

Social factors induces sex change in Orange spotted grouper, *Epinephelus coioides*

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Sex change (sequential hermaphroditism) is a normal part of the life history of many species of tropical coral reef fishes. Sex change can be either from male to female (protandrous) or it can be from female to male (protogynous). In the family Serranidae, protogynous hermaphroditism is the most common reproductive pattern. However, Orange spotted grouper is diandric, *i.e.*, they have two types of male: Primary males which are gonochorous (non sex changers) often with initial phase; and Secondary males which are derived from female to male initial phase.

Groupers are commercially important food fish in Southeast Asia. However, the expansion of grouper culture is stagnating because of the unavailability of seed for culture. The major bottle neck in this regard is the very slow progress in development of their breeding and larval rearing technologies. Since all groupers exhibit protogynous hermaphroditism, availability of males for spawning from the wild is very difficult. However, successful induced sex reversal with the help of various sex hormones and aromatase inhibitor has been reported. There are reports stating that social factors play a role in

determining sex change in groupers. It is reported that in all protogynous species, females are induced to change sex by removing a male from social system or by alterations in behavioral interactions between the sexes. In this backdrop, attempts were made to compare the influence of social factors on sex change in female grouper, *Epinephelus coioides* in two culture systems *i.e.*, open sea floating cage and Recirculatory Aquaculture System (RAS).

Forty five adult Orange spotted groupers (1.5 - 3 kg) were collected from wild and stocked in 6 m diameter floating cage with depth of 4 m. All fishes were female and each was tagged with Passive Integrated Transponder (PIT) tag to record its gonadal history. Fishes were fed with *Decapterus* sp., sardine and squid twice a day @ 5 % of body weight. The feed was fortified with vitamin E and C twice a week. The fishes were cannulated on a fortnightly basis to assess the gonadal development. After six months of stocking, the two biggest sized fishes (weighing 4 kg and 3.5 kg) were found to be oozing males and remaining smaller fishes were found to be females in different stages of gonadal development. This indicates that social factors are involved in changing the sex of the female fish to male. As there was no male in the same cage at the time of stocking it could have induced the biggest female fish to change its sex to male.

In the second experiment, ten female and ten sex reversed males (by hormonal and enzyme pellet implantation) were stocked and maintained in the RAS for breeding. The fishes were responding and fertilized eggs were obtained every month. After eight months, seven female fishes were isolated from the group and stocked in another re-circulatory tank. The gonadal development of all the seven females assessed before stocking into the tank were found to be in different stages. The fishes were fed with squid, twice a day. The feed was fortified with squid oil, cod liver oil, vitamin E and C twice in a week. These fish spawned after two months and eggs were found to be fertilized. When the fishes were checked for their gonadal assessment it was found that the biggest size fish (weighing 5 kg) was the oozing male. This study shows that by isolating mature females of the Orange spotted grouper, their sex change to male could be induced in the bigger size fishes.

The results from both the experimental studies reveal the influence of social control on sex change in *E. coioides* irrespective of the culture systems. This can assist in producing male Orange spotted grouper, which might speed up the development in breeding and larval rearing protocols for this grouper.