are displaced in Tab. 1. Viable eggs were obtained in 117 females which corresponded to 76% of those hypophysed. The size of the brood stock varied considerably, being the females heavier than the males and with higher condition factor. The eggs were free, demersal, gray, and increased about 9.8 times their volume after hydration. The ova weight:body weight ratio was high in *P. affinis*, reaching almost 30% which corresponded to a also high fertility.

Table 1 - Hypophysation data of *P. affinis* using crude carp pituitary extract, at the Três Marias Hydrobiological and Fishculture Station, Três Marias, MG, Brazil, during the period of 1987-1992.

Parameter	Number of observations	Mean \pm SD	Range
Females			
Body weight (g)	154	872 \pm 544	190 - 2,730
Condition factor (K)	86	1.40 \pm 0.15	1.11 - 1.76
Doses (pituitary dry weight, in mg/kg of body weight)			
first dose	154	0.8 \pm 0.2	0.5 - 1.0
second dose	154	5.7 \pm 0.4	5.0 - 6.2
Interval between doses (h)	154	16.5 \pm 2.3	13 - 20
Water temperature ($^{\circ}$ C) at stripping	154	23.9 \pm 0.8	23.0 - 25.0
Degree-hours at stripping	117	219 \pm 12	190 - 240
Ovarian weight:body weight (%)	59	26.9 \pm 3.5	16.4 - 31.6
Ova weight (g)	117	191 \pm 116	32 - 582
Ova weight:body weight (%)	117	22.1 \pm 4.1	13.0 - 29.6
Number of eggs/g of ova	91	1,222 \pm 119	923 - 1,478
Egg diameter (mm)			
Pre-hydration	35	1.4 \pm 0.1	1.2 - 1.6
Pos-hydration	35	3.0 \pm 0.2	2.5 - 3.5
Egg fertility rate (%)	117	71 \pm 16	27 - 97
Fecundity ($n \times 10^3$)	45	275.9 \pm 192.2	55.0 - 958.8
Initial fertility ($n \times 10^3$)	45	227.8 \pm 145.9	47.1 - 607.6
Final fertility ($n \times 10^3$)	45	171.5 \pm 111.5	25.9 - 462.0
Relative fecundity ($n \times 10^3$)	45	331.6 \pm 51.1	205.3 - 413.9
Relative initial fertility ($n \times 10^3$)	91	269.9 \pm 53.7	170.0 - 370.3
Relative final fertility ($n \times 10^3$)	91	201.3 \pm 52.9	69.7 - 325.2
Water temperature ($^{\circ}$ C) at hatching	69	23.6 \pm 0.8	23.0 - 25.0
Degree-hours at hatching	69	501 \pm 36	430 - 550
Males			
Body weight (g)	225	570 \pm 278	150 - 1,600
Condition factor (K)	86	1.14 \pm 0.15	0.71 - 1.65
Dose (pituitary dry weight, in mg/kg of body weight)	225	2.8 \pm 0.4	2.5 - 4.0

SD = standard deviation

The values of degree-hours at stripping were dependent on water temperature. They decrease as the water temperature increased ($F = 190.88$; $P = 0.0001$; $df = 116$; Fig. 1), as observed in other species (various carp species in Horváth, 1978; *Rhamdia sapo* in Espinach Ros et al., 1984; *Prochilodus marginatus* in Sato et al., 1996; *Schizodon kneri* in Sato et al., 1996). The relationship between degree-hours at hatching and water temperature followed the same pattern of that of the degree-hours at stripping ($F = 214.02$; $P = 0.0001$; $df = 68$; Fig. 2).

Fecundity, initial fertility and final fertility increased (Fig. 3). In Fig. 4, the results indicate the needs in female

P. affinis females were less than the brood stock utilized, 58% after the hypophysation treatment. Both females and males died.

- ESPINACH ROS, A., AMARAL, J. C. & NANI, A. Induced breeding in *P. affinis* (C. & V.). *Aquaculture*, 1984, 43: 1-10.
- HORVÁTH, L. Relation between body weight and fecundity in cyprinids. *Aquacultura*, 1978, 18: 1-10.
- IHERING, R. von. A method for the determination of the egg diameter. *Bull. Fish. Res. Bd. U.S.*, p.15-16, 1937.
- RICKER, W.E. Computation of growth rates in fish populations. *Bull. Fish. Res. Bd. U.S.*, 1949, 16: 389-412.
- SATO, Y., CARDOSO, J. A. & HIRATA, M. Hypophysation of the common carp (*Cyprinus carpio* L., Steindachner, 1875) for the production of fry. *Vet. Zootec.*, in press.
- SATO, Y., CARDOSO, J. A. & HIRATA, M. Hypophysation parameters of the common carp obtained in hatchery studies. *Bull. Fish. Res. Bd. U.S.*, 1996, 43: 1-10.
- WOYNAROVICH, E., HOBBS, J. & HIRATA, M. *Finfishes - a manual for the aquaculturist*. 1980.

crude carp pituitary extract, at
Station, Três Marias, MG,

Mean ± SD	Range
872 ± 544	190 - 2,730
1.40 ± 0.15	1.11 - 1.76
0.8 ± 0.2	0.5 - 1.0
5.7 ± 0.4	5.0 - 6.2
16.5 ± 2.3	13 - 20
23.9 ± 0.8	23.0 - 25.0
219 ± 12	190 - 240
26.9 ± 3.5	16.4 - 31.6
191 ± 116	32 - 582
22.1 ± 4.1	13.0 - 29.6
1,222 ± 119	923 - 1,478
1.4 ± 0.1	1.2 - 1.6
3.0 ± 0.2	2.5 - 3.5
71 ± 16	27 - 97
275.9 ± 192.2	55.0 - 958.8
227.8 ± 145.9	47.1 - 607.6
171.5 ± 111.5	25.9 - 462.0
331.6 ± 51.1	205.3 - 413.9
269.9 ± 53.7	170.0 - 370.3
201.3 ± 52.9	69.7 - 325.2
23.6 ± 0.8	23.0 - 25.0
501 ± 36	430 - 550
570 ± 278	150 - 1,600
1.14 ± 0.15	0.71 - 1.65
2.8 ± 0.4	2.5 - 4.0

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001; $df = 68$; Fig. 2).

Fecundity, initial fertility and final fertility increased linearly with body weight increase (Fig. 3). In Fig. 4 these data are presented in the cumulative form, indicating the needs in female brood stock for egg production.

P. affinis females were less resistant to the hypophysation than the males. From the brood stock utilized, 58 females and 85 males were observed until one week after the hypophysation treatment, when, respectively, 31% and 12% of those females and males died.

REFERENCES

- ESPINACH ROS, A., AMUTY, V.G., ARCEREDILLO, J.P.M., ORTI, G., NANI, A. Induced breeding of the South American catfish, *Rhamdia sapo* (C. & V.). *Aquaculture*, v.37, p.141-146, 1984.
- HORVÁTH, L. Relation between ovulation and water temperature by farmed cyprinids. *Aquacultura Hungarica*, v.1, p.58-65, 1978.
- IHERING, R. von. A method for inducing fish to spawn. *Prog. Fish-Cult.*, v.34, p.15-16, 1937.
- RICKER, W.E. Computation and interpretation of biological statistics of fish populations. *Bul. Fish. Res. Bd. Canada*, v.191, p.1-382, 1975.
- SATO, Y., CARDOSO, E.L., GODINHO, A.L., GODINHO, H.P. Hypophysation of the anostomid fish white-piau, *Schizodon knerii* (Steindachner, 1875) from the São Francisco River basin. *Arq. Bras. Med. Vet. Zootec.*, in press.
- SATO, Y., CARDOSO, E.L., GODINHO, A.L., GODINHO, H.P. Hypophysation parameters of the neotropical fish *Prochilodus marggravii* obtained in hatchery station conditions. *Rev. Brasil. Biol.*, v.56, n.1, p.59-64, 1996.
- WOYNAROVICH, E., HORVÁTH, L. The artificial propagation of warm-water finfishes - a manual for extension. *FAO Fish. Tech. Pap.*, v.201, 183p., 1980.

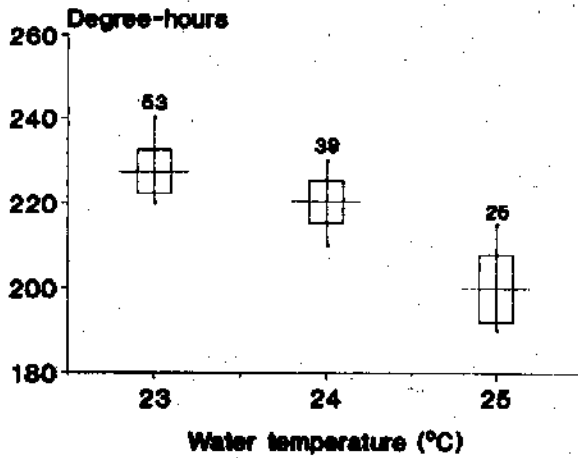


Figure 1. Degree-hours at stripping of *P. affinis* at different water temperatures. Mean (horizontal line), standard deviation (vertical box) and range (vertical line) are presented; numerals above bars = number of females.

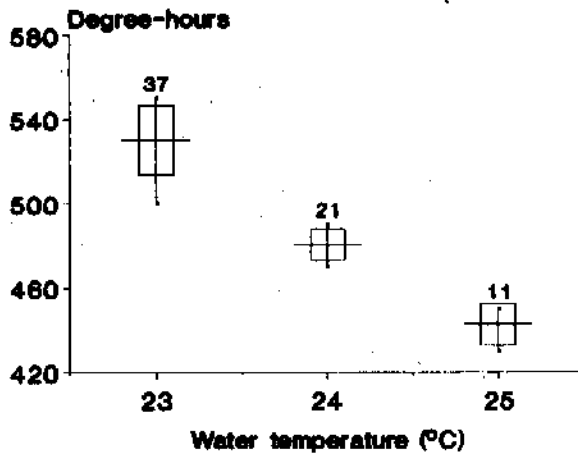


Figure 2. Degree-hours at hatching of *P. affinis* at different water temperatures. Mean (horizontal line), standard deviation (vertical box) and range (vertical line) are presented; numerals above bars = number of females.

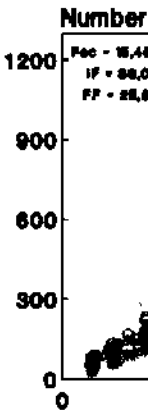


Figure 3. Fecundity (o), initial fecundity (IF), and final fecundity (FF) for *P. affinis*. Fec = fecundity; IF = initial fecundity; FF = final fecundity.

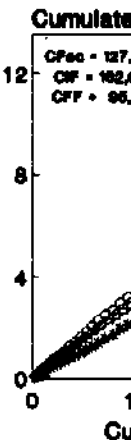
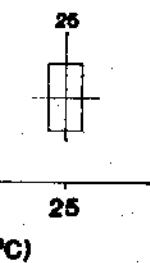
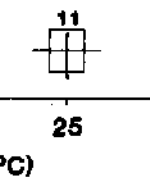


Figure 4. Cumulated fecundity (CFec) and cumulated final fertility (CFF) for *P. affinis*. CFec = cumulated fecundity; CFF = cumulated final fertility.



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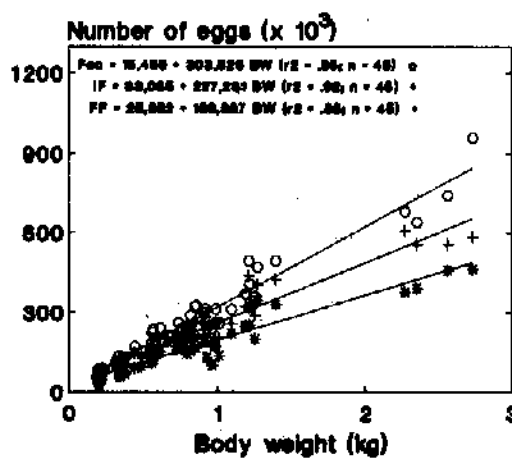


Figure 3. Fecundity (o), initial fertility (+) and final fertility (*) on body weight of *P. affinis*. Fec = fecundity; IF = initial fertility; FF = final fertility.

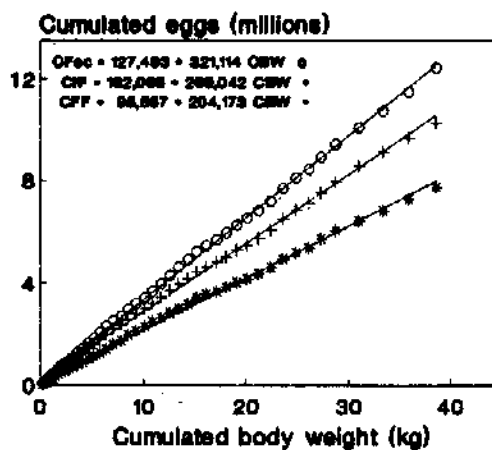


Figure 4. Cumulated fecundity (o, n = 45), cumulated initial fertility (+, n = 45), and cumulated final fertility (*, n = 45) on cumulated body weight ($r^2 > 0.99$) of *P. affinis*. CFec = cumulated fecundity; CIF = cumulated initial fertility; CFF = cumulated final fertility.