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Can they be bred in captivity?

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Can they be bred in captivity?

LUTJANUS JOHNI

The John's snapper (*Lutjanus johni*), also known as golden snapper, is a popular food fish in Singapore. It may be distinguished from other lutjanids by its golden color, and a distinct dark spot on each scale, forming dark streaks along the body. The fish is found in coastal areas in the North Andaman Sea and the South China Sea and may be caught in large schools with trawl. At present, the John's snapper is the third most important farm fish next to grouper and sea bass in Singapore. The seed supply for farming comes from the wild and is limited and irregular. Breeding experiments have been conducted on the John's snapper in Singapore.

The broodstock are held in floating cages 5 x 5 x 3 m deep at a density of 6-7 kg/m², or a total of 30-50 fish per cage. Males and females are kept together in the same cage. The broodstock are fed once daily, in the morning, with trash fish at 2.5% of body weight.

In general, females attain maturity at the age of 3-4 years (3.5-4.5 kg), while males mature at 2.5-3 years (2.3-3.0 kg). Gonadal development is monitored monthly to detect onset of spawning. Ovarian development is determined by sampling from 2-3 females with a polyethylene cannula (2.5 mm in dia) and examining oocytes under a microscope. The maturity of males is based on the milting condition. Milting males are available almost throughout the year, whereas, ripe females with oocytes at yolk globule stage can only be obtained during January to August. This period is considered the spawning season of John's snapper in Singapore.

Two spawning methods have been developed so far for John's snapper. Both methods use the hormone human chorionic gonadotropin or hCG at 100-500 IU/kg for the first injection and 250-500 IU/kg for the second injection (24 h later). The artificial spawning method employs manual stripping of eggs and milt followed by artificial fertilization. This method was first used on John's snapper in the late 1970s, and has since been improved and refined to give relatively consistent results. The

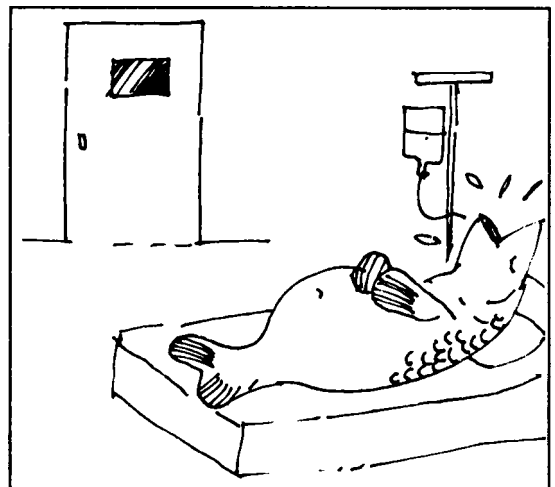
spontaneous spawning method consists of spontaneous ovulation and natural fertilization in either 10-m³ circular fiberglass or 40-m³ rectangular concrete tank. The method was developed for John's snapper in the early and mid-1980s.

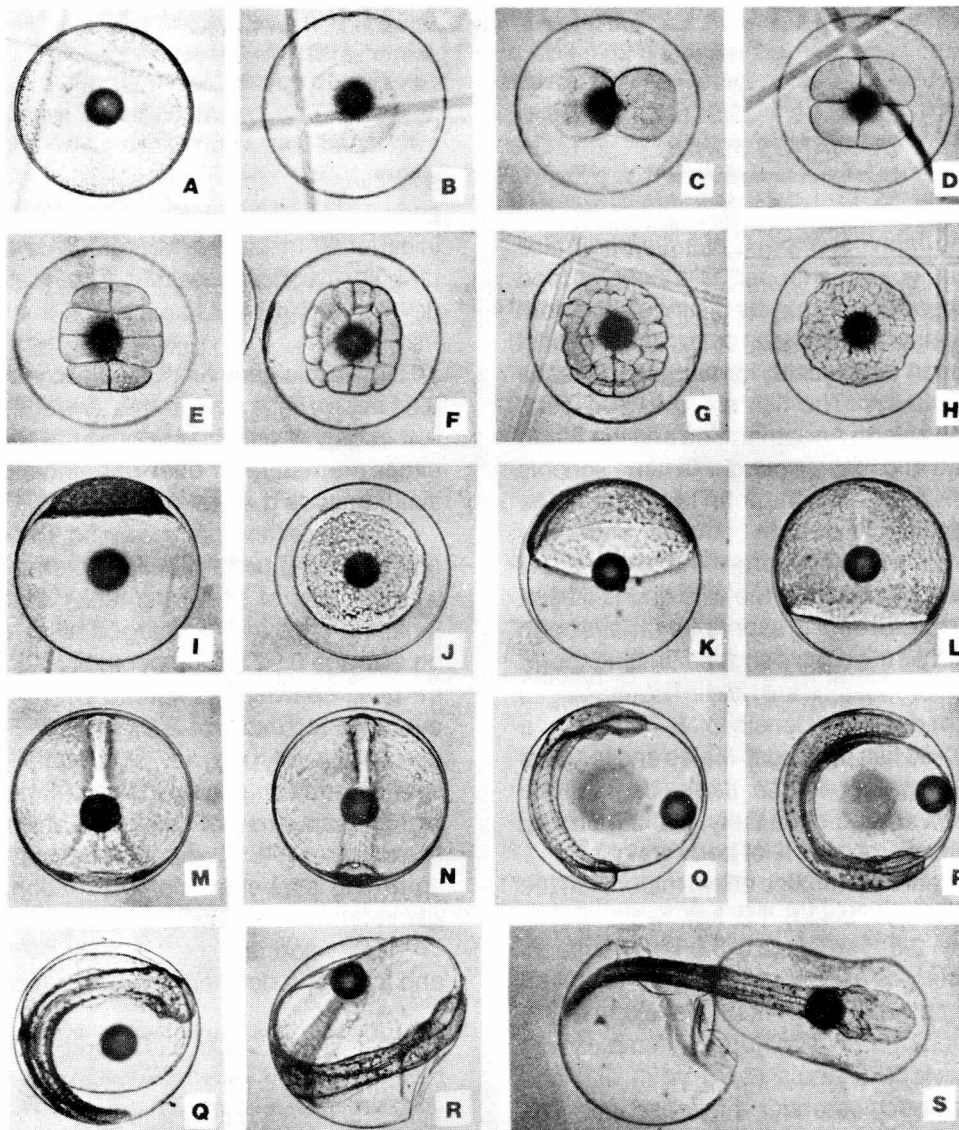
Artificial spawning usually produces 0.58-0.81 million eggs per female (average, 0.69 million eggs). A significant portion of the eggs is either premature or over-ripe, indicating non-simultaneous maturation.

In spontaneous spawning, the fecundity and spawning pattern of John's snapper differ with the type of spawning tank. In the 10-m³ tank, the eggs are discharged all at one time, on average 0.92 million per female. In the 40-m³ tank, spawning is spread over 4 days, at average fecundity of 2.83 million. The mean percentage of buoyant eggs obtained from spontaneous spawning in 40-m³ tank is 67%, higher than in 10-m³ tank and from artificial spawning (44-48%). Apparently, spontaneous spawning is a better method for John's snapper in terms of fecundity and egg quality.

Development of the eggs at 27.5-28°C and 29 ppt is detailed in the figure on p. 8.

Source: L.C. Lim, L. Cheong, H.B. Lee, and H.H. Heng. 1985. *Induced breeding studies of the John's snapper, Lutjanus johni (Bloch), in Singapore.* Singapore J. Pri. Ind. 13 (2): 70-83.





The fertilized egg (A) of John's snapper is transparent, spherical, and non-adhesive. The surface of the egg shell is smooth and non-segmented. The yolk is also non-segmented. Fertilized egg is usually buoyant and a single oil globule is present, whereas sunken eggs usually have multiple oil globules. The perivitelline space is narrow. The egg diameter ranges from 0.77-0.85 mm with mean 0.80 mm. The diameter of oil globule is about 20% of the egg diameter, with a range of 0.15-0.17 mm and mean 0.16 mm.

The embryonic development is similar to many other pelagic eggs. At 27.5-28.0°C and 29 ppt, the one-cell stage (B) appears within 10 min after fertilization while the first cleavage (C) occurs within 20 min after fertilization. Subsequent cleavages (D-G) occur at every 10-15 min. Cleavage continues until the multiple-celled (H) stage is reached at 1 h 25 min. The

blastula stage (I) occurs at 2 h 5 min. The early gastrula (J) stage is reached at 4 h 25 min. The neural groove appears at the late gastrula stage (K-L) at 7 h 10 min. The neurula stage (M) is reached at 8 h 20 min. At 9 h 25 min, the early embryo (N) is formed. The first movement of the embryo (O-R) occurs at 14 h 40 min. The movement becomes more vigorous towards hatching. First hatching (S) occurs at 17 h after fertilization. The larva breaks egg membrane, and the head emerges first. All the larvae would have emerged by 17 h 30 min.

The hatching time of John's snapper is highly temperature dependent, being 14.5-15.0 h at 29.0-29.5°C and 17.0-17.5 h at 27.5-28.0°C. The hatching rate varies with the method of spawning: 30-55% in artificial spawning, 50-75% in spontaneous spawning in 10-m³ tanks, and 70-85% in spontaneous spawning in 40-m³ tanks.

LUTJANUS ARGENTIMACULATUS

The red snapper, *Lutjanus argentimaculatus*, was spawned at the AQD Tigbauan Main Station for the first time on 20 August 1992 by Dr. Arnil C. Emata, study leader for snapper broodstock development.

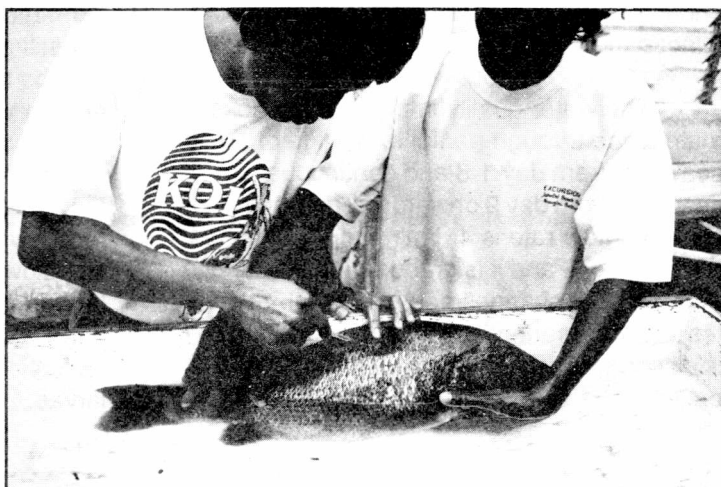
The spawners (female of body weight 4.25 kg and male of 3.6 kg) were held in a circular concrete tank (4-m dia. by 1.5-m deep) and injected with 1500 IU human chorionic gonadotropin per kg of body weight. The fish spawned between 5:00 to 5:30 PM, 27 hours after injection. A total of 1.3 million eggs were collected by seining and by means of an air-lift egg collector installed in the tank. Fertilized eggs were spherical (0.7-0.8 mm dia.), buoyant, transparent, and with a single oil globule 0.08-0.18 mm in diameter. Fertilization rate was 95%. Hatching occurred 16 hours following spawning. A total of 305 000 larvae were

produced (hatching rate, 23%). Larvae were reared to 25 days using AQD's fish hatchery technology.

Preliminary work on gonadal development indicates that wild-caught red snapper held in concrete tanks and floating net cages are sexually mature from early May to late October. Males and females used for induced spawning can remature in three weeks. Mature females weigh more than 3.5 kg and can spawn 1.3 million eggs. Further research should now focus on developing reliable techniques for spawning and larval rearing.

This first recorded spawning of snapper in the Philippines holds promise for the aquaculture industry. Snapper fry are not abundant in the wild, and they may have to come from the hatchery. Snappers have enormous potential as cultured species and have excellent market value locally. *Infofish International* indicates that the market for snappers is growing in Hong Kong, Singapore, and Japan.

Dr. Arnil C. Emata (left), study leader for snapper broodstock development at SEAFDEC/AQD, said that the Philippines now joins Singapore, Malaysia, and Thailand in having successfully matured and spawned snappers in captivity.



Available soon!

The *Proceedings of the Aquaculture Workshop for SEAFDEC/AQD Training Alumni* will be available in early 1993. The workshop was held 8-11 September 1992 at Tigbauan, Iloilo, Philippines. The volume includes the experiences of the training alumni (from three SEAFDEC Member Countries - Malaysia, Thailand, and the Philippines) in shrimp and marine fish seed production, grow-out culture, fish disease problems, and fish nutrition. SEAFDEC/AQD research, training, and information activities are also covered.

