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# Culture systems compared: Sea cages vs fishpens

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## Culture systems compared: sea cages vs fishpens

(This study compares the difference in growth of *S. guttatus* a large-growing species, in two different rearing structures and the growth of some other members of the family siganidae with respect to their potential for mariculture. Abduraji Sw. Tahil discusses ways to improve the cultivation of this meaty species in the fishpen).

The experiments were conducted in a shallow water area (0.25-2.0m deep). Maximum diurnal salinity and temperature fluctuations were 4.69 ppt and 7.8°C, with maximum values of 29.92 ppt and 25°C, respectively.

Live juveniles of *S. guttatus* were caught at night and divided into two groups of 101 each. One group was reared in a sea cage with initial sizes ranging from 7.1-30.1g (ave.:15.49 g) in weight and 6.5-10.2 cm (ave.:7.89 cm) in length. The other group, stocked in a fishpen, ranged from 7.2-30.3 g (ave.:15.47 g) and 6.5-10.1 cm (ave.:15.47 g).

The two rearing structures were identical in size-1.75mx1.75mx1.5m. The cage was built of mangrove sticks held together by nails and nylon rope, while the fishpen consisted of netting stretched between the four corner posts. The main difference was that the sea-cage had a bottom net, fastened to the wooden frame whereas the pen used the natural sea floor as its bottom.

The fish were fed solely with benthic algae (composed of *Chaetomorpha crassa*, *Cladophora* sp., *Gelidiella acerosa*, *Gigartina tenella*, *Gracilaria salicornia*, *Laurencia undulata*, *L. grevillena*, *L. sp.*, *Microcladia* sp.) and the main filaments of siphonous algae.

After 24 weeks of rearing, the fish in the sea cage grew to an average of 33.56 g in weight and 10.31 cm. In the fishpen, the fish grew to an average of 34.37 g and 10.42 cm. These figures represent about 117% increase in weight of the fish in the sea cage, and 124% in the fishpen. The fish continued to grow steadily during the 168-day experimental period.

The fish in the sea cage were more affected by the wave action than those in the fishpen. The nylon netting material at the bottom of the cage prevented the fish from

seeking shelter in the natural substratum.

The difference in growth increments of the fish in the sea cage and those in the fishpen were small as shown in the figure. Statistical comparisons revealed that the disparities were insignificant, with a probability of 99.9%. Although reared in different rearing structures, under similar semi-natural conditions, no significant differences were noted in their length/weight relationship.

Juveniles started to display distinct territorial behaviour with bigger individuals chasing and biting smaller ones. The caudal fin rays were bitten and at times are even gnawed off, almost down to their base. The fish bites on the body surface of smaller fish resulted to skin lesions which later became inflamed and infected.

The growth of juvenile *S. guttatus* fed entirely with benthic algae, whether in a sea-cage or fishpen, is slow. However, stocking of the fish in the fishpen is preferable, because the fish could seek shelter at the bottom of the fishpen.

Rabbitfishes accidentally ingest considerable amounts of limestone from rocks and algae while browsing on epiphytes, thus maintaining a definite pH value in their digestive tracts. This circumstance may account for the good physical conditions as well as the slightly better growth of the fish stocks kept in a fishpen compared to those in a sea-cage.

Scientists found that most siganid species need about one year to reach a weight of 150 g. Both juvenile and adult siganids, although naturally herbivorous, feed on a variety of food stuffs when reared in captivity. There were even indications that some siganid species grew better on a mixture of natural (algae and other marine plants) and artificial or supplementary feeds (e.g., commercial pellets, chopped fish, kitchen leftovers, mussels, and others). Better growth was obtained for *S. canaliculatus* fed a mixture of *Enteromorpha* and trout feed than with *Enteromorpha* alone.

*S. rivulatus* was also reported to grow fast if fed on a mixture of algae and fish pellets.

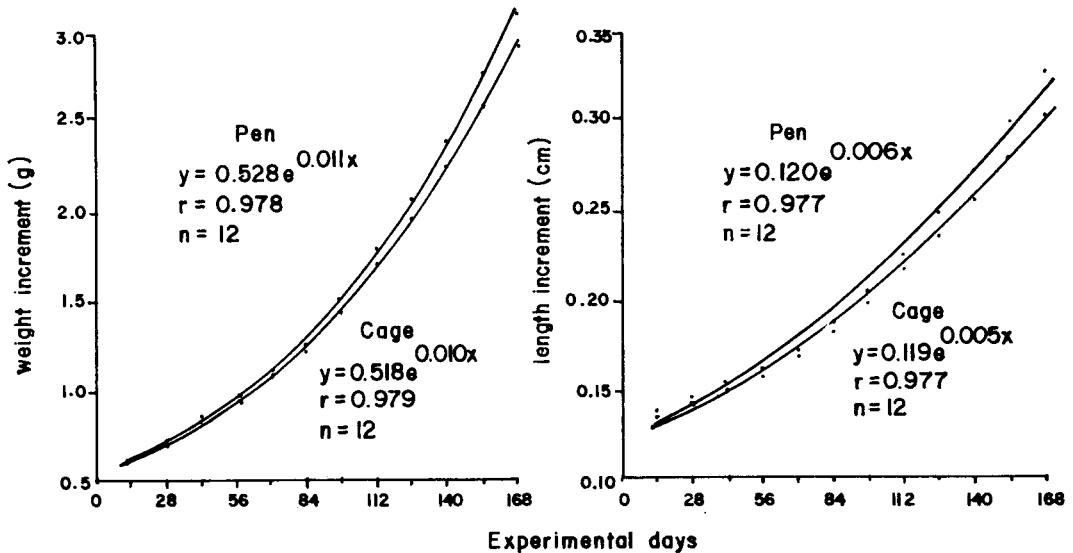
*S. guttatus* readily feed on many kinds of food (even fish scraps) and becomes omnivorous in captivity. This was observed when the fish fed voraciously on one species of brittle star and even on the dead specimens of their own stock.

The growth of *S. guttatus* is slow until it reaches marketable size (150 g) whether in a sea cage or fishpen. Feeding captive juvenile *S. guttatus* with benthic algae does not yield very promising results with respect to growth and survival. The fish's distinct chasing and biting behavior is another obstacle for successful culture of this species. Stocking of juveniles in a fishpen with a bigger area is advantageous, because the fish will thus live over the natural substratum and would have more freedom to swim around without colliding with the netting material of the fishpen.

The preferred area for siganid farming is the sea grass community, or one where

suitable species of benthic algae, seaweeds, and other marine plants can be easily collected for the fish stocks. In addition, it would be well to consider the applications of inexpensive supplementary feeds, such as kitchen left-overs, fish scraps of non-commercial species, and others. The site must be free from destructive activities such as strong turbulence due to wave action or winds, and intensive fishing activities of the villagers.

If a fishpen is used, the bottom part of the netting should be carefully mounted close enough to the ground, to prevent the escape of the fish stocks. It would be well to provide a separate structure, where injured or infected fish stocks could be treated, so as to prevent the spread of infectious diseases in the rearing system. It is advisable to use coarser nylon netting and clean frequently the netting material to prevent the thick growth of algae on the twine.



Growth increments of the fish stocks (*S. guttatus*) reared in a sea-cage and fishpen.

Source: Tahil, AS. 1978. Experiments in rearing *Siganus guttatus* (Pisces: Osteichthyes, Siganidae) in a sea-cage and fishpen in the Philippines; The Philippine Scientist 15:50-56.