

## **Biodiversity conservation of Dugong (Dugong dugon) in Madagascar**

**Applicant:** Centre for Dolphin Studies, South Africa. Prof. V.G. Cockcroft,

**Experience:** pioneering interest (17 years) in WIO dugongs and dugong tourism.

### **Partners and associates:**

Université de La Rochelle (CRELA: Centre de Recherche sur les Ecosystèmes Littoraux Anthropisés).

Wildlife Conservation Society (Rapid Bycatch Assessments/aerial survey team support)

Megaptera (aerial survey team support and logistic/awareness campaigns)

ARVAM and KELONIA (seagrass mapping)

Project GLOBAL (Global Bycatch Assessment of Long-lived Species), Duke University

L'Institut Halieutique et des Sciences Marines

**Geographical zone:** north-west and north-east of Madagascar

TOTAL cost	€140 000	MGA364000000	ZAR1,412,088.94
Amount requested	€100 000	MGA259700000	ZAR1,009,807.46

### **Complementary funding sources:**

Project GLOBAL (Global Bycatch Assessment of Long-lived Species), Duke University

Centre for Dolphin Studies – hardware/capital equipment for surveys & salary of principal investigator

CRELA – salary / subsistence allowance of survey personnel

### **Relevance:**

In terms of the Convention on Biodiversity, the Bonn Convention, dugongs, as migratory species, are extremely valuable in terms of biodiversity. A Record of Decision of the IOC (Madagascar 2007) supported this and called for dugong research and conservation in the Western Indian Ocean region (WIO).

Dugongs play a pivotal role in seagrass 'seeding'. Without dugongs the future of seagrass beds is uncertain. Importantly, seagrass beds are crucial to the maintenance of coastal fisheries.

Dugong populations everywhere are declining, making the future of these animals uncertain, much as the cheetah was 30 years ago. Conservation efforts, especially in the WIO, are urgent.

Current estimates suggest that there are fewer than 500 dugongs left in the WIO, making them the most endangered large mammal in any WIO state.

The use of Dugongs as 'flagships' for regional coastal conservation (especially as they are WIO's most endangered large mammal) offers an immense opportunity to train local scientists and conservators and to use dugongs as the core of coastal conservation (ICZM) programmes.

As the animals are so rare, there is immense opportunity for dugong based tourism, given the education of fishers and the conservation of dugongs in Madagascar. An example of this is manatee tourism in the United States.

### **Background and context: the status of dugong (Dugong dugon) in the western Indian Ocean**

The dugong is the one extant species member of the family Dugongidae of the mammalian order Sirenia. It ranges across nearshore tropical and subtropical coastal and island waters of the Indo-Pacific between southern Mozambique in the west and Vanuatu to Japan in the east. - spanning some 140 000 kilometres of coastline of approximately 40 coastal and island states. As the only true marine mammal that is herbivorous, dugongs are strongly associated with seagrasses. Tropical seagrass beds are consequently critical habitat for dugongs, but this habitat is often under pressure from various anthropogenic activities, including commercial and artisanal fishing, bycatch during the operations, hunting, vessel traffic (including tourism), and degradation and pollution of their coastal habitat. As a consequence, dugongs are listed globally as vulnerable to extinction under the 1996 World Conservation Union (IUCN). The United Nations Environment Programme's Dugong Status Report and Action Plans for Countries and Territories (UNEP, 2002) states that 'throughout much of its range, the dugong is represented by relict populations separated by large areas where its numbers have been greatly reduced or it is already extirpated. The dugong is still present at the historical limits of its global range, although there is evidence of a reduction in its area of occupancy within its range. In most parts of its range, the anecdotal evidence suggests that dugong numbers are declining'.

### **Western Indian Ocean Regional Distribution:**

Historically, dugong distribution range within the African region of the Western Indian Ocean (WIO) extended from Somalia in the north, through Kenya, Tanzania, Mozambique and further east off the islands of the Comoros, Seychelles, Madagascar and Mauritius. However current information on the status of dugongs in the WIO is sparse. Historical data indicate that most dugong populations in the region have suffered a steep decline in since the 1960s.

Current information from qualitative and quantitative surveys show that dugongs may now only remain in small numbers in a few areas in Kenya, Tanzania, Mozambique, Madagascar, Seychelles and the Comoros archipelago (Moheli and Mayotte islands). Dugongs possibly still occur in the Comoros (at Moheli Island) and off the Somalian coast, but their current status is unknown. They are believed to have become extinct from Mauritius in the early 20<sup>th</sup> century, and never to have occurred in Reunion. Their status at other WIO islands remains unknown. Although dugongs are protected across the range of all the above states, enforcement is limited by both human capacity and resources. WWF (2004) noted that current information from the WIO region suggests that dugong populations have been declining sharply since the 1960s and 70s. A recent UNEP/IUCN (UNEP, 2002) report on the global status of dugongs suggested that extinction of the dugong in the WIO region was considered inevitable without immediate and effective conservation measures.

### **DUGONGS IN MADAGASCAR**

The intensification of large mesh gill netting from the 1970s onwards (often directed at dugongs), coupled with lack of law enforcement, is thought to have been the principle cause of the decline of the dugong population in Madagascar. However, seine netting, commercial trawl operations and palisade fish traps are believed to compound the fishing pressure on dugongs. WWF (2004) suggested that habitat destruction of seagrass beds (through increased levels of riverine sedimentation and through natural cyclone and flood events), and increased anthropogenic disturbance through exposure to vessel noise (particularly tourism vessels) are further threats.

Questionnaire surveys undertaken in the northeast and entire west coasts in the mid – 1990s suggested that dugongs populations off Madagascar were in sharp decline (Cockcroft & Young, 1998). However, sightings persist in certain areas, notably the islets of Andavadoaka - Morombe; at Ambararata – Courier and Diego Bay; the bays and estuaries of Sakoany - Bombetoka; Ambavarano - Vohémar; and Sainte-Marie Island. Given the size of Madagascar's suitable dugong habitat (waters less than 30m in depth and supporting extensive seagrass meadows), it is possible that remnant, but relatively large and biologically viable dugong populations may survive on the northwest and northeast coasts.

If such populations exist, their importance for biodiversity and as seed populations for areas where dugongs have been extirpated is immense. Further, given the gradual, but inevitable, increase in Madagascar's marine tourism, dugongs will almost certainly provide economic opportunities for local tourism. Consequently, the present project proposal addresses two priority sectors of the ReCoMaP :

*Sustainable management of coastal marine resources*

*Coastal Eco-tourism*

### **Description of action and its effectiveness:**

*Objectives and phases of the project:*

Through the WWF EAME report (2004), Madagascar has been identified as an area of great potential for dugongs in the region, where a viable population could occur. Indeed, extended seagrass beds occur along the north-west and north-east coasts, providing potential habitats for dugongs. Potentially, dugong populations in Madagascar may be important and conservation/management initiatives in this area may ensure the survival of this species around Madagascar and in the western Indian Ocean region at large.

It will be critical to achieve a number of objectives, including assessing the level and types of interaction between dugongs and local communities, in particular gillnet fisheries, poaching and habitat degradation. Raising awareness among local communities will help to protect dugong populations.

*Overall objective:*

To prepare a conservation plan for the dugong in Madagascar, to propose the creation of an MPA specifically for the dugong conservation and the development of dugong based tourism.

Regardless of the 'success' in finding dugongs, the educational and awareness programmes should have a long lasting influence and be critical in encouraging sustainable use of Madagascar's coastal zone.

Given the scope of the surveys, recommendations will be made regarding the positioning of Marine Protected Areas.

### **Proposed activities:**

Assess the distribution, abundance and habitat preferences of dugongs (and other marine mammals) along the north-west and north-east coasts of Madagascar through aerial surveys (local personal of WCS, CRELA & Megaptera).

Assess the presence of suitable habitats for dugongs (seagrass beds) through habitat mapping (ARVAM & KELONIA).

Assess the extent of gillnet (primary threat to dugongs, and other marine species, in the western Indian Ocean) as well as other fishing techniques, through Rapid Bycatch Assessments (integration into project GLOBAL/Duke University, USA),

Undertake educational and population awareness campaigns in selected locations of the north-west and north-east coasts where fishing communities (at least potentially) interact with dugongs (where dugongs occur), using dugongs as 'flag ship' species for coastal zone sustainable use and conservation and the promotion of dugong tourism (all partners and associates).

Develop a plan for the implementation of sustainable marine, and especially dugong, tourism. The Florida, USA, manatee model refers. Madagascar is desperate for tourism, especially 'high end', 'good spend'. Equitable tourism - Tourism that benefits all the peoples of Madagascar.

### **Description of actions:**

#### *Distribution and abundance dugongs*

Aerial surveys are used extensively to estimate the distribution and abundance of marine mammals, including dugongs. Dugong abundance and distribution in both the northwest and northeast of Madagascar will be estimated using both strip and line transect methodology, four times per year. Habitat preference will be examined by correlating dugong distribution, seagrass distribution and bathymetry, using both spatial and power analyses.

#### *Dugong range and habitat assessment*

Given the existence of dugongs, their probable range can be estimated by the presence or absence of suitable habitat. This can be gauged through seagrass mapping, either physical mapping by collecting samples, or through the use of satellite imagery.

#### *Assessment of bycatch*

Bycatch (to be defined as "part of a fishing unit taken incidentally, in addition to the targeted species towards which fishing effort is directed", FAO) is probably the most serious threats to dugongs throughout its range, and especially off the east African coasts (Marsh et al., 2002; WWF EAME, 2004). An evaluation of the extent of bycatch is clearly needed to assess the level of exposure of dugongs to local fisheries (especially those using gillnets). To achieve this objective, a Rapid Bycatch Assessment (RBA) will be undertaken throughout the area, using standard and repeatable techniques. In consultation with the local communities (see Awareness below), the results from the RBA will be used to formulate methods and means (alternative fishing gear etc.) to mitigate against the depletion of any dugong population.

#### *Educational and awareness programme*

Educational and awareness programmes will be undertaken throughout the study. Educational programmes will include (but not be restricted to) visits to schools, where children will be introduced to 'new' environmental education programmes (interactive games etc.). Awareness programmes will include (but not be restricted to), regular workshops with local communities (beginning after the first RBA), to determine the communities' ideas and potential contribution to the studies' objectives (alternative fishing gear use, closed seasons etc); information posters, stories and photographs for distribution to the local media.

#### *Development of dugong ecotourism protocols:*

Dugongs, because of the hunting and capture pressure to which they have been subjected, are wary of power boats, unlike other marine mammals. As a result, the use of these animals in tourism requires a special and particular approach. Quiet, sailing, or hand powered vessels should be used, suggesting a direct involvement of local fishers, rather than hotel owners. These approaches need to be evaluated and assessed at stake holder workshops, where 'BEST PRACTICE' animal approach protocols can be formulated (using the knowledge of local fishers) in combination with 'BEST PRACTICE' tourism (using the experience of tourism operators and hotel owners).

### **Sustainability of the action:**

#### *Preconditions and assumptions - Validation*

The first Rapid Bycatch Assessment will be undertaken at the beginning of the study, to collect 'base line' data. A second RBA will be undertaken in the last quarter of the study. This will be done in tandem with a 'final workshop', to assess the communities' thoughts on the study and its achievements. These will provide some validation of the success of the overall programme, especially the Educational and Awareness programme.

*Sustainability:*

Three measures of sustainability pertain:

If a viable (this will be assessed using population viability analysis tools) dugong population is found in northern Madagascar, the involvement of Madagascar's Government will be essential in the conservation of this 'flagship' for biodiversity and Integrated Coastal Zone Management. Madagascar recently became a signatory to a Memorandum of Understanding (under the auspices of Convention on Migratory Species) promoting the conservation of dugongs in the Indian Ocean (31 October 2007 in Abu Dhabi, United Arab Emirates). Consequently, Madagascar's Government is bound by signature to 'conserve' dugongs and their habitat. This may have to be done with international aid.

Although not the poorest region in Madagascar, the northern area houses many poor and indigent communities. There are also several 'high end' tourism facilities on both the north west and north east coasts of Madagascar. Given that all parties subscribe to 'BEST PRACTICE' sustainable tourism and given their commitment to dugong and coastal zone conservation (a product of the workshops), 'the rich and poor should work equitably' for their own and the environments benefit.

Madagascar's coastal people rely on coastal resources for their livelihood. Given the efficacy of our education and awareness programmes, the coastal inhabitants of the north east and north west of Madagascar will hopefully realise that:

Dugongs can be a source of wealth creation, via tourism.

Dugongs are essential for the continued propagation of seagrass beds and consequently, the viability of coastal fisheries.

**Risk Assessment**

The Principal Scientist has two decades of experience in managing projects of this nature. As a result, risks and their management are considered integral to project planning. However, for the purposes of this proposal, the following risk analysis is offered.

Actions	Risks	Mitigation
<i>Distribution and abundance of dugongs – aerial surveys and personnel training</i>	Inclement weather Poor personnel performance Lack of equipment or personnel Inability to find dugongs No community support Poor planning, lack of funding	Time management, flexibility Personnel motivation and training Partner & associate involvement  Geographic flexibility Involvement of community in all stages Partner, associate and stakeholder involvement
<i>Dugong range and habitat assessment</i>	lack of personnel & expertise  lack of funding	Personnel training & partner & associate involvement Partner, associate and stakeholder involvement
<i>Assessment of bycatch</i>	No community support No Governmental support Lack of personnel Inability to raise matching funding Inclement weather	Involvement of community in all stages All stakeholder support via workshops Partner & associate involvement Partner, associate & stakeholder involvement  Time management, flexibility
<i>Educational and awareness programme</i>	No community support No Governmental support Lack of personnel & expertise Poor workshop attendance Poor validation	Involvement of community in all stages Stakeholder support via workshops/meetings Partner & associate involvement & training Stakeholder involvement via local 'monitors' Modify approach and re-evaluate
<i>Development of dugong ecotourism protocols</i>	No 'buyin' of stakeholders  No 'buyin' of Government	Restructure educational & awareness programme to achieve maximum 'buyin' Stakeholder support for implementation of international agreements and MOUs