

# Sea cucumber exploitation in the Toliara region of south-west Madagascar

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## Introduction

Sea cucumber harvesting is a traditional activity in Madagascar (Conand et al., 1997) and is very actively pursued in the south-west (Toliara). Several sources (e.g. Provincial Trade Department, Provincial Marine Fisheries Service) indicate that, between 1979 and 1986, exports fluctuated between 10 and 56 t. Data on recent exports show a very large increase, with volumes of more than 500 t. However, available data are insufficient to diagnose and analyse current over-exploitation, as the fishing sector is quite complex, and analysis at several different levels is needed (Conand, 1997a and 1997b).

For these reasons, a study was undertaken by the Fisheries and Marine Science Institute (IH-SM) to monitor fishing, fishery organisation, catches and marketing in two separate villages. The original results were reported in a post-Master's-level thesis (Rasolofonirina, 1997).

## Methods

Two villages near Toliara, Ankembé and Besakoa, were selected for comprehensive monitoring by researchers and scientists over an eight-month period (Figure 1).

Each day, sea cucumber harvesters were asked to answer questions on total fishing time, the number of working fishermen, fishing sites, etc.

Catches were sampled before processing (i.e. cooking and drying), in order to determine the exact species, the number of specimens for each species and the corresponding weights. From these data, average catch sizes and fishing effort, on a tidal or monthly basis, and catch per unit effort (CPUE) could be calculated. Finally, the marketing circuit was determined through surveys carried out in both villages and in Toliara.

## Results

The results show how fishing was organised in each village, as well as the fishing effort, catches

and corresponding CPUEs for the villages concerned. The marketing circuit is also described.

## Organisation

Harvesting is done by hand, during low spring tides only, on the reef flats. To reach the main reef, fishermen cross the lagoon in dug-out, outrigger canoes propelled by sail or paddles. When they visit the fringing reef, which is accessible on foot, they sometimes bring canoes along in order to continue fishing after low tide has ended.

Family members (or the whole family) go fishing in the morning, and come back in the afternoon. Each village fishes in the closest part of the reef to them: the northern section for Besakoa and the central or southern section for Ankiembe.

The work is divided up among the members of the family; for example, the father prepares and drives the boat, everyone present takes part in harvesting, and after returning home, the women take care of processing and selling the catch.

The time needed to get to the main reef is comparable for both villages—from 30 to 60 minutes depending on the weather. At the fishing site, each person collects sea cucumbers (see Figure 2 on page 13) and other reef resources (e.g. octopus, shellfish, crabs, shrimps) in a jute bag or a bucket. On the fringing reef, fishermen work in groups of two or three, mainly in the sea grass areas.

Sea cucumber fishing in the Toliara region is therefore mainly done on foot at low tide. Free diving (mask only) is very infrequently used, and only when there are neap tides. Fishing with diving suits or trawls is not a practice in this region, although these techniques are used elsewhere.

## Fishing effort

Table 1 summarises the monthly averages calculated for the villages of Ankiembe and Besakoa, in terms of fishing days (or trips) and fishing hours per trip.

1. IH-SM, Université de Toliara

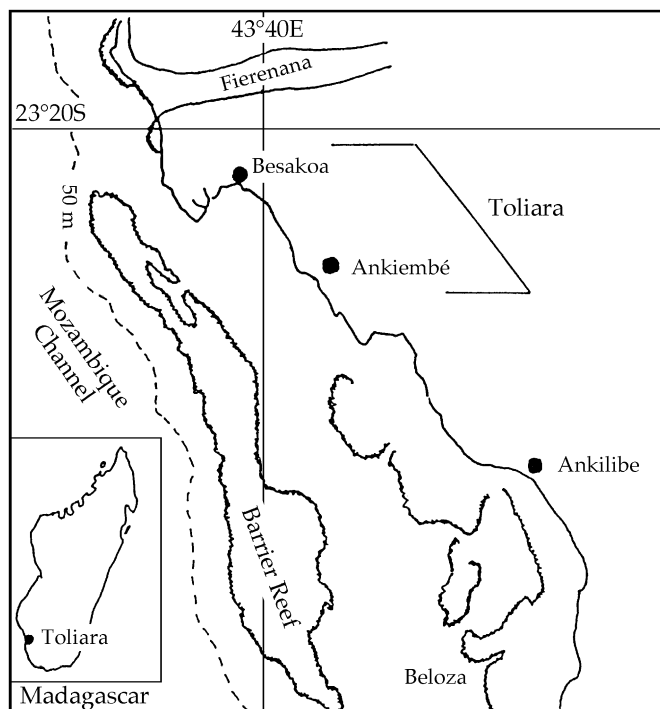
2. Laboratoire d'Écologie Marine, Université de La Réunion

Harvesting was done during the spring tide, with the number of monthly fishing days varying from 10 to 20 in each village, for an overall average of 15 days.

Collection usually lasted for three to six hours; it varied with the tide amplitude, but did not show any seasonal variations; collection time seems to have increased in Ankiembe during the study period.

The number of fishermen per month (Table 2) was significantly higher in the village of Besakoa (an average of 254 over the eight-month study) than in Ankiembe (143 on average).

The relative percentages of men, women and children also differed (Table 2). In Ankiembe, women represented the largest share (55% on average), while men and children accounted for 23 and 22 per cent respectively. In Besakoa, men had the highest share (60%), followed by women



**Figure 1**

Location of the villages and the traditional fishing areas

**Table 1:** Monthly averages in terms of the number of sea cucumber fishing days (trips) and the average length of these trips, for the villages of Ankiembé and Besakoa

Month	Number of days	Mean duration (h)
<b>Ankiembe</b>		
Nov. 95	20	2.8
Dec. 95	17	3.2
Jan. 96	21	3.8
Feb. 96	12	3.7
Mar. 96	13	4.5
Apr. 96	13	4.1
May 96	13	4.6
Jun. 96	10	4.8
<b>Mean</b>	<b>15</b>	<b>3.9</b>
<b>Besakoa</b>		
Nov. 95	17	3.4
Dec. 95	13	4.7
Jan. 96	16	3.8
Feb. 96	13	4.5
Mar. 96	12	5.6
Apr. 96	20	5.8
May 96	17	5.4
Jun. 96	14	4.8
<b>Mean</b>	<b>15</b>	<b>4.7</b>

**Table 2:** Monthly distribution of the overall number and categories of fishermen, for the villages of Ankiembé and Besakoa

Month	Number of fishermen			Total
	Men	Women	Children	
<b>Ankiembe</b>				
Nov. 95	29	111	81	221
Dec. 95	31	102	39	172
Jan. 96	40	130	84	254
Feb. 96	20	74	20	114
Mar. 96	26	35	2	63
Apr. 96	28	71	13	112
May 96	49	60	7	116
Jun. 96	35	51	8	94
<b>Mean</b>	<b>32</b>	<b>79</b>	<b>32</b>	<b>143</b>
<b>Besakoa</b>				
Nov. 95	100	74	20	194
Dec. 95	158	87	55	300
Jan. 96	76	40	27	143
Feb. 96	109	39	6	154
Mar. 96	81	34	0	115
Apr. 96	272	139	43	454
May 96	278	106	38	422
Jun. 96	159	63	24	246
<b>Mean</b>	<b>154</b>	<b>73</b>	<b>27</b>	<b>254</b>

at 29 per cent, whereas children only accounted for 11 per cent. Finally, the fishing season was slightly different in each village, with effort higher during the hot season in Ankiembe and the reverse being true in Besakoa.

### Catches and CPUEs

Table 3 shows monthly catches and the corresponding catch per unit effort (in terms of fresh sea cucumber weight), calculated by fishing days (CPUE 1), or by fishing time (CPUE 2).

Catches are presented in the form of monthly totals: 1) the number of specimens and 2) weight of fresh sea cucumber.

In Ankiembe, monthly catches averaged about 900 kg, or 3600 sea cucumbers. A net decrease occurred during the study, with catches dropping from 2000 kg to only 200 kg during the final months. The average monthly CPUE per day also went from 9 to 2 kg and the CPUE per hour dropped from 4 to 0.4 kg.

In Besakoa, monthly catches averaged about 1700 kg, around 13 000 sea cucumbers; in contrast to Ankiembe, there was a gradual increase in average monthly catches here, with catches going from 400 kg to 4000 kg. The average monthly CPUE per day went from 2 kg to 10 kg, and the CPUE per hour from 0.5 kg to 2 kg.

### Marketing

The catches were sold in one of two ways:

- the fishermen processed the catches themselves when they returned from fishing and then waited until the end of the tidal period to sell all the products processed during that period;
- the fishermen sold the fresh catch to collectors/processors who took care of processing; these collectors bought the fresh product either by sea cucumber or by bucket.

In both villages, products then went to exporters in Toliara, who exported them directly to international markets, or first sent them to operators in Antananarivo, where they were then exported.

**Table 3:** Monthly catches (in number of sea cucumbers and in fresh weight) and average monthly CPUE (in kg), calculated by fisherman per day (CPUE 1) and by fisherman per hour (CPUE 2).

Month	Catch		CPUE 1* (kg/day)	CPUE 2* (kg/hour)
	Number	Weight (kg)		
<b>Ankiembe</b>				
Nov. 95	8 432	2 168	9.33	4.10
Dec. 95	7 648	1 910	9.81	3.29
Jan. 96	6 674	1 745	5.71	1.37
Feb. 96	2 277	540	4.88	1.46
Mar. 96	530	128	1.73	0.40
Apr. 96	1 281	347	2.94	0.82
May 96	1 147	303	2.48	0.54
Jun. 96	810	202	2.01	0.42
<b>Mean</b>	<b>3 600</b>	<b>918</b>	<b>4.86</b>	<b>1.55</b>
<b>Besakoa</b>				
Nov. 95	10 271	404	1.69	0.54
Dec. 95	12 083	624	1.99	0.42
Jan. 96	5 437	319	2.17	0.59
Feb. 96	5 666	706	3.97	0.99
Mar. 96	2 820	334	2.74	0.50
Apr. 96	22 993	4 511	9.47	1.73
May 96	35 156	4 726	9.57	1.77
Jun. 96	12 150	2 566	11.8	2.23
<b>Mean</b>	<b>13 322</b>	<b>1 774</b>	<b>5.43</b>	<b>1.10</b>

\* Monthly means

### Discussion

The first conclusion is that sea cucumber fishing continued to go ahead throughout the survey, which took place both during the hot and cold seasons. The results demonstrate the importance of sea cucumber fishing to the villages of south-west Madagascar.

Fishermen harvest sea cucumbers whenever tidal conditions are favourable, that is for about 15 days a month. Each trip takes up most of the day when the time needed to reach the fishing area and come back again is taken into account. The sea cucumbers then have to be processed after the fishermen get home. The number of fishermen is significant in both villages but the differences in terms of the relative percentages of men, women and children between the two villages have not yet been analysed, and merit further research.

Total catches are large, especially at Besakoa. It is important to verify, through selective studies,

whether the opposing trends in catches and CPUEs between the two villages can be confirmed.

The specific composition of catches will be addressed in another document, but two species, *Bohadschia vitiensis* and *Holothuria scabra versicolor* have been the object of an in-depth study (Rasolofonirina, 1997). In Ankiembe, they account for a significant part of the catches, but this is not the case in Besakoa. An ecological study of the reefs visited by fishermen should allow these differences to be explained.

There were, then, some clear differences between the two villages for the various criteria studied; these differences require more information about the anthropology of the villages in order to be interpreted.

Intensive fishing of sea cucumbers, as is now carried out, will render these resources increasingly scarce. Juveniles are often harvested, and this will have very negative effects on stock. In addition, fishermen often overturn coral heads and break them, thereby damaging the surrounding environment. Implementation of sustainable management methods will take place through actions involving the various participants in the fishing sector, from the fisherman to the exporter (Conand et al., 1997).

Education of fishermen should be accompanied by training in processing methods so as to obtain a better price for the products, and by development of this fishery through limiting access and taking steps to reconstitute stocks.

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**Figure 2**

Collection at low tide on Toliara Barrier reef (photo F. Conand)