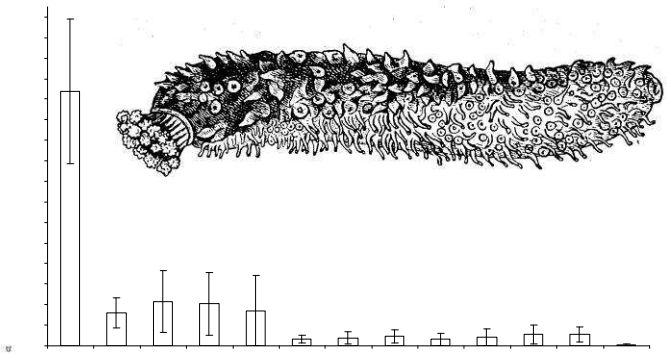
BICHLAMAR PROJECT 2011-2012

Sea Cucumber Stock Assessment in Vanuatu



Final Report

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1 BACKGROUND

Sea cucumbers are one of the most important commercial inshore fisheries in Vanuatu. Traditionally, sea cucumbers, commonly known in Vanuatu as 'beche-de-mer' are not consumed locally; the resource is harvested and exported to overseas market particularly to the Asian countries where it is a food delicacy.

Harvest and export of sea cucumber is believed to start in the early 19th century. In 2005[1], it contributed to an estimated value of about 1-2 million vatu to the rural economy. Vanuatu Fisheries Department (VFD) records in 2005 showed that on the national level, beche-de-mer export brings in about 13 million vatu per year for the last six years. Given that Sea cucumber is a valuable wealth and an imperative income source for the rural coastal people sea cucumber is one of the priority commodities in Vanuatu.

Sea cucumber fishery "boom" in the 1990s with production peaked at around 70 metric tons. The boom period however indicate that the Community based management of resources is actively practiced by many communities and resource custodians with the support of fisheries department but pressure from the industry to exploit the resource was beyond the control of communities which resulted in the depletion of the resources in most islands in Vanuatu. Since the 1990s production peak beche-de-mer export continue to decline until in 2007 the situation prompted the government to declare a moratorium. The National moratorium was put in place from 1st of January 2008 until the 1st of January 2013.

Sea cucumber belongs to a group of echinoderms called holothurians. They are sluggish, tube-shaped, bottom dwelling animals that are found inshore from 0-50metre in sea water depth. Sea cucumber sexual strategies include sexual, asexual, and hermaphroditic. They spawning season are around warmer months or summer and for some to only few species on cooler months. Mature adult are around 2 – 3 years old depending on species. In Vanuatu, Sea cucumber / beche-de-mer are wildly distributed to almost every island. They are important commercial fisheries resources however the stock has been depleted over the past year due to higher fishing pressure.

In 2007 the Vanuatu Fisheries Department declared a closure on commercial harvesting of sea cucumber fisheries for a period of five year commencing 1st January 2008 to 1st January *2013*[2] .The ban was declared in order to recover the depleted stock population. The Fisheries regulations order no.28 of 2009, stated that after the period the 5 years, the sea cucumber fisheries will be re-opened for fishing activities. This will however depend on the surveys and assessments that will be carryout to determine the stocks size.

In 2010 Vanuatu Government through Fisheries Department has requested financial assistance from the French Government through its embassy in Port Vila to fund a project named "BICHLAMAR Project". An agreement has been sign by both Government and funding has been release to complement activities which are outline in the Project matrix. The project has been developed by the Fisheries Department and IRD technical expert counterparts.

[1] Fisheries Department annual report 2008

[2] Fisheries Department Regulation order 28 of 2009

In January 2011 the Department of Fisheries began to implement the project activities. This includes an observation and a field tour to the Northern Province of New Caledonia. The trip was exchange collaboration between Province North Fisheries Division, New Caledonia and Vanuatu Fisheries. Six people participated in the trip, including four Fisheries officers and two resources monitors from Santo and Malekula. The overall objective of the trip was to get an overview of what IRD and Province North Fisheries have been working on developing a well established sea cucumber management system that has successfully been utilized by a community in Koné since 2008. The approached developed by IRD and the Fisheries Division of Northern province, New Caledonia is based on stock assessments and Total Allowable Catch (TAC), and could also be applied to Vanuatu.

The second part of activity that was implemented in the Project is sea cucumber stock assessment in Vanuatu. The stock assessment surveys were first conducted in South and North part of Malekula Island in September 2011, and another stock assessment was contacted in North of Efate in February 2012.

2 OBJECTIVES

The objectives of the sea cucumber stock assessment surveys were:

1) To determine the current sea cucumber stocks in different islands of Vanuatu: this will include description of biomass/ size structure, production of habitat maps through GIS, and data collection and storage.

2) To contribute to sustainable management of sea cucumber fisheries in Vanuatu: data collected from stock assessment was analyzed to provide directions to develop a management system (Vanuatu Management Plan for sea cucumbers 2013-2017).

3 DATA COLLECTION

Sea cucumber stocks have been assessed following the same approach developed by IRD and the Fisheries Division, New Caledonia. Data collected include 17 species of sea cucumber.

3.1 Survey Sites

Three fisheries were surveyed in Malikolo (south and north) and Efate (north).

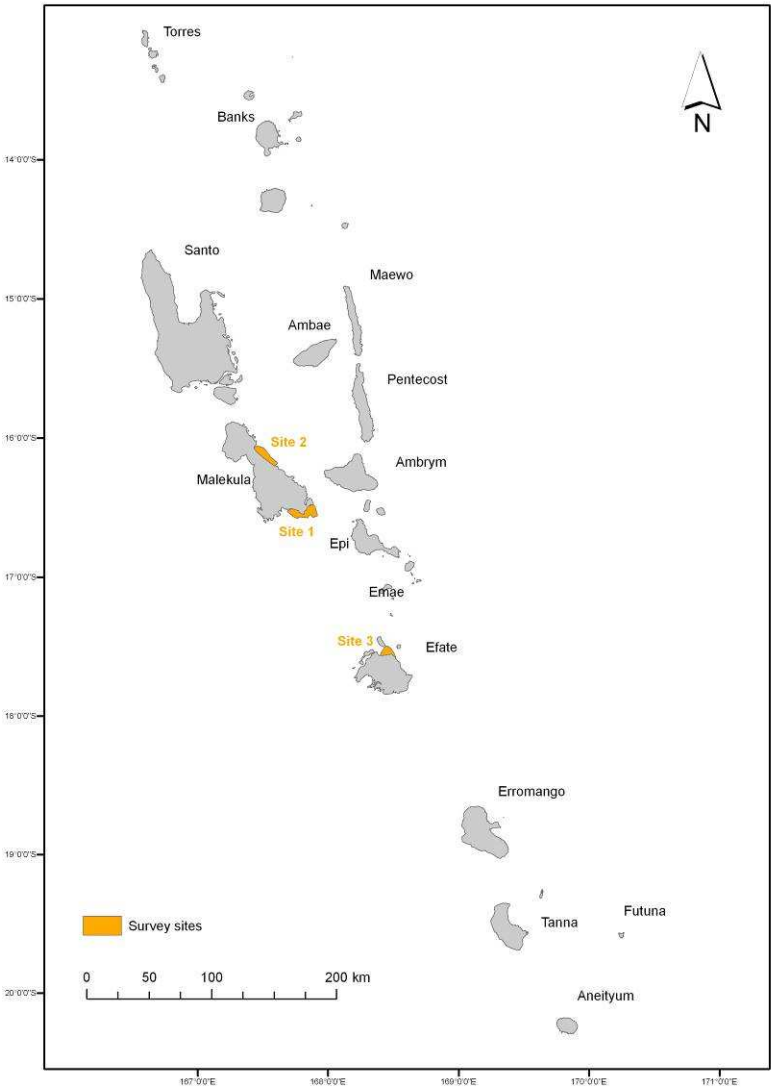

Figure 1. The three survey sites in Malikolo and Efate

3.2 Sampling Design

Two high resolution satellite image (Quickbird) are being used in all survey sites to determine categories of habitats: sea grass beds, inner reef flats, outer reef slopes, reef crest and lagoons. A stratified sampling was used to survey all habitats suitable for target sea cucumber species. Observation of station was randomly determined survey using GIS tools. The sampling rate depends on availability of human power and costs and ranged between 12-14 stations per km² of reef.

The overall sea cucumber stock assessment surveys were as follows :

A) South Malekula including Maskelynes Archipelago: 10 surveyors with 5 boats; 5 days of work (7-12 Sep 2011); 286 stations surveyed covering a total area of 24.54 km² (72 habitats).

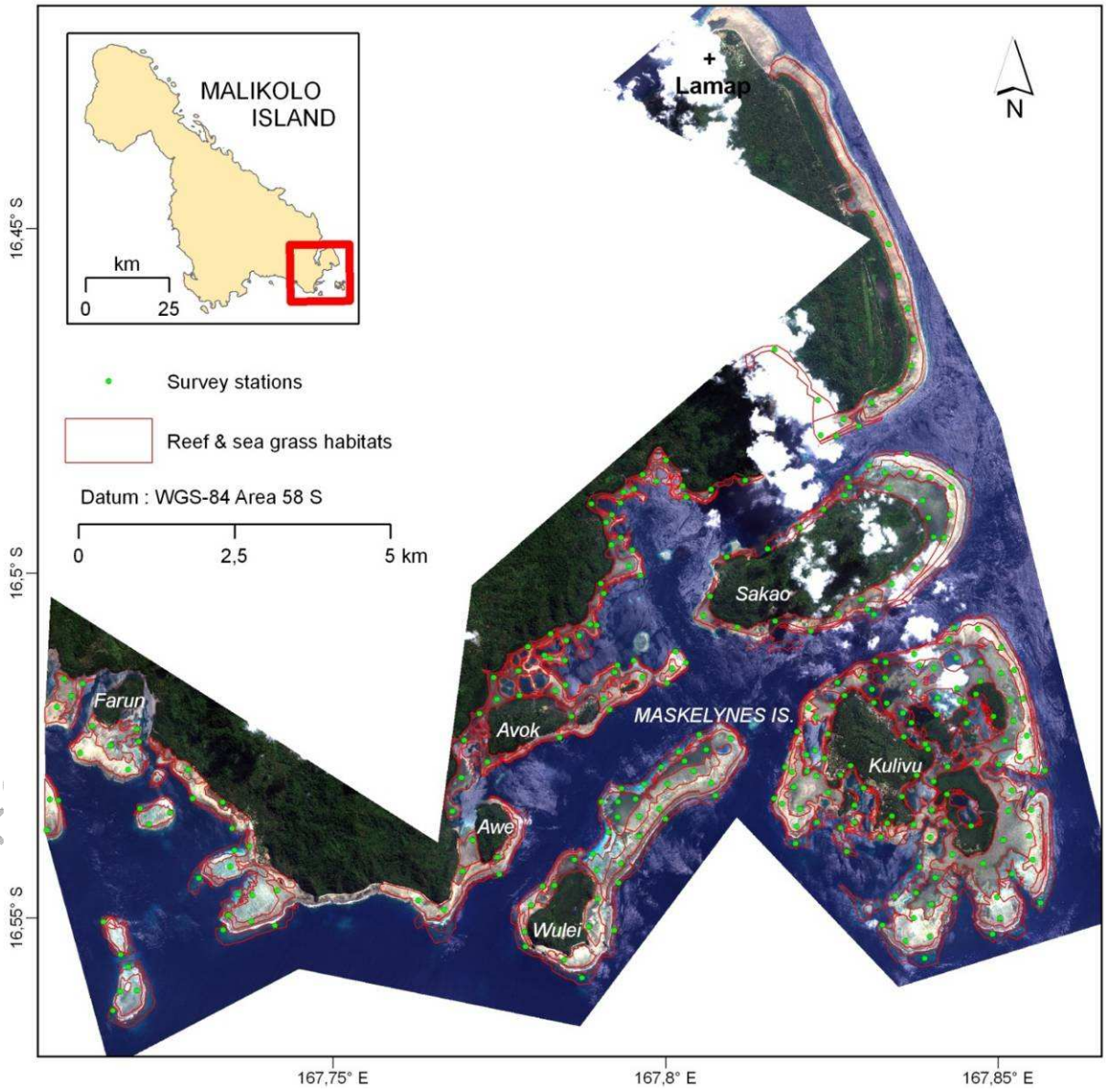

Figure 2. Map of South Malekula showing all 286 survey stations and 72 habitats.

B) North Malekula including, Crab bay, Uri and Uripiv: 6 Surveyors with 4 boats; 5 days of work (14-18 Sep 2011); 199 stations surveyed covering a total area of 14.0 km² (43 habitats).

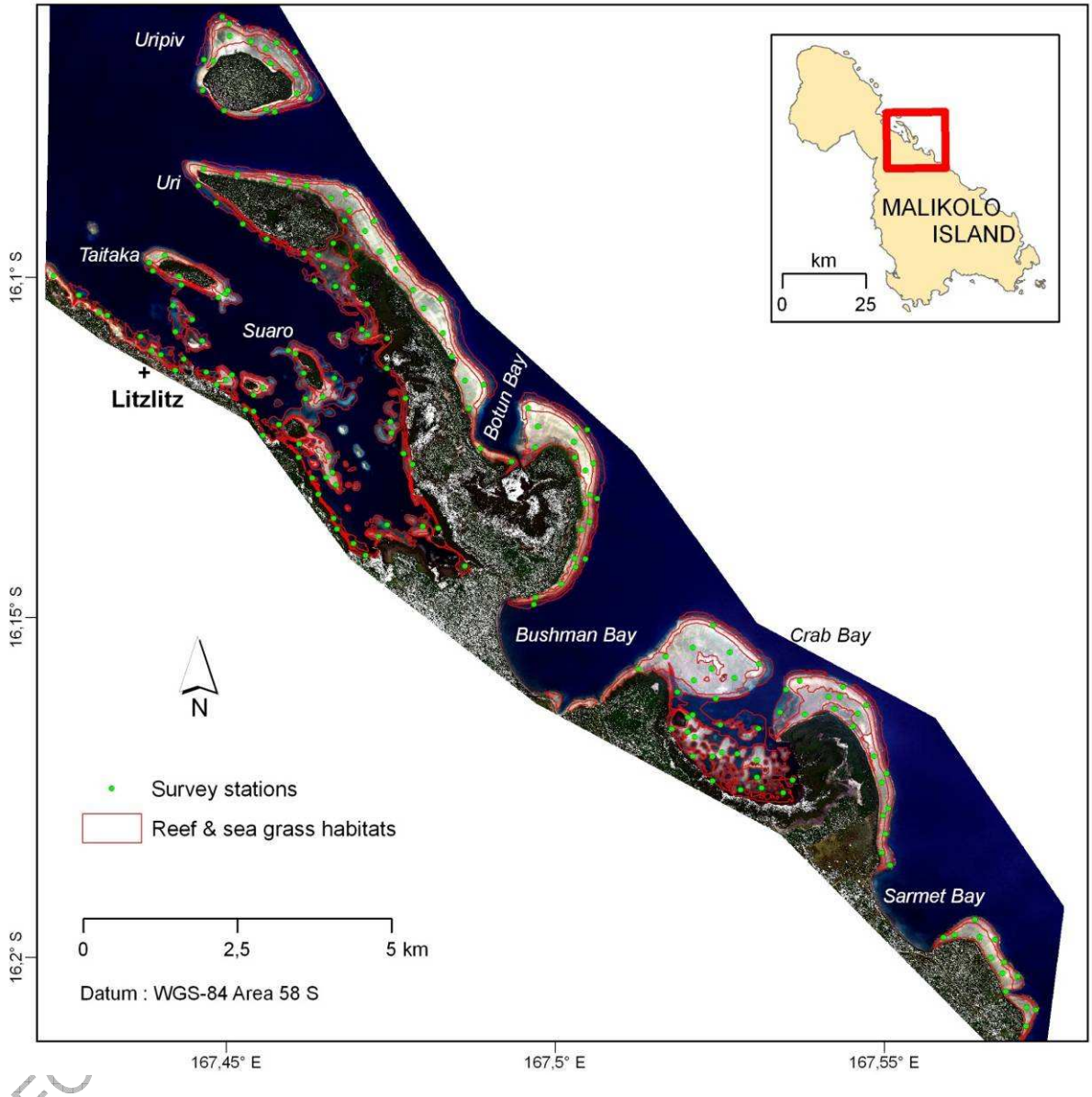

Figure 3. Map of North Malekula showing all 199 survey stations and 43 habitats.

C) North Efate – include Takara, Paunagisu, Pele and Emua: 3 Surveyors with 3 boats; 5 days of work (13-17 February 2011); 171 stations surveyed covering a total area of 14.7 km² (37 habitats).

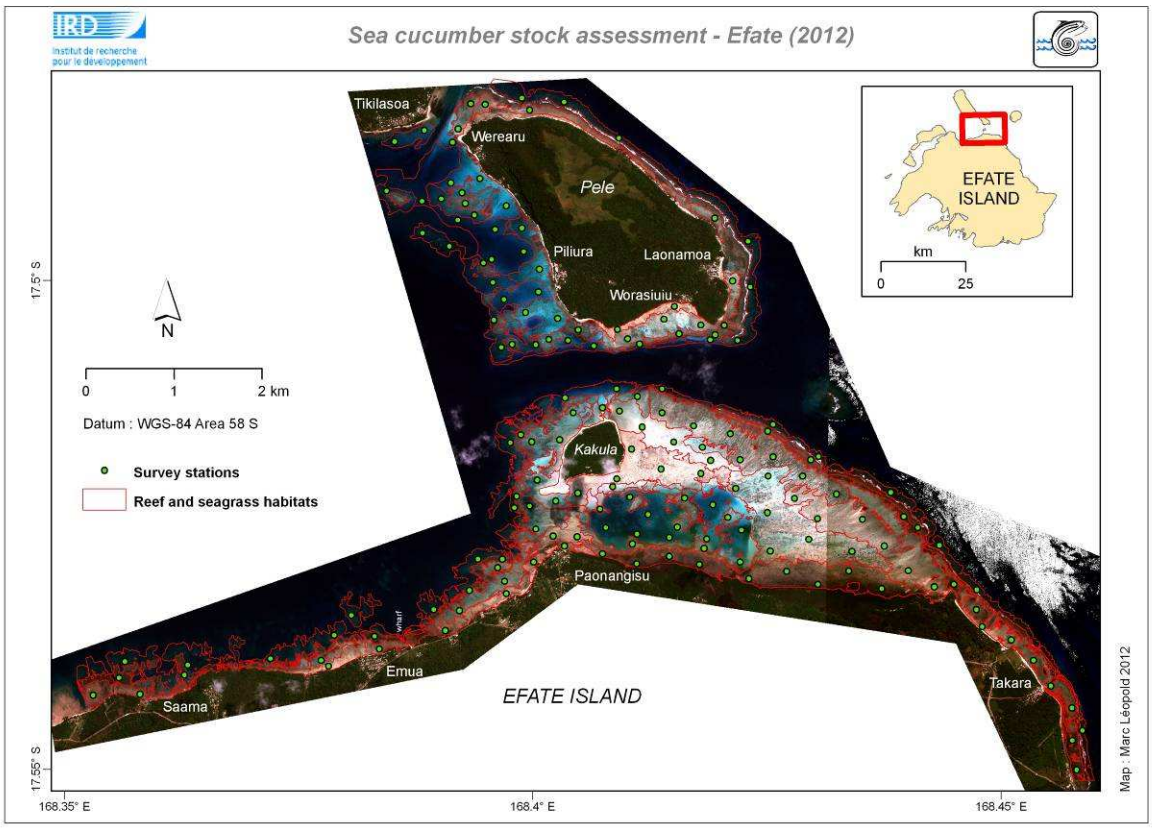

Figure 4. Map of North Efate showing all 171 survey stations and 37 habitats.

3.2 Survey Method

A single survey method was used in the three sites. It included walking, free diving and scuba diving. It is been adapted depending on depth and habitat in sample stations, using normal transect of 100 m length and 2 m width, and involving two observers (including one local observer). Transect lines were laid to ensure that the sample area is equal to 200 m². In each side of the transects, all sea cucumbers (17 species) were counted and measured (body length, nearest mm) in order to calculate individual weights and estimate their abundance and biomass in the whole survey areas.

5. DISCUSSION

All sea cucumber stock assessment data have been analyzed with given stock estimates for each species. Unsurprisingly species abundance varies greatly from one habitat to another. Some species tend to be more concentrated to one particular habitat while others distribute over range of habitats. **Overall there is low abundance (legal size) of the species surveyed in all survey sites**, North Malekula, South Malekula and North of Efate, **despite the national ban in 2008**.

This **slow recovery** of the resources may have likely resulted from :

- High fishing activities taking place over the past years before 2008 when the ban of harvest was enforced by Fisheries Department.
- Recruitment of juvenile sea cucumbers may be very low due to low number of mature sea cucumber (brood stock).
- The growth rate of juvenile of some species is very slow thus it takes more years to grow and develop into an adult.
- Ongoing illegal harvest of sea cucumber has been done during the ban period.

The 5 years ban on sea cucumber fisheries may then be too short to allow for recovery of stocks for all species expect Lollyfish (H.atra) in South Malikolo.

Lollyfish population showed a balanced size structure from young generation to older (<30cm). However only few individuals are measured above the legal size. Majority of Lollyfish measured from 9 – 25cm in body length (Figure 12) and were found in shallow waters along sea grass, mangrove and inner reefs, while the legal sized Lollyfish were found in deeper areas on the reef slope. The question is being raised whether both are same species or different species. The taxonomies are yet to confirm. Further query also rise on the legal size of Lollyfish that is been regulated in the Fisheries act. A study[3] has proven that the sexual maturity of a Lollyfish in Fiji is about 19 cm in body wet length. **This maturity size may be used to decrease the legal size of Lollyfish and allow reasonable harvest of this species in South Malikolo.**

For other species such as Tigerfish, Curryfish, Black teatfish and Prickly redfish, most individuals measured around or above the legal size. There were few young juveniles to sub-adults measured (= low recruitment) though survey designs may have biased our observations. **If the moratorium on sea cucumber is to be lifted, then all will be harvested leaving only few young to grow up to adults.** A given example: for Black teatfish (H.witmaei) in South Malekula, both total and legal sized conservative stock were 2 tones. This indicates that Black teatfish stocks are all above legal size.

Overall the result indicate that for all species surveyed in the three sites, stocks were heavily depleted and have not recovered. However Lollyfish (*H. atra*) is the only species that has a reasonable stock overall in South Malikolo.

[3] Seeto, J.1994. The reproductive biology of the sea cucumber Holothuria atra. PhD thesis.

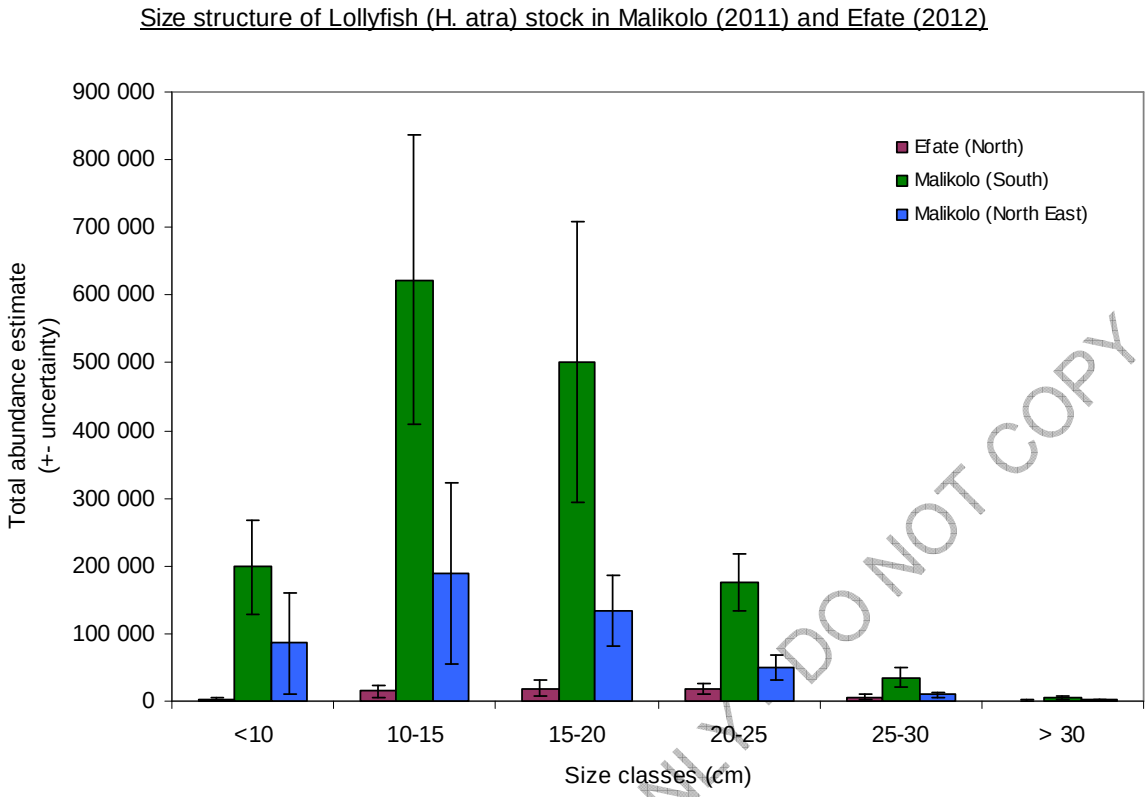

Figure 12. Size structure of Lollyfish (*H. atra*) in each survey site.

6. RECOMMENDATIONS

6.1 Management recommendations based on stock assessments in Malikolo and Efate :

1. The results from the surveys conducted in three fisheries and for 17 commercial species indicate that stock biomass and abundance greatly differ between sites and between species. **Therefore it is recommended that Vanuatu Sea Cucumber Management Plan should include site-specific and species-specific TAC (Total Allowable Catch) based on the conservative stock estimates** from the present survey. Such measures would allow for maintaining catch below overexploitation level.

2. Results show that all species surveyed are depleting except Lollyfish (*H. atra*) in South Malekula. **All sea cucumber fisheries in North Efate, in North Malekula, and in South Malekula (except Lollyfish *H.atra*) should be closed to fishing for another five years (2013-2017).** Another stock assessment should be conducted prior reopening to verify the increase in stock from previous assessment.

3. **The only fishery amongst the three survey sites that could be harvestable in 2013 is Lollyfish fishery in South Malekula if the moratorium is lifted.** However it is also suggested that a review should be made on the legal size (Fisheries Regulation) for this species to allow reasonable catches.

4. **A review of Vanuatu Regulation on legal sizes for sea cucumber species is also recommended** based on existing regulations in other countries in the Pacific (see Appendix 1 for a comparison between Vanuatu and New Caledonia minimum sizes).

6.2 Next steps forward…

1. **Inform** local communities, provincial government and other related agency on present results and recommendations.

2. Given the high differences in resource status across the three survey sites, it is recommended that **the moratorium should be extended in all Vanuatu sea cucumber fisheries as long as stocks have not been assessed and have not recovered**. Another remote fisheries should be surveyed before end of 2012 to complete BICHLAMAR results (ex. Aneityum & Banks/Torres).

3. Request SPC to **modify IRD Sea Cucumber database into a multi-species (main commercial species) and multi-sites data base**. It should all be transfer to English language.

4. **Future stock assessment for Vanuatu Fisheries Department should use only one methodology** to avoid confusion or duplication. Future training of VFD staff should be emphasized on data analysis and data management (including GIS).

7. PROJECT FINANCIAL SUMMERY

Table 3. Brief project expenditures

Activites / Items	Dates	Expenditures (VT)
Visit to New Caledonia	25th February- 4th March 2011	650 470
Stock Assessment Survey (Malekula 2 sites)	6th-18th september 2011	1 047 275
Stock Assessment Survey (North Efate)	13th-17th February 2012	172 000
Item Purchase (Satellite picture)	15th May 2011	226 983
TOTAL		**2 096 728**

Project Total Budget (VT)	**2 097 172**

Remaining Budget (VT)	**444**

8. REFERENCES

Friedman, K.,Pakoa, K., Kronen, M., Chapman,L., Sauna, S., Vgliola, L., Boblin, P., and Magron,F.2008 Vanuatu Country Report: Profile and Result from survey work at Paunagisu village, Moso Island, Uri and Urpive and Maskelynes Archipelago (July to December 2003).

Government of the Republic of Vanuatu. (2009). Fisheries Regulations Order no.28 of 2009. Republic of Vanuatu, Port Vila

Vanuatu Fisheries Department. (2008). Annual Report.

Seeto, J.1994. The reproductive biology of the sea cucumber *Holothuria atra* Jaeger, 1833 (Echinodermata: Holothuroidea) in Laucala Bay, Fiji, with notes on its population structure and symbiotic associations.

9. APPENDICES

Appendix 1: List of regulated sea cucumber species in Vanuatu and New Caledonia

Common name	Scientific name	WET Minimum length (cm)		DRY Minimum length (cm)	
		Vanuatu	New Caledonia	Vanuatu	New Caledonia
Black teatfish	*Holothuria whitmae*	22	30	10	16
White teatfish	*Holothuria fuscogilva*	35	35	15	16
Curryfish	*Stichopus hermani*	25	35	10	15
Sandfish	*Holothuria scabra*	22	20	10	10
Golden sandfish	*Holothuria scabra var. versicolor*	-	30	-	11
Lollyfish	*Holothuria atra*	30	-	15	-
Tigerfish	*Bohadschia argus*	20	-	10	-
Brown sandfish	*Bohadschia vitiensis*	20	-	10	-
Chalkfish	*Bohadschia similis*	-	-	-	-
Pinkfish	*Holothuria edulis*	25	-	10	-
Greenfish	*Stichopus chloronotus*	20	-	10	-
Prickly redfish	*Thelenota ananas*	32	45	15	20
Surf redfish	*Actinopyga mauritiana*	20	25	9	12
Hairy blackfish	*Actinopyga milliaris*	-	25	-	12

Appendix 2: List of activities carried it out in Koné, New Caledonia in 2011

Dates	Activities
25th February 2011	- Arrival in New Caledonia
26th March 2011	- Sort out travelling arrangement for Kone, Northern Province - Met with Province North Fisheries Authorities for briefing in Noumea New Caledonia
27th February 2011	- Travel to Northern Province to Koné
28thFebruary 2011	- Met up with local community in Boyen in Kone. A brief introduction by each participant from Vanuatu regarding the trip to Koné. - Discuss sea cucumber stock assessment survey with local community, IRD expert, Province North fisheries authorities and Wild life care Rangers of Northern Province - Preparation of materials, gears and GPS to be use in the stock assessment - Vanuatu participants separated and team up each community fisher with Northern Province fisheries officer and Rangers for stock assessment. - Boat preparation.
1st March 2011	- First day of stock assessment - 7 team of three people asses areas assign by IRD expert - Assessment carried out using boat, transect lines, ruler, pencil and underwater paper sheet to record counting and measurement of sea cucumber - Each team was assigned to locate their area of survey using GPS and Satellite Maps. - Each team has surveyed 7-8 stations
2nd March 2011	- Second day of stock assessment - 7 team of three people asses areas assign by IRD expert - Assessment carried out using boat; transect lines and ruler, pencil and underwater paper sheet to record counting and measurement of Sea cucumber - Each team was assign to locate their area of survey using GPS and Satellite Maps. - A total area survey is around 16km²
3rd March 2011	- All data collected from stock assessment were analysed in Access Database by IRD Expert - Basic data entry by participant in Database - Data was presented to the local community - Discussion of data regards the status of stock in Boyen - A harvest quota was set for the community of Boyen.
4th March 2011	- Departure to Vanuatu