

<October, 2014>

# Pilot Project for FAD Fishery Development and Management in Vanuatu



**Project for Promotion of Grace of the Seas for Coastal Villages  
in Vanuatu, Phase 2**

**Vanuatu Fisheries Department / JICA / IC Net**

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# 1.1. Main issues related to fishing activities (2012 when Project started)

- Tendency of high fishing pressure on reef resources
- Not enough use of other resources, such as pelagic species
- Limited number of fishers/fishing boats accessing pelagic species
- Limited type of fishing gears and methods being available



## Countermeasures

Promote diversification of fisheries for fishing communities/artisanal fishers is indispensable, in order to reduce fishing pressure on reef resources

## One approach (option) to the materialization of the basic concept

- Community-based FAD fisheries development and management approach (option)

## 1.2. Issues of FAD in Vanuatu (2012 when Project started)

### ✓ **Technical Issues;**

- (1) Short life span of FAD
- (2) High cost of FAD materials
- (3) Difficulty for deployment by artisanal boat

FAD is not much known among artisanal fishers

### ✓ **Management Issues;**

- (1) No sustainable FAD deployment/management plan by communities
- (2) Lack of regular maintenance activities by communities (users)
- (3) Lack of cost and profit data

FAD fishing is not sustainable for artisanal fishers



Promotion of economic/efficient FAD development for artisanal fishers/fishing boats

Promotion of community-based sustainable FAD fisheries development and management

## 1.3.1. Outline of Pilot Project

**Pilot Project Title:**

Pilot Project for Community-based FAD fishery development and management

**Project Period:**

Sep 2012 – Sep 2014 (2 years)

**Target Area:**

- 1) NW Efate, Lelema (Lelepa and Mangaliliu Sunae & Tasiriki communities)
- 2) Central E. Malekula (Uripiv and Mapes AKTE communities)
- 3) Aneityum (Analcauhat, Port Patrick and Umeji communities)

**Target Group:**

Fishers/Community-based Fishers Organization in the target areas

# 1.3.2. Outline of Pilot Project

## Target Communities in 3 project sites

B. Middle East of Malakula Island

Sixteen (16) communities around Crab Bay area and Uri/Uripiv Island



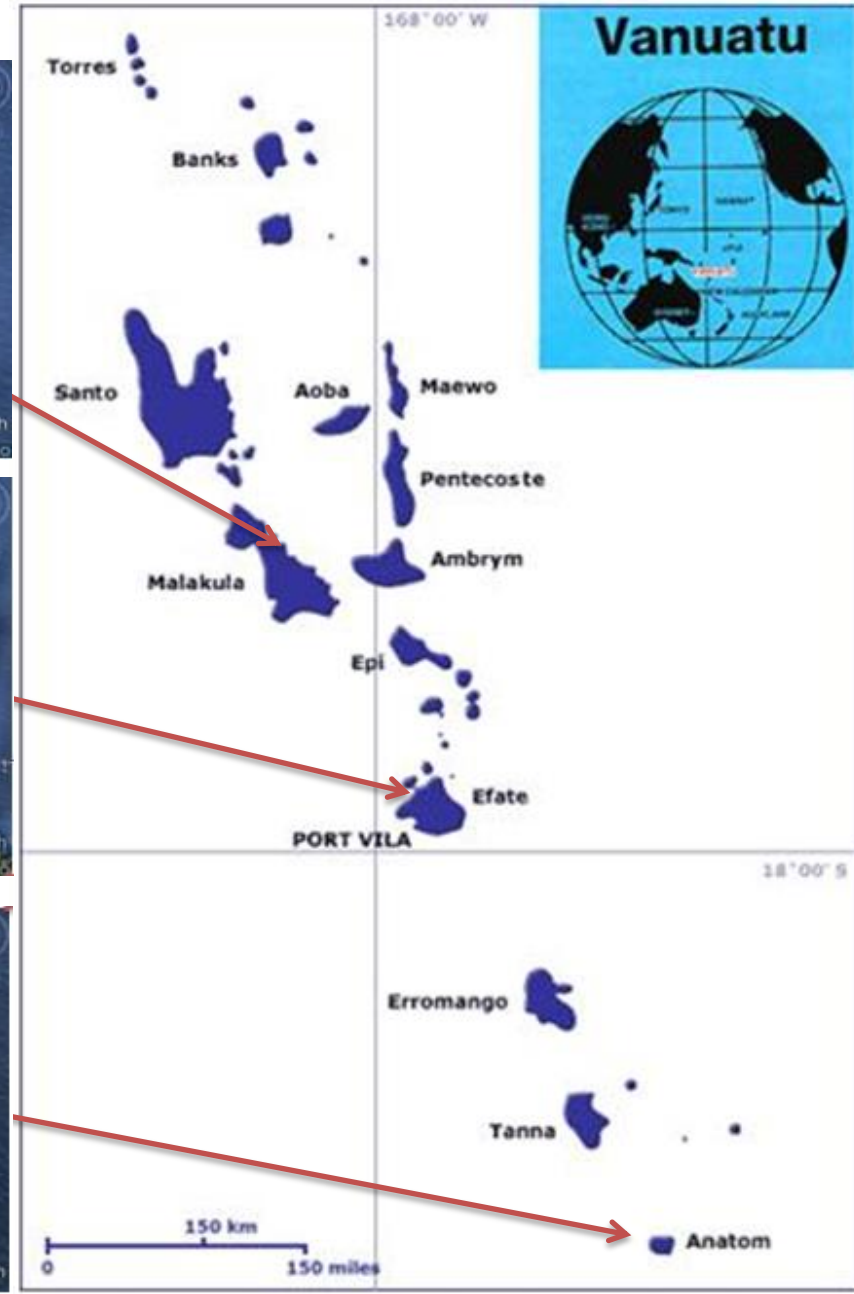
A. North West of Efate Island

Four (4) communities around Lelepa, Moso islands



C. Aneityum Island

Three (3) communities utilizing Mystery Island



# 1.3.3. Outline of Pilot Project

## **Overall goal**

Pelagic species are well utilized and managed through community-based FAD fishery development and management, and the income provided by the pelagic fishery eases the fishing pressure on reef and inshore fisheries resources

## **Project purpose**

The economical and technical viability of community-based FAD fishery development and management are examined and a model for coastal fishery resource management with the community-based sustainable FAD fishery development and management is established

## **Outputs**

- 1) Improved capability of FAD and associated pelagic fishery resource management on the part of the fisheries officers and fishers/community-based fishers organizations
- 2) Increased productive outputs of FAD and associated pelagic fishery resource by developing the skills and capacity to utilize potential species

## 1.3.4. Outline of Pilot Project

### **Output 1.**

Improved capability of FAD and associated pelagic fishery resource management on the part of the fisheries officers and fishers/community-based fishers organizations

### **Activities.**

- 1.1. Conduct Consultation meeting with fishers in the target communities
- 1.2. Establish FAD management committee in the target communities
- 1.3. Produce draft FAD fishery management guideline in the respective target communities
- 1.4. Produce one year Action Plan on FAD fishery management and development
- 1.5. Review and modify the one year Action Plan
- 1.6. Review and finalize the FAD fishery management guideline
- 1.7. Review and reorganize the respective FAD management committee



## 1.3.5. Outline of Pilot Project

### **Output 2.**

Increased productive outputs of FAD and associated pelagic fishery resource by developing the skills and capacity to utilize potential species

### **Activities**

- 2.1. Conduct Baseline survey on FAD and fishing/fishing ground
- 2.2. Modify the existing FAD design
- 2.3. Construct and Deploy the Modified FAD
- 2.4. Monitor and evaluate performance of the modified FAD
- 2.5. Improve the modified FAD
- 2.6. Introduce and improve Fishing gears and technology around FAD
- 2.7. Monitor and evaluate performance of the improved fishing around FAD

# 1.4. Schedule of implemented workshops for FAD Fishery

Name of WS	Period	Number of Participants (Venue)	Main Subjects	Remarks
<b>Baseline survey Workshop (WS)</b>	May-Jun 2012	Lelema: 6+ Malekula: 8+ Aneityum 13	<ul style="list-style-type: none"> <li>• Baseline survey on FAD and fishing ground</li> <li>• Consultation meeting with the target communities</li> </ul>	
<b>1<sup>st</sup> FAD Fishery WS</b>	19-23 Nov 3-7 Dec 12-17 Dec 2012	Lelema: 14+ Malekula:18 Aneityum:15	<ul style="list-style-type: none"> <li>• Modification of FAD design</li> <li>• Construction of Modified FAD</li> <li>• Deployment of Modified FAD</li> <li>• Draft guideline and Action plan making workshop</li> </ul>	<ul style="list-style-type: none"> <li>• Shallow water FAD</li> <li>• Deep water FAD</li> </ul>
<b>2<sup>nd</sup> FAD Fishery WS</b>	27-31 May 10-14 Jun 19-26 Jun 2013	Lelema: 31 Malekula: 13 Aneityum: 26	<ul style="list-style-type: none"> <li>• Review of FAD and FAD fishing</li> <li>• Modification of FAD Head and Appendage parts</li> <li>• Troll Fishing Gears for different layers around FAD</li> <li>• Basic knowledge of GPS</li> <li>• Review/modification of Action Plan</li> </ul>	<ul style="list-style-type: none"> <li>• Modification of Head</li> </ul>
<b>3<sup>rd</sup> FAD Fishery WS</b>	28 Oct- 1Nov 11-15 Nov 25-29 Nov 2013	Lelema: 27 Malekula:23 Aneityum: 20	<ul style="list-style-type: none"> <li>• Bottom-set vertical longline</li> <li>• Drop line fishing</li> <li>• Diamondback squid (DBS) fishing</li> <li>• Review/Modification of Action Plan</li> </ul>	<ul style="list-style-type: none"> <li>• Modified shabashaba</li> <li>• 1<sup>st</sup> DBS being caught in Vanuatu</li> </ul>
<b>Follow-up WS on FAD Fishery</b>	5-7 Feb 10-12 Feb 21-25 Feb 2014	Aneityum: 16 Malekula: 18 Lelepa: 26	<ul style="list-style-type: none"> <li>• Feedback about the introduced fishing gears</li> <li>• Review of FAD maintenance work</li> <li>• Review of Action plan and discussion of future plan</li> </ul>	

## 2. Activities and Achievements

### 2.1. Results of Baseline Survey

#### 2.1.1. Fishing calendar and fishing ground information in pilot project sites (Lelepa and Managaliu)

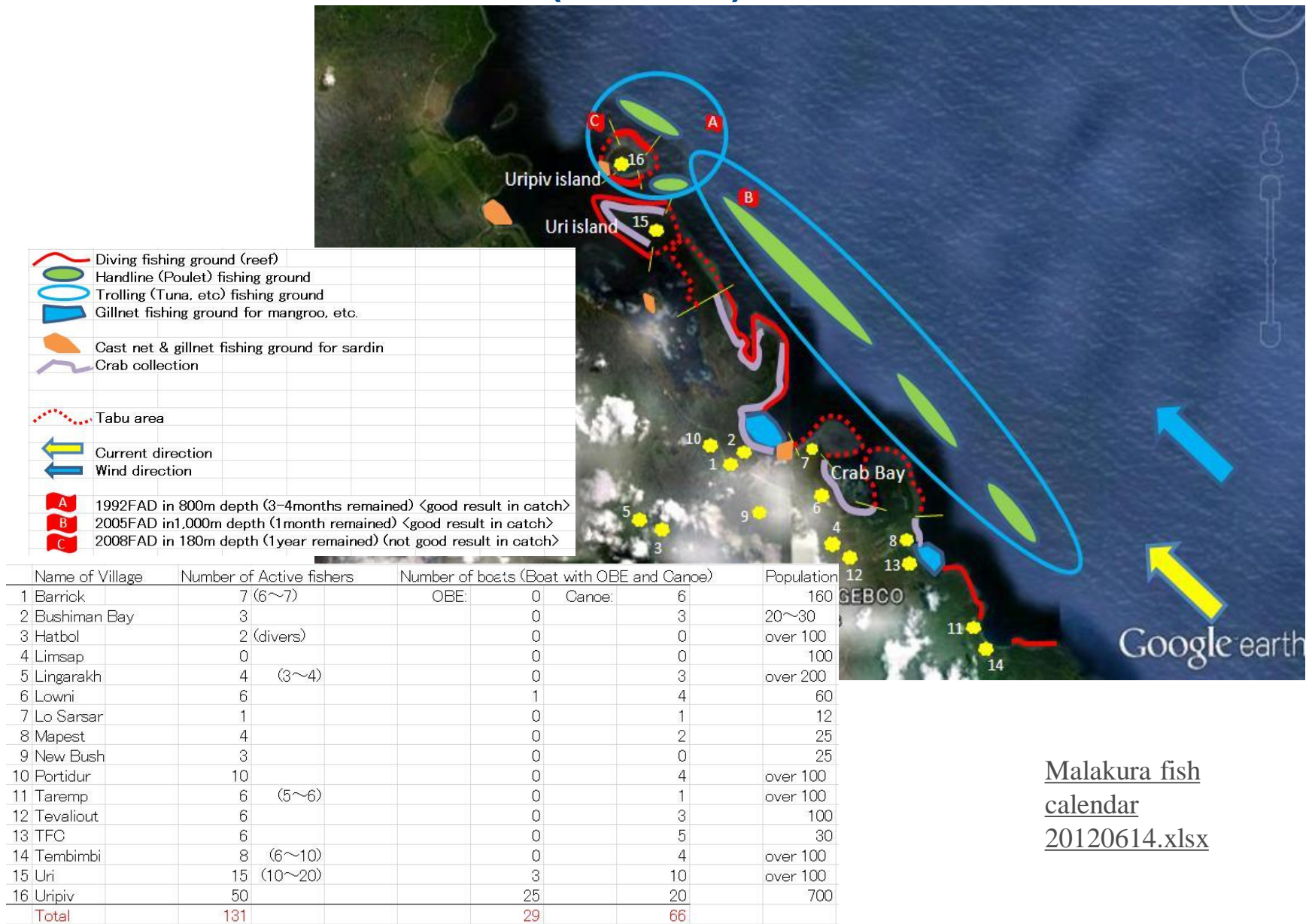


Lelepa			
Number of fishers:	60 (30 + 30 divers)		
Number of boats:	11 OBE boats		
	more than 20 canoes		

Mangaliu			
Number of fishers:	29		
Number of boats:	5 OBE boats (1 community owned canoe)		
	10 canoes (including 3 larger size canoes for 3)		

# 2.1. Results of Baseline Survey

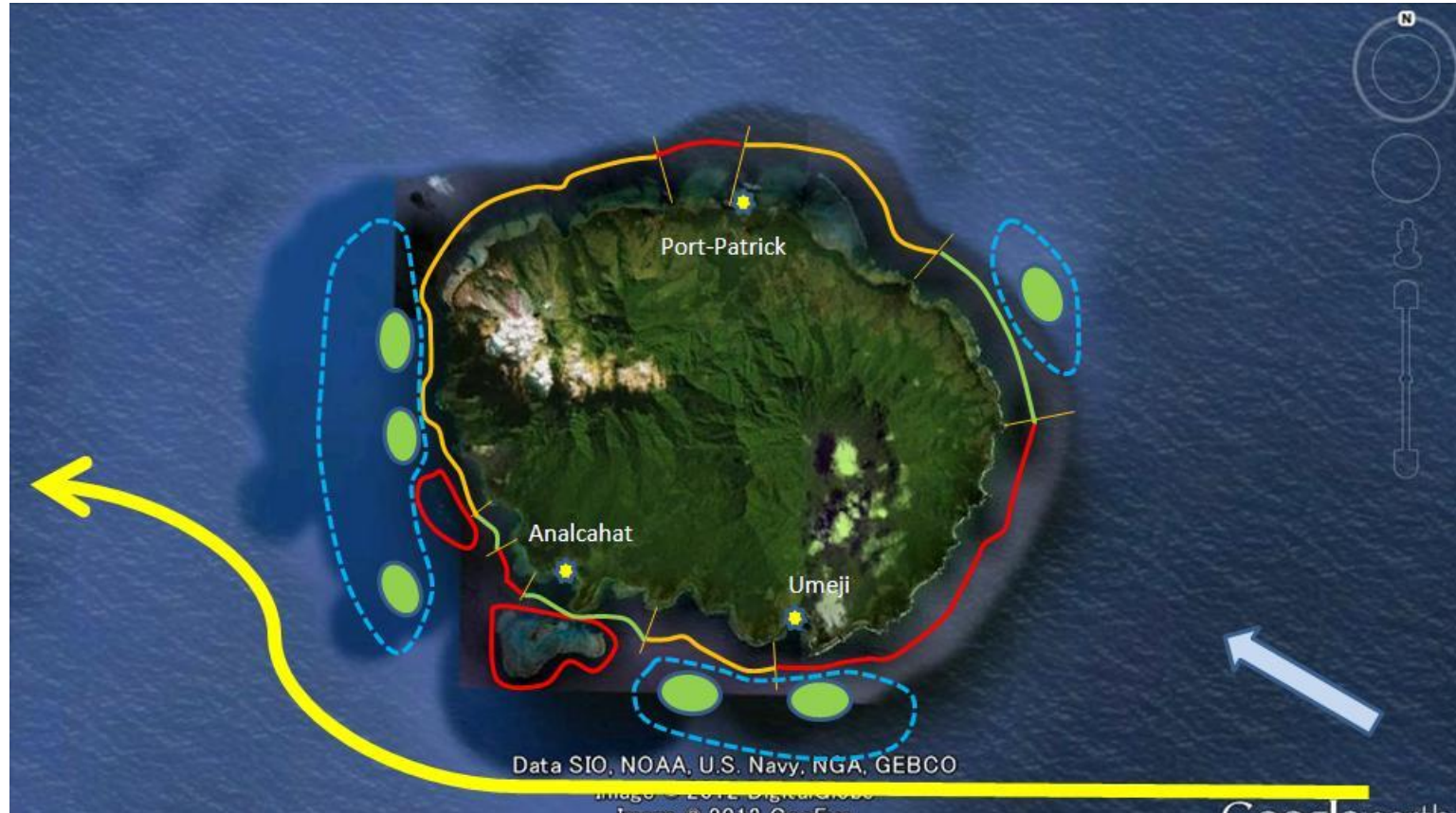
## 2.1.2. Fishing calendar and fishing ground information in pilot project sites (Malakula)



Malakura fish calendar  
20120614.xlsx

# 2.1. Results of Baseline Survey

## 2.1.3. Fishing calendar and fishing ground information in pilot project sites (Aneityum)



Aneityum	
Name of Villages	Number of boat
Analcahat	7 OBE boats (FRP & Alminum), 8 traditional canoes
Umeji	1 OBE boat, some traditional canoes
Port-Patrick	5 OBE boat, some traditional canoes

	Poulet fishing ground
	Trolling fishing ground
	Lobster fishing ground
	Fully closed area
	Seasonally closed area
	Open area
	Wind direction
	Current direction

[Aneityum fish calendar 24 May 2012.xlsx](#)

## 2.2. Introduction of Modified FAD

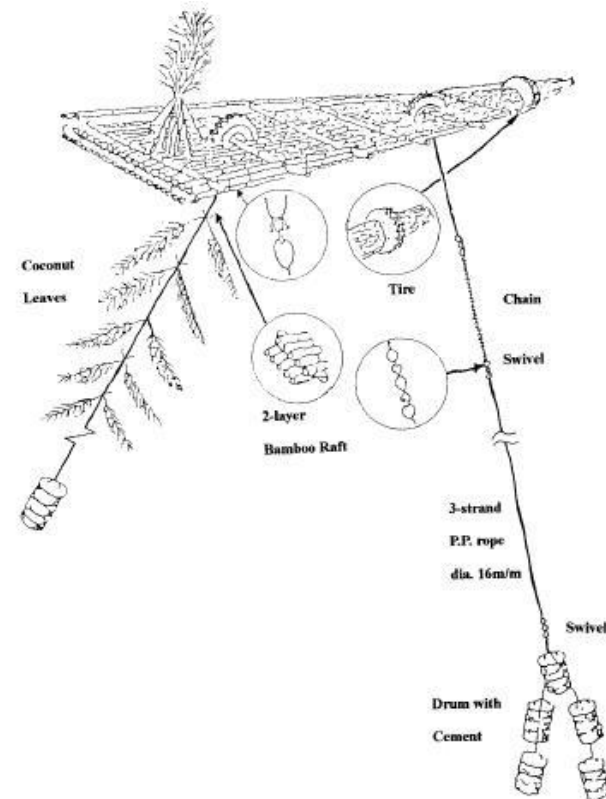
### 2.2.1. Principle of FAD

#### *What is FAD?*

#### **Definition of FAD;**

A fish aggregating (or aggregation) device (FAD) is a man-made object used to attract ocean going pelagic fish such as marlin, tuna, skipjack and dolphin fish. They usually consist of buoys or floats moored to the ocean floor with concrete blocks (anchors).

FAD, Fish Aggregation Device, is well known as “*Payaw*” in the countries of Southeast Asia where it may have originated.



## 2.2. Introduction of Modified FAD

### 2.2.1. Principle of FAD

#### *Why fish gather around FAD?*

FAD works basically on three (3) biological principles as follows;

- a) Food chain or prey-predator relationship
- b) Sheltering or harboring behavior of fish/ tendency of fish to gather around and follow large floating objects like logs
- c) Photo-tactic reaction of fish (the movement of fish toward or away from a source of light)

Other suggested explanations for fish behavior toward FAD are as follows;

- d) The smell from floating objects attracts fish
- e) The floating objects and the anchoring rope produce sounds when moving current, waves and swell. These sounds encourage fish to gather around them
- f) Spawning fish gather to lay eggs on floating objects
- g) Some fish gather around floating objects in order to form schools and consider floating objects as members of their school

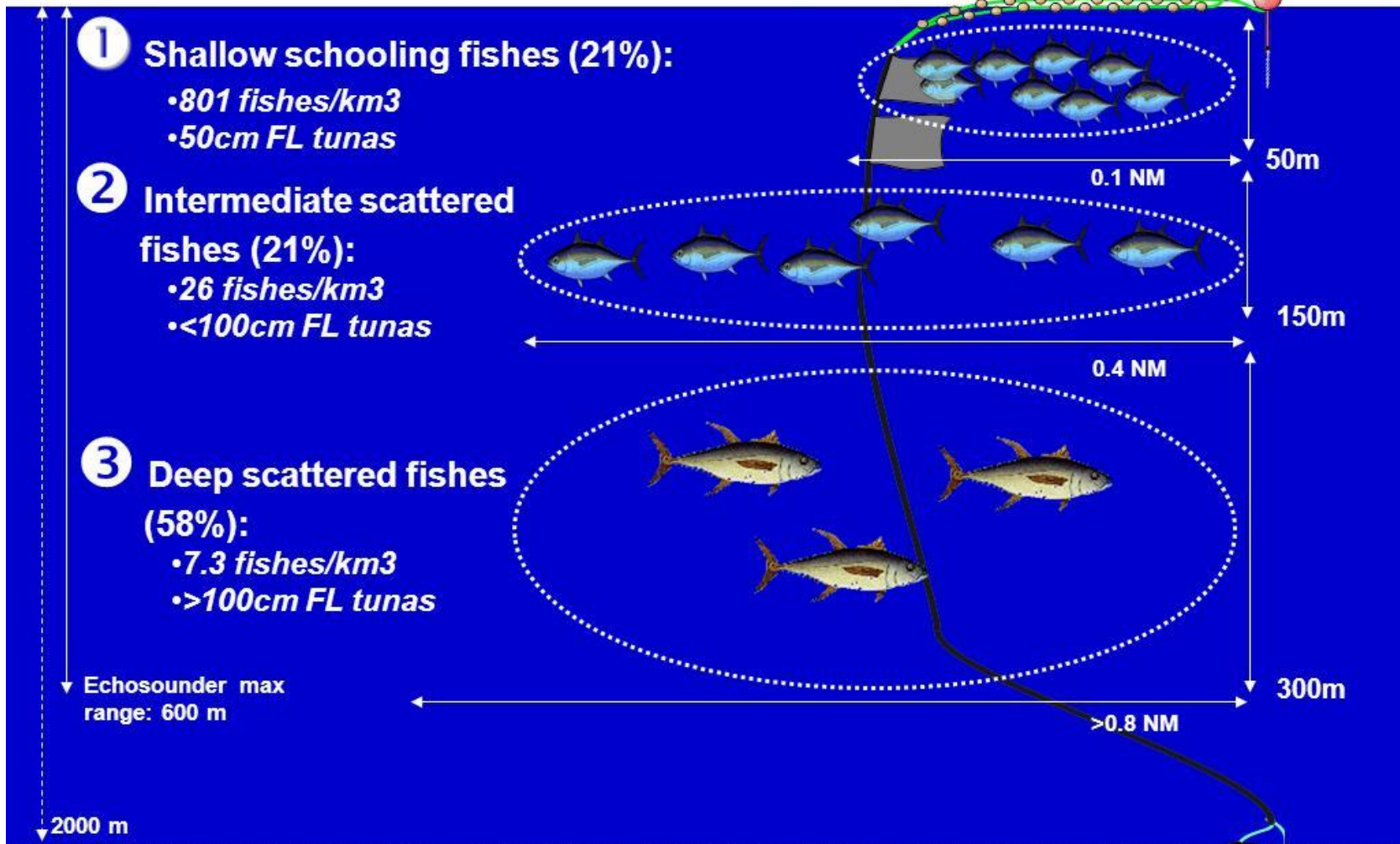
## 2.2. Introduction of Modified FAD

### 2.2.1. Principle of FAD

*How fish gather around FAD?*

Ifremer

### *Typology of fishes aggregations around moored FADs in French Polynesia (ECOTAP)*





## 2.2. Introduction of Modified FAD

### 2.2.1. Principle of FAD

#### *Some visible benefits of FADs*

- 1) Diversification of fishery
- 2) Increased landings
- 3) Cost and effort savings
- 4) Eases pressure on reef fish population
- 5) Encourage greater collaboration among fishers

#### *Some problems associated with FADs*

- 1) Potential of user rights conflict
- 2) Vandalism
- 3) Low usage opportunities in rough seas and strong currents condition
- 4) Requires some technology improvement
- 5) Daily check and regular maintenance by FAD users being required

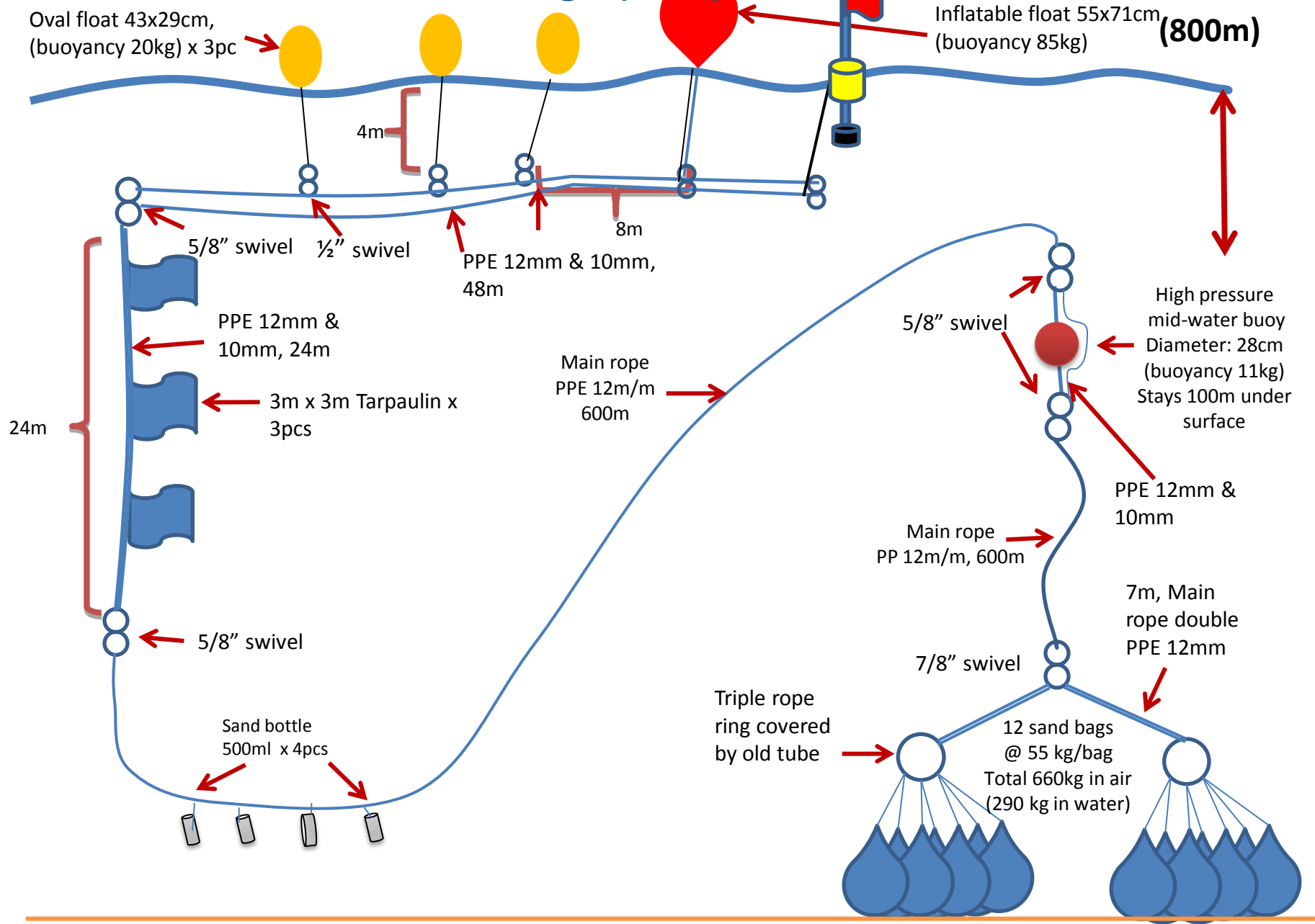
## 2.2. Introduction of Modified FAD

### 2.2.2. Modification of FAD design

*SPC designed FAD*



# 2.2.2. Modification of FAD design (2012)

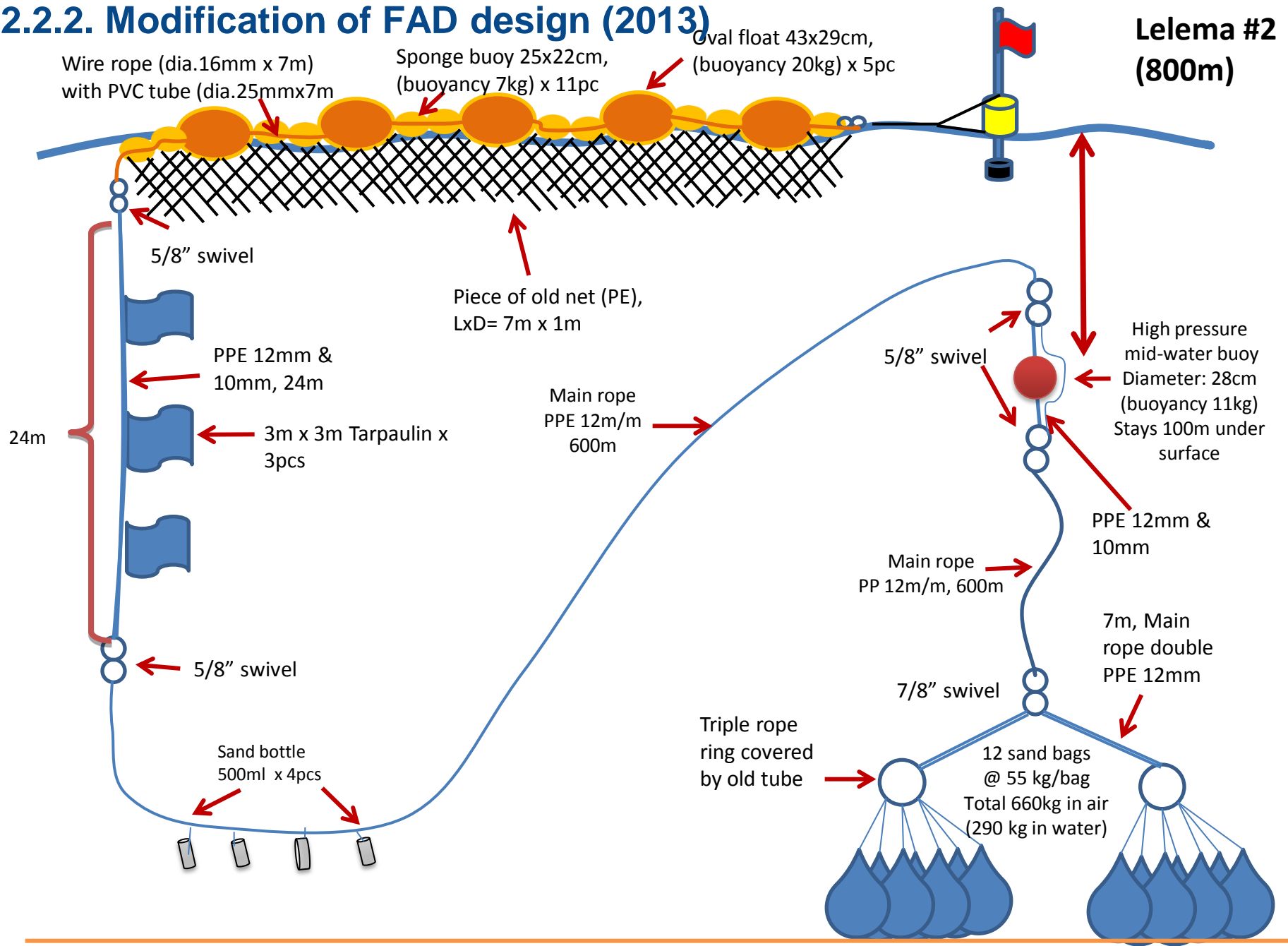


## 2.2.2. Modification of FAD design (2012)

### Material List for FAD in 1,000m depth (1)

No.	Item	Description	QTY	Unit price	Price(US\$)	Remarks	Buoyancy	Sinking force
1	Polyform float	A-4, 55x71cm, buoyancy 85kg (red)	1	75	75	Inflatable buoy	85kg	
2	Oval float	30G-2 ABS 200m, 437mmx290mm+40mmHole, buoyancy 20kg (yellow)	5	28.6	143	Head parts	100kg (20x5)	
3	Swivel	Galvanized Eye&eye swivel 1/2", 0.64kg/pc	6	13.5	81	for floats		3.3kg (0.64x6x0.87)
4	Tarpaulin	2.2mx1.7m	7	10	70	appendages		
5	Duradan PPE rope	12mm/dia x 250m/coil, 16.5kg/coil, breaking load 2,654kg (green)	1,000	0.37	370	main rope for FAD, 4coils	3.6kg [16.5x(1/0.93-1)x3]	
6	Sand bottle	500ml plastic bottle with sand	6	0	0	sinkers for rope		1.3kg (0.5x6x0.44)
7	Duradan PPE rope	12mm/dia x 250m/coil, 11.9kg/coil, breaking load 2,654kg (green)	750	0.37	277.5	main rope for FAD, 3coils	3.6kg [16.5x(1/0.93-1)x3]	
8	Swivel	Galvanized Eyw&eye swivel 5/8", 1.2kg/pc	4	21	84	for appendages & mid-water buoy		4.1kg (1.2x4X0.87)
9	Pressure float	ABS float, 10b-8, dia x hole: 290 x 28mm, buoyancy 11,000g, water resist 800m	1	96	96	High pressure type, mid-water buoy for FAD	11kg	
10	Swivel	Galvanized Eye&eye swivel 7/8", 2.9kg/pc	1	42	42	for anchor part		2.5kg (2.9x1x0.87)
11	Sand bag	Synthetic bag 550x850mm (for 60kg)	16	3.5	56	55kg sand/bag as FAD anchor		387kg (55x16x0.44)
						Total	202.3kg	398.2kg
	Duradan PPE rope	4mm/dia x 500m/coil, breaking load 338kg (green)	250	0.06	15	working rope	1/2coil	
	Garden hose		20		0	for rope reinforcement		
	Tyre tube		2		0	for rope reinforcement		
				US\$	1309.5			

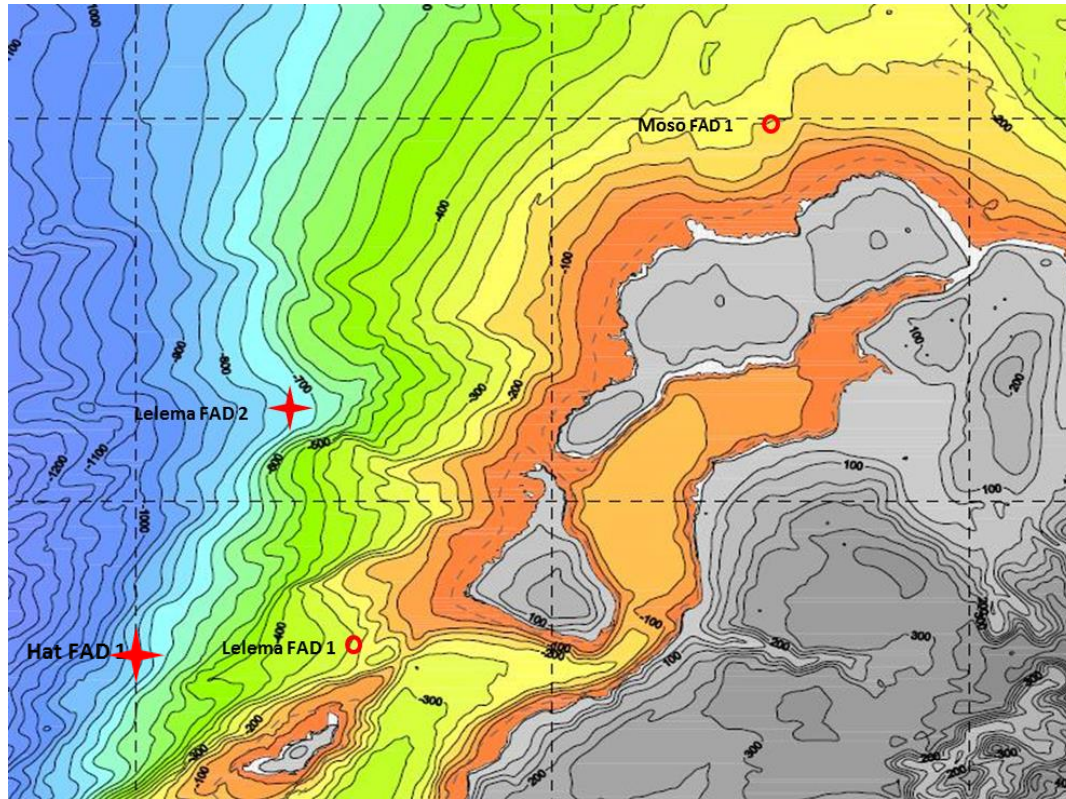
## 2.2.2. Modification of FAD design (2013)



## 2.2.2 . Modification of FAD design Deployment of Modified FAD



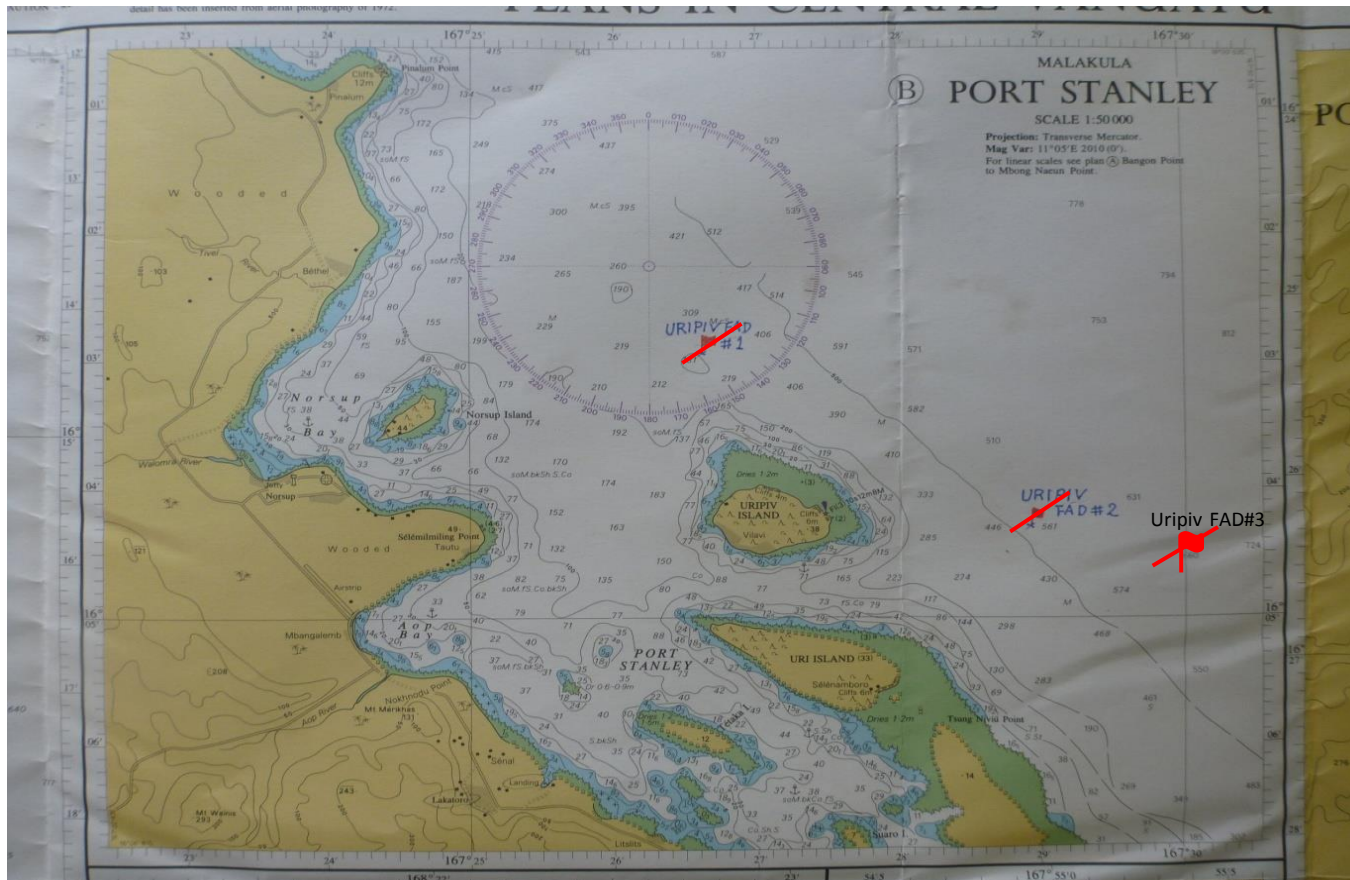
## 2.2.3. Latest Information on FADs in NW Efate



(Revised on Oct 2013)

FAD ID	Coordinate (Anchor position)	Coordinate (Flag position)	Depth of Water	Distance	Date of Deployment	Remarks
Lelema FAD 1	S 17° 36.823 E168° 09.752	S 17° 37.030 E168° 09.965	314m	2.5NM NW off Mangaliliu landing site	2012/Nov/21	Lost
Moso FAD 1	S 17° 29.797 E168° 15.679	S 17° 29.811 E168° 15.544	189m	3NM N off Sandy beach, offshore- side, middle of Moso island	2012/Nov/21	Lost
Lelema FAD 2	S 17° 33.135 E168° 09.359	S 17° 33.842 E168° 09.583	730m	4.5NM NNW off Lelema FAD 1	2013/May/31	FAD head part was replaced on 19/Nov/2013
Hat FAD 1	S 17° 36.379 E168° 07.575	S 17° . E168° .	800m	5.28km off Hat Island	2013/Oct/10	FAD head has new design

## 2.2.3. Latest Information on FADs in Malakula

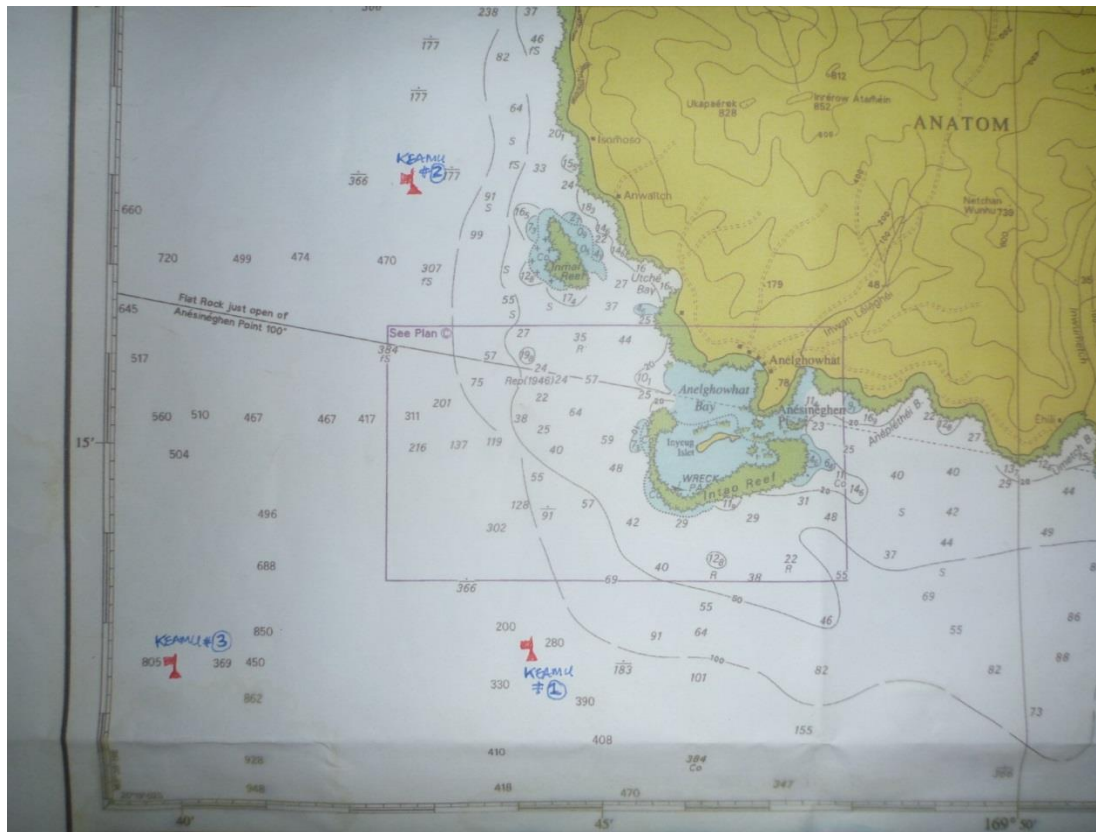


(Revised on Oct 2013)

FAD ID	Coordinate (Anchor position)	Coordinate (Flag position)	Depth of Water	Distance	Date of Deployment	Lost Date
Uripiv FAD #1	S 16° 03.012 E167° 26.792	S 16° 37.030 E167° 09.965	200m	1NM NNW off Uripiv island, 2.1NM NNE off Lakatoro landing site	2012/Dec/05	2012/Jan
Uripiv FAD #2	S 16° 03.999 E167° 28.732	S 16° 29.811 E167° 15.544	550m	1.2NM E off light house in Uripiv island, 3.8NM NE off Lakatoro landing site	2012/Dec/05	2013/May
Uripiv FAD #3	S 16° 04.536 E167° 30.157	S 16° 04.600 E167° 30.000	660m	2.2NM E off light house in Uripiv island	2013/June/14	2013/Oct



## 2.2.3. Latest Information on FADs in Aneityum



(Revised on Nov 2013)

FAD ID	Coordinate (Anchor position)	Coordinate (Flag position)	Depth of Water	Distance	Date of Deployment	Maintenance (date)
Keamu FAD #1	S 20° 16.822	S 20° 16.844	350m	2.5NM SW off Mystery island, 3,7 NM SW off Anelcauhat landing site	2012/Dec/14	The head part was replaced (20/Jun/2013 & 28/Nov/2013)
	E169° 44.164	E169° 43.945				
Keamu FAD #2	S 20° 11.523	S 20° 11.601	270m	2NM W off nearest coast line, 4.7 NM NW off Anelcauhat landing site	2012/Dec/13	The head part was replaced (21/Jun/2013)
	E169° 42.665	E169° 42.636				
Keamu FAD #3	S 20° 17.488	S 20° 17.500	805m	3NM W of Keam #2, 7.5 NM SW off Anelcauhat landing site	2012/Jun/25	The head part was replaced (2013/Nov/29)
	E169° 40.052	E169° 40.510				

## **2.2.3. Latest Information on FADs in other areas**

## **2.2.3. Latest Information on FADs**

### **Analysis of Catch Data around FADs**

## 2.3. Management of FAD by Community-based Fishers Organization

### 2.3.1. FAD fishery Management Guideline & Committee members

- 1) Lelema: [NW Efate FAD Management Guidline \(final\).pdf](#)
- 2) Malekula: [Malekula FAD Management Guidline \(final\).pdf](#)
- 3) Aneityum: [Aneityum FAD Management Guidline \(final\).pdf](#)

### 2.3.2. Action Plan

- 1) Lelema: [20140225 Lelema Modified one year action plan.docx](#)
- 2) Malekula: [20140212 Malekula Modified One year Action Plan.doc](#)
- 3) Aneityum: [20140207 Aneityum FAD Mng Committee One year Action Plan.doc](#)



## 2.4. Introduction of Fishing Gears and Technology

### 2.4.1. Surface Splashing Trolling Devices



Surface- plane device

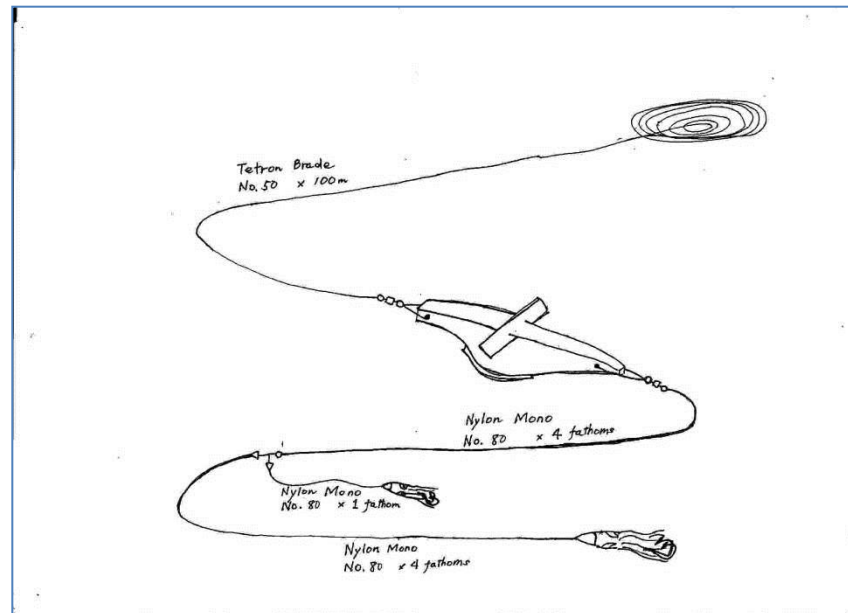


Trolling rabbit device



These gears send out the sound and splash water in the surface of the sea

Fishes are attracted by the function of these gear and come to bite the artificial bait by mistake



## 2.4. Introduction of Fishing Gears and Technology

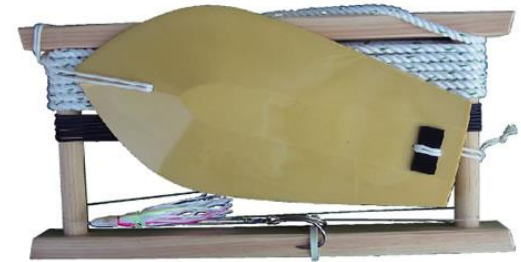
### 2.4.2. Mid-water Trolling Gear



Bishi namari



Hime-trolling lead



Diving board

- ✓ Bishi namari can work under the water by a series of lead which were attached to the main line
- ✓ Hime-trolling lead keeps the main line under the water
- ✓ Diving board keeps the main line under the water and makes attractive movement for the bait

## 2.4. Introduction of Fishing Gears and Technology

### 2.4.2. Trolling Gear



## 2.4. Introduction of Fishing Gears and Technology

### 2.4.2. Trolling Gear

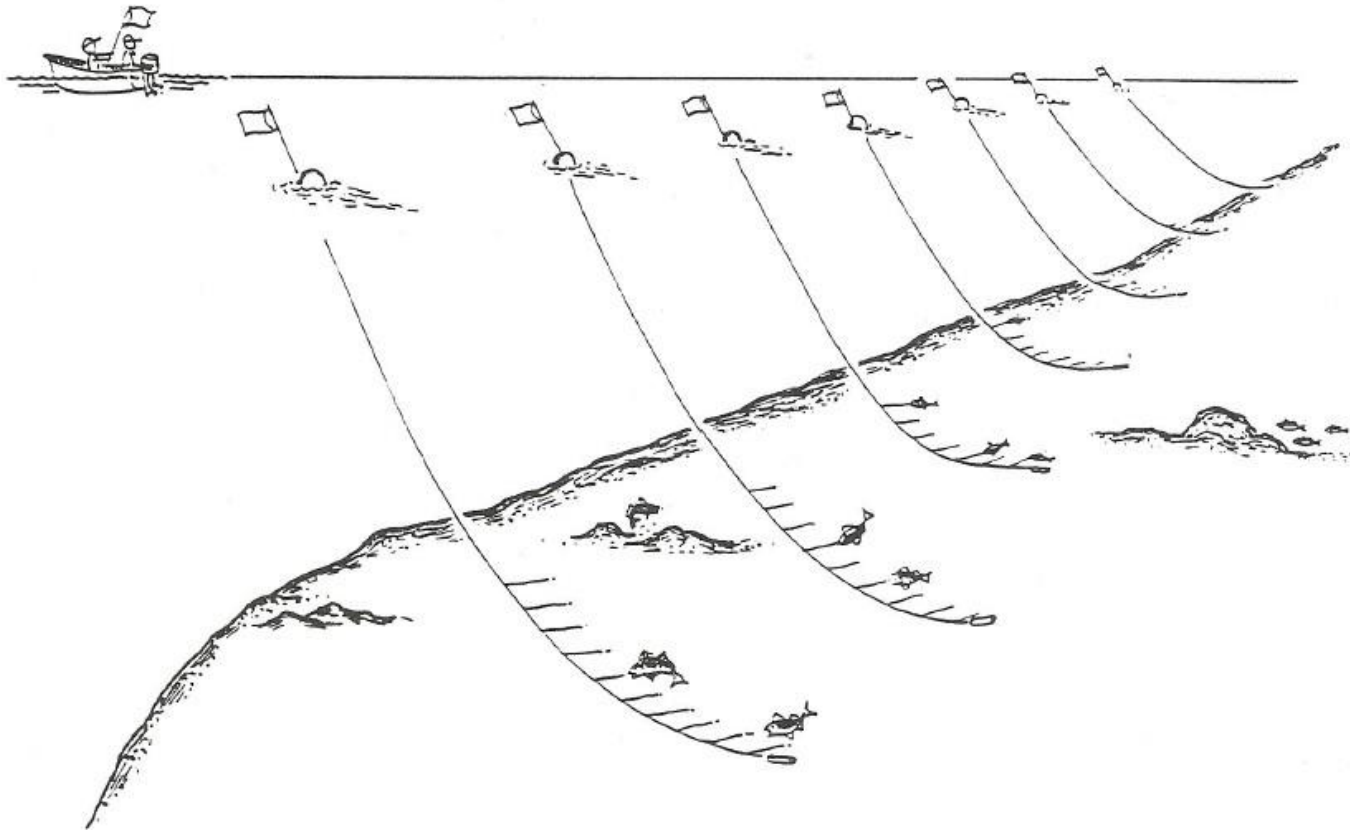




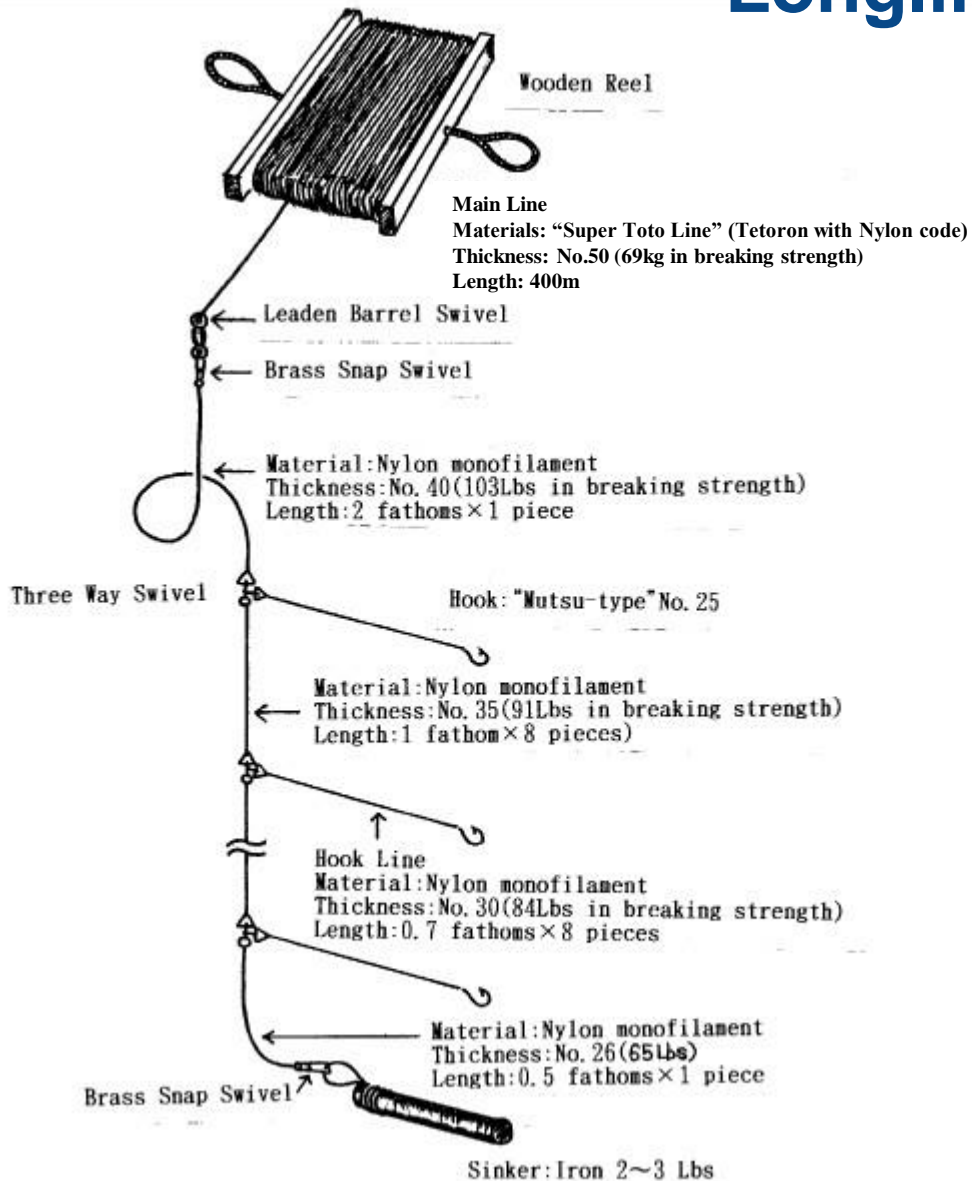
## 2.4. Introduction of Fishing Gears and Technology

### 2.4.3. Bottom-set Vertical Longline fishing

**Bottom-set vertical longline**, which targets demersals, such as red fish and grouper, from the bottom to midway in the water layers.



## 2.4.3. Structure of Bottom-set Vertical Longline



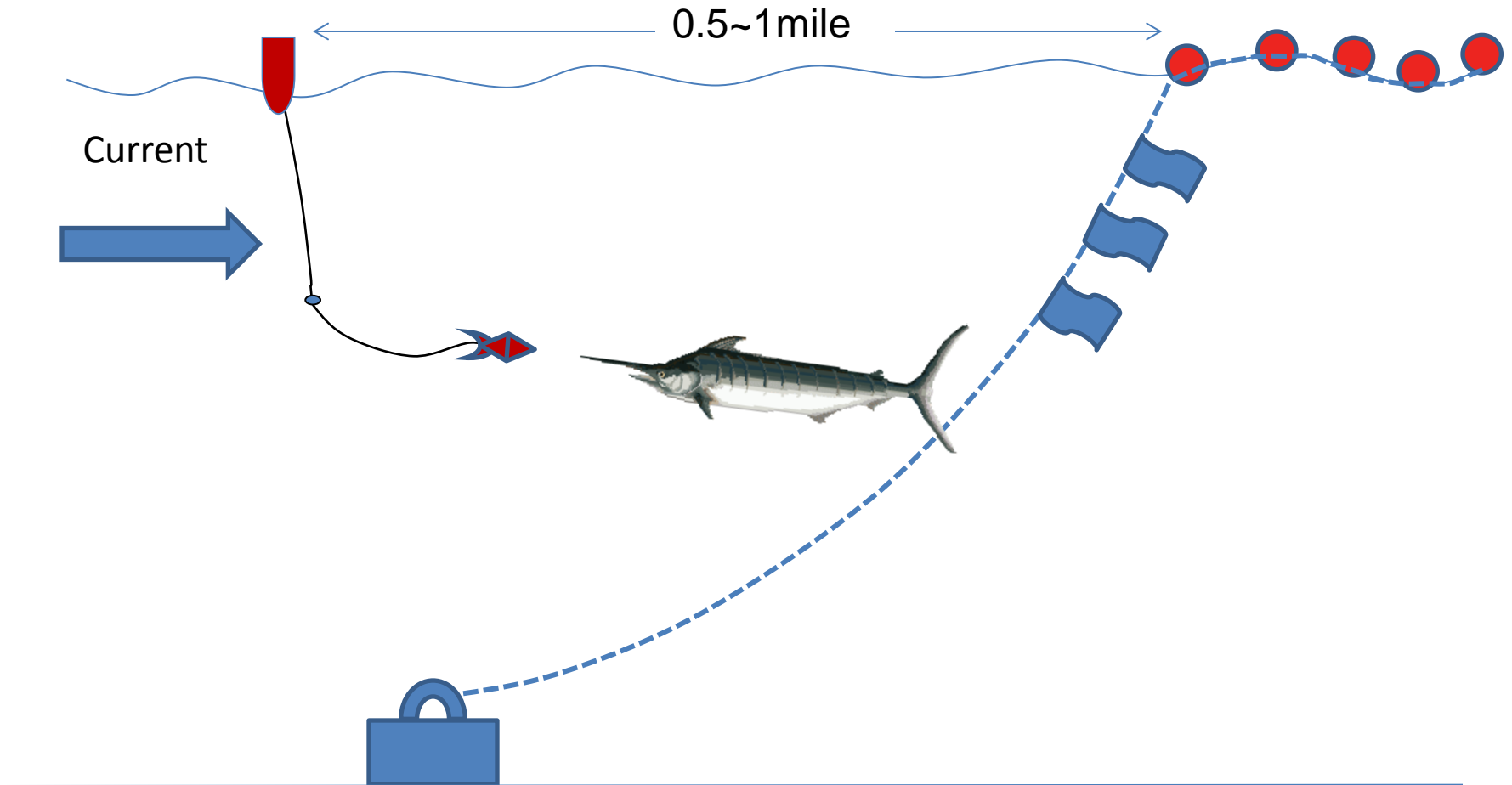
- The basic structure of the Bottom-set vertical longline consists of a main line to which branch lines are attached at regular intervals. Each line consists of about eight (8) hooks and is kept vertically in the water by a small piece of iron or a stone at the bottom. The gear is also held at the top by buoys and marked by a flag.
- The materials used in the construction of this gear consists of polyester braided w/nylon core, leadens swivel, three ways swivel, brass snap swivel, nylon monofilament, and sinker.

## 2.4.3. Bottom-set Vertical Longline fishing

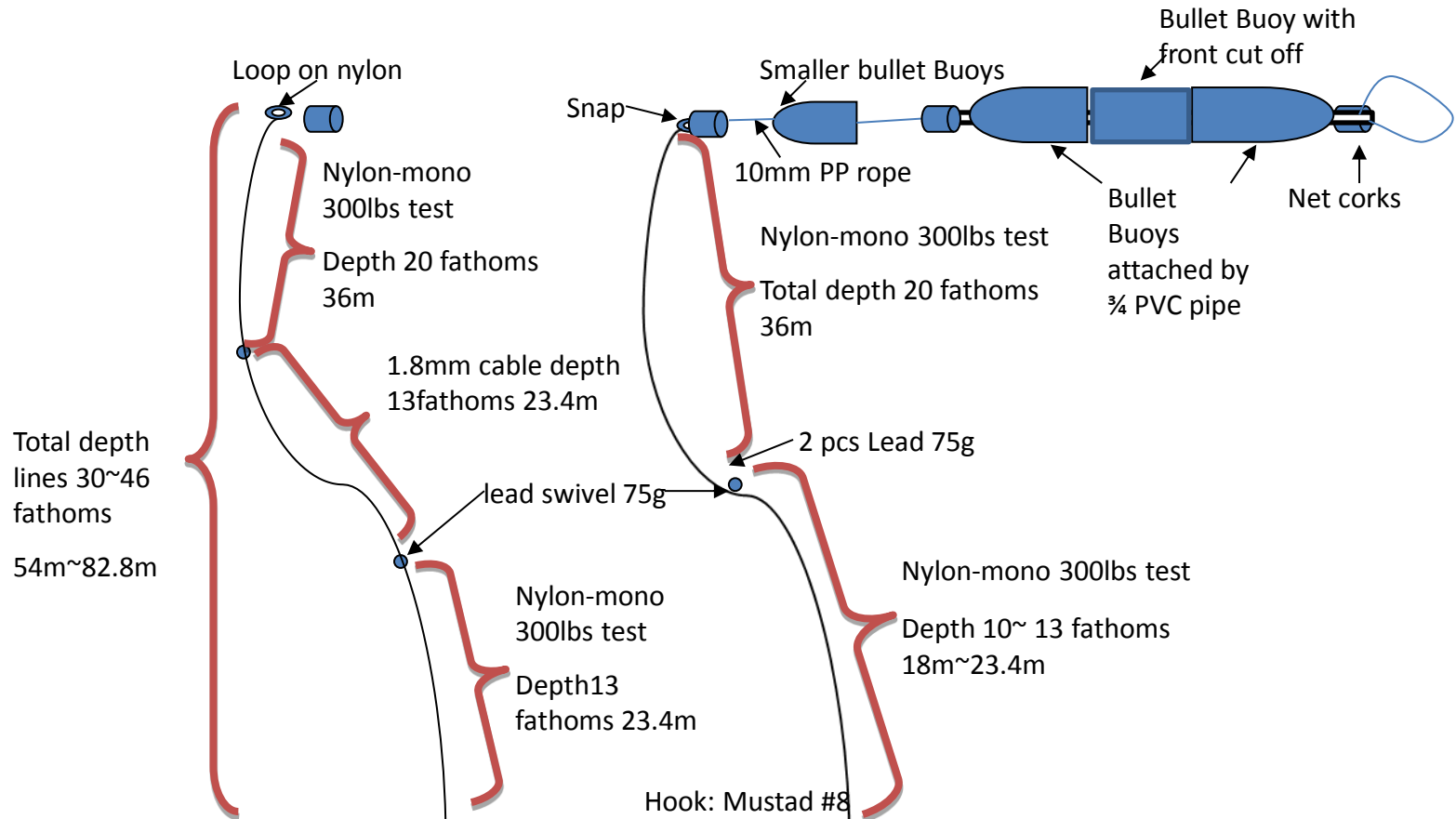


## 2.4.4. Drop Line Fishing around FAD

Drop line are set upward of current about half to one mile of head section of FAD, and left to drift.



# 2.4.4. Drop Line Fishing Gear Structure



## 2.4.4. Drop Line Fishing around FAD



## 2.4.5. Introduction of Diamondback Squid (DBS) fishing gear

### *What is Diamondback Squid?*



Scientific name: *Thysanoteuthis rhombus*

Under/Unutilized new resource in Sub-tropical/tropical waters

Large squid: mantle length 80cm, weight – 15kg (35lbs)

High quality meat and suitable materials for Japanese dishes of Sushi and Sashimi

Drift vertical longline gear are used

## 2.4.5. Introduction of Diamondback Squid (DBS) fishing gear

### *Ecology of Diamondback Squid*

- The vertical distribution of DBS varies regionally and daily.
  - During the day it is generally found in moderately deep water (to 500 metres), but at night it often moves into shallower waters to feed.
- It is also thought that they move to shallower waters to reproduce.
- Inhabit water layers:
  - 400 – 650m in the day time
  - 50-100m in the night time
- Water depth:
  - 600 – 1000m offshore of the island.
  - 1000 - 5000m in open sea
- Water temperature:
  - 10 - 13°C in 500 – 550m

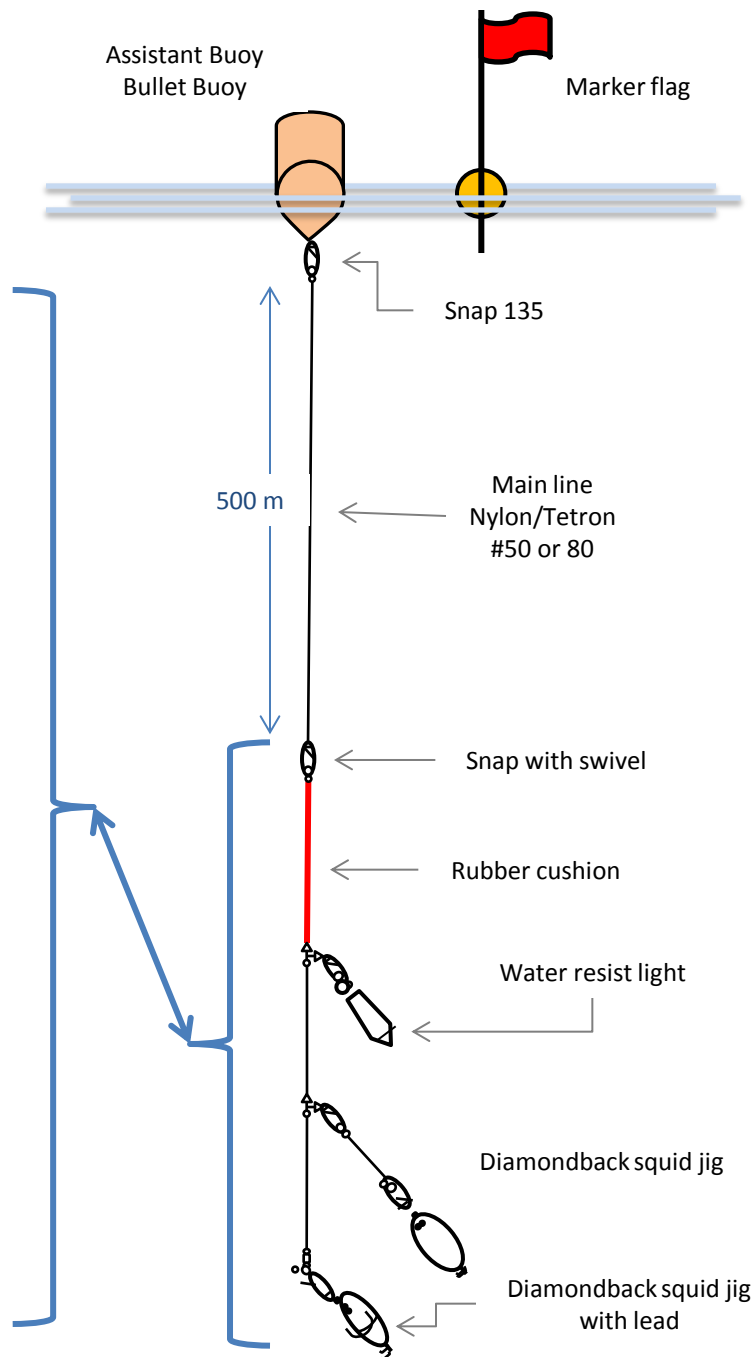
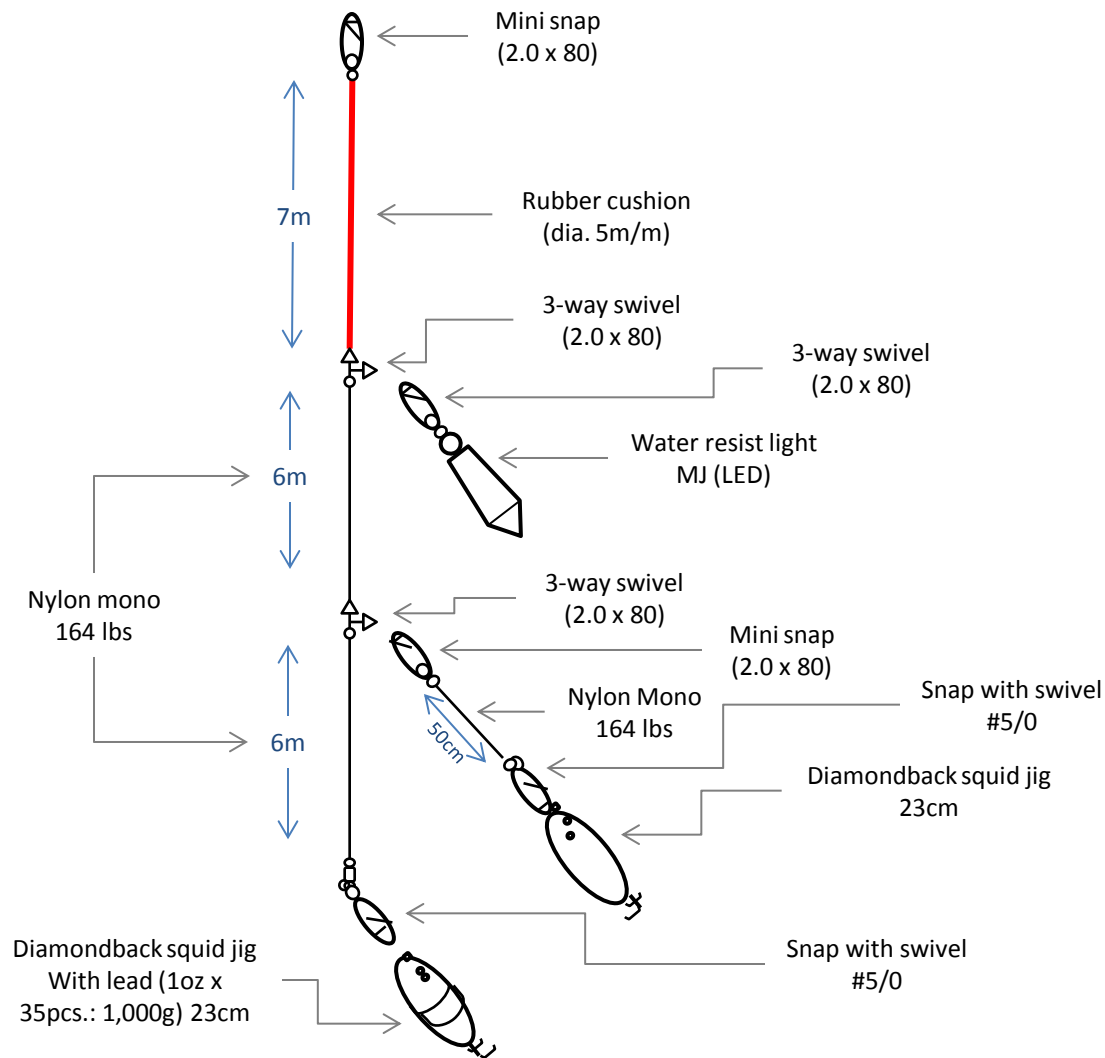


## 2.4.5. Introduction of Diamondback Squid (DBS) fishing gear

### *Biology of Diamondback Squid*

- Large squid
  - Maximum mantle length ~ 100 cm
  - Total body weight ~ 20 kg (45lbs)
- One of the fastest growth rates of squids
- Live approximately a year with maturity being reached by 6 to 8 months
- It is believed that squid larger than 30 cm mantle length grow about 7–10 cm mo<sup>-1</sup>
- Mating & Spawning Season (in North Hemisphere)
  - November – May (multiple times)
  - (March – May is the peak season)

## 2.4.5. Diamondback Squid Fishing Gear



## 2.4.5. Diamondback squid Fishing

### 1<sup>st</sup> Catch of DBS in Vanuatu waters



Date & Time: 09:30, 28<sup>th</sup> of Nov 2013

Fishing ground: 9NM SW of Anelcauhat, Aneityum Island

Weather: Fine

Wind: from SE, gentle

Current: to W, moderate

Moon phase:



Boat: Yamaha 7m FRP boat

Team: George Amos team

Lat: S 20° 18.918

Long: E169° 37.471

Depth of water: 1,000m

Gear depth: 500m

## 2.4.5. Diamondback squid Fishing Technology

### *Biological data collection*



Mantle length: 80cm

Total length: 146cm

Width: 66cm

Total weight: 13kg

Sex: male

Maturity: mature

Gonad weight & length: 100g, 15cm

# 8-7. Diamondback squid Fishing Technology

## *Processing & Tasting*



# 3. Lessons learned and Recommendations

## 3.1. Importance of Community-based FAD fishery Management and Development

- Fishing right = Responsibility
- Self imposed rules and regulations
- FAD management = Fishing ground management
- Free to limited access
- Unclear to clear responsibility



In order to *conduct sustainable and beneficial fisheries*

# 3. Lessons learned and Recommendations

## 3.2. Importance of Integrated approach

- Understanding of *design, construction, deployment method, maintenance and management* of FAD **by the fishers/community-based fishers organization**
- Introduction and modification of FAD fishing technology, not only *Surface Trolling*, but also *Mid-water Trolling*, *Drop line*, *Bottom-set Vertical Longline* and *Diamondback squid fishing*
- Establishment of supporting system, such as *fisherman's house* (gear and fish sale shop), *fish café* (restaurant), *modification of traditional canoe*

# 3. Lessons learned and Recommendations

## 3.3. Importance of Sharing of Information & technology

- Sharing information & technology *among the participants* during the workshops
- Sharing information & technology *between the respective target site fishers groups*
- Sharing information & technology *among the region* by Regional workshop, SPC news, etc.,



Technical and Management *Improvement for sustainability*

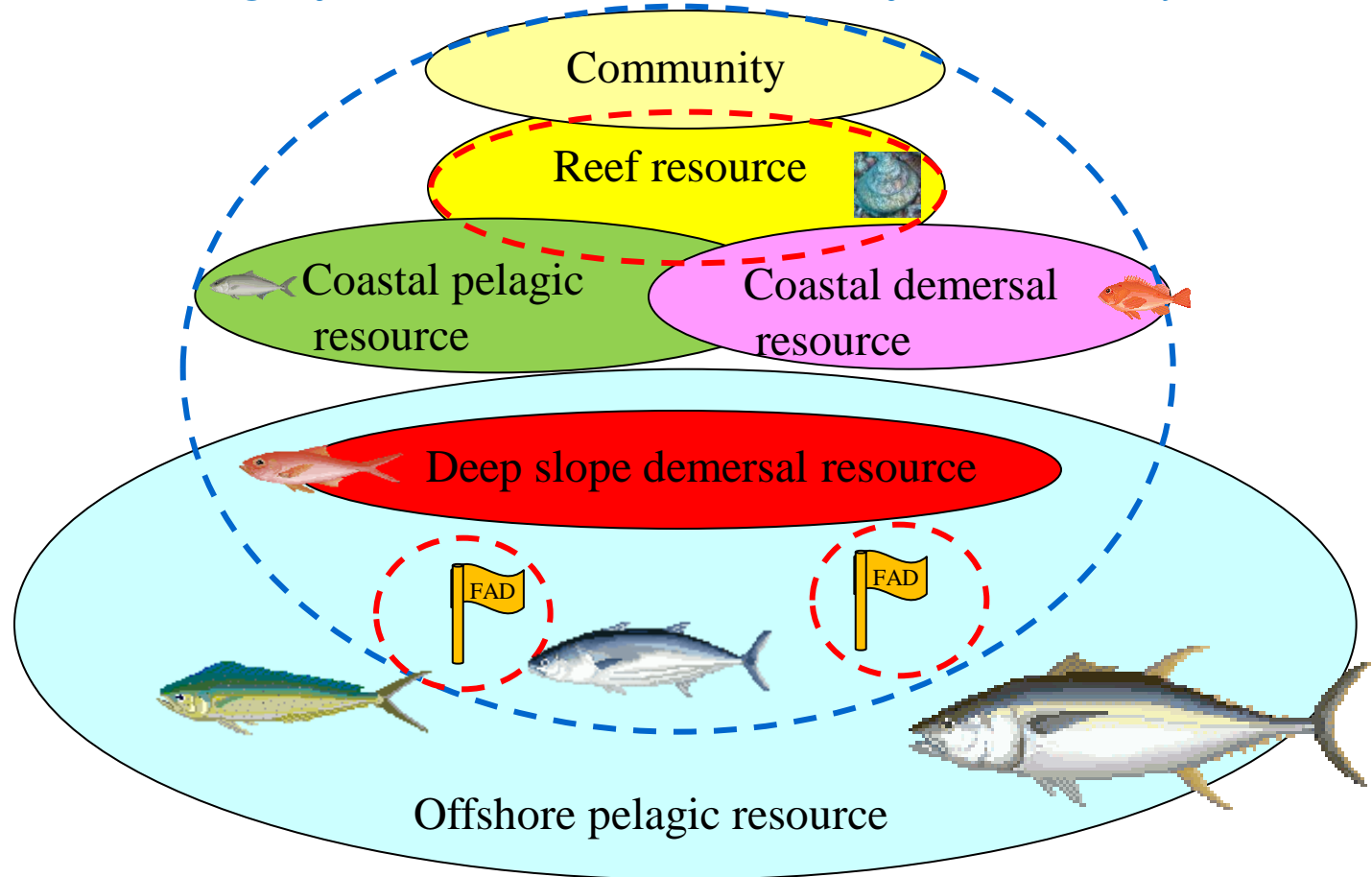


# 3. Lessons learned and Recommendations

## 3.4. Importance of diversification of fisheries development

- Development and Management of Available Coastal Resources, including *Under/Un-utilized potential resources*, for Community and *restore Over-exploited resources*

*Image of Available Coastal Resources for Community*



## 4. References

- 1) Baseline survey report: Project for Promotion of Grace of the Seas for Coastal Villages in Vanuatu, Phase 2, Vanuatu Fisheries Department / JICA 2012
- 2) Results of 1<sup>st</sup> Workshop for Development of Management of FAD Fishery: Project for Promotion of Grace of the Seas for Coastal Villages in Vanuatu, Phase 2, Vanuatu Fisheries Department / JICA 2012
- 3) Results of 2<sup>nd</sup> Workshop for Development of Management of FAD Fishery: Project for Promotion of Grace of the Seas for Coastal Villages in Vanuatu, Phase 2, Vanuatu Fisheries Department / JICA 2013
- 4) Results of 3<sup>rd</sup> Workshop for Development of Management of FAD Fishery: Project for Promotion of Grace of the Seas for Coastal Villages in Vanuatu, Phase 2, Vanuatu Fisheries Department / JICA 2013
- 5) Results of Follow-up Workshop for Development of Management of FAD Fishery: Project for Promotion of Grace of the Seas for Coastal Villages in Vanuatu, Phase 2, Vanuatu Fisheries Department / JICA 2014
- 6) FAD fishing digital textbook 1~4: Study on Formulation of Master Plan on Sustainable Use of Fisheries Resources for Coastal Community Development in the Caribbean, CRFM/JICA, 2010
- 7) Diamondback squid digital textbook 1~3: Study on Formulation of Master Plan on Sustainable Use of Fisheries Resources for Coastal Community Development in the Caribbean, CRFM/JICA, 2010