
Summary of Day 2 Sandfish sea ranching and farming, resource tenure issues

Issue 1: Grow-out

Potential risks effects of releasing

Translocations

1. Genetic risks
 - The main risk stems from the lack of knowledge about introgression, out-breeding depression, or other potential risks
 - This knowledge gap must be filled to develop a Code of Best Practice for translocations, taking into account “depleted” vs. “locally-extinct” release areas.
 - Where knowledge is lacking the Precautionary Principle applies – the FAO Code of Conduct Part 5 provides guidelines for aquaculture generally, however to guidelines specific to sea cucumber need to be developed?
2. Ecological risks
 - Is there risk from OVER-restocking? For example, irreversible shifts in community structure, potential for genetic bottlenecks if releases impede natural recruitment. Or is it already too late, because over-fishing has already caused irreversible shifts so current structure is not pristine or “ideal” anyway?
3. Biosecurity risks
 - Potential for spread of pathogens, parasites, or hitch-hiker species into hatcheries, and from there to multiple release sites.
 - We need guidelines in Best Management Practice, and Quarantine Protocols (see, for example, those for Marine Ornamental spp.)

New-species Introductions

4. Competent-Authorities that are responsible for decisions about introductions find there is a paucity of information about ecological, genetic or pathogen risks to inform Risk Assessments.

Quarantine protocols to manage risk have not yet been developed specifically for sea cucumbers. Pathogens will largely be “unknowns” for which there are no diagnostic tests like PCR. A Manual to identify “known” slug pathogens needs to be compiled.

Priority Actions

- a. Base-line genetic research to estimate diversity and detect structure to estimate homogeneity of stocks and connectivity between them.
- b. Code of Best Practice for translocations, that addresses management of genetic, ecological and pathogen risks of hatchery-based releases
- c. Quarantine protocol for new-species introductions
- d. Base-line benthic community structure should be described before releases (but are we already 200 years too late?)

Issue 2: Pond culture, co-culture and integrated systems

Pond culture

- Bioremediation – Needs for more science.
- Cost-benefit analysis of mariculture
- Suitable (or optimal) substrates for farming
 - Known environmental-chemical parameters will allow optimal pond preparation and management
- Ideal conditions for growth
 - Feeding rates
 - Stocking density
- Best pond management practices
 - Water supply
 - Dealing with water quality issues
- Predators are an issue
 - How to manage (remove or exclude) them
- Nursery ponds
 - Allow for mass production of large size seed material
 - Allow for easier grading among slow and fast growers – smaller sizes will grow faster if separated from larger specimens.
- Ideal stocking size

Co-culture

- Is co-culture viable with some species. More investigation needed. Importantly the culture environment must remain optimal for sea cucumber growth performance.
- Brackishwater co-culture. Probably not an option.
- Identify co-culture species that are adaptable to other conditions.
- Need to look at co-culture options at different sizes of sandfish. Size refuge?
- Is polyculture/co-culture with seaweeds an option for tropical species?
- Polyculture with different species of sea cucumbers.
- More work required on rotational culture.
- Setting conditions when polyculture can be promoted (if an option).
- Sea ranching options should be further investigated.
- Fallowing of open water culture sites deemed important. More investigation needed

Issue 3: Governance and social issues

Definition

Governance is about the people who are affected, empowering them to manage their resources and get the most out of the profits

Important to identify the players/ stakeholders

- Regional players, NGO's, advocacy groups,
- all relevant levels of government,
- private sector (must work with government),
- local community,
- community leaders/elders/headmen,
- resource owners (land owners/traditional owners),
- economic development groups,

Interrelatedness of issues means agencies must work together and fisheries management strategies must be broad

- Must have within governance not only the aquaculture stakeholders but the wild fishery and environment agencies/bodies. They are interrelated. Each relevant department must work together.
- Must consider impact/negative consequences on wild fishery of the introduction of aquaculture practices in a region. Eg, governments may lessen management with aquaculture as a fallback. Same with wild fishermen – can now exploit the wildstocks as government will repair.
- Sea cucumber culture should be integrated into the broader fisheries management strategy – encompassing multi- species and operating at the regional and municipal level. Not just targeted to address a single fishery problem or a commodity need.
- Community-based management plans- must define the scale of the management area. Need to ensure influencing factors outside the community region is brought into management strategies.

Consultation

- good consultation of stakeholders is required. Needs to be with the right people at all levels.
- Important to avoid 'big promises/ big expectations' misunderstanding around aquaculture. Need to communicate realistic timeframes for delivery of benefits and realistic expectations of benefits.

Governance arrangements are country/region specific

Best governance arrangements are location specific. Each country has its unique issues/government arrangements/community capacities.

- Village is the key to success, need social cohesion/ good governance framework in operation.

Social equity

-Governance must seek to capture profits at the low level – ensure social equity.

For eg. Co-operatives, short market chains.

In China co-ops are a very effective way for farmers to have their interests met. Small co-ops that by-pass government governance. Co-ops are under broader species-specific umbrella organisations that manage at the regional/ market level.

-permits are a mechanism to ensure equity in access rights

-Need to develop models for social equity for sea cucumber culture. Important to set the goals up front, eg food security or restocking, etc

Poaching/unscrupulous traders

-Important to identify who is doing the poaching and understand why – drivers for poaching. They can manage it more effectively. More targeted education within the community.

- Be good to do a social-economic study of poaching to identify the drivers.

- Best management of poaching is achieved at the community level. They can do their own surveillance and enforcement.

-who is responsible legally for poaching? Are there legal powers for them to do their job? Are there Codes of Practice? Aim to put community management of poaching within a legal framework.

- Poaching increases after disasters (cyclones) and during celebrations, at times when surveillance is low.

-Sea cucumber is particularly vulnerable to poaching as it is readily accessible – no gear is required.

Issue 4: Releasing animals to the sea

Issues for consideration, some requiring research:

- **Acclimation and Release methods**

Many issues here, including transport to the release site; acclimation to receiving water; release times - day/night; tides; others.

Techniques for release of non-scabra species need to be considered - could be quite different to *H scabra*

- **Criteria for site selection**

Need to review and document site selection criteria, of which there will be many

Biophysical - substrate, nutrients, tides, wind, grain size, presence / absence sea grass, other fauna including predators.

Governance - must have community support - but note the community's preferred site will often not be the same as the preferred biophysical site.

Also, best or preferred nursery sites may be different to grow-out sites. Note we do not have a lot of information on biology of juveniles in the wild.

- **Carry capacity - assessment methods**

Need criteria for estimating carrying capacity of sites

- **Rehabilitating degraded environments prior to stocking** - a possible consideration

For instance degraded sea grass meadows - could they be replanted / enhanced prior to stocking

Could extend to providing artificial shelters or habitat at the time of stocking.

- **Predation**

How to minimise predation, what are the predators in each situation

Predator removal prior to stocking may be an option in some cases

- **Longitudinal surveys - sequential surveys pre- and post-stocking**

Systematic surveys to monitor stocked animals is necessary to build the pool of knowledge on success and failure.

- **Security**

Recognised as a major and possibly limiting factor in most ranching situations.

Approaches to managing the issue will vary from site to site, country to country

A more general comment

- **Production chain economic models**

Much effort goes into improving the efficiency of hatchery systems, but relatively little into release methods. It would be good to look at the "economic efficiency" all along the production cycle. We may find much better return on investment could be gained from, for instance, redirecting effort to improving survival over the first couple of months post-stocking.