

Blueprint for a Regional Dugong Conservation Strategy

A Methods Guide for the South West Indian Ocean



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Global concern for dugongs

The dugong (*Dugong dugon*) is in critical need of conservation intervention (UNEP 2002), particularly in the South West Indian Ocean (SWIO) (WWF-EAME 2004). This coastal marine mammal has a low maximum rate of increase of 5% per year and feeds exclusively on seagrass. Populations worldwide have suffered overexploitation primarily due to direct and accidental capture (UNEP 2002). The World Conservation Union lists the dugong's status as vulnerable to extinction on a global scale with an estimated population decline of 20% in the last century (UNEP 2002).

Through the United Nations Environmental Programme (UNEP)'s Convention on Migratory Species of Wild Animals (CMS), an international 'Memorandum for the Conservation of the Dugong and its Habitat' was created in 2007. Although it is a non-binding agreement with voluntary participation, this instrument encourages all signatory range states to develop national Conservation Management Plans for the species' future protection.

Few countries within the species' range currently have active management initiatives in place due to a combination of factors including lack of data, technical expertise and political will. This is particularly true for the SWIO region, where a severe shortage of information on the species and a lack of financial and technical resources have hampered conservation efforts. Without immediate efforts to implement rapid research and conservation initiatives the local extinction of this species is considered inevitable (UNEP 2002; WWF-EAME 2004).

The Need for a Regional Blueprint

In the past, a number of sophisticated population survey techniques have been developed for marine mammals. These include conducting line transect surveys from ships, boats and airplanes. Unfortunately, these methods often have limited application in developing countries, because they require expensive and complicated equipment, trained support personnel, or cost too much. However there are several lower cost survey techniques for marine mammals that are applicable in developing countries, such as interview surveys, land/shore-based monitoring, and carcass analysis. These more economical research techniques are ideal for initial surveys in areas where there is little or no information such as in the SWIO region.

In 2009 Community Centred Conservation (C3) proposed the development of a Blueprint for a Regional Dugong Conservation Strategy to the UNEP-CMS and received small scale funding to explore the possibility of developing a suite of methods that could be applied for rapid assessment of the species within the SWIO region. The dugong research methods used by C3 in the Union of Comoros (2006-2008) were adapted and applied to similar surveys in northern Madagascar (2009-2010) to explore the possibility to form a 'Blueprint', or definitive methods guide for further studies throughout the region. The assumption was that methods which could successfully be used across both a small archipelago state (Comoros) and also a large island nation (Madagascar) could be transferred to other nations within the region.



Development and wider application of the Blueprint

Community Centred Conservation (C3) began conducting dugong research in 2002, focusing specifically on the SWIO region from June 2006. Following initial investigations into the dugong population around Mohéli Island, Union of Comoros, a three-phase approach for a rapid low-cost species assessment was developed using 1. Fisher Questionnaires, 2. Key Informant Interviews and 3. Seagrass Habitat Mapping. In 2009, this three-phase approach was successfully applied in northern Madagascar with minor adaptations with data gathered from over 600 fishers, and seagrass mapped across the entire Northern Province. It is important to note that the fisher interview component has since been incorporated into and superseded by the UNEP/CMS Standardized Dugong Catch/Incidental Catch Survey Tool developed by a panel of experts, including C3, at a workshop in Singapore in February 2010. The Survey Tool and three-phase approach have since been promoted at the First Technical Meeting for the Conservation of the Dugong and its Habitat in the SWIO region, held in Madagascar in August 2010.

1. Fisher Questionnaires

- Dugong status and distribution can be investigated using semi-structured interviews of community members (based on Davis and Poonian 2007).
- The first stage in this process is to conduct a thorough literature review of any information relating to dugongs and/or their habitat in grey and/or published reports. This can include historical reports by zoologists and/or explorers dating back as early as the 1800s, accessed through searches in libraries and museums in both the host countries and overseas.
- Sites should be selected based on previous studies in the locality which have identified priority areas with high numbers of dugong observations and detailed consultation with local government bodies and NGOs.
- Local university graduates can be engaged to conduct the interviews in local dialects, following three days of training and piloting of the questionnaire. Amendments may be needed to the questionnaire to make it relevant to the local context.
- A stratified sampling protocol needs to consider the size of the fishing population at each site (at least the total population if this level of detail is unavailable) and aim to approach a uniform proportion of fishers at each site.



- Seasonal migration of fishers must be considered in some cases to avoid wasting funds and time visiting areas which fishers may only use at certain times of the year.
- Government personnel should never be engaged to conduct such surveys as respondents are unlikely to give open and honest responses about hunting activities or even accidental bycatch if they believe there will be ramifications in terms of arrests and/or greater enforcement.
- Fishers can be gathered and selected for interview by local authorities, such as the village chief or council. Arranging this ahead of time minimizes time wasted by the researchers waiting for fishers to return from trips and reduces time spent at field sites to meet targets.
- Interviews should be conducted individually in all cases.
- Detailed maps of the coastline should be brought so that fishing areas and localities of dugong sightings can be marked by the interviewer.
- Respondents are first shown a picture of the dugong and asked whether they have seen the animal before. If they have, the interview commences with a few ‘tester’ questions to ensure there has been no confusion with other species, such as dolphins or seals. Such questions can relate to typical dolphin behaviour, e.g. presence of dorsal fin, breaching behaviour, description of caudal fin.

- Once it has been ascertained that the respondent is indeed referring to a dugong, they can be questioned about the characteristics and incidence of dugong observations, capture, cultural practices, consumption and sale of meat and their level of understanding of the species' status and relevant local and national laws.
- The survey team should always consolidate data within three months of the fieldwork and provide feedback to the communities, in particular fishers who have participated in the study; this needs to be considered when creating budgets and plans.

2. Key Informant Questionnaires

- Key Informants (KIs) are generally those regarded by their communities as 'dugong experts' (e.g. senior or experienced fishers / dugong hunters). KIs can also take part in the fishers questionnaire as outlined above and additional Key Informant interviews (open-ended questions with probes/lead questions) to provide wider qualitative information which may not be captured in the Fisher Questionnaires.
- It is difficult to predict the number of Key Informants that may be approached at each site but this can range from less than five to more than 10 depending on the size of the community and the degree of interaction between fishers and dugongs in the area.
- KI interviews typically take much longer than the Fisher Questionnaire, lasting over an hour, as questions are open-ended and can lead to the respondent describing dugong hunts and customary practices in great detail. This is valuable information for the research and helps put Fisher Questionnaires in context. Often KIs are elders and may have more historical knowledge than the majority of fishers who, in developing countries, can be several decades younger.
- A detailed map of the coastline should be used to mark any sites mentioned by the KI
- Never offer payment for interviews but an appropriate small gift as an appreciation of the person's time and participation can be offered to keep them motivated and maintain good relations with community members (e.g. t-shirt, refreshments).

3. Seagrass Habitat Mapping

There are two stages to seagrass mapping :

1) **Wide-scale mapping based on inference of seagrass habitat from aerial and satellite imagery, validated by ground-truthing**

- Spectral analysis of satellite imagery and aerial photographs should be utilized to identify the potential location of seagrass habitats.
- Seagrass detection is feasible by using Thematic Mapper (TM) band values as a proxy for the presence of seagrasses.
- Different images should be used to increase reliability of inferred seagrass areas (e.g. Landsat satellite imagery and GoogleEarth - available free of charge).
- If you have access to colour recognition software this is preferable, but not essential.
- The different images can be superimposed onto one map to assess accuracy of seagrass inference.



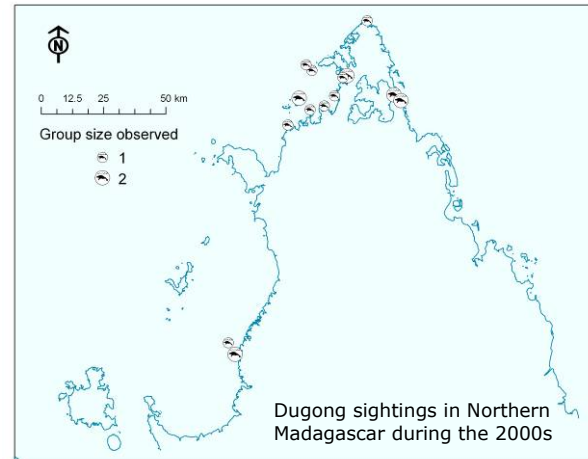
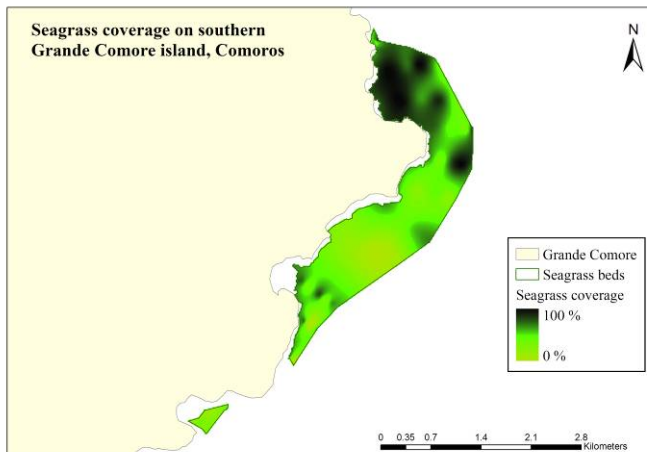
- Random sites inferred from the image analysis should be visited to validate the presence of seagrass.
- These ground-truthed sites can be utilized to infer further potential areas of seagrass habitat using the satellite image analysis since a spectral range (red, green and blue band pixel values with a specified range tolerance) can be identified which encompasses the ground-truthed sites where seagrass is known to occur.
- Using the spectral range further potential seagrass areas can be traced by hand.
- Habitats that corresponded in multiple images should be identified so that a scale of certainty can be created, e.g. if seagrass beds correspond in all three images they can be assigned the highest level of certainty, followed by those which corresponded in two images and lastly the least certain are those which only appear in one image.
- Areas where water depth is greater than 10m can be automatically excluded from the analysis due to the limited depth penetration of the imagery used.

2) Fine-scale mapping based of seagrass species distribution and abundance

- Seagrass Watch is a low-cost globally-recognized methodology for collecting data on seagrass and is easy for community members and non-technical audiences to learn and apply.
- Data can be collected rapidly on species abundance, distribution, health and long-term monitoring programmes can be implemented with communities in priority areas.

Data Consolidation & Application

Guidance on data analysis of fisher interviews is available from the UNEP/CMS Dugong Secretariat, which also provides a standardized data entry form to use in conjunction with the Standardized Survey Tool. Analysis of KI interviews can be conducted using information from the SocMon Manual (See Useful Resources section). SeagrassWatch provides guidance on analyzing and presenting data from in-water seagrass surveys. For presentation of broad-scale seagrass maps based on inference from satellite and aerial images, basic skills in Geographical Information Systems (GIS) are required.



By overlaying habitat data, information on bycatch and utilization of gillnets as well as other threats a map can be created showing relative risks to dugongs as well as 'hotspots' for conservation action where dugongs are sighted frequently alive and/or dead. This information can be of particular use to marine park managers, relevant government departments and non-governmental conservation organizations.

Level of awareness of regulations and the endangered status of this species elicited from interviews can be used to effectively design community outreach campaigns. In some cases, respondents may be engaged to help lead dugong conservation efforts in their communities, therefore the need to provide at least preliminary feedback to respondents in a timely fashion is critical to maintaining good relations which will pave the way for successful community-centred conservation actions. Feedback in remote fishing communities is often best achieved through group discussion, presentations, theatre and film (electricity permitting!) rather than media reliant on literacy or minimum educational background (posters, brochures, briefs).

Further reading

C3 Madagascar and Indian Ocean Islands Programme (2010) RAPID ASSESSMENT OF DUGONGS AND THEIR SEAGRASS HABITAT IN NORTHERN MADAGASCAR. A Report Submitted to the Convention On Migratory Species Of Wild Animals (CMS) Secretariat, Abu Dhabi. C3 Technical Report Series No. 6. ISSN 1754-5188. Community Centred Conservation (C3), London, UK. 19pp

Davis PZR, Poonian CNS (2007) INCIDENTAL CAPTURE OF THE DUGONG, DUGONG DUGON IN GILLNETS, MOHÉLI, UNION OF THE COMOROS. In Kiska J, Muir C (Eds) 1st Regional Workshop on Incidental Catches of Non-targeted Marine Species in the Western Indian Ocean, Workshop proceeding. 13-15th November 2006, Mayotte, France.

UNEP (2002) DUGONG STATUS REPORT AND ACTION PLANS FOR COUNTRIES AND TERRITORIES. Early Warning and Assessment Report Series. UNEP/DEWA /RS.02-1

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. 68p

Useful resources

Community Centred Conservation www.c-3.org.uk

Dugong Necropsy Manual

http://www.gbrmpa.gov.au/data/assets/pdf_file/0005/5585/gbrmpa_RP85_Procedures_For_The_Salvage_And_Necropsy_Of_The_Dugong_Second_Edition_2007.pdf

SocMon Manual (WIO) <http://www.socmon.org/publications.aspx>

UNEP/CMS Standardized Dugong Catch/Incidental Catch Survey Tool

http://www.cms.int/species/dugong/pdf/standard_dugong_questionnaire.pdf

UNEP/CMS Dugong Survey Project Manual www.cms.int/species/dugong/project_manual.pdf

Seagrass Watch Manuals <http://www.seagrasswatch.org/manuals.html>

UNEP/CMS Dugong Secretariat <http://www.cms.int/species/dugong/index.htm>

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