Culture of Sciaenops ocellatus L.

Ramos M.A.

Marine aquaculture finfish species diversification

Zaragoza : CIHEAM
Cahiers Options Méditerranéennes; n. 16

1995
pages 157-161

Culture of *Sciaenops ocellatus* L.

M.A. RAMOS
IPIMAR
AV. BRASILIA
1400 LISBOA
PORTUGAL

SUMMARY

Fish culture was started to supply fish in areas where over fishing destroyed the natural stocks like *Salmo* sp., *Onchorhynchus* sp. and *Alosa alosa* (U.S., Canada).
The new interest of aquaculture today is the natural resource management and the commercial production of hight quality low fat food. In the last 20-30 years, sea bass (*Dicentrarchus labrax*), sea bream (*Sparus aurata*) and flat fish (*Scophthalmus maximus* , *Solea* sp.) are the principal groups of food fish produced by aquaculturists.The recent intensive culture of yellow tail (*Seriola* sp.) in Japan, the production of *Sciaenops ocellatus* in the U.S. and the fish farming increase in Asia with the production of milk fish (*Chanos chanos*) are examples of industrial diversification in aquaculture. *Sciaenops ocellatus*. occurs in the coastal area of the Atlantic from New York till the Gulf of Mexico. This is an important species for recriation and competition. Attending the need to produce hight quality food, this species is also used recently for aquaculture purposes and for restocking the sea (Rutledge, 1989; Swingle, 1990).Facilities were built to produce fry for restocking the coastal waters and for intensive and extensive culture of *S. ocellatus* in Florida and in the Gulf of Mexico.

Key words: Reproduction, larvae rearing, production systems.

RESUME

La culture de poissons a étè inicialment developé dans des regions ou la surpeche a detruit les stocks naturels de *Salmo* sp., *Onchorhynchus* sp. et de l'*Alosa alosa* (U.S.,Canadá). L'interet nouveau en aquaculture envisage surtout l'amenagement des resources naturels et la production commerciel des aliments de première qualité.
Dans les derniers 20-30 années le loup (*Dicentrarchus labrax*) la daurade (*Sparus saurata*) et les poissons plats (*Scophthalmus maximus*, *Solea* sp.) sont les principaux groupes de poissons produits par les aquaculturistes. La recente culture intensive de la seriole (*Seriola* sp.) au Japon, la production de *Sciaenops ocellatus* aux Etats Unis et la croissante augmentation de la production de poissons en Asie avec la production de Chanos (*Chanus chanus)* sont des examples de la diversification industriel en aquaculture.

Sciaenops ocellatus occurs dans la côte de l'Atlantique de New York jusqu'au Golf du Mexique. C'est une espèce trés importante pour la pêche sportif et pour la competition. Due à la necessité de production d'aliments de haute qualité, cette espèce est aussi utilizé pour la production d'aliments et aussi pour la production de poissons pour restocket la mer (Rutledge,1989; Swingle,1990). Des facilités on étè construit pour produire des alevins à restocker la côte, et aussi pour la culture intensive et extensive de *S. ocellatus* dans la Floride et au Golf du Mexique.

Mots-clés : Reproduction, élèvage larvaire, sistèmes de production.

REPRODUCTION

The study of the reproductive behaviour of *S. ocellatus* to attain final maturation and ovulation in captivity conditions,has been developed using different technics.According to Pearson (1929) *S. ocellatus* matures in nature when reach 750 mm in lenght. The natural spawning of this species occurs during September,October and November when the temperature of the water is 24 to 28°C outside the estuaries (Holt *et al.* 1987). According to Arnold (1988) fish selected from spawning studies, began to spawn in a precocious way when they atain 19.5 months after hatching. He developed a method for *S. ocellatus* reproduction including manipulation of the photoperiod with a constant 12L-12D and air temperature of 26°(Holt *et al.*1985). Four brood stoocks were cycled in 30000 liter tanks with a biological semi-open system. The fish used 2♂ to 2♀, were 10-15 kg. Spawning frequency was altered by temperature manipulations. It is well known that fish are very sensitive to external environment factors especialy to the medium duration of the day light and temperature changes. The frequency of spawning was lower at temperature under 23°C. A decrease in temperature submiting the fish to temperatures of 6-8°C, interupts spawning and the spawning season can be retarded.
According to Tomas and Boy (1988) the effect of the superactive analog of luteinizing hormon- releasing hormone (LHRH sub (a)) on ovulation and spawning of this species shows that 0.1mg/kg body weight resulted in successful spawning around 30-35 hours post injection. A second spawn occurred at dusk on the following day . Colura (1990) describes the method of hormone induced strip-spawning of *S. ocellatus* as offering several advantages over photoperiod and temperature conditioning, eliminating the long term maintenance of the broodstock. Althought both methods require the diagnosis of the maturation stage of germ cells (Ramos,1992).

EGGS AND LARVAE

In nature the *S. ocellatus* eggs density from September through mid October in the Gulf of Mexico within one mile of Aransas pass were determined by Holt *et al.*(1987). They observed that the eggs density presents a "selective tidal strem transport" as a mechanism for movement of larvae from offshore spawning area into the estuary nursery grounds. In captivity conditions the broodstock of *S. ocellatus* can produce 1 milion eggs/day,in a

controlled periodicity any time of the year (Holt *et al.*,1985; Arnold, 1988). An average femmale produces one half to two milion eggs per season. The average diameter of the eggs in this species is 0.86-0.98 mm with an oil globlet and 13 hours of embrionic development. Live eggs float and are collected in 500 µm net. Spawning takes place 0-3 hours after light turned off. Hatching takes place 28-29 hours after fertilization at 22-23° C and the hatching rate is 94-99%. Larvae are 1.71-1.79 mm at hatching (Holt, 1981).
The study of *S. ocellatus* larvae culture using a special closed circuit with an internal biological filter and with an electric feeder, was also developed by Holt (1993).

GROWTH

The nutritional requirements of *S.ocellatus* a fast grow species, were studied by Daniels and Robinson (1986) and Robinson (1988). Growth experiments of the juveniles of *S. ocellatus* were done by Arnold *et al.*,(1988) in a race way using a bilogical filter.The fish stocked at lower density with no separation until harvest generaly grow at an average rate of:

Hatch to 40 days	1g .
40 days to 200 days	260g
200 days to 18 months	2kg

Fingerling stocked at 1g (33-40mm) and at a density of aproximately 280/m3 had 44% survival after 116 days. The final fish weight ranged from 20-190g.
Tomas *et al.* (1988) conducted a growth experiment using two groups of *S. ocellatus* a control group and another using ovine growth hormone during two weeks. A commercial diet was administered.The results were: the 360 juveniles used in the experiment increased rapidly from 12.1 to 89.5g with an average weight of 26% per week. The growth acceleration test using ovine growth hormone showed similar results to the control experimental group.
Experimental grow-out in ponds was developed by Sandifer *et al.* (1993) using an intensive pond culture, with a commercial diet. The production tests were done in six 0.1 ha saltwater ponds with juveniles of 1.7-4.3g and a stoking density of 7.500, 15000 and 22.500 fingerlings per ha in duplicate ponds. From April until September the mean fish weights were 1.3,1.0 and 1.2kg respectively at the three densities.
Other pond experiments (Procarione *et al.*, 1989) were done using water fertilization to increase the primary production. The fry stocking density was 674.000 fry /ha and the 2-4 weeks spring production was 2.11 to 3.19kg/ha/day with a survival from 65.9 to 86.4%.
Soletchnik *et al.*(1988) transfered fingerling of *S. ocellatus* from U.S. to Martinique but the experiment didn't succed because the fish were affected by a dinoflagellate *Amyloodinum* sp.and significant mortalities occurd in tanks. The survival was 6-19%.
Hybridization experiments were conducted by Henderson *et al.* (1994) comparing the growth of *Sciaenops ocellatus* X *Pogonias cromis* with *S. ocellatus* and *P. cromis,* in hearth pounds and he found a final production of the hybrid was10.7Kg/ha/day, for *S. ocellatus* 7kg/ha/day, and for *P. cromis* 10.6 Kg/ha/day. The survival was respectively 72 %, 63% and 94%.

DISCUSSION AND CONCLUSIONS

As a marine fish, for recreation and for commercial fisheries, *S. ocellatus* has great economical importance in the U.S. The culture of *S. ocellatus* using the technology presented by Holt (1993) and Arnold (1988) from breeding to larvae rearing and fry intensive production seems to be easier produced than the other marine fish species used until know in aquaculture.Temperature is a particular important factor in poikilothermic animals since the metabolism rates change drasticaly with ambient temperatures .At hight temperatures the feeding rate and growth are much more rapid then at lower temperatures.In the environmental conditions of the Gulf of Mexico *S. ocellatus* as a fast grower doesn´t show difference in growth when growth hormone is tested, probably because this species is geneticaly prepared to grow faster.In comparison the hybrid growth was more rapid than either parents.

In general, the economical conditions to rise a species different from the indigeneous, can not be improved in a place where temperature is impossible to control, but in some upper Sahara areas, temperatures are similar to those of the U.S. where the culture of *S.ocellatus* is developed. Attending the need to diversify in aquaculture other *Sciaenids* are already produced in Italy like *Umbrina cirrosa* which probably is more appropriat to develop in the Mediterranean region.

REFERENCES

Arnold C. R., (1988). Controlled year round spawning of red drum *Sciaenops ocellatus* in captivity. *Contributions in Marine Science*. Supp to 30:65-70.

Arnold , C.R , Browner B.,and Reid B. (1988). High density recirculating grow- out system.In *Manual on Red Drum Aquaculture*. Texas A&M Sea Grant College Program N°. TAMU-Sg-90-603: 183-185.

Colura, R.L.(1990). Hormone induced strip- spawning of red drum. Symp. on the culture of red drum and other warm water fishes Corpus Cristi, Tx (USA).In *Red Drum Aquaculture* 33-34.

Daniels, W.H., Robinson, E.H. (1986). Protein and energy requirements of juvenile Red Drum (*Sciaenops ocellatus*) . *Aquaculture*, 53:243-252.

Henderson, A., Colura, R.L.,and Maciorowski, A.F.,1994.A comparison of black drum, red drum and their hybrid in salt water pond culture. *J.World Aquacult.Soc.*25 (2) 289-296.

Holt,J., Godbout, R., Arnold, C.R.(1981). Effects of temperature and salinity on egg hatching and larval survival of red drum *S. ocellata.Fishery Bolletin:*29(3) 569-573.

Holt, J.G., Johnsen, A.G., Arnold, C.R.; Fable, W.A, and Williams, T.(1981). Description of eggs and larvae of laboratory reared Red Drum, *S.ocellata. Copeia* 4:751-756.

Holt J.G., Holt, S. A., and Arnold, R C.(1985). Diel periodicity of spawning in *Sciaenids. Marine Ecology Prog. Ser.*, 27: 1-7.

Holt, S.A.,Holt.G.J.,and Arnold,C.R. (1987) .Distribution of eggs and larvae of red drum (*Sciaenops ocellatus*) in Texas Coastal Waters. Symp. on the culture of Red Drum and other warm water fishes, Corpus Cristi, Tx(USA) 30 n° suppl.p 196.

Holt,J.G., (1993). Feeding larval red drum on microparticulate diets in a closed recirculating water system. *Journal of the World Aquaculture Society.*24(2) :225-230.,

Paerson, J.C. (1929). Natural history and conservationof red fish and other commercial sciaenids on Texas coast. *Bull. U.S.Bur. Fish.* 44:129-214.

Procarione,L.S., Henderson, A.A.,and Maciorowski,A. (1989). Comparison of pound culture characteristics between Atlantic and Gulf coast Red Drum fingerlings. *Prog. Fish Cult.* 51(4)201-206.

Ramos, M.A., 1992. Final maturation and ovulation in Marine fish.Workshop on Hatchery Management. Medrap.8-11 April, Cadiz:1-19.

Robinson, E. H.(1988). Nutritional requirements of red drum: a review. *Contrib. Mar. Sci.*, 30 (Supp.) :11-20.

Rutledge, W.P. (1989). The Texas marine hatchery program. Rep- CCOFI, 30:49-52.

Sandifer, P.A., Stephen, H.J., Stokes, D.A.and Smile, D.R. (1993). Experimental pond grow-out of Red Drum, *Sciaenops ocellatus*, in South Carolina. *Aquaculture*,118:217-228.

Soletchnik,p., Fhouard,E., Goyard,E.,Ivon,and C.Baker,P.1988. First larvae rearing trials of Red Drum (*Siaenops ocellatus*) in Martinique (French West Indies) Doc. Sc. Pole-Rech-Oceanol. Halieut. Caraibe.17:1-7.

Swingle, W. E. (1990). Status of the commercial and recreational fishery. *Rep.Tex. A.M.Univ.Sea Grant*- Program 22-24.

Thomas P.,and Boyd, N. 1988. Induced spawning of Spotted sea trout, Red Drum and Orangemouth corvina (Family Siaenidae) with Luteinizing Hormone Releasing Hormone analog injection.*Contributions in Marine Science* .(Supp.).30:43-48.

Tomas, P., Westerman, E., Dehn, P.F.,Nowick, E., Holt G. J.,and Arnold, C.R., 1988.Growth of juvenile Red Drum: Adenylate metabolism, RNA-DNA ratio and effects of ovine growth hormone. *Contributions in Marine Science* .30: 29-36.