

chapter 2

SPECIES SELECTION



■ Introduction

The major characteristics that determine the suitability of a species for aquaculture are its potential marketability, its growth rate and its ability to function under culture conditions. For selection, economic considerations should be even more important to an aquaculturist than biological factors.

Carnivorous species generally need a high protein diet and are therefore considered to be more expensive to rear, even though costs will depend largely on the local availability and price of the necessary feedstuffs. However, compensating for high feeding costs, most carnivorous species command higher market prices. Such species generally have greater market potential and therefore attract substantial investment (Pillay 1995). This is true for most types of aquaculture practices, but for capture-based aquaculture it is of special importance, as most of the species farmed are carnivorous. The species groups used in capture-based aquaculture include molluscs (oysters, mussels, scallops), crustaceans (shrimps, crabs) and finfish (eels, grey mullets, milkfish, yellowtails, groupers, rabbit fish, tunas) (Pillay 1995; Hair, Bell and Doherty 2002).

This report focuses on four target species groups: eels, groupers, tunas and yellowtails. These have been selected for their high level of importance in capture-based aquaculture as they have rapid grow-out and high market demand; in addition, there is an expanding interest in their culture and technological innovations are being developed to aid their rearing (Yamaoka *et al.* 2000; Bombeo-Tuburan *et al.* 2001; Doumenge 1999; Nakada 2000).

Groupers are popular food fish farmed in Southeast Asia and have the potential to become an important aquaculture species, owing to their fast growth, efficient feed conversion, high market prices and reduced availability from wild resources (Randall 1987; Beets and Hixon 1994; Sluka and Reichenbach 1996; Boonyaratpalin 1997; Morris, Roberts and Hawkins 2000; Millamena 2002). The demand for groupers has grown markedly over the last two decades in parts of South-East Asia. The value of live groupers depends on the species. In Hong Kong, for example, prices range from US\$ 8-31/kg (INFOFISH 2003). Groupers are also good candidates for aquaculture for gastronomical reasons; they are valued as one of the highest quality seafoods in many parts of the world (Shiau and Lan 1996). Groupers are covered in Chapter 4 of this report.

The amberjack or yellowtail is another good candidate species for the diversification of farmed fish products because of its high growth rate and good performance in captivity (acceptance of food, low mortality). Yellowtails have a good market especially in Japan; this has developed over the last 30 years due to capture-based aquaculture production. One of the most interesting characteristics of these fish is that they can be processed and marketed as a range of products, e.g. whole, fillets, steaks, etc. This is one of the few cases where a farm-raised fish is unanimously considered superior in quality to fish caught from the sea, and fetches a much higher price in the market. In Japan, the traditional production of the Japanese amberjack, also known simply as “yellowtail” (*Seriola quinqueradiata*) is being amplified by the culture of other species from the same group, namely the greater amberjack (*Seriola dumerili*) and the goldstriped amberjack (*Seriola lalandi*). *S. lalandi* is highly valued for fresh consumption in Japan, as “sushi” and “sashimi”; *S. dumerili* has potential for culture in the Mediterranean (Spain, Italy, Greece and France) (Nash 1995; Nakada 2000). South Australia has begun to harvest

S. lalandi, to satisfy the increasing export demand. In Japan, market prices for the Japanese amberjack, greater amberjack and goldstriped amberjack, mainly for “*sashimi*” consumption, range from ¥ 1 200-3 000/kg (Nakada 2000). The capture-based aquaculture of yellowtails is described in chapter 6 of this report.

Eels are also an important species for commercial aquaculture; they are considered a delicacy in many countries. Traditionally, Western Europe and Japan have been the areas where demand is highest. Eels can fetch up to US\$ 32/kg, twice the price of good-quality shrimp. In Japanese restaurants, where eels are considered a healthy food, an eel dish can cost between US\$ 20 and US\$ 32 per portion. Global demand for eels exceeds 200 000 tonnes annually and eel aquaculture has developed into a highly specialized industry. Chapter 3 of this report deals with the capture-based aquaculture of eels.

The fourth of our selected species, increasingly the object of interest to farmers, is the bluefin tuna. Over the past few years, there has been a rapid increase in the practice of capture-based tuna farming, which is described in chapter 5 of this report. Generally speaking, the major focus is on three populations: *Thunnus thynnus thynnus* in the North Atlantic and the Mediterranean, *Thunnus thynnus orientalis* in the North Pacific, and *Thunnus maccoyii* in Australia. These developments have been driven by the market demand for “*sushi*” and “*sashimi*” products in Japan, and many projects are joint ventures between local fishermen/fish farmers and Japanese companies. There are production centres in Japan, Australia, the Mediterranean and Mexico. Notwithstanding its high development costs, this dynamic sector of aquaculture has now established itself, and it stands as being the most profitable. The preference accorded to bluefin tuna is justified by the high prices paid on the Japanese market for it. Generally, prices are five times those paid for *Thunnus obesus* (big-eye) and ten times those for *Thunnus albacares* (albacore) (Doumenge 1999). Farmed bluefin tuna, destined for the uncooked fish market (“*sushi*” and “*sashimi*”) has become a top quality product; with its higher fat content it is particularly suitable for “*sushi*”. The fish that are raised by capture-based aquaculture can not only achieve substantial weight gains but, more importantly, increases in fat content, thus becoming more valuable. On the Japanese market, 1 kg of top quality tuna can be sold for up to US\$ 600.

Capture-based aquaculture practices involve a thorough understanding of the behaviour, habitat and general environmental requirements of each species, as well as knowledge of its reproductive biology, nutritional requirements, larval and juvenile physiology, culture systems, and “seed” availability. In addition, the susceptibility of each species to disease under culture conditions needs investigation. However, despite the level of technology that has developed in capture-based aquaculture, all will be wasted unless market prices can support further investment, and future research.