Sandfish production and sea ranching trial in Fiji

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Sandfish (Holothuria scabra) or Dairo are part of the Fijian traditional diet.

Sandfish are restricted by legislation to domestic consumption, but Fisheries laws are ambiguous.

After the 1987 coup, export-driven over-fishing of sandfish has occurred.
Project objectives

1. Transfer hatchery and juvenile grow-out technology
   - Government and private sectors
   - Improve capacity of project staff in sea cucumber production techniques, release and monitoring skills

2. Trial sandfish sea ranching in a Fijian qoliqoli
   - Monitor juveniles growth and survival
   - Determine social, technical and economic feasibility
   - Scope out management options for sea ranching as a village livelihood
1. Technology transfer
Project location

FIJI ISLANDS

YASAWA GROUP

VITI LEVU

SUVA

Vatulele

Beqa

Nadi

Naviti

Nacala

Waya

Tautoka

BLIGH WATER

Koro

Makogai

Vanusa

Ovalau

Nairai

Nabouruwa

Yadua

Yasawa

Ringgold Isles

Vanua Balavu

NORTHERN LAU GROUP

Naitauba

Vanua Levu

Labasa

Savusavu

Rabi

Taveuni

Qamea

Koro Sea

Lakeba

Moce

Totoya

Kabara

Fulaga

Ogea Levu

SOUTHEN LAU GROUP
Savusavu (Hatchery 1)
J Hunter blacklip pearl oyster hatchery
Savusavu resources

- Spawning tank
- Microalgae production
- 1,600 L larval tanks
- Temporary raceways
- Reliable broodstock source
- Marine pond (rocky, well flushed, non-secure)
Galoa (Hatchery 2)
Fiji Fisheries Department shrimp hatchery
Galboa resources

- Spawning tank
- No microalgae unit (supply from USP)
- 1,000/300 L larval tanks
- Concrete raceways
- Unknown broodstock source
- Marine ponds (ex-shrimp)
Training and production

- **Five** hatchery runs at Savusavu, **one** run at Galoa
- Successful spawning & larval production **every time**
- Settlement on **three** occasions
- Juvenile production on **two** occasions
- **One** juvenile release
Technology transfer outcomes

- Successfully trained private and government staff in sea cucumber production techniques
- Demonstrated the relative ease of producing sea cucumber in non-sea cucumber hatcheries
- Successfully reared larvae and early juveniles with Reed’s Instant Algae (shellfish mix)
- Increased awareness and raised interest in the technology
2. Sea ranching trial
Release site selection

- A *qoliqoli* is a traditionally managed fishing area
- Criteria for the juvenile release site:
  - Optimum physical microhabitat
  - Community interest / security for sandfish
  - Proximity to hatchery
- Negotiate with *qoliqoli* owners on use of release site
- Determine an interim management framework to suit all stakeholders
- Final decision: Natuvu (Wailevu, Vanua Levu),
Project location
Broodstock

- Sourced from Natuvu (i.e. released juveniles are same genetic stock)
- Transported in plastic bags with sea water and oxygen

- Collected and held in pond for spawning initially
- Later, collected from wild and then returned to sea
Release site microhabitat

- Used WorldFish criteria developed by Steve Purcell
- Water depth 0.2 to 2.5 m at low tide
- 40-70% seagrass cover
- Primarily *Syringodium* with some *Halodula*
- Many invertebrates, including sandfish and other sea cucumbers
- Minimal freshwater input (but some flood risk)
- Muddy sandy sediments of moderate softness
Release protocol

- Followed WorldFish protocol
- Tag juveniles with fluorochrome dyes, one week recovery and conditioning sand
- Health check before release
- Four 100 m² pens constructed at site
- Transport to site (plastic bag with water and oxygen)
- Overnight conditioning at release site (in enclosed nets)
- Juveniles individually ‘planted’ within pens by community
- A sample marked with pegs and checked at regular intervals afterwards to observe behaviour
Experimental release

- Into Natuvu *qoliqoli* (May 2009)
- Pilot scale release of 500 juveniles
- 4 pens of 100 m² (1/m²)
- Two size classes:
  - Small (1-3 g)
  - Large (>3 – 10 g)
- Local wardens assigned to protect juveniles and maintain pens
- Monthly monitoring by student, Fisheries officers and wardens
Monitoring results

Survival (28% overall, 33% large, 23% small)
Monitoring results

Growth

Average weight ± se (g)

May '09 Jun '09 Aug '09 Oct '09 Nov '09 Dec '09 Jan '10 Feb '10 Mar '10 Apr '10

Large (A/C) Small (B/D)

Sp Sp
Community engagement

- Imposed a ban on sandfish collection prior to project
- Declared a marine protected area during project
- Community assisted with all project work in village
- Chief assigned “dairo” wardens to check pens, assist with monitoring, maintenance, etc
Marine Protected Area

Vanua Levu

Legend
- Red: Waypoints
- Coastline
- Offshore
- Dotted line: Proposed MPA

James Cook University Australia
Community management

- Community enforced ban on sandfish collection within entire qoliqoli
- Harvested other species in consultation with Dept Fisheries (e.g. curry fish)
- Community noted increase in other marine species
Cyclone damage

December 2009 Cyclone Mick (power and bad water quality)

March 2010 Cyclone Tomas (power loss for weeks, intake line lost, hatchery damage, sea pen damage)
Sea ranching outcomes

- High survival of large and small juvenile sandfish
- Spawning of released sandfish in November 2009 and April 2010 (6 and 11 months post release)
- High level of community cooperation
- Project led to application of local management measures
- Keen interest to continue the project
Priority challenges (Fiji...Pacific?)

- Production of microalgae for feeding
- Collection, maintenance and security of broodstock
- Low scale of hatchery production to juveniles (>3 g)
- Management of environmental “hicups”
- Accurate post-release monitoring/data collection
- Equitable management of ranched sandfish
merci!