

STUDY TO CONFIRM THE EXISTENCE OR EXTINCTION OF DUGONGS IN THE WATERS OF MAURITIUS

A REPORT SUBMITTED TO THE CONVENTION ON
MIGRATORY SPECIES OF WILD ANIMALS (CMS)
SECRETARIAT, ABU DHABI



Community Centred Conservation
C3 Madagascar and Indian Ocean Islands Programme
2010

© C3 Madagascar and Indian Ocean Islands Programme 2010

C3 Madagascar and Indian Ocean Islands Programme is a collaborative initiative between Community Centred Conservation (C3), a non-profit company registered in England no. 5606924 and local partner organizations.

The study described in this report was funded by the Convention on Migratory Species of Wild Animals (CMS) Secretariat.

Suggested citation:

C3 Madagascar and Indian Ocean Islands Programme (2010) STUDY TO CONFIRM THE EXISTENCE OR EXTINCTION OF DUGONGS IN THE WATERS OF MAURITIUS. A Report Submitted to the Convention On Migratory Species Of Wild Animals (CMS) Secretariat, Abu Dhabi. 12pp

FOR MORE INFORMATION

C3 Madagascar and Indian Ocean Islands Programme 31 Boulevard La Liberté, B.P. 518, Antsiranana 201, Madagascar Tel: +261 034 18 372 72	UNEP/CMS Office – Abu Dhabi c/o Environment Agency – Abu Dhabi United Arab Emirates www.cms.int cmsoffice.ae@cms.int
Community Centred Conservation (C3) www.c-3.org.uk info@c-3.org.uk	Shoals Rodrigues www.shoalsrodrigues.net
Ministry of Agro-Industry and Fisheries (Fisheries Division) Albion Fisheries Research centre, Albion Mauritius www.fisheries.gov.mu	University of Mauritius Reduit Mauritius www.uom.ac.mu

Cover photo: Dugong at Marsa Alam, Egypt © Luke Atkinson

STUDY TO CONFIRM THE EXISTENCE OR EXTINCTION OF DUGONGS IN THE WATERS OF MAURITIUS

Edited by Patricia ZR Davis

Community Centred Conservation (C3)

Mauritius 2010



ACKNOWLEDGEMENTS

This report is the culmination of the advice, cooperation, hard work and expertise of many people. In particular, acknowledgments are due to the following for their contributions:

COMMUNITY CENTRED CONSERVATION (C3)

Patricia ZR Davis, Director and Chris Poonian, International Programme Manager

SHOALS RODRIGUES

Sabrina Desire, Field Centre Manager and Reshad Jhangeer-Khan, Science Co-ordinator

MINISTRY OF AGRO-INDUSTRY AND FISHERIES (FISHERIES DIVISION)

for providing necessary permissions and general assistance, particularly V. Mangar and D. Rumjeet

UNIVERSITY OF MAURITIUS

for support from the Faculty of Science and Social Studies Department

All interns and students who assisted with data collection

CONTENTS

1. INTRODUCTION	1
2. AIM	1
3. METHODS	2
4. RESULTS	6
4.1 LITERATURE REVIEW	6
4.2 FISHER INTERVIEWS	9
5. DISCUSSION	10
6. REFERENCES	11

APPENDICES

I. DUGONG KNOWLEDGE QUESTIONNAIRE – MAURITIUS

**II. PERMISSIONS FROM MINISTRY OF AGRO-INDUSTRY AND
FISHERIES (FISHERIES DIVISION), MAURITIUS**

1. INTRODUCTION

This study was proposed in 2008 to confirm whether or not dugongs (*Dugong dugon*) were indeed extinct from the Mauritius and Rodrigues and if so, to determine the approximate timing of this extinction. The dugong is classified as extinct from Mauritius and native to Rodrigues; however its status is also noted as 'unknown' and the reliability of the information as 'no information' (IUCN 2009). The latest review of information on dugongs in the western Indian Ocean was based on a literature review in each country, supplemented by interviews with fishers in 2002-2003 (WWF-EAME 2004). The report states that 'dugongs are thought to have disappeared from Mauritius' although this had not been confirmed by scientific studies and no interviews were conducted on either Mauritius or Rodrigues.

Historical records indicating that dugongs were abundant around the islands of Mauritius and Rodrigues, evidence from other areas that the species is able to undertake large-scale migrations and anecdotal recent sightings revealed a need to clarify the species' status in Mauritius and Rodrigues through a systematic research study (Haskins & Davis 2008). Evidence for reappearances of dugongs around remote island groups through immigration is provided by the recent 'reappearance' in 2001 of dugongs at Aldabra Atoll, Seychelles, at least 300km from the nearest known populations (Marsh et al 2002), and at a lone individual at Cocos Island, at least 1000km from the nearest population, in 2003 (Hobbs et al 2007).

2. AIM

The aim of the work was to confirm the existence or extinction of dugongs in Mauritian waters through systematic surveying of fisher communities on Mauritius and Rodrigues to elicit local knowledge, present or historic, in relation to the occurrence and distribution of this species.

3. METHODS

Initially, a thorough literature review was conducted which involved visiting the National Archives, museums and searching for any references to dugongs around the Mascarenes in historical accounts by early explorers, naturalists and colonists dating back to the early 1600s.

Questionnaire interviews were then conducted with fishers on both Mauritius and Rodrigues with the aim of surveying approximately 5% of the total artisanal fishing community. It was assumed that if there was any knowledge relating to the species it would be second-hand, originating from at least the previous generation; thus questionnaires were designed to gather first and second hand information on dugongs. First a photograph of a dugong was shown to a fisher and they were asked if they recognized the animal. This approach was deemed preferable to asking 'Do you know what a dugong is and have you seen one?' which may have led to false positive responses (interviewees may have been ashamed to admit that they did not know something they perhaps they should have been aware of).

If the fisher recognized the dugong, they were questioned further to determine whether this was following personal observation or anecdotal information related to them by another individual. If they claimed to have made a direct observation, they were questioned about the date and location of the sighting and asked various questions about the appearance and behaviour of the animal to confirm whether or not their description was consistent with a dugong and not another marine mammal. Such questions included: 'Did it have a fin which emerged from the water?'; 'Was it lying on the shore?' Such questions were designed to check for confusion with delphinids or pinnipeds, which also occur locally.

If the fisher did not recognize the animal they were asked whether or not they had heard of the Creole name, *Lamentin*, as they may have been told stories about the animal by their grandparents or great grandparents, which could provide information on historical occurrence.

Between 9th June and 30th July 2008, 14 fish landing sites around Mauritius (Figure 1; Table 1) were visited and a total of 105 fishers were approached and asked about first and second-hand accounts of dugong observations. Based on government figures, there were approximately 2,300 fishers operating in Mauritius (AFRC 2007) therefore this represented a sample size of 4.6%.

On Rodrigues the interviews were conducted between 6th May and 3rd July 2009 at six fish landing sites (Figure 2; Table 1) and 97 fishers were interviewed out of approximately 2,000 licensed fishers, representing 4.9% of the known fishing population.

Table 1 Number of fishers interviewed at each study site

Site	No. of fishers
Mauritius	
Albion	3
Baie de Tombeau	10
Cape Malheureux	4
Grande Baie	9
Grande Gaube	5
La Preneuse	5
Le Morne	1
Mahebourg	23
Point aux Sables	6
Poudre d'Or	14
Roche Bois	2
Souillac	5
Trou aux Biches	9
Trou d'Eau Douce	9
Rodrigues	
Pointe Monier	21
Baie du Nord	15
Point Corail	17
Saint Francois	16
Port Sud-est	13
Pointe Coton	15

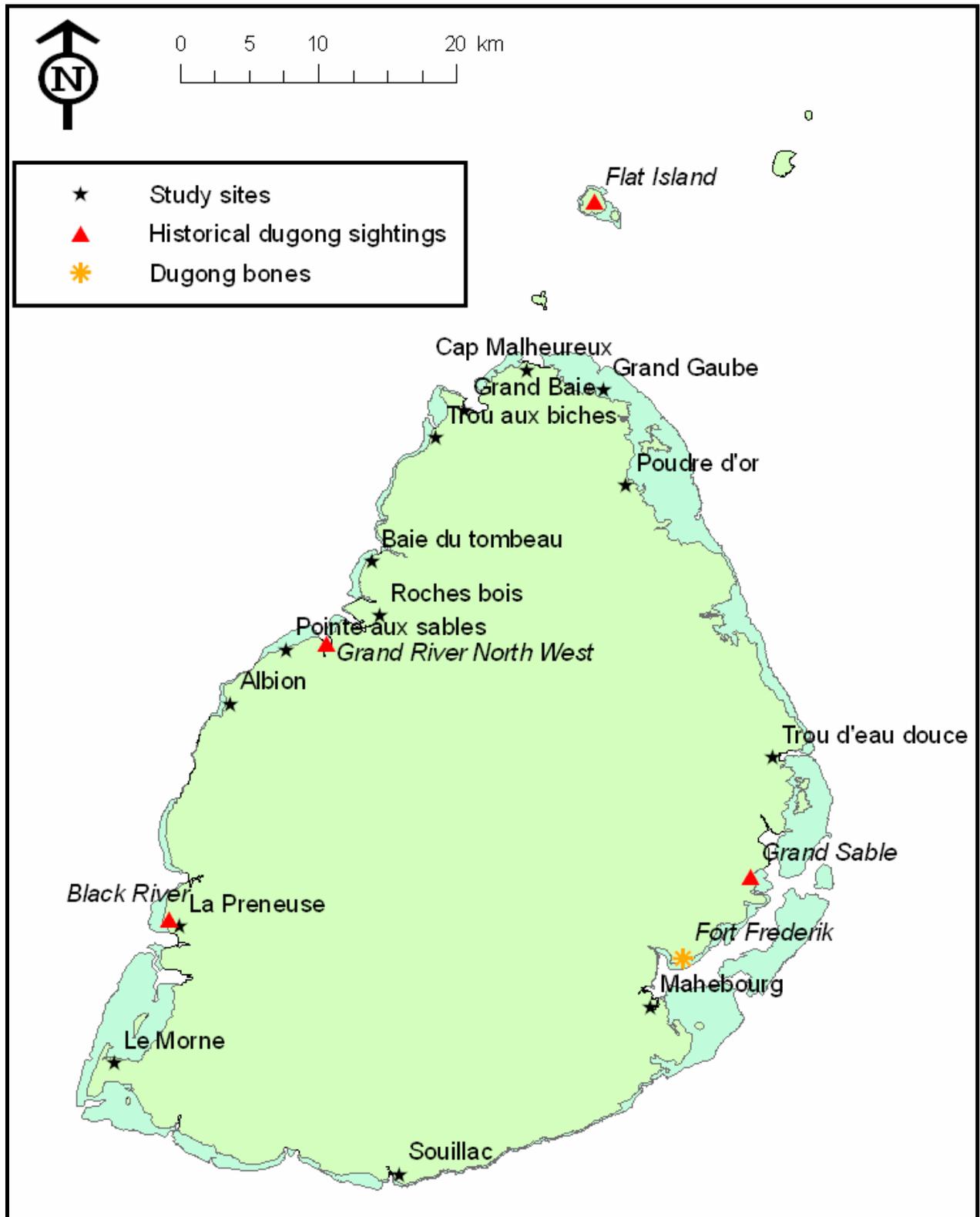


Figure 1. Map of Mauritius showing study sites for interview surveys, historical sightings and archaeological excavation

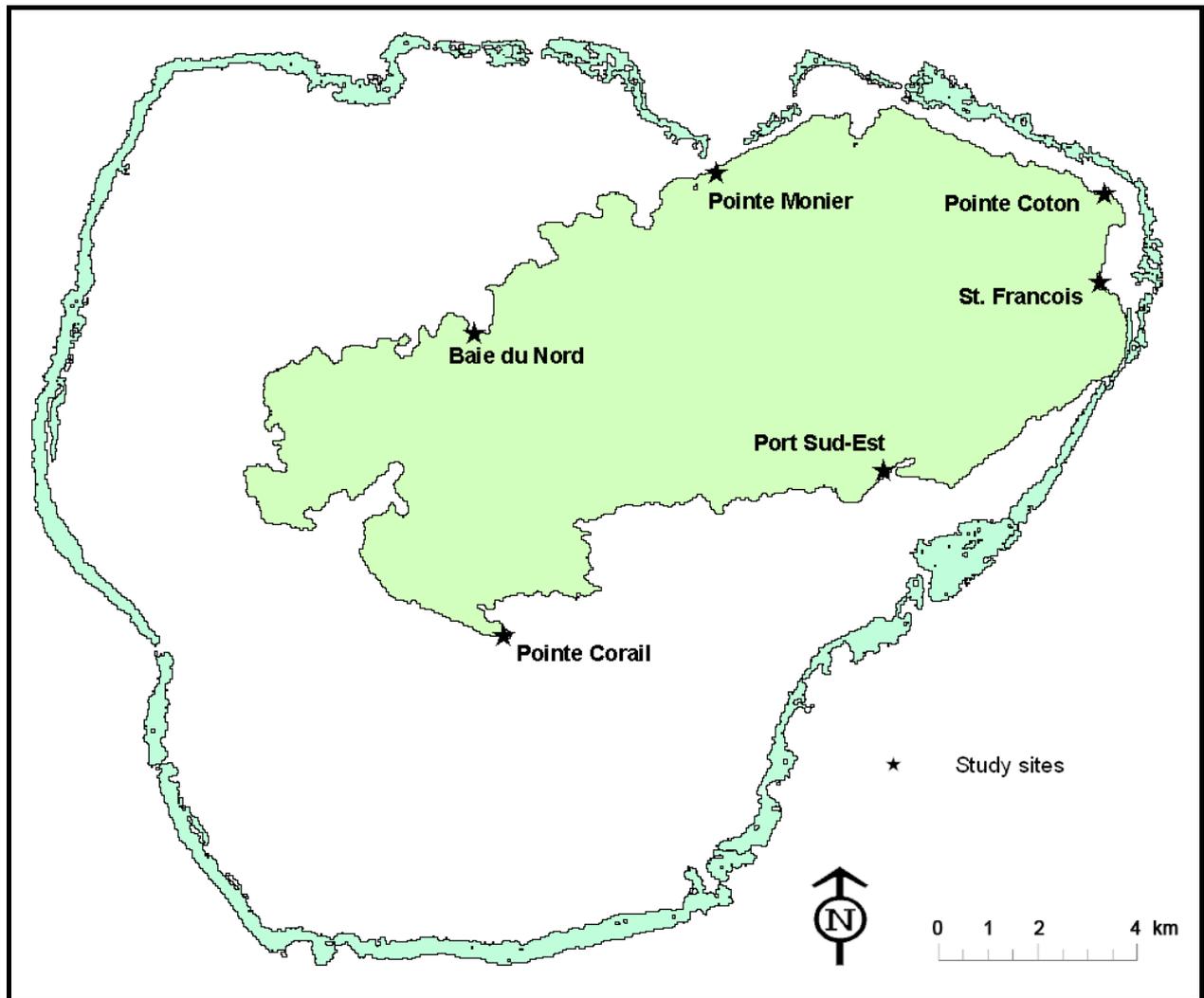


Figure 2. Map of Rodrigues, showing study sites for interview surveys

On Mauritius, interviews were conducted by four students from the Department of Biological Sciences at University of Mauritius; on Rodrigues the interviews were conducted by a local NGO, Shoals Rodrigues. All questions were posed in Creole, the local language.

4. RESULTS

4.1 LITERATURE REVIEW

Observations of dugongs around the islands of Mauritius and Rodrigues appear in early literature from the 1600s until the end of the 1700s. It has even been suggested that Portuguese sailors from the 17th century referred to Mauritius as 'Island of the Siren' or *Ilha do Cirne* (from *Sirene*) on account of the abundance of these animals in its coastal waters (Lozoya 2004).

Observations were reported by Dutch captains, Colonial governors and early French explorers and naturalists who were all struck by the peculiarities of the species and in some cases wrote detailed accounts of individuals; noting size, weight, anatomy, feeding and suckling behaviour, group size, methods of capture and flavour and consistency of the meat.

It proved impossible to find accounts of dugongs around Mauritius post-1800 although they were still described from Rodrigues in the mid-1800s (Pridham 1849). It appears, like their iconic terrestrial counterparts, the Dodo (*Raphus cucullatus*), Rodrigues Solitaire (*Pezohaps solitaria*) and giant land tortoises (*Cylindraspis peltastes*, *Cylindraspis vosmaeri*, *Cylindraspis inepta*, *Cylindraspis triserrata*) that dugongs were hunted particularly intensely in the mid-1700s, were extremely rare by the early 1800s and most probably functionally extinct by the end of the 19th century.

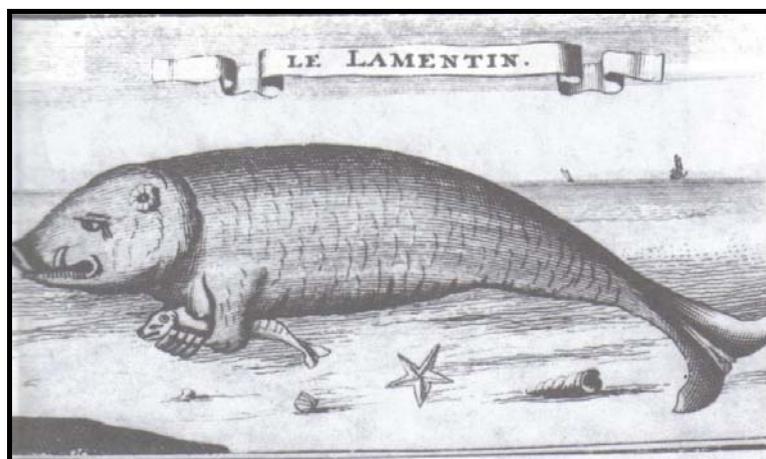


Figure 3. Artist's impression of a dugong (Leguat 1708)

To provide some context to the levels of natural resource exploitation at the time, colonial records describe the harvesting of approximately 10,000 land tortoises per year from Rodrigues in the mid-1700s (Grihault 2007). Only 50 years later, in 1804, the land tortoise had effectively become extinct from Rodrigues (Gade 1985). Other terrestrial counterparts to suffer the same fate include the dodo and solitaire, both flightless birds hunted intensively for their meat by early settlers and passing merchant ships. Permanent colonization took place in 1638 by the Dutch who remained in control of the islands until 1710. Contact with early explorers quickly led to the overexploitation of dugongs with men shooting (Leguat 1708) or harpooning them (Pitot 1905) in shallow water.

From 1638 to 1710 the Dutch colonists at Fort Frederik in the south east of Mauritius relied on dugong meat as a major component of their diet, as evidenced by large quantities of dugong remains found in recent archaeological excavations of the site (Cheke & Hume 2008, Gill 2009, Peters et al 2009, Julian Hume pers. comm. 2010). These Dutch faunal remains were analysed from a food refuse site at Fort Frederik Hendrik and were found to date from the last quarter of the 17th century, possibly between 1694 and 1698. These remains represent the first detailed archaeozoological data for Mauritius. A total number of 53 identified specimens of dugong bones were found with evidence of consumption. In terms of weight it was estimated that the harvested dugongs and sea turtles made a major contribution (around 40%) to the settlers' diet despite the presence of domestic animals. The rest comprised of deer, pigs, goats, cattle and fish.

Although under French occupation from 1721, major efforts to develop the island did not begin until 1735. Dugongs, as a valued source of red meat and oil were hunted intensively by a burgeoning colonial population. Inhabitants on Mauritius increased more than ten-fold within less than 80 years between 1767 (pop.18,777) and 1846 (pop.196,550; Pridham, 1849). In contrast, the population of Rodrigues stood at only 495 in 1851 (Gade 1985) resulting in increased export of marine resources from the Rodrigues lagoon to the already-depleted island of Mauritius from the mid-1700s onwards.

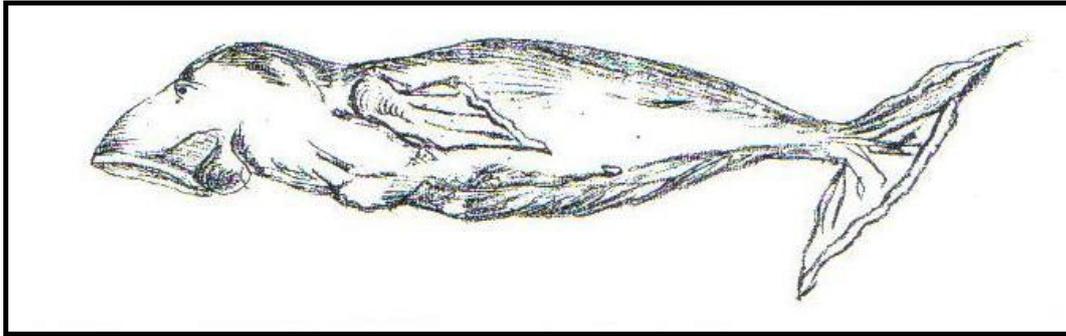


Figure 4. Sketch of a dugong in a journal by Hubert Hugo, the Dutch governor of Mauritius from 1673-1677

Dugongs seem to have been particularly abundant in Rodrigues where they were reported to occur in herds of 300-400 individuals (Leguat 1708). Reports from the 1730s document how large quantities of salted dugong meat were supplied by Rodrigues to Mauritius (d'Heguerty in de Lozoya 2004) but just 30 years later it was noted that the species had become rare (Abbey de Pingré 1766, in Dupon 1969). Later sightings pointed to their continued existence in small numbers at the end of the century (Marragon 1795 in Dupon 1969). In Mauritius, sightings of single animals or small groups were reported from all around the island, including more specifically Grande Riviere Nord Ouest (north-west), Black River (south-west) and Flat Island (north) from the 17th and 18th centuries (in Stoddart 1972).

In addition to direct take of dugongs, their primary habitat, seagrass beds, would also have been impacted by sedimentation resulting from deforestation that was taking place on a massive scale on both islands. In the early 1700s, the island of Rodrigues was mostly covered in evergreen forest (Leguat 1708). By the mid-1800s this had been mostly removed from both Rodrigues and Mauritius as land was cleared for timber and agricultural purposes (Gade 1985).

Prater (1928) mentioned Mauritius as part of the dugong's range but this was not based on direct observation and thus may have been purely an inference from earlier documents. He does remark that at this time dugongs were in serious decline across the Indian Ocean islands, no longer seen in herds but in small groups of 3-4 individuals.

Gade (1985) reported that a young dugong was caught in a net in the Rodrigues lagoon in the late 1970s but successfully released. Following further enquiries both on Rodrigues and with the author himself, this account cannot be verified and may relate to a seal.

A marine mammalogist, Delphine Legay (deceased) studying delphinids in Tamarin Bay, Mauritius, reported seeing a dugong underwater in 1999 (Imogen Webster, Mauritius Marine Conservation Society pers comm. 2010) although this is, again, an unconfirmed sighting and may relate to a seal.

4.2 FISHER INTERVIEWS

The sample of fishers interviewed were aged between 15 and 79 and the majority were male. 13% were over the age of 60 although 20% did not disclose their age so the proportion of older fishers could have, in fact been higher. On Mauritius, three fishers recognized the dugong from the photo and stated that they had seen the animal in the past between the years of 1935 and 2008 (Table 2).

Table 2: Recounted first-hand observations of dugongs around Mauritius

Location	Year	Details
Baie du Tombeau	1935, 1987	Four encounters
Albion	1945	No details
Grande Sable	2008	Seen on seagrass while fishing with mask and snorkel; estimated weight: 150kgs

Thirty percent of respondents, although they did not recognize the animal from the photo, claimed they had heard of the word *lamentin* before, 4% had heard people talking about it and 26% had seen it on television. However there were no second hand accounts from previous generations.

On Rodrigues, no fisher recognized the photo of the dugong although some recognized the word *lamentin*. However when questioned further, it was clear that the fishers were, in fact, referring to seals.

5. DISCUSSION

Less than 4% of respondents claimed they had seen a dugong when they were shown the photograph. In almost all of these cases the animal described was clearly a seal when the fisher was questioned in more detail. Although one sighting was made while underwater over seagrass it is impossible to confirm that the animal reported was in fact a dugong, particularly as there appeared, even with a reference photo, confusion between seals and dugongs. Furthermore there is no means of testing the veracity of the fishers' statements.

Many reported 'dugong' sightings clearly referred to stranded seals. In 2001 a male juvenile Subantarctic fur seal (*Arctocephalis tropicalis*), was found stranded at Rodrigues and later the same year two additional juveniles were found in Mauritius. Southern elephant seals, (*Mirounga leonine*), are also occasionally found stranded at Mauritius (AFRC 2007) The publicity surrounding these strandings, in particular the reporting of these events on local television, may have increased confusion with pinnipeds, whose occurrence in Mauritian waters may be more frequent than previously thought (Stoddart 1972). This confusion has been recorded in other regions of the world, both historically and in recent times (Stoddart 1972) and must be a consideration when interpreting anecdotal information on dugongs in any regions where pinnepeds are known to be present. This is an important consideration when gathering anecdotal information on the presence of dugongs both within and beyond the western Indian Ocean region.

Since more than 10% of fishers questioned were over 60 years of age, there was the potential to gather second hand information on the species dating back to the late 19th century/early 20th century. If dugongs were present and encountered by fishers 100 years ago, stories of this rare and peculiar animal would surely have been passed on through the generations to the present day, but the failure to find any information except for likely seal encounters reinforces the hypothesis that the species had already been exterminated by the end of the 19th century. The literature review also confirms this theory with the last reference to direct observations in the mid-1800s.

6. REFERENCES

AFRC (2007) ALBION FISHERIES RESEARCH CENTRE ANNUAL REPORT 2007. Ministry of Agro Industry, Food Production and Fisheries. Government of the Republic of Mauritius

Cheke A and Hume J (2008) LOST LAND OF THE DODO. AN ECOLOGICAL HISTORY OF MAURITIUS, RÉUNION & RODRIGUES. T & AD Poyser, London, 464 pp

De Lozoya AR (2004) ON THE ANCIENT PORTUGUESE NAME OF MAURITIUS: ILHA DO CIRNE. Proceedings of the Royal Society of Arts and Science of Mauritius 7:81-84

Dupon JF (1969) RECUEIL DE DOCUMENTS POUR SERVIRA L'HISTOIRE DE RODRIGUES. Port Louis : R.Coquet.

Gade DW (1985) MAN AND NATURE ON RODRIGUES : TRAGEDY OF AN ISLAND COMMON. Environmental Conservation 12:207-216

Gill AC (2009). DID THE DUTCH EAT THE DODO? THE BONE MATERIAL OF FORT FREDERIK HENDRIK IN MAURITIUS. Unpublished MSc thesis

Grihault A (2007) SOLITAIRE: THE DODO OF RODRIGUES ISLAND. Précigraph, Mauritius, 132pp

Haskins G and Davis PZR (2008) HAS THE DUGONG GONE THE WAY OF THE DODO? Sirenews 49:16-17

Hobbs, J-PA, Frisch AJ, Hender J and Gilligan JJ (2007). LONG-DISTANCE OCEANIC MOVEMENT OF A SOLITARY DUGONG (*DUGONG DUGON*) TO THE COCOS (KEELING) ISLANDS. Aquatic Mammals 33:175-178

Leguat F (1708) VOYAGES ET AVENTURES DE FRANCOIS LEGUAT & DE SES COMPAGNONS EN DEUX ILES DESERTES DES INDES ORIENTALES. 2 vols. David Mortier, London.

UNEP (2002). DUGONG: STATUS REPORT AND ACTION PLANS FOR COUNTRIES AND TERRITORIES. UNEP : Early Warning and Assessment Report Series, Townsville, 162pp.

Milne Edwards A (1875) NOUVEAUX DOCUMENTS SUR L'EPOQUE DE LA DISPARITION DE LA FAUNE ANCIENNE DE L'ILE RODRIGUE. Annales Sciences Naturelles 4:1-20

Peters N, Neer WV, Debruyne S and Peters S (2009) LATE 17TH CENTURY AD FAUNAL REMAINS FROM THE DUTCH 'FORT FREDERIK HENDRIK' AT MAURITIUS (INDIAN OCEAN). *Archaeofauna* 18:159-184

Pitot A (1905). T'EYLANDT MAURITIUS : ESQUISSES HISTORIQUES (1598-1710). Port Louis coiquet Freres et Cie

Prater SH (1928). THE DUGONG OR SEA COW (*HALICORE DUGONG*). *Journal of the Bombay Natural History Society* 33:84-89

Pridham C (1849) AN HISTORICAL, POLITICAL AND STATISTICAL ACCOUNT OF MAURITIUS AND ITS DEPENDENCIES. T. and W. Boone, London, 1849.

Saint-Pierre JB (1773) JOURNEY TO MAURITIUS. Translated by Jason Wilson 2002. Signal Books Ltd, Oxford.

Stoddart DR (1972) PINNIPEDS OR SIRENIANS AT WESTERN INDIAN OCEAN ISLANDS? *Journal of Zoology* 167:207-217

WWF Eastern African Marine Ecoregion Programme (2004) TOWARDS A WESTERN INDIAN OCEAN DUGONG CONSERVATION STRATEGY: THE STATUS OF DUGONGS IN THE WESTERN INDIAN OCEAN REGION AND PRIORITY CONSERVATION ACTIONS. Dar es Salaam, Tanzania: WWF. 68pp

APPENDICES

I. DUGONG KNOWLEDGE QUESTIONNAIRE – MAURITIUS

**II. PERMISSIONS FROM MINISTRY OF AGRO-INDUSTRY AND FISHERIES
(FISHERIES DIVISION), MAURITIUS**

DUGONG KNOWLEDGE QUESTIONNAIRE - MAURITIUS

1. Have you ever seen or caught a dugong? – show picture – go to **1st Hand** section
2. Do you know what a dugong or *lamentin* is? – go to **2nd Hand** section

1st Hand

Fisher information

Date:	Village and Island:	Interviewer:
Age:	Occupation:	Name (Optional):

1.1 How old were you or what year was it when you saw the dugong? Age _____ Year _____

Please mark on the map the location of sighting(s)

Location	# individuals	Habitat ¹	Size ²	#encounters	Day/Night	Year	Season	Alive/Dead	Cause of death ³

¹seagrass/mangrove/reef/open sea; ²small (<1m)/ Medium (<2m) Large (>2m); ³e.g. gillnet, driftnet, unknown

1.2 What activity were you undertaking when you saw it/them?

Fishing (canoe) Fishing (motorboat) Observed from the coast Other _____

1.3 Have you ever caught a dugong while fishing? yes no If yes, what fishing method were you using?

<p style="text-align: center;"><i>Gillnet</i></p> <p>mesh size: total net length: net width/depth: floating or anchored:</p>	<p style="text-align: center;"><i>Basket trap</i></p> <p># of Baskets Basket size</p>	<p style="text-align: center;"><i>Other</i></p>
<p style="text-align: center;"><i>Long lines</i></p> <p>hook size: Number hooks per line: line length: Floating or sinking lines:</p>	<p style="text-align: center;"><i>Basket and Line</i></p>	
<p style="text-align: center;"><i>Large net</i></p> <p>mesh size: total net length: net width/depth: Floating or anchored</p>	<p style="text-align: center;"><i>Harpoon</i></p>	

1.4 Do you know any legends or myths about the dugong?

2nd Hand

Fisher information

Date:	Village and Island:	Interviewer:
Age:	Occupation:	Name (Optional):

2.1 How did you hear about the animal?

2.2 Have any of your friends, family, parents or grandparents ever mentioned or seen a dugong? yes no

If yes, who? - Please can we contact them?

If yes, contact the person to complete a questionnaire

2.3 Do you know any legends or myths about the dugong?



REPUBLIC OF MAURITIUS

MINISTRY OF AGRO INDUSTRY AND FISHERIES
(FISHERIES DIVISION)

Albion Fisheries Research Centre, Albion, Petite Rivière

F63/1/IV²

My Ref :

25 February 2008

Your Ref :

Dear Sir,

Proposal for research study on the Dugong (Dugong dugong)

Please refer to your request dated 7 January 2008 seeking the authorization of this Ministry to conduct a study to ascertain the level of local knowledge, both current and historical about dugong in Mauritius waters.

2 The request has been examined and the Ministry has no objection for your organisation to undertake the study, subject to the following conditions:

Prior to the study:

- (i) C₃ should provide a detailed programme complete with the methodology of the project;
- (ii) C₃ should define clearly in writing how it would collaborate with AFRC;
- (iii) There will be no cost involvement from the Government of Mauritius;
- (iv) The study should not interfere with/hamper the daily livelihood of the artisanal fishermen;
- (v) Appropriate acknowledgments shall be given to the Ministry in all publications resulting from the study and a copy shall be submitted to the Ministry of Agro-Industry & fisheries (Fisheries Division);
- (vi) Any breach of the conditions stated above will lead to the cancellation of the authorization.

Yours faithfully

V. Mangar

For Ag. Senior Chief Executive

The Director
Community Centred Conservation
3 Bis, Ave. St Geran
Albion, Mauritius

/cb