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Note

Embryogenesis of the neotropical freshwater Siluriforme *Pseudoplatystoma coruscans*

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Embryogenèse du silure néotropical d'eau douce Pseudoplatystoma coruscans

INTRODUCTION

Pseudoplatystoma coruscans (Agassiz, 1829), a Siluriforme belonging to the Pimelodidae family, is a species of great interest to Brazilian fish culturists due to its large size (reaching over 100 kg of body weight), wide distribution in South America, from the Amazon to the Plata river basins (Fowler, 1951), and to its high commercial value. The recently successful artificial propagation of this species (Sato *et al.*, 1988) has opened up a unique opportunity to know its early life history.

In the present paper, we present the main morphological characteristics of the *P. coruscans* embryonic development stages. This pictorial record is intended to help the proper identification of these stages in hatchery station work as well in ecophysiological studies.

MATERIAL AND METHODS

Pseudoplatystoma coruscans broodstock was submitted to hypophysation at Três Marias Hydrobiological and Fishculture Station, Três Marias, MG, Brazil. Two intramuscular doses of crude carp pituitary extract (CCPE) were given to the females (0.8 mg and 6 mg of CCPE/kg of body weight, respectively), with time interval of 13 h between doses, and one intramuscular dose for the males (2 mg of CCPE/kg of body weight).

Stripping was performed under anesthesia with Quinaldine (1 ml: 25 liters of water) 225 degree-hours after the second injection, at a water temperature of 23.5-25.0°C. The eggs were free, demersal and measured 0.8 mm before hydration and 1.3 mm after hydration.

After fertilization, performed by the "dry method", the eggs were placed in a 60 l funnel-type incubator, whose water temperature was at 23.5-25.0°C. The water flow was kept at 2 l/min from blastodisc formation to blastopore closure and then raised to 5 l/min until hatching. The water at the incubator had the following characteristics: dissolved oxygen = 5.6-6.5 mg/l, pH = 6.6-7.2 and conductivity = 80-105 μS/cm^2.

The embryogenesis was followed in fresh eggs of 4 females, from fertilization to hatching, under an inverted microscope. The descriptions of the embryonic development stages were limited to their main morphological characteristics. In one female, the interval between observations was about 15 min in the first 6 hours and 1 h thereafter. In the remaining

females, the observations were restricted to the time of occurrence of the main events. The abnormalities seen during embryogenesis were not registered; however, the egg fertility rate, estimated at blastopore closure, was about 70%, which was considered satisfactory in hatchery routine work.

RESULTS

This is the first time the embryonic development of *P. coruscans* has been registered. It was divided in to 9 stages which extended from the formation of the blastodisc to hatching. An apparent double chorion membrane was observed in the fresh eggs under the inverted microscope, throughout the period of study. However, in histological preparations, using plastic embedding and 1% toluidine-blue staining, the chorion membrane appeared as a single structure.

The main morphological events registered in each embryonic development stage of *P. coruscans* are summarized in *table* 1 and depicted in *figure* 1.

DISCUSSION AND CONCLUSION

The morphological events registered during the embryogenesis of the *Pseudoplatystoma coruscans* were similar to those of other freshwater neotropical Siluriformes (Godinho *et al.*, 1978; Matkovic *et al.*, 1983; Cussac *et al.*, 1985). The short duration of its embryogenesis was also similar to that of other neotropical fish which exhibit reproductive migration, are total spawners, spawn non-adhesive eggs and take no care of their offspring (for review see Lamas, 1993). The African catfish *Heterobranchus longifilis* and *Clarias gariepinus* also enhibit similarly short gametogenesis although they spawn adhesive eggs (Legendre and Teugels, 1991).

The type of egg segmentation in vertebrates depends on the amount of yolk and on the proportion between it and the cytoplasm which will constitute the blastodisc (Gilbert, 1991). The cleavage in the telolecithic eggs of *P. coruscans* is meroblastic, the initial blastomeres remaining in continuity with the yolk globules as indicated by Kimmel and Law (1985). The first cleavages in telolecithic eggs are usually meridional and incomplete due to the continuous migration of cytoplasmic material towards the blastodisc (Gilbert, 1991). Following the first layer of blastomeres in *P. coruscans* eggs, equatorial segmentation planes give rise to the stratified blastodisc.

The yolk syncytial layer can be distinguished in the early blastula stage (Lentz and Trinkaus, 1967) or even earlier (Trinkaus, 1993). In the present work, it could only be detected in the low blastula stage since our observations were performed in fresh eggs. The flattening of the blastula in *P. coruscans* appears to be, as in other fish (Kimmel *et al.*, 1990; Warga and Kimmel, 1990; Trinkaus, 1992 and 1993), a conjugation of the superficial layer of blastula cells with the yolk syncytial layer which spread together over the yolk mass. In *P. coruscans*, epiboly was faster than the lengthening of the blastodisc – a characteristic observed in fish with small eggs (Trinkaus, 1992). Delimitation of embryo's body and

Table 1. – Stages of the embryonic development in *Pseudoplatystoma coruscans* (observed with the water temperature at 23.5-25.0°C).

Stage	Time after fertilization (h)	Description	Figure 1
1. Blastodisc formation	1.0	Migration of the granular cytoplasm toward one pole; formation of the animal pole (blastodisc); delimitation of the vegetal pole; cleavage of the blastodisc.	A, B
2. High blastula	2.5	Continuation of blastodisc cleavage.	C
3. Low blastula	4.0	Flattening of the blastomeres; yolk syncytial layer is evident (between blastodisc and vegetal pole).	D
4. Gastrula	5.5	Cell movements in the blastodisc; lenthening of the blastodisc (by convergence of the deep blastodisc cells); covering of the vegetal pole (epiboly);	E
5. Blastopore closure	6.0	Fusion of the blastodisc borders; delimitation of the embryonic body and yolk sac.	F
6. Optic vesicles	7.5	Recognition of the cephalic and caudal edges of the embryo; five pairs of somites; presence of the optic vesicles.	G
7. Auditive and Kupffer's vesicles	11.5	Eleven pairs of the somites; presence of the auditive (cranially) and Kupffer's vesicles (caudally).	H
8. Otoliths and olfactory pits	14.5	Presence of the olfactory pits; presence of otoliths in the auditory vesicle; movements of the free embryonic tail; cardiac beats.	I
9. Hatching	19.0	Vigorous tail beats against the chorion; contraction and rotation of the embryo; chorion rupture and hatching.	...

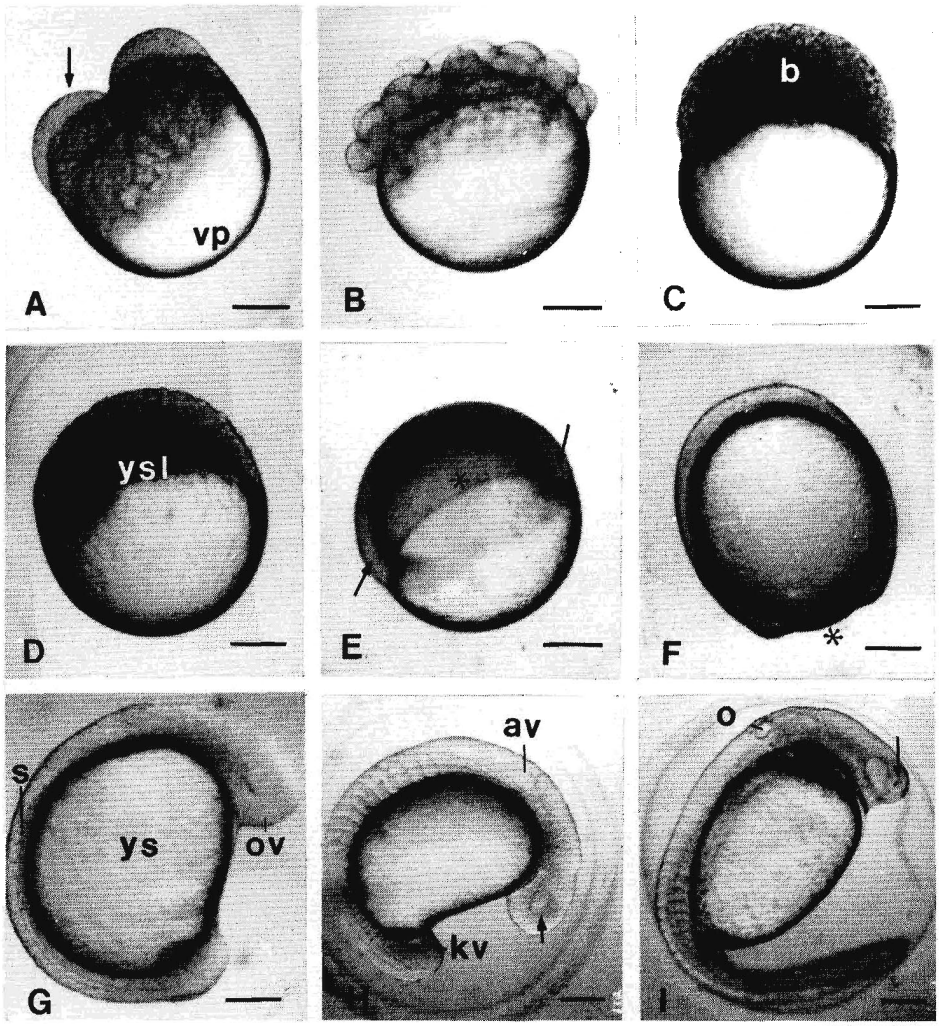

Figure 1. – (Scale bar: 0.2 mm) A - Blastodisc with two blastomeres (arrow); vegetal pole (vp); B - Blastodisc with approximately 32 blastomeres; C - Prominent blastomeres (b); D - Flattened blastomeres; yolk syncytial layer (ysl); E - Elongated blastodisc (arrows), epiboly (*); F - Closure of the blastopore (*); G - Optic vesicle (ov), somites (s) and yolk sac (ys); H - Auditive vesicle (av) and Kupffer's vesicle (kv); optic cup (arrow); I - Embryo just before hatching: olfactory pit (arrow); otoliths (o); the tail is out of focus due to its beating.

yolk sac takes place when the blastopore closes (Wood and Timmermans, 1988). The Kupffer's vesicle is a transient structure in *P. coruscans* and constitutes a characteristic marker in the teleost embryo (Laale, 1985).

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