



LäjeRotuma Initiative

A REVIEW OF THE BECHE-DE-MER FISHERY IN ROTUMA

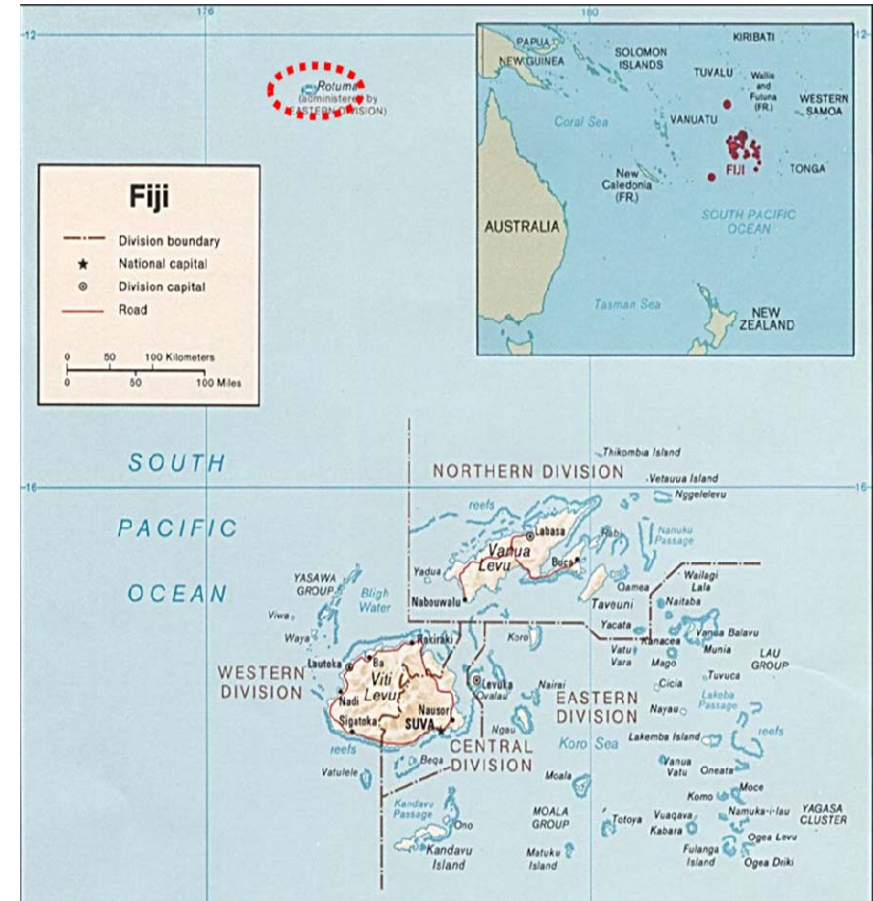


Photograph taken from sandy flats near Husia twin islets, Noatau lagoon.



Location of Rotuma Island.

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I. Rotuma Island setting

The main island of Rotuma (location: 16°35' S, 177°00' E) with an estimated land area of 43 km² is located about 465 km North of mainland Fiji. Rotuma has a central chain of forest clad peaks and undulating coastal flats of varying width that supports rich volcanic soil with luxuriant growth of flora. There is a narrow sandy isthmus at Motusa which connects the two essentially distinct parts of the island. Three small volcanic islets (Hatana, Uea, Hafliua) and five reef islets (Afgaha, Husia rua, Solkope, Solnahu, Haua) surround the main volcanic island of Rotuma. The highest point in the Rotuma group is approximately 255 metres above sea level, on the outer island of Uea. There are well-developed fringing reefs that surround the island, the reef is narrow in all but a few places, notably the southeast corner of Noatau district.

Rotuma is located 6 degrees North of Fiji and noticeable warmer. Annual average rainfall during period of 1912-2006 was 3558mm (Fiji Meteorological Service, 2008). There is no surface water on Rotuma and a past report indicated that there will be high filtration to the groundwater system (Dawe, P., SOPAC, 2001). That is, the high permeability of the Rotuma basalts mean that saltwater intrusion of wells located close to the coast is likely and that other contaminants could have a direct route into the groundwater system.

The recorded air temperature range during period of 1933-2006 was 24.3 - 30 degree Celcius, however, ocean water temperature recorded on dive computers during a May 2004 dive expedition ranged from 28-29 degree Celcius. Another 2008 expedition recorded ocean water temperatures to range from 29-31 degree Celcius. Visibility in Rotuma waters for most days range typically 15-25 metres.

Extreme weather patterns affect coral reef health depending on location around the island. Eight months of the year, South East trade winds (10-15 knots) prevail on Rotuma after which it turns to the North East. The Southern reefs are exposed, two-thirds of the year compared to only four months' exposure for the Northern reefs of the island. Conditions for optimal coral growth sheltered from strong wind and wave action, favor reefs from Itu'muta to 'Ut'utu along the Northern coast.



II. Status of Rotuma's marine environment

Based on nine years' of consultation during island community outreach, field observation and capacity building experiences, LäjeRotuma lists a number of prioritized marine related environmental concerns that includes:

- the incessant growth of a hard known coral *Pavona* species locally known as **kama** which grows in shallow lagoon areas usually outgrowing all other coral growth form;
- a declining trend in the use of local fishing practices and the use/ownership of **vaka**, with access to improved fishing technology (mask –snorkel-torch) and outboard engine boats;
- the persistent dumping of household rubbish along coastlines mainly comprising of non-biodegradable materials (that do not rot or breakdown easily) like plastic bags, empty tin cans and bottles;
- lack of community level-basic ecological knowledge of marine organisms and life-food web connections in the lagoon usually leads to mismanagement or exploitation of subsistence/artisanal fishery potential for e.g beche-de-mer, invertebrate for curio sales, seaweed and aquarium.

Overall anthropogenic impacts along the reefs and surrounding waters of Rotuma is considered to be low to medium range. The distance of potential export market and erratic shipping schedule has been a major deterrent to the development of any major fishery that requires critical treatment of collected specimen during chain of custody from collection, handling to packaging for export.

Photographs 1-3 (from left to right): Coral life diversity at Noatau lagoon; Women fishers at Hapmak cleaning their catch; *Kama* (*Pavona* sp.) infested lagoon at Pepjei.



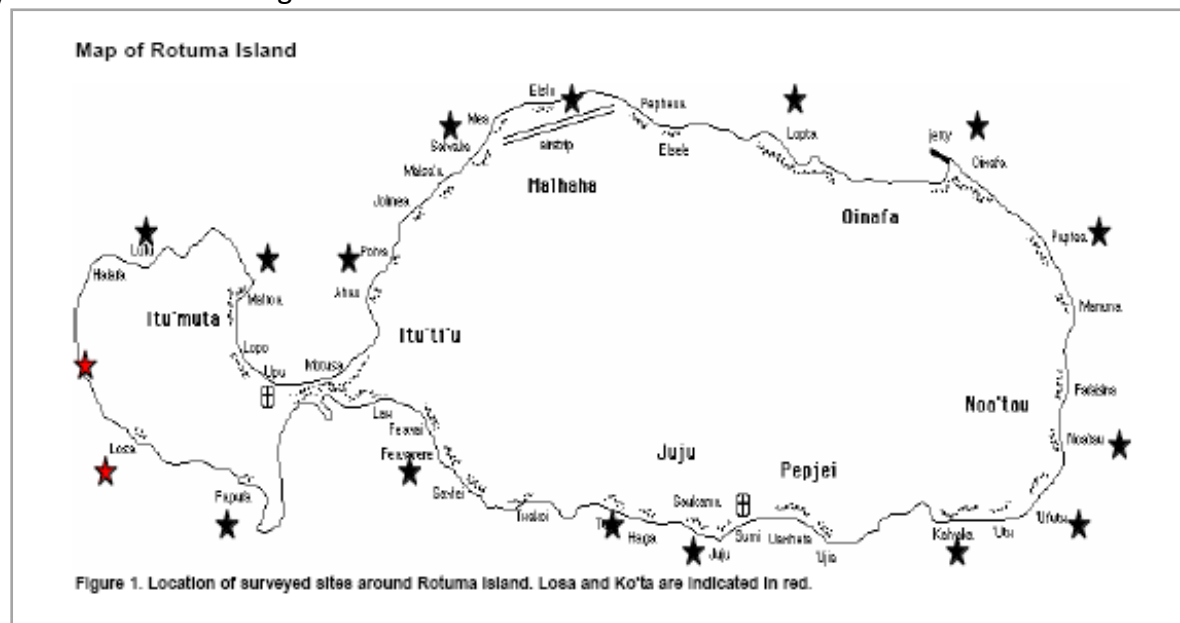


III. Purpose of the Review

The reintroduction of the beche-de-mer collection for sale with prospects of income generation for households at Rotuma, has created debate amongst the island community of the benefits in allowing such use of this marine resource. Some argued that due to the limitation of fishing areas adjacent to villages and more importantly the ecological role of the beche-de-mer in the lagoon, it is important to consider the long term effects of the extensive collection of sea cucumbers. This review document intends to best answer questions raised by both sides of the debate for the benefit of the Rotuman community regarding export of the beche-de-mer.

1. To better understand the role of sea cucumbers or beche-de-mer in sustaining the health of a lagoon to make informed decisions about how to manage the fishery in a balanced manner for a positive effect on community life whilst protection of the species and inadvertently our island biodiversity.
2. To update key community elders and the relevant authorities on the research and awareness outreach provided by LäjeRotuma Initiative, an environmental role that continues to build with increasing need by the islanders to access information for making choices beyond subsistence living on the home island.

Past surveys conducted in Rotuma's reefs during year 2003, 2004 and 2006 described coral life growth form, types of macroalgae, abundance of fish and invertebrates observed along an estimated 250 m². Rotuma reefs are generally healthy by the ratio of percentage live coral cover (LC) and the non living part of the reef (Abiotic) and (DCA) types (refer to Table 1). Reef composition indicate a suitable environment for sea cucumbers to live on which are also observed in deeper waters, shallow lagoons and seagrass meadows at Maka bay, Motusa.





IV. Do we know our beche-de-mer fishery?¹

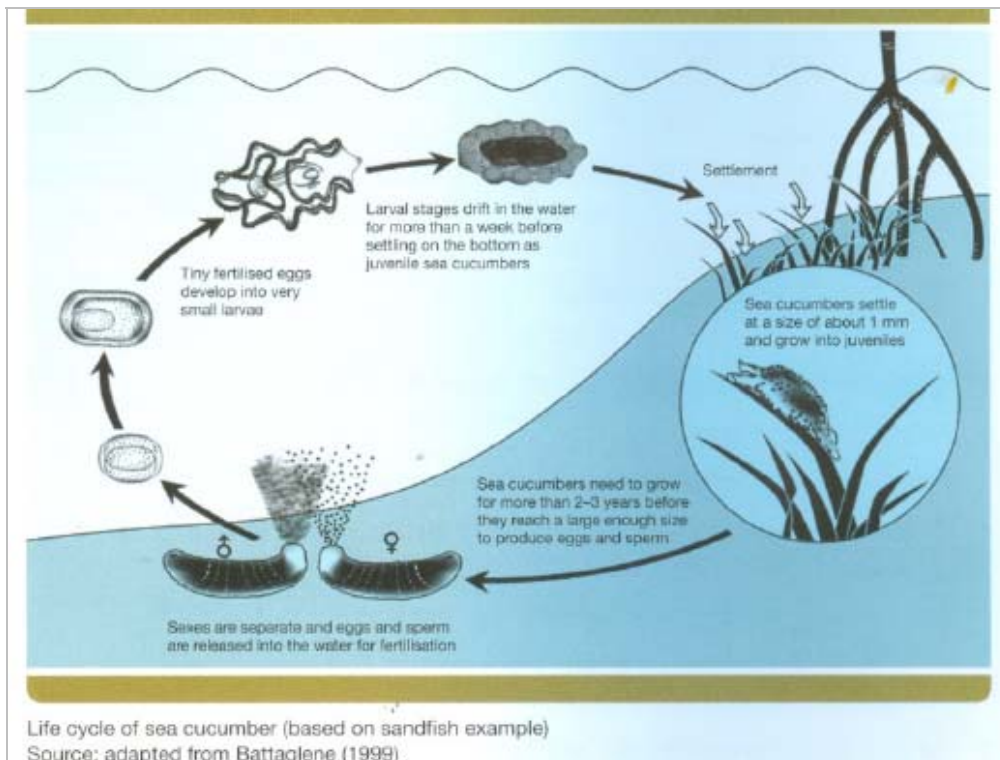
For any fishery one must understand an organism's life cycle by considering these major questions:

- * How do sea cucumbers live, reproduce and grow?
- * Understand the 'natural factory' that supply new generations of sea cucumbers to lagoon areas?

¹Source: Friedman, K. et al., 2008.

Table 1. Mean substrate cover for all resurveyed sites.

Substrate Type	Deep			Shallow		
	2003	2004	2006	2003	2004	2006
Live Coral (LC)	32.63	26.38	53.32	30.00	30.21	62.09
Soft Coral (SC)	0.00	0.75	0.60	0.00	0.42	0.30
Sponges (SP)	0.25	1.38	0.00	0.63	0.21	0.15
Zoanthids (ZO)	1.25	1.50	1.38	0.00	1.04	0.00
Algae	42.75	46.50	28.94	34.38	38.33	23.96
Dead Coral w/ Algae (DCA)	13.13	10.25	2.33	21.67	11.67	2.99
Abiotic	7.63	11.76	16.37	11.25	17.08	13.51



Sea cucumbers as 'earthworms' of our lagoons help vacuum sediment off corals from blockage where polyps (small animals that live in the coral skeleton) need the sunlight for food to build our coral reefs. Sea cucumbers feed off detritus found on the reef bottom by engulfing sediment, grinding it as the sand bits pass through its gut and excreted, leaving a trail of finer sand than before. The sea cucumbers' feeding process contributes to the breakdown of larger sediment types and aeration of reef sediment, crucial for all bottom dwelling organisms which feed and live within the reef substrate on the floor of the lagoon.

Maka bay where seagrass grows and the sandy flats of Noatau lagoon are areas with high sea cucumber counts based on past reef health surveys and currently known to be popular collection sites of beche-de-mer before being sold to a middleman.



V. How well do we know our fishery?



Previously, the Rotuman community's attempt at harnessing marine-based economic returns has been opportunistic rather than well planned for maximum yield potential. This case study of the sea cucumber fishery is an example of a small scale fishery that can benefit the island community if provisions for management by all resource users on Rotuma are agreed upon. It is crucial that a management plan for the beche-de-mer is developed in recognition of Rotuma's developmental needs and balance for trade in protecting our island biodiversity.

-
- *Which species are harvested?*
 - *What areas do they come from?*
 - *How are they caught? Who catches them?*
 - *Which species have declined in abundance?*
 - *Where do they live?*
 - *Are they high value or medium-value species?*
 - *How does money earned from selling sea cucumbers benefit communities?*
 - *How is the fishery managed?*
 - *Are they working?*

Despite the lack of specific information on the status of sea cucumber population in Rotuma's reefs, there is sufficient local knowledge and experience from past collection activities to establish a threshold for extraction measures of the island's sea cucumber fishery. According to 2006 survey results, most invertebrates observed (of mainly sea cucumbers) were found in the shallow depths (3-6m) than in the deep (8-12m) waters and making it easier for collection. There are at least four districts involved in the beche-de-mer fishery i.e. Itumuta, Pepjei, Juju and Noatau, two of which currently collect for trade mainly, are Itumuta and Noatau village. Within these sites, most collection arrangements of beche-de-mer were done individually rather than in cooperative form. It has been reported that villagers get a middleman rating for value of their collected beche-de-mer, depending on the species and size collected with preference for trade in either dried or wet form.


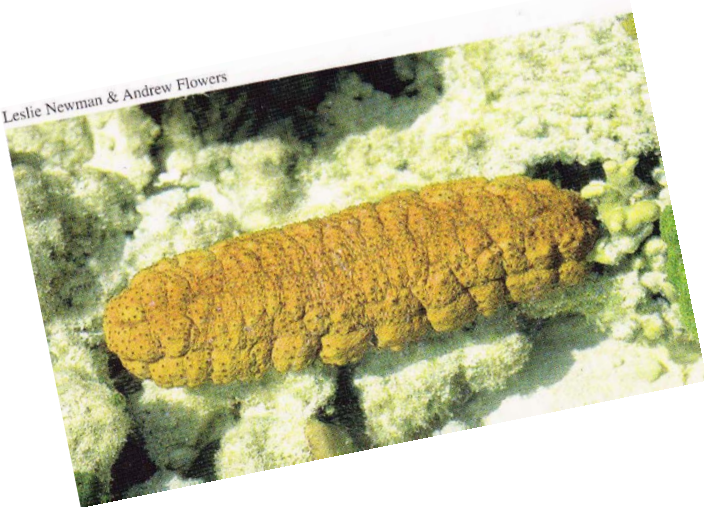


BECHE DE MER SPECIES OF FIJI IN THE EXPORT MARKET

COMMON NAME	DESCRIPTION
 <p data-bbox="1045 727 1167 751">Amber fish</p>	<p data-bbox="1192 402 1493 427">Common name: Amber fish</p> <p data-bbox="1192 435 1545 459">Scientific Name: <i>Thelenota anax</i></p> <p data-bbox="1192 467 1478 492">Fijian Name : Dri volavola</p> <p data-bbox="1192 500 1402 524">Wet Length : 80cm</p> <p data-bbox="1192 532 1444 557">Export Length : 7.62cm</p> <p data-bbox="1192 565 1318 589">Value : Low</p> <p data-bbox="1192 597 1583 654">Features –Wet color: Upper surface cream grey with brown patches.</p>
 <p data-bbox="1058 1317 1167 1341">Black Fish</p>	<p data-bbox="1192 824 1486 849">Common Name : Black fish</p> <p data-bbox="1192 857 1598 881">Scientific Name : <i>Actinopyga miliaris</i></p> <p data-bbox="1192 889 1423 914">Fijian Name : Dri Loa</p> <p data-bbox="1192 922 1430 946">Wet Length: 20-30cm</p> <p data-bbox="1192 954 1444 979">Export Length: 7.62cm</p> <p data-bbox="1192 987 1318 1011">Value: Low</p> <p data-bbox="1192 1019 1604 1076">Features- Wet color: Black sometimes brown underside.</p>



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 <p data-bbox="989 818 1167 846">Brown sand fish</p>	<p>Common Name : Brown sand fish Scientific Name: <i>Bohadschla marmorata</i> Fijian Name: Vula Wet Length: 15-35 cm Export Length: 7.62cm Value: Low. Islanders trade for \$2/animal Features- Wet color : Small brown dots with golden brown color.</p>
 <p data-bbox="1052 1408 1167 1435">Curry Fish</p>	<p>Common Name : Curry Fish Scientific Name: <i>Stichopus variegatus</i> Fijian Name: Lokoloko Wet Length: 20-25cm Export Length: 7.62cm Value: Low Features- Wet color : Typically dark yellow with brown patches</p>



Deep water red fish

Common Name : Deep water red fish

Scientific Name: *Actinopyga echinitus*

Fijian Name: Dritabua

Wet Length: 15-30cm

Export Length: 7.62 cm

Value: Low

Features- Wet color : Surface red orange underside.



Elephants Trunk Fish

Common Name : Elephant trunk fish

Scientific Name: *Microthele fuscopunctata*

Fijian Name: Dairo ni cakau

Wet Length: 40-60cm

Export Length: 7.62cm

Value: Low

Features- Wet color : Dark orange or rust brown



Green Fish

Common Name : Green Fish

Scientific Name: *Stichopus chloronotus*

Fijian Name: Dri votovoto

Wet Length: 40-60cm

Export Length: 7.62cm

Value: Low. Islanders trade at estimated price of \$4/kg (wet) on Rotuma.

Features- Wet color : Very dark green almost black



Lolly Fish

Common Name : Lolly fish

Scientific Name: *Holothuria atra*

Fijian Name: Loliloli

Wet Length: 10-50cm

Export Length: 7.62cm

Value: Low. Islanders trade@ \$1.20/kg (approx. 60 dried pieces).

Features- Wet color : Black with sand cover



Pink Fish

Common Name : Pink Fish
Scientific Name: *Holothuria edulis*
Fijian Name: Dri damu
Wet Length: 20-30cm
Export Length: 7.62cm
Value: Low
Features- Wet color : Dark brown upper surface & pink under

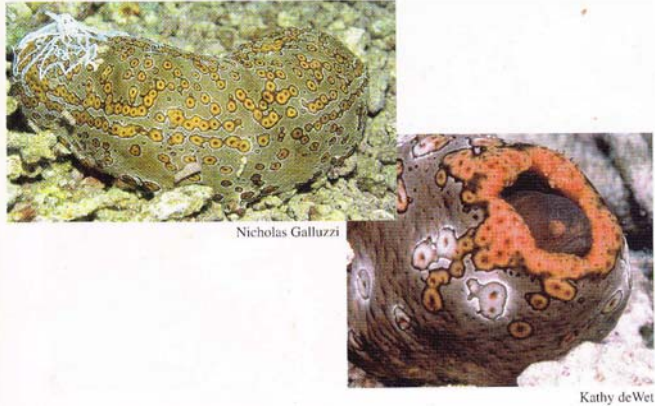

d McConnaughey



White teat fish

Common Name : white teat fish
Scientific Name : *Holothuria fuscogilva*
Fijian Name: Sucuwalu
Wet Length: 30-40cm
Export Length: 7.62cm
Value: High
Features- Wet color: Yellowish white to grey-brown.



 <p>Nicholas Galluzzi</p> <p>Kathy deWet</p> <p>Tiger Fish</p>	<p>Common Name : Tiger fish Scientific Name : <i>Bohadschla argus</i> Fijian Name: Vula ika Wet Length: 15-35cm Export Length: 7.62cm Value: Low</p>
 <p>1221 - <i>Actinopyga mauritiana</i> * Mariana Islands</p> <p>Surf red fish</p>	<p>Common Name : Surf red fish Scientific Name : <i>Actinopyga mauritiana</i> Fijian Name: Tarasea Wet Length: 20-30cm Export Length: 7.62cm Value: Low Features- Wet color: Similar to deep water red fish but no sand coat.</p>



David Reid

Stone fish

Common Name : Stone fish
Scientific Name : *Actinopyga lecanora*
Fijian Name: Dri vatu
Wet Length: 40cm
Export Length: 7.62cm
Value: Low
Features- Wet color: Varies but light color patch at the anus.



Prickly Red fish

Common Name : Prickly Red Fish
Scientific Name : *Thelenota ananas*
Fijian Name: Sucudrau
Wet Length: 40-70cm
Export Length: 7.62cm
Value: Medium
Features- Wet color: Reddish Orange with tube feet

[http://www.scuba-equipment-usa.com/marine/AUG06/Pineapple_Sea_Cucumber\(Thelenota_ananas\).htm](http://www.scuba-equipment-usa.com/marine/AUG06/Pineapple_Sea_Cucumber(Thelenota_ananas).htm)
|



Sand fish (banned)

<http://www.seafreshaustralia.com/index3.shtml>

Common Name : Sand fish
(banned)
Scientific Name : *Metryatyla scabra*
Fijian Name: Dairo
Wet Length: 25-45cm
Export Length: 7.62cm
Value: High
Features- Wet color: Greenish upper surface



Sand fish (Banned)

http://www.alibaba.com/product-free/104806274/Sea_Cucumber_Sand_Fish.html

Common Name : Sand fish
(banned)
Scientific Name : *Metryatyla versicolor*
Fijian Name: Dairo
Wet Length: 25-45cm
Export Length: 7.62cm
Value: High
Features- Wet color: Variety color



VI. How healthy is our fishery?

The issuance of license to collect beche-de-mer for its commercial sale is primarily intended to regulate collection. However, the current state of the sea cucumber fishery practiced within Rotuma's limited reef area that is benefiting only a few due to lack of concerted management effort, far exceeds the licensing requirements. It is important to keep check on the status of the fishery. There are six key ecosystem health indicators framed for management concerns (in textbox) and hopefully to be considered during review of beche-de-mer fishery for management on Rotuma's lagoon.

- | <u>INDICATORS OF HEALTH</u> | |
|------------------------------------|--|
| ✓ | <i>take some, leave some for breeding</i> |
| ✓ | <i>how to fish for sea cucumber</i> |
| ✓ | <i>how many sea cucumbers</i> |
| ✓ | <i>types of sea cucumbers</i> |
| ✓ | <i>sizes of sea cucumbers</i> |
| ✓ | <i>profit to fishers</i> |

Indicator #1 Sea cucumbers reproduce by releasing their eggs and sperm into the water, its larvae drift in currents and settle into shallow coastal habitats safe from being eaten and allowed to grow into adults. Therefore it is important to leave enough adults to produce enough eggs for the continuance of its life cycle.

Indicator #2 Improved fishing methods for sea cucumber collection allows greater area coverage and capacity which reduces the chances of adults remaining at masses enough to find mates during the spawning season! Collection methods mainly involve gleaning off the shallows by snorkel diving. There is no quota system for collection of beche-de-mer so collection usually occurs at least thrice weekly for six months or collection stops in an area when there was no more sizeable sea cucumbers to collect. Several collection areas are used on a rotational basis with most areas visited for a couple of months before stopping. There are varied reasons for stopping which are mainly attributed to social factors caused by suspicion and disgruntlement of non-collectors in the village.

Indicator #3 When sea cucumber abundance falls to very low levels, fishers and collectors may need to wait for many years until stocks recover and healthy enough to replenish themselves regularly to support some collection again!

Indicator #4 Changes in the composition and relative abundance of species are a good indicator of over-fishing. A good recording of the sea cucumbers collected and exported will provide useful information of the fishing intensity.

Indicator #5 Size of sea_cucumbers. Over-fishing happens when larger animals disappear from catches, then fishers and collectors no longer maximise their potential sustainable earnings, for larger sea cucumbers are needed to produce A-grade species.

Indicator #6 Ideally, the islanders should collect and process the sea cucumbers themselves to spread the income throughout the village. Instead there is a high risk of over-fishing when the catch is sold to others to process as they need to catch more sea cucumbers to make the same amount of \$\$ that they did when they process their catch themselves!



VII. How to manage our fishery?

LäjeRotuma in this document provides a few practical steps towards understanding and management of the beche-de-mer fishery on the home island. It is recognized that our community environmental awareness outreach program needs to be strengthened with an expanded scope on all issues including the social, economic and cultural aspects of Rotuma and her people.

Key immediate actions suggested in this review encourage the participation of mainly the Council of Rotuma, beche-de-mer collectors, and district representatives involve:

- Communicate with all stakeholders. This series of sessions can be facilitated by LäjeRotuma with guidance from Department of Fisheries in the development of a small scale island fishery for the sea cucumber collection.
- Protect spawning adults. Establish no collection areas or protected zones at identified potential spawning grounds like the seagrass meadows at Maka bay, Motusa.
- Promote high quality processing. It is understood that cleaning facilities/areas that sort the beche-de-mer for trade on Rotuma has been cited by the Health Inspector.
- Documentation of the entire chain of custody from collection on the reef to drying and sorting for export is an important aspect of managing the beche-de-mer fishery on Rotuma.
- Implement and monitor the desired management plan. This can be undertaken by LajeRotuma in partnership with collection groups.

Finally, this proposed action to manage the beche-de-mer fishery must be integrated to an island ecosystem biodiversity management plan as part of Rotuma's development planning process.

VIII. Sources of information

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