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Responsibility

Assessing culture potential of red emperor snapper in New Caledonia

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Centre for Development and Transfer in Marine Aquaculture shares initial results of technical feasibility studies

The red emperor snapper (*Lutjanus sebae*) is known as “pouatte” in New Caledonia and is distributed throughout the Indo-West Pacific region from the southern Red Sea and East Africa to New Caledonia, north to Japan and south to Australia. It is a valuable commercial fish species targeted by recreational anglers throughout their range.

In New Caledonia, it is a highly valued food fish that is marketed whole, usually fresh on ice. During the last decade, fishery catches have been decreasing in the southern province, and currently catches are larger in the northern province.

Like all snappers, the red emperor snappers are gonochoristic – the sexes are separate, with the male and female reproductive organs occurring in different individuals, as opposed to hermaphroditic, gynogenetic and others.

The red emperor snapper is a highly valued food fish in New Caledonia.

Red emperors can live for many years: The oldest specimen reported in New Caledonia was 35 years old, while a specimen close to 40 years old was reported from Australia. In the wild, larger fish can have ciguatera, a foodborne illness that affects humans and is caused by consuming some reef fishes from tropical and subtropical waters, and whose flesh is contaminated with a toxin produced by dinoflagellates, a common type of marine plankton.

Aquaculture activities in New Caledonia are mostly limited to private companies farming Pacific blue shrimp (*Litopenaeus stylirostris*) in earthen ponds for more than 20 years now. Production reached a maximum of 2,500 MT in 2005 and has been fluctuating since then at around 1,500 MT annually. A long-term strategic plan aiming at diversifying aquaculture production into finfish farming was adopted in 2006, resulting notably in the construction of the New Caledonian Centre for Development and Transfer in Marine Aquaculture (CCDTAM). The market demand for species like the red emperor snapper provides an incentive to determine its aquaculture potential.

The New Caledonian Centre for Development and Transfer in Marine Aquaculture (CCDTAM), where research is being conducted to develop techniques to culture red emperor snappers.

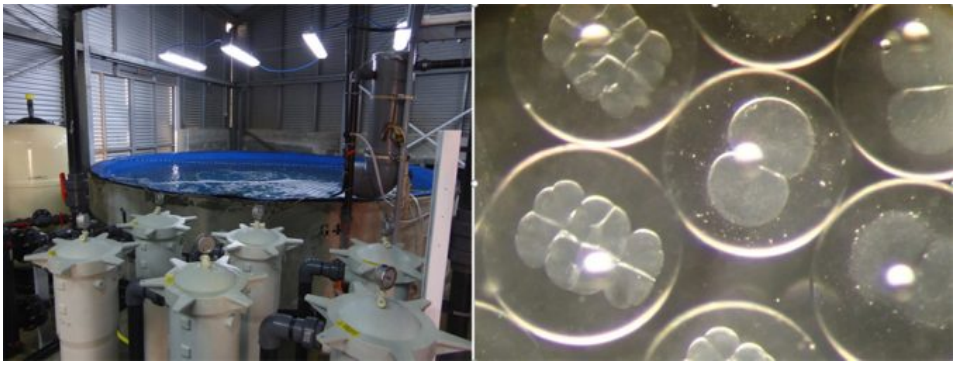
Studies to evaluate the technical feasibility to produce seedstock of red emperor snapper and grow these juveniles to market size in sea cages began in 2012, as part of a five-year program to assess the aquaculture potential of this indigenous fish species, and here we report on some of the results to date.

Broodstock and egg production

A pool of broodstock fish was established from line-caught wild specimens ranging in size from 2 to 9 kg (with average weight 4.5 kg). These breeders are stocked and maintained, at a biomass of 2 kg/m^3, in a concrete, 40-m^3 circular tank with a recirculated water filtration system. Since the beginning of the program, we promoted natural spawning events in the hatchery, and consequently, no hormonal treatments have been used to trigger spawning events.

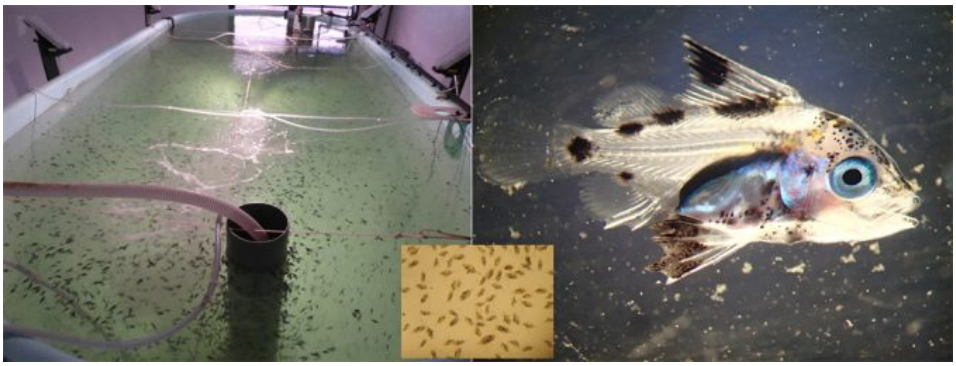
Routine, standard quarantine and prophylaxis protocols have been implemented with broodstock animals, applied especially to control various monogenean and prostomatean parasite infestations.

The red emperor snapper is a very curious fish, and is easy to acclimate to captivity conditions. Most of the time they accept dry pellets only two weeks after being caught and been brought in from the wild. Broodstock fish are routinely fed every two days using dry pellets from commercial feed producers, and monthly with natural feeds like squids, prawns and pilchards.



View of broodstock tank and recirculating water, life-support system (left) and microscope view of developing eggs (right).

Maturation mainly follows the natural cycle of temperature and photoperiod. The natural spawning season ranging between October to January, and our broodstock animals have been spawning spontaneously from early October to January each year since 2012. Floating eggs are collected using a flow-through system and aggregated in a 400-micron mesh basket. Fertilized eggs are then stocked into specific hatching tanks. Several larval rearing trials are done each spawning season.



View of larval rearing tank with young snappers (left), a closer view of developing young snapper (left), and reared copepods used to feed the young snappers (center insert).

Larval and nursery trials

As many other snappers, our first feeding trials with rotifers only as first prey have produced poor results (Table 1). Copepods (small crustaceans, many planktonic) were quickly considered and collaborations were established with scientists from France and Australia. Exchanges of know-how and dedicated scientific experiments allowed us to overcome a major bottleneck. As a result, indigenous copepods were isolated from wild stocks and various species have been selected for their suitability for intensive culture. These copepods are now routinely reared in our hatchery and used to feed larval snappers.

Year	Number of larval cycles	Total fingerlings produced (27 DPH)	Average survival (%)	Average productivity (larvae/L)
2012	2	350	0.18	0.02
2013	8	4,779	0.69	0.08
2014	6	56,392	6.26	0.74
2015	5	123,708	16.43	3.24

We have successfully conducted larval rearing trials of red emperor snapper using the green water technique – using microalgae – and water at 28.5 degrees-C, feeding copepods nauplii from days 2-6, 6, rotifers from days 2-12 and Artemia from days 10-22. Commercial brand microparticles are given from day 10 onward, and weaned larvae are harvested on day 27.

These 27-day-old larvae are transferred into nursery tanks for about 60 days of pre-growing operations, including multiple size gradings. The 90-day-old fingerlings reach 15 to 20 g average weight and are then stocked into net sea cages for grow-out to market size.

Fig. 1. Larval feeding schedule for red emperor snappers.

Grow-out to market size

A pilot-scale marine farm on the East coast of New Caledonia is used to rear snapper juveniles to market size and collect basic information like growth rates, FCR and survival. The farm includes eight 100 cubic-meter square cages and grow-out trials are conducted during 18 months.

Floating cages used for growout of snappers to market size (left), and sampling fish (right).

There is inadequate information available on the nutritional requirements of red emperor snappers. Currently, fish are fed with commercial pellets imported from Europe, and various feed formulations have been – and continue to be – assessed regarding their potential to meet nutritional requirement of the snappers.

Underwater view of snappers growing to market size inside a floating cage.

The results of these studies will be used to work with local animal feed producers to locally formulate and manufacture fish feeds. One of the priorities of our studies was not to use any chemical treatments, and no antibiotic treatments have been administered to the fish in any trials at the growout farm.

Fig. 2. Growth curve of red emperor snapper in 2013 based on results of studies at the CCDTAM.

Harvesting and marketing

The first small-scale market trials were conducted during July and August 2015, with fish averaging 500 grams in weight. Harvesting the fish from the cages is usually conducted early in the morning and the fish are instantaneously sacrificed by thermal shock using an ice bath. In a dedicated, sanitary, approved packaging facility, whole fish are weighed, graded and placed into plastic boxes with ice.

Harvesting of cultured red emperor snappers after reaching market size (left), and harvested fish ready for market (right).

These fish boxes are then collected by wholesalers directly at the packaging facility, and they sell the fish directly, mainly to local markets and in at restaurants in the capital Nouméa. Additional trials will be conducted to improve the understanding of the absorption capacity and market price sensitivity in local markets.

Harvested, cultured red emperor snappers (in iced water bath) from a growout trial.

Perspectives

We are close to mastering larval and fingerlings production techniques for commercial production purposes, but growout operations need more research work. Feedback from the first commercial sales to local markets are encouraging and this new product seems to be promising in New Caledonia, and additional market trials will be conducted locally and abroad.

The next challenge we face is to provide clear answers regarding the technical and economical sustainability of fish farms in the New Caledonian setting, and where appropriate, to support stakeholders in their planning for development of this new sector in an integrated manner. In this perspective, other local species as well as polyculture systems are also being investigated.

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