EXPERIMENTS ON INDUCED BREEDING OF THE GREY MULLET *MUGIL CEPHALUS* L. IN CHILKA LAKE

ABSTRACT

The results of the experiments on induced breeding and larval rearing of the grey mullet *Mugil cephalus* L. conducted at Chilka lake mouth, during the winter months of three years 1989-'92 are presented in this study. A pioneer attempt on hormone pellet implantation was also made.

IN SPITE of the fact that controlled breeding and larval rearing of *Mugil cephalus* L. has been perfected elsewhere (Kuo & Nash, 1975; Kuo *et al.* 1973, 1974; Lee *et al.* 1987; Liao, 1975; Shehadeh & Ellis, 1970; Yashouv, 1969) in India success in commercial production of the seed is yet to be achieved. The few efforts on experimental breeding and larval rearing of the species are those of Anon (1962), Chaudhuri *et al.* (1977); Mohanti (1971); Krishnan (1989) and Rajyalakshmi *et al.* (1991). Chilka lake in Orissa supports a rich mullet fishery and the fish go to the sea from Chilka on a breeding migration (Jhingran, 1958) every winter. The present work is an attempt in breeding and larval rearing of the species.

We are deeply indebted to Dr. K. Alagarswami, former Director, Central Institute of Brackishwater Aquaculture for giving us consistent encouragement, adequate facilities and the required funds for conducting these experiments.

Breeding camps were setup very close to the chilka mouth during the winter seasons of 1989-'90 through 1991-'92. Healthy uninjured females with soft swollen bellies, and males with milt oozing were carefully selected and transported to the experimental site. In the camp site the mullets were released in nylon hapa's (6′ × 3′ × 3′) tied inside plastic pools of 15′ × 4′ dia. and filled with filered sea water of salinity 25‰ or above. The female fish was then immediately subjected to live ovarian biopsy vide the method suggested by Shehadeh *et al.* (1973). Only those females whose ova were in the tertiary yolk globule stage of development and whose average ova dia. was above 0.5 mm are retained for experimentation. The females alone were induced with different types of hormones such as carp pituitary homogenate, fresh mullet pituitary homogenate, H.C.G. (Profassi) and Pimozide.

Incubation of eggs was done inside the hapa itself. Once hatching was observed, the surface floating larvae were carefully collected and transferred to rearing pools within 24 hrs. of hatching. Matured, filtered sea water of 20‰ salinity was used for rearing. During 1989-90 the larvae were transported to the shore laboratory and reared indoor. In the subsequent years the larvae were reared in the field itself. Cultured *Chlorella sp.* was added to the rearing medium every day as suggested by Nash *et al.* (1973). Larvae were fed with live cultured rotifers from day 3 onwards.

Environmental data on air and water temperature, salinity and pH were recorded regularly. Hormone pellets (using H.C.G. hormone) were prepared as per the method of Lee *et al.* (1986) with slight modifications. Pellet implantation was done on the dorsolateral musculature.

TABLE 1. Details of Induced breeding experiments on *M. cephalus* - Year wise

			1989—'90			
Length/Weight of Female (cms./gms)	45/1175	43.6/1175	45/750	46/1000	44/750	49/1200
Dosage details & response- No. of treatments/hormones	2/55C/20P/ N	2/85C/25P N	4/40C/40M/40P P,SP,ND	2/39C/20P N	2/12C/6M/10PP ,SP,ND	2/32M/20P P,SP,LR
Length/Weight	45/1200	51/1005	42/900	—	—	—
Dosage details	1/7M/10P FD	1/10M/10P P,SP,NH	2/13M/20P P,D	—	—	—
			1990—'91			
Length/Weight	42.5/750	*42.5/850	43/850	44/1005	47/1000	43.2/900
Dosage details	2/3000 IU N	2/PI/3000 IU P	2/10,000 IU N	NI —	5/126M/15,000 IU/40P N	3/81M/ 30P N
Length/Weight	40.4/400AS	43.8/450AS	48.5/1005	50/1500	42/800	—
Dosage details	3/135C/ 10,000 IU/ 30P P,LH,M	1/60C/10P P,LR	NI P,S,NH	2/60C/ 30M/ 20P N	1/600 10P N	— —
			1991—'92			
Length/Weight	*42/520	*44/690	44/735AS	44/850	37.6/580	—
Dosage details	1/PI/ 4500 IU N	1/PI/ 4500 IU N	1/30M/ 10P P,LR	3/50C/ 20M/30P N	2.45M/ 20P N	— —

M, Mullet pituitary in mg.; C, Carp pituitary in mg.; P, Pimozide in mg. LR, Larvae reared; NH, No hatching; I.U HCG in units; P, Postive; N, Negative; FD, Fish died; SP, Spawned; M, Moribund; LH Larvae hatched; NI, No injection; ND, No development; AS, After spawning; PI, Pellet implanted; *PD, Pellet implanted fish.

A total of 23 female *M. cephalus* specimens out of 25 were subjected to induced breeding experiments during the 3 year period. Of these, 9 responded positively to the hormones. Spawning could be achieved in 7 specimens out of which larval hatching was obtained in 4. One female specimen spawned naturally without any inducement at all (Table 1). It was observed that the ideal threshold to initiate hormone inducement in *M. cephalus* females of chilka lake is the presence of an average ova diameter of 0.57 mm, when the ova are in the advanced tertiary oil globule stage. Spawning could be induced in these females using even a single dose of a combination of 10 mg. mullet pituitary extract and 10 mg. of pimozide or 60 mg. carp pituitary extract along with 10 mg. pimozide. Natural spawning could be achieved within 8 to 23 hr. after the resolving dose which is given when the ova have reached sub-peripheral stage as described by Kuo and Nash (1975). The fertilized eggs measured 0.85 mm in diameter, with a single centrally placed golden yellow oil globule. Fecundity was 20 lakhs/kg. wt. of breeder. The fertilization rate of eggs ranged from 55 to 77%. Germinal disc formation was visible within 45 minutes in fertilized eggs. The first cleavage could be observed within 1 hour of spawning and the 32 cell stage was reached within 3 hours. Newly spawned eggs as well as developing eggs stayed sunk in the region of study.

Hatching period varied from 32 to 48 hours in a temperature range of 18.5° to 29.5°C. The late hatching larvae invariably ended up either being abnormal or were dead. Larvae at hatching measured 1.140 mm and stayed upside down and floating on the water surface. In preliminary trails conducted developing embryos and one day old larvae could be transported in 50 litre polyethylene bags with oxygen packing to destinations (ranging in a period upto 6 hours) without any problems in survival. Three batches of larvae numbering 1.5 lakhs 18,000 and 30,900 respectively were subjected to rearing trials. In spite of this, a maximum larval survival upto 10 days, 13 days and 11 days alone could be achieved during the rearing of these 3 batches of larvae.

In spite of the closed systems of rearing the implanted fish survived and the wounds healed very quickly. Out of the 3 female specimens subjected to pellet implantation (Table. 1) one showed good ova size increment from 0.49 mm to 0.53 mm in 5 days as a response to the H.C.G. hormone.

The air temperature ranged from 15.6°C to 28.5°C, water temperature from 18.5°C to 29.5°C, salinity from 20 to 30‰ and pH from 7.6 to 8.5 at the experimental site.

Our observation is the first record where homoplastic pituitary homogenate with pimozide have been used to give good results in spawning. Pimozide is dopamine receptor antagonist that blocks dopamine inhibition of gonadotropin secretion. Since the discovery of Peter and co-workers (Peter *et al.* 1987, 1988) of a dopaminergic inhibition of G.T.H. secretion in cyprinid pituitary, even the various LHRHA are combined with dopamine receptor inhibitor, to act on the pituitary when dopamine inhibition is reduced.

All the fertilized and developing eggs in the present study were observed to stay submerged inspire of the presence of oil globules. One of us (Krishnan) working on *M. cephalus* in Cochin area observed all fertilized and developing eggs to be floating on the water surface while using sea water of 32 to 35‰. salinity. Chilka lake water pumped during high tide and collected very near to the sea mouth having a salinity of 25 to 30‰. was used in our experiments. Hu and Liao (1981) through their experiments showed that buoyancy of eggs of *M. cephalus* is related to salinity, which seems to corroborate our observations.

In our observations, heavy larval mortality occurred after the 2nd day, 7th day and 10th day of hatching, and a maximum survival period of 13 days alone could be achieved. Rajyalakshmi *et al.* (1991) working on *M. cephalus* in Chilka reported a maximum larval survival upto 7 days only and observed that sudden drops in temperature coupled with low oxygen at late night and early mornings as affecting larval survival leading to mortality. However the actual reasons for larval mortality in our experiment cannot be discussed since our trial were few to come to plausible conclusions.

Central Insititute Of Brackishwater Aquaculture, Chennai

L. KRISHNAN
K. V. RAMAKRISHNA
P. K. GHOSH
R. D. PRASADAM
D. RAJA BABU

REFERENCES

ANON, 1962. Annual Report 1961-62. C.I.F.R.I., Barrackpore, 55 p.

CHAUDHURI, H., BHOWMICH, K. M., KOWTAL, G. V., BAGCHI, M. M., JANA, R. K. AND GUPTA, S. D. 1977. *J. Inland Fish. Soc. India,* 9:30-41.

HU, F., AND I.C. LIAO 1981. Rapp. P-V Reun. cons. int. Explor. Mer. 178:460-466.

JHINGRAN, V.G. 1958. *Curr. Sci.,* **27** : 181-182.

KRISHNAN, L. 1989. CIBA special Publication No. 2, pp. 56-91.

KUO, C. M. AND NASH, C. E. 1975. *Aquaculture,* **5** : 19-29.

———, ——— AND SHEHADEH, Z. H. 1974. *Aquaculture,* **3** : 1-14.

———, ——— AND ——— 1973. Vol. II Report No. 01-73-128, Oceanic Institute, Hawaii.

———, Z. H. SHEHADEH AND K. K. MILISEN 1974. *J. Fish. Biol.* **5** : 459-470.

LEE, C. S., C. S. TAMARU AND C. D. KELLEY, 1986. *Aquaculture,* **59** (2) : 161-168.

———, ———, G. T. MIYAMOTA AND C. D. KELLEY. 1987 *Aquaculture,* **62** : 327-336.

LIAO, I. C. 1975. *Aquaculture* **6** .: 31-58.

MOHANTI, S. K., 1971. *J. Ind. Fish Assoc.* **1** (2).

NASH, C. E., C. M. KUO AND Mc CONNEL, S. C. 1973. Vol. II Oceanic Institute, Hawaii, Report No. 01-73-128 23-24.

PETER, R. E., LIN, H. R. AND VAN DER, KRAAK, G. 1987. In Reproductive Physiology of Fish pp 120-123. Ed. by D. R. IDLER, L. W. CRIM AND J. M. WALSH. Memorial University Press, St. Johns.

———, ———, AND ——— 1988. *Aquaculture* **74** : 1-10.

RAJYALAKSHMI, T., S. M. PILLAI AND P. RAVICHANDRAN 1991. *J. Inland Fish. Soc. India,* **23** (1) : 16-26.

SHEHADEH, Z. H. AND ELLIS, J. N. 1970. *J. Fish. Biol.,* **2** : 355-360.

———, KUO, C. M. AND MILISEN, K. K. 1973. *J. Fish. Biol.,* **5** : 489-496.

YASHOUV, A. 1969. *Bamidgeh.* **21** (1) : 19-24.

ON AN UNUSUAL CONCENTRATION OF *SAGITTA TENUIS* CONANT IN THE ESTUARY OF POTENGI, NATAL, BRAZIL

ABSTRACT

An unusual concentration of *Sagitta tenuis* Conant is reported from one of the sampling stations within the estuary of Potengi, Natal, Brazil on December 8, 1992. A major proportion of the population was within the size range of 4.7 mm and 6.7 mm and dominant stages were II and III.

A COMPREHENSIVE study of zooplankton carried out within the estuary of Potengi, Natal, Brazil, during the period 1979-1980 furnished information on the diurnal and seasonal variations in the abundance of the main components (Esnal *et al* 1985, Sankarankutty & Medeiros, 1985, Sankarankutty *et al.*, 1985, Nair & Sankarankutty, 1988, Sankarankutty, 1991 and Sankarankutty *et al.*, in press-a). Recognizing the need to detect and monitor any modifications in the zooplankton community, further investigations on a long-term basis was initiated in October 1992 selecting three fixed stations situated at varying distances from the mouth of the estuary. Present paper deals with an unusual concentration of *Sagitta tenuis* observed on December 8, 1992 at Station 3.