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Artificial Propagation and Seedling Cultivation Techniques of Barracuda

Xiao Jiang Chen, Xi Shuang Shan, Wei Li, Zi Ming Zhao*
Jiangsu Agri-Animal Husbandry Vocational College

Abstract: *In order to improve the success rate of artificial propagation and seedling cultivation, the paper introduces the Barracuda's technologies, including parent fish rearing, artificial induced spawning, artificial insemination, hatching and factory-like seeding cultivation. It is suggested that the number of parents should be sufficient, the time of artificial insemination should be accurately grasped, the developmental malformations of roes should be reduced and the mortality rate should be reduced.*
Keywords: *Barracuda; artificial propagation; artificial breeding;*

The head of Barracuda is short and wide, eyes are reddish, and meat is delicious, rich in protein and low muscular fat [1]. It is an ideal health food for human beings and is favored by consumers [2]. It can tolerate high salinity, fast growth [3], high fecundity [4], powerful disease resistance [5], which is habituated to fresh water, brackish water, sea water and other water, and can be cultivated by the ways of poly culture and intensive culture [6]. Currently, it is the one of main objects of breeding in the coastal areas of north Zhejiang in China [7]. In this paper, artificial propagation and factory breeding methods of barracuda are described below.

I. Parent Fish Collect

The purchased parent fish are more than 3 years old, the average weight is 2.2kg, maximum weight is 5.5kg, and gonad development phases III and IV (corresponding to the maturing stage)

II. Parent Fish Cultivation

2.1 Pond conditions

Parent fish breeding pond is rectangular, towards east and west, its single area is 2668 ~ 3500m^2, pool depth is 2 ~ 2.5m, water depth is 1.5 ~ 1.8m, pond bottom mud thickness is less than 15cm. There are sources of fresh water and sea water, easy to irrigate and drain. It is equipped with water tank-type aerator and micro-oxygen pipe.

2.2 Cultivation management

Breed method: select the physically healthy and disease-free individuals as parents, sterilize them for 10 ~ 20 min with 20 ppm KMnO4 after they arrive at multiplying farm by water transport, then put them into the pond. Density is controlled between 50 to 80 tails /667 m^2.

Salinity adjustment: salinity of parent fish breeding pond during the winter is controlled below 7 ‰. From March, pour seawater into the pond by several times, and gradually increase the salinity to achieve 15 ‰ or more.

Fodder and feeding: began to feed artificial parent fish on artificial mixed feed in above 10℃ water and the weight of daily feeding is between 1 to 5%. When the water temperature is high, such as parent fish's ingestion is strong and the water quality is easy to control, overdose can be conducted. For wild parent fish, it needs to be artificially domesticated, and feed them on artificial mixed feed. Usually use clam worm as attractant to be added into the mixed feed, the ratio is gradually decreased.

Prenatal care: during prenatal half a month, flush water one time every 3 to 5 days; during prenatal a month, regularly check gonad development. Pay attention to weather changes, regularly inspect oxygenation equipment, strengthen the frequency of pond inspection, so as to prevent the hypoxia caused by weather. Stop feed for 1 to 2 days before the induced spawning fishing.

III. Artificial Induced Spawning

3.1 Selection of spawning season

In Jiangsu Province, artificial spawning season generally is between late April and early May, the most appropriate water temperature is 18±2℃, high temperature easily lead to gonadal degeneration. When the water temperature rise to 15℃ or more, artificial induced spawning begin to be conducted; after mid-May, when the water temperature rise to 23℃ or more, the Barracuda's gonad starts to degenerate; If artificial induced spawning is ineffective, then stop induced spawning.

3.2 The choice of induced parent fish

The advantages and disadvantages of the selected mature parent fish is the key to ensure the success of induced spawning, especially early induced spawning should be stricter. Male fish is selected by gently pressing in abdomen to see the outflow of white milky semen. Dip the semen into water and disperse evenly. If collected semen is yellow and cannot disperse it indicates aging. Stop feed for 1 to 2 days before choosing female parent fish, to make parent fish defecated, so as to avoid the illusion of judgment. The abdominal appearance of mature female fish is larger, soft and flexible, anus is slightly prominent, place around cloacal aperture is ruddy. At the same time, in order to avoid errors of satiety and excessive fat accumulation, and further directly take out a small amount of ovum from the ovary with digger for observation. The diameter of a good mature oocytes is more than 600 ~ 800μm. Oocytes are adjoined with each other but not closely, gently stir them in the water, they can be separated. Under low power lens, oocytes were milky white translucent state, intracellular fat droplets is clearly visible and evenly distributed. If the oocytes is black opaque, then it indicates that the fish is not yet mature, not suitable for induced spawning; if the oocytes are adjoined with each other but flat, even mingled with droplets "oil flower" in ovarian, most are the degraded ovary, which no longer be used. The sex ratio of parent fish is 1: 0.6.

3.3 Spawning agent injection

Injection dose: The type and dosage of spawning agent is based on the degree of gonad development of parent fish, water temperature and so on. Generally, several spawning agents are used cooperatively; the first needle is LHRH-A_2: 3~6μg/kg, the second needle is LHRH-A_2: 6-15μg/kg, HCG: 1000-1500 IU/kg. The average interval of two needles is between 18 and 24 hours; male injection only once, if the female injections are conducted twice, the male should be injected when female's second injection, the dose is 1/2 female.

3.4 Parent fish breeding

Hormone-impregnated parent fish were housed in a net cage (2×1×1 m^3) made of polyethylene mesh, and were housed separately. Each net cage has 5 to 8 tails, for easily check. In order to prevent hypoxia death, put 2 to 4 inflatable head. After 12 to 15 hours of the second injection, check female roe mature condition from time to time, once the mature ovulation, timely conduct ovulation insemination.

IV. Artificial Inseminations

4.1 Check the maturation of sperm and spawn

In the artificially breeding conditions, generally Barracuda cannot spawn and fertilize by itself, which can only conduct artificial insemination. After induced spawning of parent fish, the development of parent fish ovum and sperm should be promptly checked and accurate grasp time of ovulation and artificial insemination, which is the key to the success of artificial insemination. From 15 hours of the last injection, check once per 1 to 2 hours. When checking the male, use hand squeeze method, the high quality semen is thick, milky white, great semen volume, and immediately spread evenly when drops into water. It is high density when microscopic examination, and powerful vitality after activation.

When checking the female, use the method of "firstly look, secondly touch, thirdly squeeze, fourthly dig and squeeze", good mature Barracuda, its abdomen is relax and elastic. Observe the ovum under a microscope, it is rounded and full, transparent and orange, single and large oil ball , ovum membrane has a good tension; ovum diameter is 1mm or so, oil ball occupy about 1/2, the ovum flow is smooth and viscous when squeeze ovum.

4.2 Artificial insemination:

Wrap the mature female tightly with a cloth bag, squeeze the ovum into the pot, and then squeeze a few drops of semen, and then add hatching water, shake and put it aside for 1 to 2 minutes, and then remove blood clot and ovarian tissue by 10 mesh filter clot, and then evenly into the incubator after several times wash by the sea water. In the process of artificial insemination operation and delivery of fertilized ovum, shade measures are taken in order to prevent ultraviolet radiation.

V. Hatch Of Fertilized Ovum

Incubation pond is rectangular, which size is between 24 to 42 m^2, the water depth is 1.5m, gas stones are arranged according to one per square meter. The density of ovum is 200,000 ova / m^3. Water quality indicators control: dissolved oxygen is greater than 3~5mg/L; salinity is between 16~20‰; inflatable volume is appropriate to flip ova without dead angle; no strong light; temperature is 17~24℃; pH is 7.5 ~ 8.5; depth of water is usually controlled between 0.8~1m, hatching water is filtered by sand filter and silk filter above 300 mesh screen [8]. During the process of incubation, embryonic development should be observed and number of fertilized egg should be recorded. Moisturize 10 cm water when the egg hatches and fry come out.

VI. Fry Cultivation

Newly hatched fry is 2.5 ~ 3 mm long, abdomen is upward and float in the water, mouth and anus are not open, the digestive tract is isolated from external, mainly feed on yolk in the yolk sac and lipid in the ball for nutrition, so as to maintain life events. After 80 ~ 90h, it begins to swim, yolk sac shrinks and extends, oil ball is relatively large, the esophagus and intestine can be seen in the digestive system, eyes are golden. And then by the 35h opening, opening degree is from small to large, opening frequency is from slow to fast, curved intestinal tract is appeared, it begins feeding.

6.1 Feed selection

In the factory-like fry cultivation process, timely provide enough high quality palatable bait is another key to the success or failure of seeding, which should be based on the different stages of fry development, crack size, food intake level, to timely feed adequate food bait, so as to ensure normal growth and healthy growth of fry. Usually, fry feeding bait varieties are as follows, the first 25 days age fry uses rotifers, 15 to 25 days age fry uses copepods, and use mixing powder feed after 20 days. Rotifers mainly adopt the soil pool cultivation. The demand is small in early openings, which can use small pond cultivation, the late need to take large pond for cultivation when they need a large number of worms. Inoculation and harvest are controlled between 10 and 15 days. Copepods can take the fishing method at the sea estuary [9].

Feeding quantity: 2 to 3 days before the fish opening after the fry comes out of the membrane, add chlorella to the pool to maintain its density of $10 \times 10^6 \sim 15 \times 10^6$ cell / ml, feeding rotifers density when nursery opening is 20 to 30 per milliliter, in order to maintain a sufficient amount of rotifers around the fry and reduce the consumption of energy for search bait. Within 20 days age, feed 2 to 4 times rotifers a day, maintaining the density of 20 / ml or more. After 15 ~ 20 days age, increase in fresh copepod feeding, from 50g / 10000 tails to 300g / 10000 tails. When up to 1cm, appropriately feed sea eel with mixed feed [10]. Rotifers and copepods should be subject to decontamination and disinfection before feeding.

6.2 Cultivation Management

In the early stage, use the clean seawater filtered by the first class sand filter after sedimentation; in the middle and later periods, use fresh seawater filtered through 80 mesh after sedimentation; dissolved oxygen control in the 5 ~ 8 mg/ml, gently flush gas in early stage, increase the amount of gas in later stage. Layout is according to a gravel head / 0.8 ~ $1m^2$; light control in the 500 to 2500 Lx [11]. Too strong pond is easy to quickly produce harmful algae. Too weak pond is not beneficial for young fish feeding. Density control: 10000 tails/m^3 in early stage, 20000 to 30000 tails/ m^3 in latter stage, and timely divide fry. Scatter method: use juvenile fish concentrated cluster's characteristics. Light it in the night while shade it in the daytime. Divide the seedlings with a barrel of water. Absorb sewage and clean bottom. In the latter part, every day use siphon age to absorb pollution once due to the more sewage in the bottom. Regularly use microorganism to adjust water quality and done good disinfection work to prevent disease. Change the water, which starts in every night from the feeding, the requirements and methods of changing the water during the training are shown in Table 1.

Table 1 water changing during fry rearing

Specification (cm)	screen	water exchange
0.25~0.5	80	20%~30%
0.5~1	60	30%~60%
1~1.5	40	60%~120%
1.5+	20	120%~200%

VII. Conclusions

7.1 Ensure that the number of parents is sufficient

Ensure adequate and reasonable proportion of the parent number is very considerable. In the artificial insemination, extract a part of the sperm of the parent fish which has good gonad and high quality sperm, and use it after with crushed with sieve silk bags, the remaining part is retained in the abdominal cavity or removed into the low temperature insulation bottle, which can be used for multiple times in the short term.

7.2 Accurately grasp the time of artificial insemination

Fertilized eggs of Barracuda lose fertility no more than 10 hours; from the moderate maturity to over ripeness; the time of ovule is no more than 2 hours. Therefore, master the best timing of fertilization is the key to the breeding of barracuda. Often take a double test method: According to the situations of female abdomen swelling, elasticity, ovum flow; another way is taking digging ovum microscopic examination.

7.3 Reduce the developmental malformation of roe

Malformations may be related to the poor external environment and parent fish culture; it also is related to the hormone injection time interval or too large injection dose; high temperature in hatching and incubation period can also cause fish ova and fry malformations. In order to avoid such a situation, generally the first needle injection is LHRH~ A_2 and the second needle is HCG. Pay attention to ventilation and cooling during high temperature.

7.4 Reduce mortality

In cement pond cultivation, if fed overdose easily lead to bad water, it should more use live rotifer as bait. If the live bait is not enough to complement the use of bait, conduct pollution absorption for the bottom for every 1 to 2 days; in dividing the fry, water with seedlings and light induce seedlings can effectively reduce the mortality rate. If division pond is close to incubator pond, siphon fry transformation can be directly used. In fry desalination process, they are susceptible to parasites; desalination water can be used after sterilization.

Conflict Of Interest

The authors confirm that this article content has no conflict of interest.

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Reference

[1]. Barreiros, J. P., Santos, R. S., & Borba, A. E. (2002). Food habits, schooling and predatory behaviour of the yellowmouth barracuda, sphyraena viridensis (perciformes: sphyraenidae) in the azores.*Cybium International Journal of Ichthyology, 26*(2), 83-88.

[2]. Grubich, J. R., Rice, A. N., & Westneat, M. W. (2008). Functional morphology of bite mechanics in the great barracuda (sphyraena barracuda). *Zoology, 111*(1), 16-29.

[3]. Zhang C.N.,(2013) Effects of dietary lipid levels on fat deposition, lipid metabolize enzyme and antioxidantic activities of Chelon haematocheilus. *Journal of Fishery Sciences of China. 20(1): 108−115.*

[4]. Geng X.y., (2011) Morphometric Attributes To Body Weight For The Redlip Mullet Liza Haematocheila. *Oceanologia Et Limnologia Sinica. 42(2):530-537.*

[5]. Xian W.W, Zhu X.H. (2001) Effect Of Ration Size On The Growth And Energy Budget Of The Mullet Liza Haematocheila (T.ET S.) *Oceanologia Et Limnologia Sinica.* 32(6)：612-620

[6]. Shui C., Zang H.M.,(2015) Effects of salinity on growth，osmophysiology and body composition of juvenile soiuy *Liza haematocheila. Journal of dalian ocean university.30(6):635-639*

[7]. Kuo, C. M., Nash, C. E., & Shehadeh, Z. H. (1974). A procedural guide to induce spawning in grey mullet (mugilcephalus, l.). *Aquaculture, 3*(1), 1-14.

[8]. Nash, C. E., Kuo, C. M., & Mcconnel, S. C. (1974). Operational procedures for rearing larvae of the grey mullet (mugil cephalus, l.) *Aquaculture, 3*(1), 15-24.

[9]. Knoff, M., Luque, J. L., & Amato, J. F. (1997). Community ecology of the metazoan parasites of grey mullets, mugil platanus (osteichthyes: mugilidae) from the littoral of the state of rio de janeiro, brazil. *Revista Brasileira De Biologia, 57*(3), 441-454.

[10]. Como, S., Lefrancois, C., Maggi, E., Antognarelli, F., & Dupuy, C. (2014). Behavioral responses of juvenile golden gray mullet liza aurata, to changes in coastal temperatures and consequences for benthic food resources *Journal of Sea Research, 92*(6), 66-73.

[11]. Sun Cheng bo. *(1995)* A Study on Industrialized Breeding Technique for Mulllet, Liza haematocheila (Temminck et Schlegel). *Modern fisheries information.. (8), 14-16.*