Choosing a good site for cage culture

By **E Aldon**

Site selection is very important in aquaculture because it could spell failure or success. Choosing the best site can reduce risks to the aquafarm, and maximize production and profit. Cage culture is vulnerable to environmental hazards and nature's forces. While it is comparatively less expensive than land-based culture, investments can be easily wiped out if care is not taken in selecting the site.

Here are some tips from Beveridge (1996) and Chua (1979):

Basic requirement

Sites for cage culture must have:
(1) good water quality, and adequate water exchange
(2) no predators; and
(3) protection from strong winds and waves.

Water parameters

Temperature and salinity

Know the temperature and salinity requirement of the species to be farmed. Fish temperature changes with the environment, affecting the metabolic rate of the fish. Salinity controls osmotic pressure, affecting the ionic balance of aquatic animals. Temperature and salinity requirements, if not met, can adversely affect feeding, food conversion and growth. Rapidly fluctuating temperatures and salinities are often more harmful than seasonal changes, although some species are more tolerant than others.

In marine areas, temperature variations are complicated by salinity which in seawater would vary between 32 and 40 ppt. Salinities and temperature in estuaries are stratified, i.e., surface salinity differs from bottom salinity.

Oxygen

Beware of the site that is strongly stratified or where algal blooms carry risks of periodically poor oxygen condition. Marine sites which have good bottom currents and which disperse sedimenting wastes are desirable. Oxygen is required to produce energy which digest and assimilate food and maintain osmotic balance. Its requirement varies with species, stage of development and size and are influenced by temperature. Feeding, food conversion, growth and health can be adversely affected by supply of O_2. Seawater contains less dissolved oxygen than freshwater of the same temperature while cold water contains more DO than warm water of same salinities.

Beveridge (1996) noted that high particulate waste loadings greatly increase benthic oxygen demand, reducing the DO content in and around the cages.

pH

Take note of the pH of the water. pH is a measure of the hydrogen ion activity of a solution and is important to aquaculturists. High pH can damage gills leading to death and also could affect the toxicity of several common pollutants and heavy metals. A pH value of 7 is neutral and the ideal pH for fish is between 6.5-8.5. Seawater usually has a range of pH between 7.5-8.5 while freshwater is between 3-11.

Turbidity

Check on turbidity of the area. Suspended solids due to soil erosion, industrial and domestic wastes and even cages cause turbidity which can be toxic and can cause depletion of DO. Poor growth may be attributed to turbidity as it affects food intake.

Pollution

Make sure that the area is free from pollution. For cage farming, pollution can damage cage structure, adversely affect farmed stocks, or accumulate in the fish which can be toxic if eaten. Risks are minimized by siting cages as far as possible from industries, heavily populated areas, or navigational routes for possible oil spills. Thermal effluents from power stations may contain biocides to control fouling, corrosion inhibiters and heavy metals. These, Beveridge said, should be investigated during site selection.

Phytoplankton blooms

Avoid areas where plankton bloom abounds. Phytoplankton blooms prevail in high light and nutrient levels and warm temperatures. Blooms not only adversely affect fish but cause musty flavor to fish flesh, while others produce toxins.

Disease

Check on pathogenic or potentially pathogenic organisms and those disease organisms which would likely thrive following the establishment of the farm. Organically polluted water bodies harbor more disease agents than unpolluted water bodies.

Disease risks can be minimized by avoiding sites where parasites occur or where there are disease agents in wild fish, intermediary hosts, or the environment which could be transmitted to caged fish.

Water exchange

Choose site with good water exchange. Flushing minimizes the accumulation of wastes and all the associated problems. Water exchange is dependent upon currents but may be influenced by salinity, temperature and topography.

Requirements for the farm area

Weather

Investigate and acquire weather information in an area. Breakwaters and the use of submersible cages may minimize destruction but farms may still be destroyed during violent typhoons.

Should you use cages and pens instead of ponds?

A SIMPLE COMPARISON OF FARM ECONOMICS

By **L Tabigoon Jr**

From our list of species that can be cultured in ponds, fishfarmers may well ask themselves if indeed they will gain more from using cages and pens rather than ponds. Not including environmental impact and not accounting for other costs, below is a simple comparison of farm economics for mudcrab, grouper, and tilapia culture in cages or pens vs. ponds.

MUDCRAB Locally known as *alimango*, mudcrab is a highly esteemed table delicacy and the most important crab for commercial culture in the Philippines. It commands a high price in domestic and export markets. Technical data used in the economic analysis of the monoculture of the mudcrab *Scylla serrata* were derived from an AQD study in 1981. Stocking mudcrab at 5,000 per ha gave the highest average weight and survival.

At present, AQD has a technology verification project on mudcrab production in mangrove or tidal zone using nylon net enclosures. AQD's Technology Verification Head, Dan Baliao, says that the project aims to attain production yield of 600 kg per ha per crop or more in 3 to 4 months culture period.

	[a]Cage culture	[b]Pond culture (fattening)	[c]Net enclosures in mangroves
Capital outlay	P 232,000	P 2,568[d]	201,765
Operating cost	P 116,000	2,250	109,820
Stocking density	10,000 / ha	5,000 / ha	2,040 / ha
Size at stocking	30-40 g	150-200 g	9-22 g
Size at harvest	250 g	250 g	275 g
Culture period	3-4 months	15 days	6 months
Survival	70%	97%	86%
Total yield	1,200 kg	43.5 kg	485 kg
Gross revenue	P 432,000	6,525	164,900
Net profit	P 130,000	3,960	55,080
Return on investment	56%	100%	59%
Payback period	1.78 yr	-	1.6 yr

Data from [a]SEAFDEC / AQD 1997; [b]Anon. 1991; [c]SEAFDEC / AQD 1998.
[d]For additional structures only.

GROUPER Although grouper pond culture is still in its infancy, it is considered lucrative investment. It may be capital-intensive (see table next page), but farmers are attracted to its high return of investment. Cage culture may be in submerged stationary or floating set-ups, and is considered an intensive system. Grouper are usually brought to the market live.

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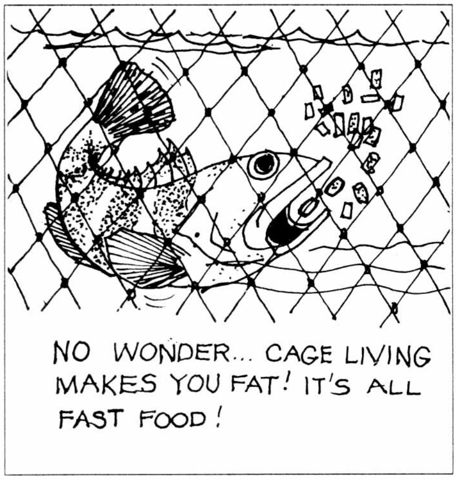

Shelter and waves

Install structures that can withstand the impact of the open sea. Strong winds and waves may destroy the structures. Shelter from the forces of waves and winds is a prime consideration in site selection. Beveridge (1996) found ebb and tidal currents in the range of 0.1-0.6 m per second and mean tidal currents of 0.03-0.2 m per sec to be satisfactory. Sites with currents exceeding 1 m per sec are not recommended.

Depth

Consider depth in choosing site for cage culture. The costs and problems associated with mooring increase with depth. Cages should be sited in sufficient depth to maximize the exchange of water. The cage bottom should be well clear of substrate.

Substrate (from rocky to muddy) can influence cage design. It is difficult to drive supports in rocky substrate but may be advantageous in marine water as rocky substrate indicates good current scour thus reducing wastes build-up.

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Beveridge M. 1996. Cage aquaculture. 2nd edition. Fishing News Books.

Chua TE. 1979. Site selection, structural design, construction, management and production of floating cage culture in Malaysia.