THE INDUCED SPAWNING OF PLA SAWAI, *PANGASIUS SUTCHI*

by

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ABSTRACT

The paper describes the results of experimentally induced spawning of *Pangasius sutchi* by the injection of homogenized pituitary gland substances. The conditions of the experiment are briefly described and data on rates of embryonic development and early growth are given, including an indication of food requirements for the larvae and early fry.

Pangasius sutchi, known in Thailand as "Pla sawai", is a large freshwater catfish of very high economic importance as food for the people. It occurs in many of the rivers, lakes and water reservoirs of Thailand and neighbouring countries, and is one of the fish species that has long been popularly cultured in ponds, floating boxes and pens.

It is a fairly fast grower. Under good management and given adequate food, this fish is able to grow from a small fingerling of about 10 g in weight to approximately 1.5 kg in one year and 3-4 kg in 2 years. Under natural conditions, the average size of this fish caught is about 5-6 kg, fish of 10-15 kg are also commonly caught, while fish of over 1.4 meter long and weighing over 30 kg in weight have also been recorded.

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The unpredictable occurrence of the fry and fingerlings of this fish under natural conditions and the various difficulties in collecting them in sufficient numbers for culturing purpose have always been serious limiting factors for the would-be fast expanding fishculture operation. Top priority has long been given by the Thai Fisheries Department to develop practical ways and means to propagate this fish on a large scale under controlled conditions.

Several experiments on induced spawning of this catfish by pituitary hormone injection have been attempted by Thai fisheries biologists since 1958, at Bung Borapet but without success. In some cases the injected fish responded well and yielded mature eggs, but unfortunately, either the eggs failed to be fertilized or if fertilized, failed to complete their development and died before hatching (Tubb 1958 and Mek 1959). However, experiments initiated after the first abortive trial in 1958 failed to develop any improvements in technique.

The present series of experiments was conducted during July/August 1966, at the Thai Freshwater Fisheries Station, Bung Borapet, Central Thailand. Success in spawning, fertilization of eggs, hatching of larvae and rearing of fry and fingerlings have been achieved.

MATERIAL AND METHOD

The fish specimens used for these experiments were collected from the area around the water discharge channel of Bung Borapet, a large water reservoir. Healthy and sexually ripe males and females were selected and kept segregated in separate pond compartments. They were conditioned for 1-2 days before being used for pituitary hormone treatment.

Criteria used for the selection of good mature fish for the experiments were as follows:

1. Males - About 3-5 kg in weight (2-3 year old), yield milt easily when the region around the vent is lightly pressed.

2. Females - Around 5-10 kg in weight (3-5 year old) belly well extended and soft, lateral portions in front of vent slightly swollen, rim of vent slightly swollen and light reddish in colour.

The pituitary glands used were collected from sexually mature specimens of *Pangasius sutchi*. The glands were used fresh whenever possible, otherwise they were preserved in acetone solution. The glands were thoroughly homogenized in normal saline solution. Injections were intramuscular.

The stripping and fertilization of the eggs were done according to the well known "dry method".

Material used as egg receivers included roots of Water-Hyacinth, *Hydrilla, Ceratophyllum,* fibers of nipa palm, and jute fronds. The plant fibers were made into small mats, similar in design to the "kakaban" - a popular type of egg receiver used in spawning the common carp.

Egg-hatching nets were made of fine nylon netting material, rectangular in shape, about 1 x 2 x 0.5 m in size. The hatching nets were set either in water tanks (provided with gentle flow of water) or in the lake with strong bamboo raft as support.

AGE OF SEXUAL MATURITY AND FECUNDITY

There is yet no reliable method for determining the age of this fish, but basing on the average size of fish of known age cultured in ponds, the age at sexual maturity has been estimated to be 2-3 years for males and 3-4 years for females.

The number of eggs varies according to the size of the fish, thus females of about 5-6 kg in weight have approximately 1 million eggs, 8-9 kg fish, 1.2 million and 10-12 kg fish, 1.5 million.

The eggs are spherical, small, only about 1.2 mm in diameter, light yellowish in color and become adhesive after coming into contact with water.

EXPERIMENT ON DOSAGE OF PITUITARY GLAND AND TIMING OF INJECTIONS

The pituitary gland of *Pangasius sutchi* is small. The average weight of glands preserved in acetone from fish of different sizes are given in Table I.

TABLE I

Weight of fish	Av. Wt. of gland preserved in acetone
3 kg	2.2 mg
4 "	3.0 "
5 "	4.0 "
6 "	5.1 "
7 "	6.2 "
8 "	7.4 "

For convenience sake, a gland from a donor fish of approximately the same weight as that of the recipient is regarded as one dose, which is approximately 0.8 m of preserved gland to one kg of fish.

Various dosages ranging from 1.5 - 3.5 doses and intervals between injections from 6-24 hours have been tested. The results obtained are given in Table II.

TABLE II

RECORD OF EXPERIMENT OF PITUITARY INJECTIONS

Fish No.	1st injection		2nd injection		3rd injection		Ovulation			Remarks
	Dosage	Time	Dosage	Time	Dosage	Time	Time	Quality	Quality	
1	½ d.	12.00	1 d.	24.00	-	-				Fish responded to some extent but no ovulation
2	½ d.	12.00	1 d.	12.00 - 2nd day	-	-				Fish responded poorly, no ovulation
3	1 d.	12.00	1 d.	24.00	-	-	24.00 - 2nd day	very few	poor	Fish responded fairly well, large amount of ovarian fluid
4	1 d.	15.00	1 d.	15.00 - 2nd day	-	-	15.00 - 3rd day	few	poor	" "
5	½ d.	20.00	1 d.	08.00 - 2nd day	1 d.	20.00- 3rd day	08.00 - 3rd day	few	fairly good	failed to be fertilized
6	1 d.	11.00	1 d.	17.00	1½d.	05.00- 2nd day	14.00 - 2nd day	few thousand	fairly good	Some fertilized
7	1 d.	11.00	1 d.	23.00	1½d.	11.00- 2nd day	18.00- 2nd day	few thousand	fairly good	Some fertilized
8	1 d.	11.00	1 d.	23.00	1½d.	08.00- 2nd day	14.00 2nd day	approx. 20,000	fairly good	About 20% fertilized, some hatched
9	1½d.	11.00	2 d.	23.00	-	-	11.00 2nd day	over 500,000	Excel-lent	Fertilization over 95% hatching over 85% (under good water conditions and care)
10	1½d.	18.00	2 d.	06.00 - 2nd day	-	-	06.00 - 3rd day	over 1 million	good	High % of fertilization but none hatched; probably either eggs were over ripe or some unforeseen bad water conditions prevailed

FERTILIZATION OF EGGS

Eggs stripped from the fish that responded to pituitary hormone treatment gave varying degrees of success at fertilization. When there is much ovarian fluid extracted with the eggs, or when the eggs are uneven in size, not fully spherical in shape or dull in colour, the percentage of successful fertilization was low. When eggs were extracted with practically no excess ovarian fluid, light yellow in color, translucent in appearance, even in size and spherical in shape and with none or extremely few "white" ones the fertilization rate was high.

Varying degree of success of fertilization of eggs after they have been released from the ovaries have been observed. From the first stripping of fish No. 9, done 12 hours after the 2nd injection, or 24 hours after the 1st injection, of the some 500,000 eggs obtained over 98 percent were successfully fertilized. Eggs obtained from the same fish 2 hours after the first stripping showed only about 70 percent successful fertilization, and less than 20 percent of the eggs from the same fish stripped 5 hours after the 2nd stripping were successfully fertilized. Failure of the eggs stripped from fish No. 10 to complete their development was probably due to the fact that those eggs were held in the fish too long and were over ripe.

TRANSFERING EGGS TO EGG-RECEIVERS

After the eggs were fertilized and washed they were spread on to the egg-receivers which were set in the hatching nets or the water tanks about 4-5 cm below the surface of water. Within a few minutes the eggs started swelling slightly and adhered to the fibers of the egg-receivers.

HATCHING OF EGGS

Under good water conditions and with a sufficient supply of dissolved oxygen over 85 percent of the fertilized eggs hatched. In the tanks where the water quality was poor-low pH value and low dissolved oxygen content the hatching was less than 20 percent. Eggs kept in hatching nets set in the lake hatched successfully-about 75 percent.

Fertilized eggs developed very fast. Under a water temperature of 28-30°C hatching occurred about 24 hours after the eggs were fertilized. It took 6-8 hours for the whole batch of eggs to hatch. Those that hatched later were usually weak and had a low survival rate.

DEVELOPMENT OF EGG AND LARVA

The various stages of cleavage and embryonic development at water temperature of 28-30°C are given in Table III.

TABLE III

APPROXIMATE

Time after fertilization	Stages of development
0 hr. 40 mins	2 - cell
0 hr. 55 "	4 - cell
0 hr. 65 "	8 - cell
1 hr. 15 "	16 - cell
1 hr. 25 "	32 - cell
2 hrs. 0 "	Morula
3 hrs. 0 "	Blastula
4 hrs. 0 "	Gastrula
8 hrs. 0 "	Somites appear
11 hrs. 0 "	Optic vesicles appear
20 hrs. 0 "	Larva fully formed
24 hrs. 0 "	Hatching

LARVAE

Newly hatched larvae are transparent, without pigment and are poor swimmers. One to two hours after hatching they became rather active and started swimming in a vertical fashion - up to the surface of water then down to a short distance then up again, repeatedly. They are attracted by moderate illumination but tend to avoid strong direct sunlight.

Eye pigment and small pigment spots around the yolk sac appear about 18 hrs. after hatching. About 10 hrs. later the barbules appeared and grew rapidly reaching full length at the time when the mouth opens, about 1½ day after hatching. When the larvae are about 48 hrs. old the yolk sac is fairly well absorbed and feeding commences.

The larvae are initially carnivorous, feeding mainly on small animals that either live on the surface of the sediment or swimming

near it or in mid water. Small crustaceans, cladocerans, copepods and ostracods are preferred. Small larvae of aquatic insects and small aquatic worms are also taken. When hungry the larvae may become cannibalistic.

The larvae fed greedily and grew rapidly, and within a period of 5-6 days metamorphose into young fry of about 2 cm in length. From then on the young fry can be fed, in addition to the natural food mentioned, with small pieces of cooked fish, molluscs, worms and other substances of animal origin, and attain a length of about 5-6 cm in about 3 weeks after hatching. At this stage they may be distributed for pond culturing.

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