CHOOSING THE RIGHT AQUACULTURE SPECIES

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Introduction

Mariculture is an industry that has emerged in the last few decades. Despite being a relatively young industry, mariculture already supplies more than half of the world's seafood.

The global mariculture industry is difficult to characterise, owing to the different approaches to marine fish cultivation around the world. In many cases, these different approaches are influenced by and dependent on culture and tradition. This is highlighted in Japan, which has the highest annual fish consumption per capita (75 kg, FAO data) and consequently, cultures more than 60 different fish species to meet the high and varied national demand. The fish cultured in Japan are sold predominantly as live or whole fresh fish, similar to most other Asian nations.

In contrast, the Mediterranean countries, which have a relatively high fish consumption (30-50 kg per capita per year, FAO data), only culture two main fish species: the gilthead sea bream and European sea bass. The main products of these mariculture industries are sold as whole, fresh or chilled fish.

Maturing industries (i.e. EU) and countries interested in developing the mariculture industry (Gulf countries) are eagerly seeking the 'next fish species' (i.e. an alternative species that will generate high demand and good market return).

The two main criteria involved in the selection of species for mariculture are fish biology and market structure.

Other factors such as brood stock fish availability, the availability of suitable grow-out sites, environmental and industry regulations must also be considered.

Fish Biology

"Closing" the life cycle is the first step towards establishing a viable industry. To achieve this the following factors need to be considered:

• Broodstock

1. Size and weight when mature
2. Time to maturation (sometimes up to 5-8 years)
3. Ease of broodstock handling
4. Nutritional requirements
5. Hormonal cycle (synchronised, spawning season)
6. Ecophysiological manipulation to achieve round-the-year seed supply (photoperiod, temperature)

• Larvae and juvenile rearing

1. Growth rates and survival
2. Zootechnical requirements
3. Length of the larval stage
4. Special nutritional requirements (special live food organisms)
5. Special ecological requirements (e.g. depth, migration patterns)
6. Cannibalism

• Grow-out phase

1. Growth rates and time to market size
2. Zootechnical requirements
3. Food requirements (and cost) at each stage
4. Susceptibility to disease and/or deterioration in water quality

• Facilities

1. Determine the estimated cost to establish a reliable and consistent method of culture for a given fish species, taking into consideration all the biological aspects

2. Determine the cost of a suitable and economical grow out site

3. Growout systems: ponds, fish cages or RAS

Market

The main factor influencing the suitability of a species to mariculture is its market value and volume. Mariculture is inherently capital-intensive and requires large investments. Therefore, fish species produced in mariculture need to be of a contemporary high value, with the potential to sustain price at a larger volume to develop a Return On Investment.

In addition to Market Price (current and fluctuation with time, increase, decrease or stable market) the following factors needs to be considered:

• Market location - local, national or international

• Market Segmentation - live, chilled, fillets or plate size, processed fish, fish quality

• Market volume - sometimes it is very hard to assess market volume (or the amount that a specific market can absorb without price decrease)

• Cost of marketing (taking into account special market requirements such as live fish)

Determining what will be the 'best' fish species to culture involves ranking the combination of market value with fish biology, specific culture methods and the current state of knowledge of the species. There is no 'one truth' to a ranking list and different emphasis can lead to different decisions. The ranking of the biology of a fish species may indicate the time frame for a pilot or R&D program to provide a sustainable commercial-scale production, as well as, the difficulties and the size of investment involved. Tables 1 and 2 ranks the biology/culture and market of several fish species currently cultured and/or under development and considered as potential species for aquaculture.

Case study – Yellowtail kingfish *Seriola lalandi*

Yellowtail kingfish is a temperate water species of high value, second to Tuna in fish price hierarchy. It is one of the fastest growing fish species and can reach 2.5 kg within a year, 2-3 times faster than other popular fish (sea bream and sea bass). It has a variety of market segments including: fresh filets (sashimi) and plate-size whole fish (reaching that size within 3-4 months).

While not yet widely cultured, its culture technology is well established. Larvae and juveniles can be available year-around through out-of-season broodstock.

Yellowtail Kingfish is endemic to the Indian Ocean and is an ideal species for both cage culture and RAS systems.

Due to its fast growth and high market price and acceptability, the ROI for this species is much faster than any other aquaculture temperate species currently grown.

Market Evaluation

Species	Value	Volume	Market requirements	Market segment	Market evaluation[1]
Groupers *Epinephelus spp.*	H	M	Live, chilled	Whole, plate size	High
Snapper *Lutjanus spp.*	H	L	Live, chilled, frozen	Whole, plate size	Medium
Tuna *Thunnus spp.*	H	H	Chilled, frozen	Fillets, cutlets, sashimi	High
Flounder spp. *Pseudorhombus spp., Rhombosolea tapirina*	M	L	Chilled, frozen	Whole, plate size	Low
Grey mullet *Mugil cephalus*	L	L	Chilled, frozen	Fillets, Whole, plate size	Low
Milkfish *Chanos chanos*	L	H	Chilled	Fillets	Medium
Mahi mahi *Coryphaena hippurus*	L	L	Chilled	Fillets	Low
Yellowtail kingfish *Seriola lalandi*	H	H	Chilled, frozen	Fillets, Whole, plate size, sashimi	High
Trevally *Pseudocaranx spp.*	M	M	Chilled, frozen	Fillets	Medium
Mulloway *Argyrosomus hololepidotus*	M	L	Frozen, chilled	Fillets	Low
Amber jack *Seriola dumerili*	H	L	Chilled, frozen	Fillets, Whole, plate size, sashimi	Medium
Cobia *Rachycentron canadum*	M	L	Chilled, frozen, fillets	Fillets, cutlets	Medium

H-high, M-medium, L-Low

[1]. Market evaluation estimated the market value of the species, volume and return on investment (ROI)

Fish Biology and Culture Evaluation

Species	broodstock	hatchery phase	nursery phase	grow-out	Growth rate	culture evaluation
Groupers *Epinephelus spp.*	H	H	M	L	H	**High**
Snapper *Lutjanus spp.*	H	H	M	M	H	High
Tuna *Thunnus spp.*	H	H	H	H	H	Very high
Flounder spp. *Platichthys spp.*	M	M	M	L	L	Medium
Grey mullet *Mugil cephalus*	H	M	M	M	M	Medium
Milkfish *Chanos chanos*	L	L	L	L	H	Low
Mahi mahi *Coryphaena hippurus*	H	H	H	H	H	Very high
Yellowtail kingfish *Seriola lalandi*	L	M	L	L	H	Low/Medium
Trevally *Pseudocaranx spp.*	M	M	M	L	H	Medium
Amber jack *Seriola dumerili*	H	M	L	L	H	Medium/High
Cobia *Rachycentron canadum*	M	H	M	L	H	Medium

Raanking refers to the difficulties in the biology and every stage of the culture. H-High (difficult to culture), M-Medium, L-Low (easy to culture).

FISH TANKS TO EASTERN EUROPE

In the beginning of this year BUWATEC transported nine steel fish tanks to Europe. Our Eastern European aquaculture dealer has made a special combination between concrete and steel fish tanks. As can be seen on the photos, the BUWA-tanks are placed on a steel bridge above the concrete tanks.