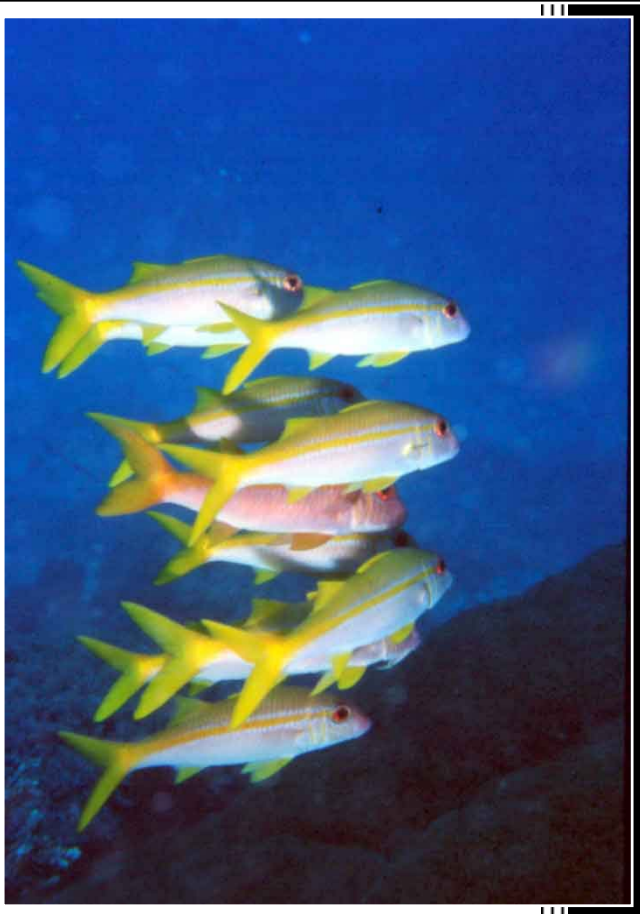
Kaledupa Fisheries Report: March 2008



This report has been produced as part of the Darwin Initiative project 'Building capacity for sustainable fisheries management in the Wallacea region' managed by Operation Wallacea Trust and Indonesian project partner FORKANI

This report has been produced as part of the Darwin Initiative project 'Building capacity for sustainable fisheries management in the Wallacea region' managed by Operation Wallacea Trust and Indonesian project partner FORKANI.

AUTHOR

Dr Duncan May

Marine Biological Solutions, Rientraid, Kylesku, Lairg, Sutherland. IV27 4HW UK

CONTENTS

INTRODUCTION

PURPOSE OF REPORT

"The main purpose of the Kaledupa Fisheries Report is to assess the health of the reef fisheries of Kaledupa with the aim to make recommendations for fisheries management to the Kaledupan community through the Kaledupa Fisheries Forum and the Wakatobi government".

This is the 2nd quarterly (seasonal) Kaledupa Fisheries Report produced by the Darwin Initiative with the intention of being used to compare fisheries data from the same season each year, data from consecutive years and data from Kaledupa in relation to similar reef fisheries in South-East Asia and the Western Pacific. The report presents a template for future reporting by local Darwin Initiative Kaledupan staff, a responsibility which they will take on by 2009. These reports are to express fisheries issues in a clear uncomplicated style so that fisheries information can be understood by the general public and Kaledupans may appreciate and support management recommendations.

The 2nd report builds on corrections to issues identified in the 1st report in December 2008 and also explains the modifications and issues yet to be addressed before the monitoring, data storage and reporting system are fully optimised.

MAIN ACTIVITIES TO DATE

Start	Finish	Activity
June 2007	NA	**Project starts on Kaledupa**: Permission for project gained from local government, office established on Kaledupa and 4 Darwin staff trained.
July 2007	Ongoing	**Construction of fisheries database**: Database build to store fisheries data – continually improved to remove glitches and optimise data analysis.
17th July 2007	NA	**Training of Fisheries monitors**: 22 fisheries monitors trained during a 1 day training course with lectures and field practicals, and examined over a 6 week trial period.
24th July 2007	Ongoing	**Start of weekly Fisheries monitoring in 9 villages:** daily data entry of fish catches into database begins.
5th July 2007	10th Feb.	**Census of 9 villages**: Data collected on fishers to aid fisher and boat

	2008	registration, and determine quantity of fishing gear and gear details such as inch of mesh.
26th March 2008	29th March 2008	**Village law (Perdes) training**: Forkani members from every village and Darwin team members were trained during a 4 day course on Kaledupa in the formation of Perdes and their application by Perdes specialist form Kendari

CONCEPTS OF FISHERIES MANAGEMENT

GENERAL

(Note: in this section when referring to fish this includes marine invertebrates unless stated.) Fish stock decline is caused by excessive numbers of fishers, a large number of fishers using fishing gear that target species before they mature (unsustainable fishing gear) or normally a combination of a large numbers of fishers using many unsustainable fishing gears. When there are too many fishers fishing for too long using unsustainable fishing gear and catches decline year after year this is called overfishing.

Overfishing occurs where there is no management controlling the individualistic behaviour of fishers to maximise their own catch without consideration of long term sustainability of a shared resource. Fisheries monitoring in 2005 indicated that stock decline is occurring around Kaledupa. Action needs to be taken by communities to stop overfishing by managing the fishery for the profitable and equitable economic benefit of the whole community. Moreover, the fisheries need to be managed to protect food security for the local community.

Note: Stock decline is compounded by the use of habitat damaging techniques, such as bomb, cyanide or crowbar use, which reduce the capacity of the reef to support large numbers of fish or invertebrates.

Catch per Unit Effort (CPUE)

CPUE is an estimate of the relative abundance of fish stocks. Maximum CPUE is attained when few fishers catch a high number of fish, where the level of fishing still leaves enough fish to reproduce, replenishing stocks and maintaining catches for future years. This situation is one of the targets of sustainable fisheries management. If too many people are fishing for too long or there are too many fishers using fishing gear that catches too many fish too fast, CPUE declines as fish are less easy to catch and stocks struggle to replenish themselves. Unfortunately fishers tend to fish harder when stocks start to decline as they still require an income and the price of fish increases as fish are scarcer in the market. This increase in price also normally compensates for the increased distance fishers have to travel to new fishing grounds or the increased investment in numbers of fishing gear or lengths of nets required to make the

same level of income. In this situation the CPUE is declining rapidly as fishers increase their capacity to catch fish, by rapidly increasing fishing effort and change to very efficient fishing techniques, it does not allow enough fish to escape capture and reproduce. Eventually CPUE declines to a point where fishers are forced to 'chase the last fish' in a futile attempt to make a living, which drives stocks so low they can not replenish themselves and eventually stocks collapse to unfishable levels – and in some cases this causes local extinction.

By plotting the CPUE each year fisheries managers can establish if CPUE is still increasing and the fisheries has not yet reached Maximum CPUE (reflecting a healthy fishery), or detect if CPUE is declining (indicating a collapsing fishery and confirming that management action is required). Local CPUE can also be compared to other similar tropical fisheries to check if the local CPUE is good or bad.

Species Composition

Change in species composition is the change the percentage of different species within a multi species catch. As species can be grouped into similar feeding habits (predators, omnivores, detritivores, coralivores, herbivores and planktivores), the change in the percentage of different feeding groups caught can be examined every year. The change in the percentage of feeding groups and even of specific species can provide an indication of the level of fishing and can indicate whether fishing is causing irreversible changes in fish species caught. Changes in fish species caught are normally from high value fish to small species with little market value.

Percentage of sexually mature individuals

The percentage of sexually mature individuals per species in catches indicates the impact of fishing techniques on the reproductive capacity of stocks. The percentage of sexually mature individuals is calculated by comparing the mean fish (from Creel Surveys) or invertebrate (from Trader Logbooks) lengths of a species to the sizes of maturation required for each species. The sizes of maturation required for each species are listed in scientific publications. Generally, management should try to minimise any capture of fish or invertebrates below the size of maturation to avoid the capture of most fish before they can reproduce.

DATA COLLECTION AND ANALYSIS

CENSUS

A census of house holds with residents involved in fishing or seaweed farming activities was conducted in 9 villages (Balasuna, Darawa, Mantigola, Sama Bahari, Peropa, Langge, Laulua/Lewuto, Lentea, and Sombano) in July 2007 and February 2008. These 9 villages were selected as they were found to contain 70% of fishers in Kaledupa in 2003. A rapid census of the remaining 30% of fishers will be completed between the 1st May 2008 and 15th July 2008. This data will be used for estimations of incomes from fishing, and help develop an alternative income and fisheries management strategy.

REEF FISH CATCH MONITORING 'CREEL SURVEYS'

Reef fish catch monitoring was conducted during a 24hr period on randomly selected days by two Fisheries Monitors (FM) in each of the villages of Balasuna, Darawa, Peropa, Langge, Laulua/Lewuto, Lentea, and Sombano, and by four FM in each of the villages of Mantigola and Sama Bahari. FM positioned them so that they could see all fishers returning to their village and questioned the fishers and measured their catches before the fishers distributes the catch. FMs attempted to record all fishers but if there were a number of fishers returning at one time FM focused on accurately recording as many catches from each gear type as possible, irrespective of how large their catch was. Fishers returning from fishing without catching anything were also questioned, as they indicate that there may not be many fish left. Information gathered by FM is shown on the catch recording sheet in appendix II.

Fisheries Monitors weighed the entire catch (to the nearest 0.1kg) and identified fish to species names using local names and cross referencing them to the book 'Marine Fishes of South-East Asia' by Jerry Allen. Fish of each species were counted and the length of up to 20 randomly selected fish from each species was measured to the nearest 0.5cm. If there were over approximately 100 fish of one species an estimate of the number of fish was made by the number of buckets of fish. Fisheries monitoring started on 23rd July 2007 and data used in this report are for the months of August and September 2007.

INVERTEBRATE CATCH MONITORING 'TRADER LOGBOOKS'

Within the 9 villages, individuals who bought marine invertebrates for export were identified and asked to fill out log books which were periodically checked by FM. Species caught, total weight caught per fisher per day, fishing area, name of fisher and purchase price were recorded. Recording started on 1st September 2007 and data used in this report are for the months of September and October 2007. Values do not include collection of invertebrates for subsistence or resale on Kaledupa.

RESULTS: CENSUS OF 9 VILLAGES

Within the 9 villages 2105 individuals were recorded, 1251 had incomes, and 860 had incomes from fishing or trading in fished products. Samples of the data stored in the database are given below.

Number of fishers in each village

Village	Income	Number
Balasuna	Bubu Fishing	2
Balasuna	Line Fisher	1
Balasuna	Net Fishing	16
Balasuna	Sero Fishing Bamboo	1
Balasuna	Sero Fishing Net	2
Darawa	Abalone Fishing	1
Darawa	Bubu Fishing	9
Darawa	Gleaning	1
Darawa	Line Fisher	1
Darawa	Net Fishing	9
Darawa	Octopus Fishing	9
Darawa	Seacucumber	1
Darawa	Sero Fishing Net	1
Langgee	Bubu Fishing	7
Langgee	Gleaning	10
Langgee	Line Fisher	11
Langgee	Net Fishing	9
Langgee	Panah Fisher	1
Langgee	Sero Fishing Net	6
Lentea	Gleaning	2
Lentea	Line Fisher	4
Lentea	Net Fishing	10
Lentea	Octopus Fishing	3
Lentea	Sero Fishing Net	1
Lewuto	Bubu Fishing	2
Lewuto	Gleaning	7
Lewuto	Line Fisher	5
Lewuto	Long Line Fisher	1
Lewuto	Net Fishing	3

Lewuto	Sero Fishing Net	14
Mantigola	Abalone Fishing	9
Mantigola	Fishing Lobster	3
Mantigola	Gleaning	14
Mantigola	Line Fisher	16
Mantigola	Long Line Fisher	30
Mantigola	Net Fishing	102
Mantigola	Octopus Fishing	39
Mantigola	Octopus Trading	1
Mantigola	Panah Fisher	24
Mantigola	Pearl shell Fishing	3
Mantigola	Seacucumber	93
Mantigola	Seacucumber Trading	20
Mantigola	Sero Fishing Net	1
Mantigola	Trading fish	1
Peropa	Abalone Fishing	2
Peropa	Bubu Fishing	3
Peropa	Gleaning	2
Peropa	Line Fisher	2
Peropa	Long Line Fisher	3
Peropa	Net Fishing	21
Peropa	Octopus Fishing	5
Peropa	Pearl shell Fishing	1
Peropa	Seacucumber	1
Peropa	Sero Fishing Net	37
Sama Bahari	Abalone Fishing	1
Sama Bahari	Bubu Fishing	1
Sama Bahari	Fishing Lobster	5
Sama Bahari	Fishing Strombus luhanus	1
Sama Bahari	Gleaning	22
Sama Bahari	Line Fisher	18
Sama Bahari	Long Line Fisher	3
Sama Bahari	Net Fishing	74
Sama Bahari	Octopus Fishing	40

Sama Bahari	Octopus Trading	7
Sama Bahari	Panah Fisher	7
Sama Bahari	Pearl shell Fishing	4
Sama Bahari	Seacucumber	23
Sama Bahari	Seacucumber Trading	4
Sama Bahari	Trading fish	1
Sama Bahari	trading Lobster	2
Sama Bahari	Trading Shark	1
Sombano	Abalone Fishing	3
Sombano	Abalone Trading	1
Sombano	Bubu Fishing	10
Sombano	Gleaning	18
Sombano	Line Fisher	13
Sombano	Long Line Fisher	2
Sombano	Net Fishing	6
Sombano	Octopus Fishing	3
Sombano	Octopus Trading	1
Sombano	Panah Fisher	3
Sombano	Seacucumber	1
Sombano	Seacucumber Trading	1
Sombano	Sero Fishing Net	1
		860

Income of each fishing activity

Income	East Low	East Med	East High	West Low	West Med	West High
Abalone Fishing	201,250	285,000	372,500	313,125	395,938	490,000
Abalone Trading	75,000	150,000	300,000	200,000	300,000	500,000
Bubu Fishing	163,056	239,722	339,028	135,556	210,139	328,472
Fishing Lobster	240,625	328,125	393,750	221,250	337,500	468,750
Fishing Strombus luhanus	25,000	50,000	100,000	100,000	250,000	300,000
Gleaning	199,605	299,474	426,842	178,311	274,054	395,946

Line Fisher	172,606	247,254	344,437	191,761	265,352	367,183
Long Line Fisher	391,410	482,821	591,282	450,769	544,872	652,436
Net Fishing	359,320	547,488	784,280	367,229	590,048	740,904
Octopus Fishing	388,283	646,919	867,475	547,857	803,827	1,688,929
Octopus Trading	213,333	385,556	544,444	600,000	811,111	2,861,111
Panah Fisher	136,143	192,000	262,000	177,571	228,571	287,429
Pearl shell Fishing	456,250	725,000	975,000	520,000	718,750	975,000
Seacucumber	408,613	512,227	645,126	618,613	759,874	912,101
Seacucumber Trading	743,340	994,400	1,261,200	661,200	860,400	1,096,000
Sero Fishing Bamboo	50,000	100,000	200,000	50,000	100,000	200,000
Sero Fishing Net	419,762	676,984	1,003,175	388,571	608,730	923,810
Trading fish	400,000	650,000	850,000	650,000	1,200,000	1,800,000
trading Lobster	350,000	475,000	650,000	350,000	550,000	900,000
Trading Shark	50,000	80,000	100,000	50,000	70,000	120,000

Number of boats

Village Name	Type of Boat	Number
Balasuna	Canoe	16
Balasuna	Motor, small	10
Balasuna	Motor, Tuna	7
Darawa	Canoe	22
Darawa	Motor, small	44
Darawa	Motor, Tuna	2
Langgee	Canoe	19

Langgee	Motor, small	17
Langgee	Motor, Tuna	2
Lentea	Canoe	15
Lentea	Motor, small	16
Lentea	Motor, Tuna	2
Lewuto	Canoe	13
Lewuto	Motor, small	3
Lewuto	Motor, Tuna	3
Mantigola	Canoe	184
Mantigola	Motor, big	1
Mantigola	Motor, small	2
Mantigola	Motor, Tuna	112
Peropa	Canoe	41
Peropa	Motor, small	27
Peropa	Motor, Tuna	1
Sama Bahari	Canoe	88
Sama Bahari	Kayak	2

Sama Bahari	Motor, big	1
Sama Bahari	Motor, small	4
Sama Bahari	Motor, Tuna	55
Sombano	Canoe	40
Sombano	Motor, small	1

Number and type of nets (sample: not for analysis)

	Balasuna	Darawa	Langge	Lentea	Lewuto	Mantigola	Peropa	Sama Bahari	Sombano
Gillnet Drive-in, encircling		3	2	3		17	8	24	
Gillnet Drive-in, parallel to reef	1	1	2	3		80	3	17	
Gillnet set parallel to reef	17		4	5	1	56	4	42	1
Gillnet set perpendicular to reef			2			1		4	2
Hand cast net						1			
Ray net						10		1	
Seine net with scare lines		1	1	1		18	1	3	1
Shark tangle net						3		3	

Number of fish fences

Village	Name	Father	Length	Mesh size
Lentea	La Marmi	Maida	100	15
Peropa	La Buaraja	La Sari	150	1
Lewuto	Hasanudin	Alibaba	150	1
Langge	La Akuba	La Ili	150	1
Lewuto	Ld, Rujui	Ld, Rajuma	135	1.5
Lewuto	Jafarudin	La Muka	150	1
Lewuto	Jafarudin	La Muka	150	1
Lewuto	La Ongo	La Runa	180	1
Lewuto	Ane Ndako	Ndako	120	1
Lewuto	Salahudin	La Sede	150	1
Lewuto	Salahudin	La Sede	150	1
Lewuto	Rakiu	La Kambi	180	1
Lewuto	Rakiu	La Kambi	180	1
Lewuto	La Noko	La Midi	170	1
Peropa	La Tono	La Jaku	1500	1
Peropa	La Bede	La Saisu	450	1
Peropa	La Alamaa	La Faabu	180	1

Peropa	La Sikuru	La Moko	100	1
Peropa	La Sikuru	La Moko	100	1
Peropa	Jumahadi	La Anso	100	1
Peropa	Jumahadi	La Anso	100	1
Peropa	La Inta	La Bae	180	1
Peropa	Masaudin	La Fanudu	100	1
Peropa	Mahasuri	La Ane, P	100	1
Peropa	Mahasuri	La Ane, P	100	1
Peropa	Husulii	Nuru Isa	100	1
Peropa	La Katu	La Aje	165	1
Peropa	La Hasa	La Ndoke	150	1
Peropa	La Kuki	Taudu	60	1
Peropa	La Odi	Kamare	120	1
Peropa	La Odi	Kamare	120	1
Balasuna	La Surufia	La Pou	120	0
Balasuna	La Halia	La Sale	480	1
Langgee	Koane	La Aji	150	1
Langgee	Alimudin	La Saopu	170	1
Langgee	La Abu	La Moko	225	1
Langgee	Surulii	La Manega	0	0
Langgee	Asana	Kofasi	120	1

Number of other gear types (sample: not for analysis)

Village	Bubu Trap	Lantern	Speargun
Balasuna	28	12	0
Darawa	69	9	1
Langgee	37	20	1
Lentea	37	15	2
Lewuto	35	9	2
Mantigola	0	168	175
Peropa	25	16	0
Sama Bahari	30	59	121
Sombano	95	22	6

RESULTS: INDICATORS OF HEALTH OF FISHERY

REEF FISH

Between the 24th of July 2007 and the 2nd of February 2008 there had been 252 24 hour reef fish surveys performed which had sampled 994 fishing operations (on average 4 per day). Data from these surveys has been inputted into the data base and analysis of data from July and December 2007 was analysed. Subsequent analysis has been temporally prohibited due to work on the database to allow CPUE to be calculated automatically. Data shown below is thus CPUE from the December 2007 report. Furthermore, the database is still undergoing new additions to allow the analysis of 'percentage mature' fish and 'species composition' of catches from different years which will be completed in July 2008.

DECEMBER 2007 DATA

Bubu

Use of paired Bubus in Darawa in 2007 had same effect on CPUE calculation as placing two single Bubus close together and considering the catch from two Bubus to be from one paired Bubu. Thus the doubling of CPUE seen by the use of paired Bubus in 2007 compared to single Bubus in 2005 is not real, and once corrected by dividing by 2 no significant difference in CPUE is seen in Darawa between 2005 and 2007. Lentea and Sombano also show no difference in CPUE between 2005 and 2007, though CPUE for Lentea and Sombano are both significantly lower by double than in Darawa, which probably reflect the healthier reef able to support more stock at Darawa. Generally, no significant change in 'Normal Bubu' CPUE was detected between 2005 and 2007. Normal Bubu CPUE of 0.44kg/day/trap in 2005 and 0.34 kg/day/trap in 2007 is on the low end of the range of CPUE's expected for Bubus (0.1-3.4 kg/day/trap).

Fish fences

Though a reduction in average CPUE between 2005 and 2007 was recorded the high variability in total catch in 2005 and the use of very different sample sites in 2007 means that no conclusion can be made regarding fish fences using this CPUE data. However, very precise measurements taken at Peropa and

Laulua/Lewuto indicate a significantly larger CPUE (almost 3 times) in Peropa and this data will be very useful for future comparisons. No comparative figures are available from scientific publications.

Speargun

No comparison can be made due to only 3 records in 2005 and 3 from 2007 and because both years are from different sites. However, a general CPUE of around 1kg/hr for both years is below the average CPUE expected for Speargun fishing from scientific publications (2.4kg/hr) and at the bottom end of the range (0.4-8.5kg/hr).

Line

A significant increase in average CPUE between 1.36kg/hr in 2005 and 2.21kg/hr 2007 can not be considered to reflect the actual situation due to the samples coming from different sample sites. There are indications of an increase in CPUE between 2005 and 2007 at both Darawa and Lentea, and a CPUE as high as 2.5kg/hr would be considered to be good. However, CPUE for line fishing is generally at the low end of the range expected from scientific publications (0.59-5.1kg/hr.

Table 1: Average CPUE with standard error and sample size for bubu, fish fence, speargun, trawled lure and line fishing around Kaledupa in 2005 and 2007. Use of '?' denotes an absence of samples where monitoring would have been expected to sample.

	Bubu			Fish	Spear	Trawled	Line
	Normal (kg/day)	Pair (kg/day)	Large (kg/day)	fence (kg/day	Gun (kg/hr)	Lure (kg/hr)	(kg/hr)
Balasuna 2007	?			7.17 (3.56:3)			1.89 (1.06:3)
Darawa 2005	0.55 (0.04:15)	?	0.63 (0.18:3)	32.92 (18.03:3)		1.16 (0.21:4)	1.40 (0.63:3)
Darawa 2007	?	0.91 (0.15:18)	0.87 (0.16:3)	?		1.00 (_:1)	2.49 (0.90:7)
Langge 2007	0.63 (0.02:4)			10.81 (3.74:4)			2.40 (0.41:5)
Laulua/ Lewuto 2007	?			5.78 (1.17:27)			
Lentea 2005	0.26 (0.13:2)			4.83 (1.91:3)			1.33 (0.30:8)
Lentea 2007	0.27 (0.09:4)	0.46 (0.12:4)		?			1.94 (0.39:3)
Mantigola 2007					1 (0.00:3)	0.75 (_:1)	0.46 (_:2)
Peropa	?			16.61			

2007				(2.58:36)			
Sama Bahari 2005					1.32 (0.25:7)	1.42 (0.48:8)	1.38 (0.34:6)
Sama Bahari 2007					?	1.00 (_:1)	5 (_:1)
Sombano 2005	0.36 (0.06:18)			13.47 (2.96:3)			
Sombano 2007	0.30 (0.04:19)	0.21 (_:1)		6.00 (_:1)			0.90 (0.12:3)
Average 2005	0.44 (0.04:35)	N/A	0.63 (0.18:3)	17.07 (6.74:9)	1.32 (0.25:7)	1.33 (0.32:12)	1.36 (0.20:17)
Average 2007	0.34 (0.04:27)	0.80 (0.12:23)	0.87 (0.16:3)	11.62 (1.52:71)	1 (0.00:3)	0.92 (0.08:3)	2.21 (0.36:22)

Gill net - active encircling

The average CPUE for Darawa in 2007 is not considered to be accurate as it only represents 2 samples and both are of unusually high CPUE. However, both at Lentea and Sama Bahari (also with small sample sizes) there a drop in CPUE can be seen between 2005 and 2007. Moreover, the average CPUE's for 2005 (0.004kg/m/hr) and 2007 (0.002kg/m/hr) were below the CPUE expected from a poor fishery (0.024kg/m/hr).

Gill net - active parallel to the reef

Sama Bahari shows a significant reduction in CPUE between 2005 and 2007, and Darawa shows a high CPUE in comparison to other villages. No comparative figures are available from scientific publications.

Table 2: Average CPUE with standard error and sample size for net fishing around Kaledupa in 2005 and 2007.

	Gill net set		Gill net active			
	Parallel (kg/m/hr)	Perpendicular (kg/m/hr)	Encircle (kg/m/hr)	Parallel (kg/m/hr)	Night Parallel (kg/m/hr)	Seine Net (kg/m/set)
Balasuna 2007	0.003 (0.001:4)	0.025 (0.021:2)				
Darawa 2005			0.05 (0.01:8)			
Darawa 2007		0.230 (0.039:3)	0.57 (0.18:2)	0.11 (0.02:5)		
Langge 2007	0.004 (0.004:2)			0.02 (0.01:2)		0.08 (0.03:3)
Laulua/ Lewuto 2007						

Lentea 2005	0.028 (0.022:2)		0.03 (0.01:4)	0.01 (_:1)		0.80 (_:1)
Lentea 2007	0.010 (_:1)		0.02 (0.01:2)	0.05 (0.01:16)		
Mantigola 2007	0.009 (0.003:22)	0.001 (0.000:2)	0.01 (0.00:6)	0.03 (0.01:34)		0.17 (0.04:5)
Peropa 2007						
Sama Bahari 2005	0.007 (_:1)	0.035 (0.004:7)	0.05 (0.01:9)	0.08 (0.05:6)		
Sama Bahari 2007	0.019 (0.002:9)	0.016 (0.002:24)	0.03 (0.01:4)	0.03 (0.00:12)	0.03 (0.02:2)	0.42 (_:1)
Sombano 2005	0.037 (0.011:15)			0.01 (_:1)	0.04 (0.03:3)	
Sombano 2007	0.003 (0.001:11)	0.042 (_:1)			?	
Average 2005	0.034 (0.009:18)	0.035 (0.004:7)	0.04 (0.01:21)	0.07 (0.04:7)	0.04 (0.03:3)	N/A
Average 2007	0.009 (0.002:49)	0.036 (0.012:32)	0.02 (0.02:12)	0.04 (0.01:70)	0.03 (0.02:2)	0.04 (0.01:9)

Gill net - set parallel to the reef

Sombano 2005 and 2007, Sama Bahari 2007 and Mantigola 2007 are large samples with a low standard error, and thus results from analysis are likely to strongly indicate if there are differences in CPUE. A significant drop in CPUE at Sombano between 2005 and 2007, and low CPUE at Sombano, Sama Bahari and Mantigola in 2007 indicates that there is a significant three fold decrease in CPUE between 2005 and 2007. Generally an average CPUE 0.034 kg/m/hr for 2005 would be considered to be low and a CPUE of 0.009 kg/m/hr in 2007 would indicate a very poor fishery.

Gill net - set perpendicular to the reef

Sama Bahari 2005 and 2007 are good samples and indicates a significant decline in CPUE between 2005 and 2007. The non significant difference in Average CPUE between 2005 (0.035kg/m/hr) and 2007 (0.036 kg/m/hr) are due to 3 extremely high CPUE records for Darawa in 2007 and are likely to be a recording error. CPUE's as low as 0.004kg/m/hr would indicate a very poor fishery.

Seine Net

Insufficient numbers of catches were recorded for analysis in both years.

INVERTEBRATES

Between September 2007 and Octobers 2007 log books were completed by three traders in Sama Bahari (1 trading octopus, 1 trading Seacucumber and 1 trading Octopus and lobster), two traders in Mantigola (1 trading Seacucumber and live fish and 1 trading seacucumber), two traders in Peropa (both trading in octopus) and two traders in Sombano (1 trading octopus and abalone and 1 trading abalone). CPUE data collected on octopus on east and west Kaledupa can not be compared to each other as CPUE for octopus is greatly affected by wind conditions. No comparisons could be made for any invertebrates log books as the data being recorded by traders was in a non standardised format (though traders were previously instructed clearly) across the Island. March 2008 all traders were revisited and a standardised format was developed with traders and clearly reiterated to all invertebrate traders on Kaledupa. Tables below indicate data collected in 2007 and data required for analysis.

Octopus

Species	Village	Fishing Area	Fishers/day (catches recorded)	CPUE (SE)	Sex, Mean and range size (kg)
Octopus	Sama Bahari	East Kaledupa	7 (424)	2.26kg/day(0.05)	?
	Sombano	North Kaledupa	0.5 (29)	?	?
	Peropa	West Kaledupa	0.5 (105)	4.01kg/day(0.21)	?

Abalone

Species	Village	Fishing Area	Fishers/day (catches recorded)	CPUE (SE)	Mean and range size	% Mature
Abalone	Sombano	North Kaledupa	3.5 (220)	?	?	?

Seacucumber

Seacucumber Species	Village	Fishing Area	Mean and Range Size	% Mature
?	Sama Bahari	East Kaledupa	?	?
	Mantigola	Kaledupa atoll	?	?
	Mantigola	West Kaledupa	?	?

Lobster

Lobster	Village	Fishing Area	Fisher per day	Mean and	% Mature

Species				Range Size	
?	Sama Bahari	East Kaledupa	0.5 (27)	1.01kg (0.10) 0.4-2.6kg 31 lobsters	?
?	Sama Bahari	Kaledupa Atoll	1 per month (2)	?	?

CONCLUSIONS: ESTIMATED STATUS OF THE FISHERIES

FISHING EFFORT

The census of the 9 villages shown in this report demonstrates the data available for fisheries management decisions such as number of specific fisher types and requires alternative income for fishing activities. The main issues revealed from the census are the large number of fishers in Sama Bahari and Mantigola which will require alternative incomes and large number of fish fence owners in Lewuto and Peropa, who have invested large incomes into fish fences and generate large incomes. Largest fishing incomes came from octopus fishing, a fishery that will require watchful management to ensure its sustainability and income.

REEF FISH

Currently results from the period from December 2007 to March 2008 are not available and will be analysed and reported in the next quarterly report. As such the conclusions from the December 2007 report can be reiterated. Overall 2007 CPUE's are lower than would be expected from a healthy fishery and have generally declined or similar from 2005 CPUEs. Results from a 2005 report indicated that catches consisted of more herbivorous species than would have been expected from a healthy fishery and that most gears targeted undersized fish leaving few mature fish to reproduce. Analysis of species composition and percentage mature for Easterlies 2007 data will be shown in the next report. General indications from easterlies 2007 show the reef fishery as poor and declining in status, with the worst fishery in Sombano and Sama Bahari, and the best in Darawa.

INVERTEBRATES

For the months examined in this report (September and October 2007) insufficient data was collected to analyse the status of the invertebrate fisheries. The reasons for poor data collection are likely to be due to this being the first time invertebrate data was recorded by traders, and introduction and

understanding of the log book by all traders will take time. Recommendations made in the December 2007 report have been implemented.

IMPROVEMENTS TO MONITORING

Reef Fish

Recommendations from the December 2007 report have been implemented. Generally, fisheries monitors were told to record at least 3 catches per sample day from each gear type to improve analysis. Monitoring was hoped to be improved by a tally of the estimated total numbers of fishers per technique fishing that day by fisheries monitors allowing checks to be made on the quality of their work. Specific improvements were:

Improved monitoring of fish fence catches from Sombano and Darawa and Lentea. Improved monitoring of speargun catches in Sama Bahari and Mantigola. Improved monitoring of trawled lure or line catches in Darawa, Mantigola and Sama Bahari. Improved monitoring of bubu catches In Balasuna and Laulua/Lewuto. Checks were done on monitoring at nights by the Darwin team. Fisheries monitors now ensure they are recording both the number of sets and total number of hour fishing for active gillnets.

Invertebrates

Standard format for invertebrates developed in March 2008 was as follows:

Octopus: wet weight and sex of individuals caught per fisher per day

Abalone: Shell length (in standard traded size classes) of individuals caught per fisher per day

Seacucumber: dry weight of individuals (recorded in trade names) collected per month

Lobster: wet weight of individuals (recorded in local names) caught per fisher per day

These adjustments and repeated explanations of the log books are expected to generated good data for analysis of the main invertebrate fisheries and allow management decisions to be made