

Background Photo: Lynton Francois Burger

IAIA18: Applying the mitigation hierarchy to address marine biodiversity impacts

Addressing Data Paucity to Improve Avoidance for Marine Biodiversity

Neil Cousins, May 2018

The first stage of recovery is understanding that there is a problem

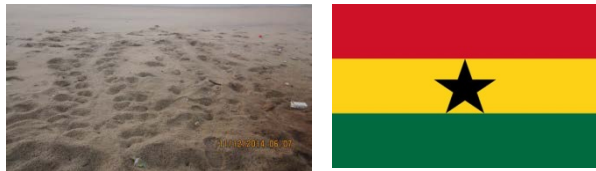
We keep facing projects where there are conflicts with high coastal and marine biodiversity values and we are asked to use our advice to manage the issues



A new port in critical humpback whale habitat – post ESIA



A new port and national economic hub in critical humpback whale habitat – post ESIA



An LNG development in Ghana with nesting turtles – post site selection



A new port with nesting sea turtles – post ESIA



An a new mining terminal with nesting sea turtles – post site selection



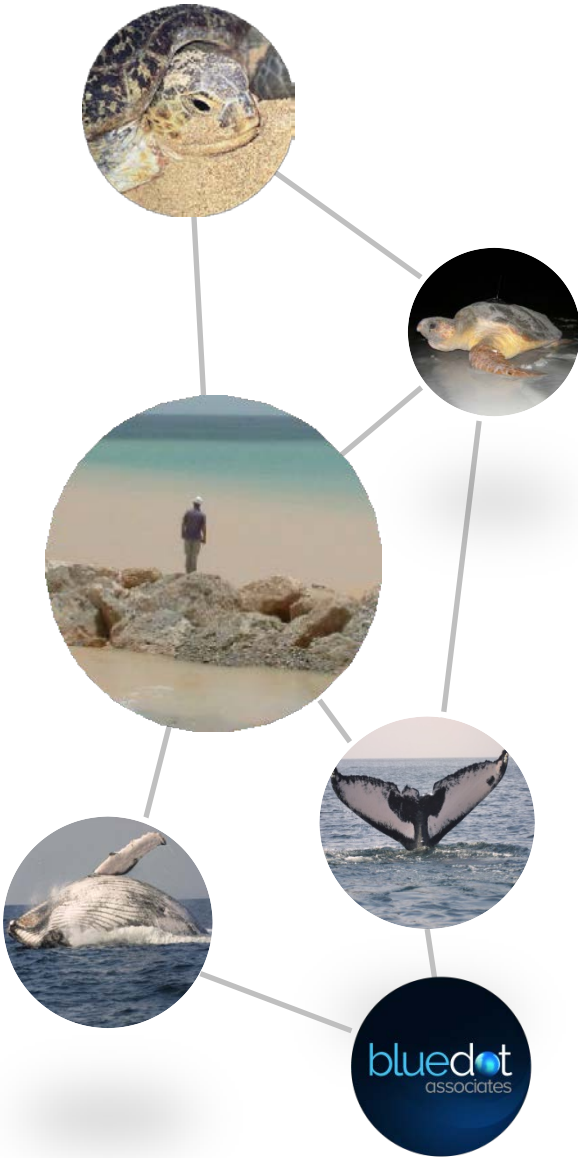
Major tourism development adjacent to an international critical habitat for sea turtles – post spatial planning

What is happening?

Are these issues across projects, clients, countries, practitioners a function of:

- Lack of effective planning and screening?
- Ineffective delivery of studies and decision-making?
- The process?*
- Governance?
- Lack of data?*

** All of these may be apparent and lead to issues, but for this presentation we will focus on these aspects in line with the theme of the session – applying the mitigation hierarchy*



Mind the gap – is data the underlying limiter

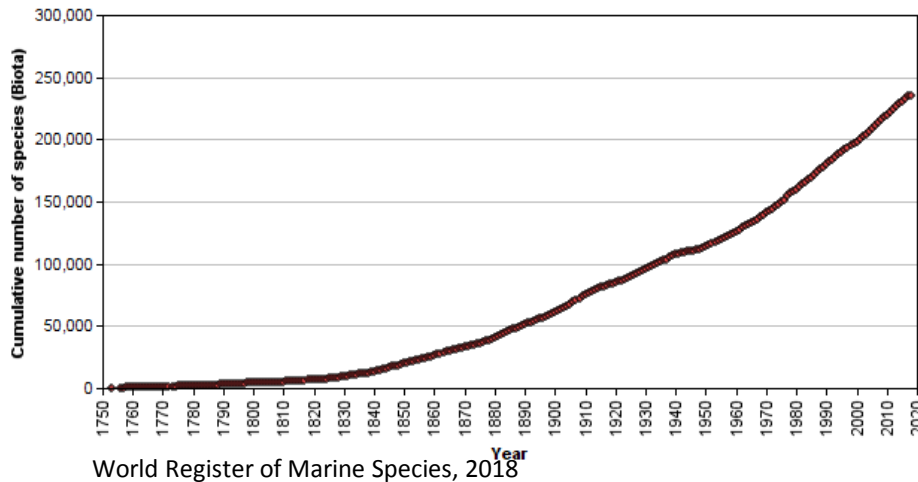
The gaps in what we know are big

The certainty in what we know can be low

We have a better resolution of Mars and the Moon than the seabed

Around 2000 new species are being identified each year

We are losing what we know and don't know

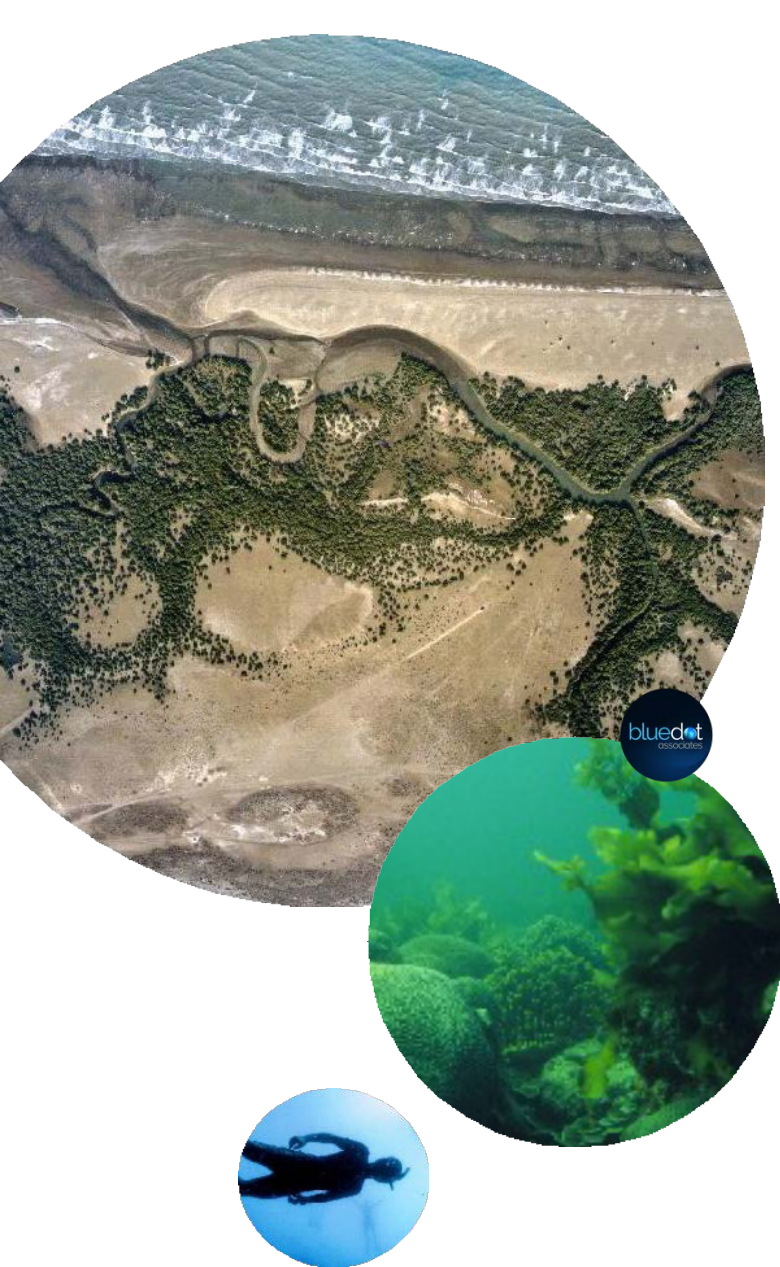




Mitigation and time

If we agree that avoidance is the first and most important step to protect marine biodiversity then we should pay most of our attention to delivering it wherever that influence is possible.

If the timing of actions affect the implementation of avoidance, and delivering this is vital to better manage risks and improve outcomes; then embedding early actions must be an important goal for effective decision-making.



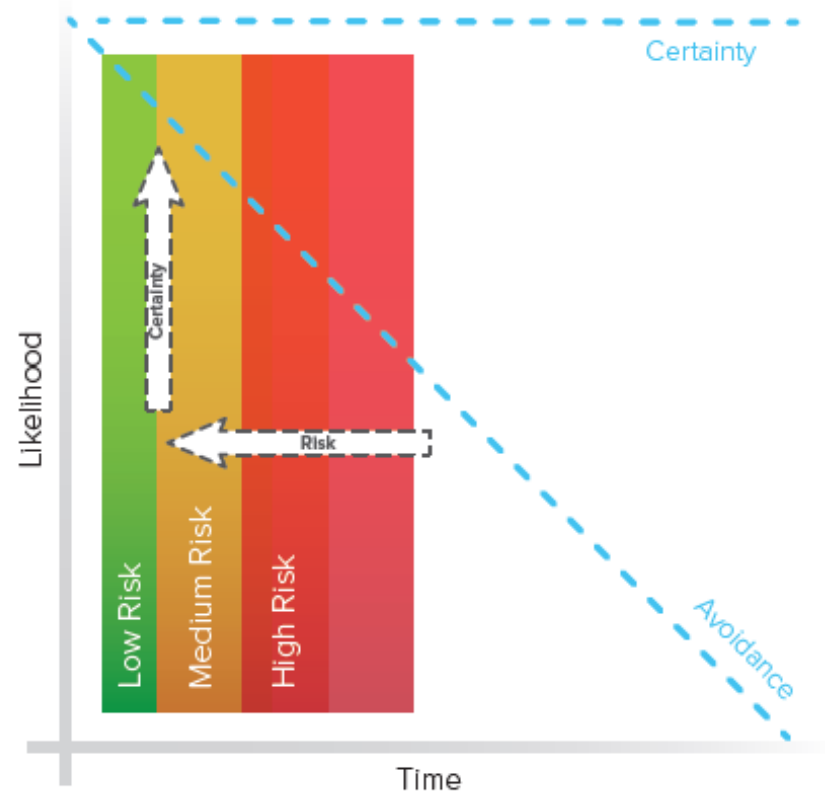
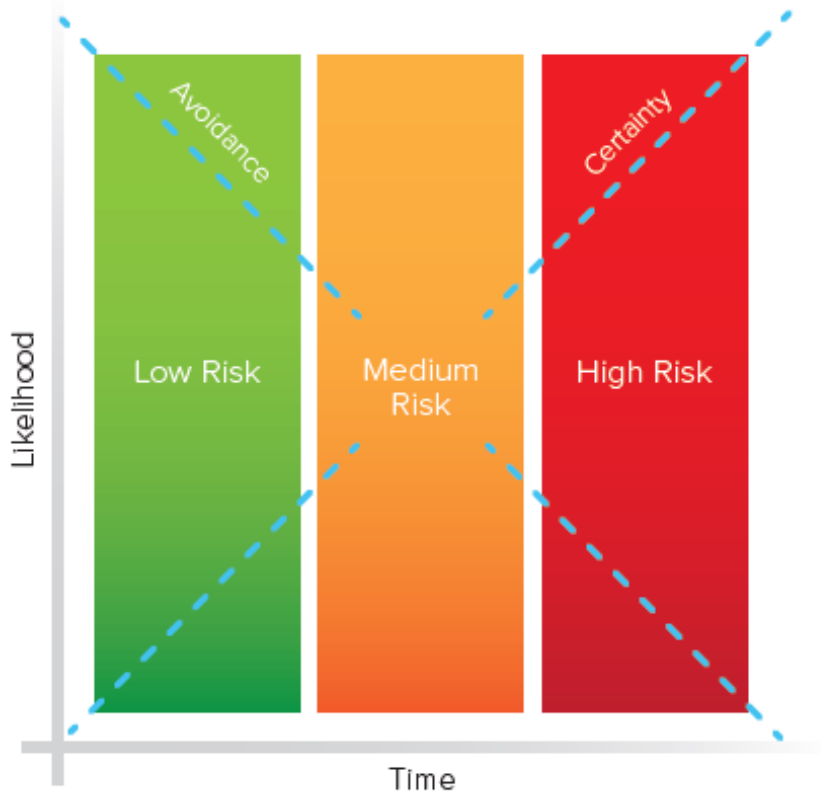
The certainty conundrum

The quest for certainty drives research, processes, decision-making and the measurement of outcomes.

With marine biodiversity things are often quite uncertain even when data has been collected.

Understanding how to make effective actions to avoid impacts must therefore be dependent upon drawing the lines where there is acceptable certainty and risk.

Zones of decision-making to avoid impacts





Questioning and shifting the paradigms

To find good solutions we need to understand the framework in which they sit; and part of the solution may be to address the paradigms that drive the framework:

- How much certainty do we need?
- Is a best educated guess ok to make a decision?
- Must a good decisions for biodiversity be balanced by multi-criteria or be independent?
- How likely are we to trigger precaution early and what is the threshold?
- Are we able to convince when we propose uncertain options?
- How do we deal with acceptability when we know we will likely have uncertain and unexpected results?
- Does a complex problem require detailed and complex solutions?



How can we solve the issues – some solutions



Using independent expert panels as a function for delivering effective advice in an uncertain world

The Bluedot Advisors: addressing uncertainty, making expert judgements, building bridges in data, forming collaboration to solve issues, expanding networks, and using experience and aligned ethos to build capacity



Defining the goal and picking the right tools



Improving certainty and developing actions that lead to more effective early decisions & de-coupling decision-making from EIA

Screening & Avoidance:

Global screening tool to identify potential triggers for critical habitat related to sea turtle presence



Rapid Assessment of Priorities:

Sea Turtle Nesting Beach Indicator Tool to provide a rapid assessment approach to quickly understand the potential for sea turtle nesting.



Early Mitigation Planning:

Standardised Biodiversity Action Planning for addressing potential impacts on sea turtles



EIA

A drought is never ungrateful for a drop of rain and a waterfall has never formed without it

Simple solutions that address important common issues and support research, strategic planning, project studies, decision-making and management of risks



Better
Screening



Rapid
Data



Showing
Significance



Common
Guides



Accounting for
Mitigation

Rapid assessment predictive ground tools

Excel and printed form based to ease use and sharing



Sea Turtle Nesting Beach Indicator Tool

Version 1.0

© 2017 Neil Cousins, Alan Rees and Brendan Godley

Authors: Neil Cousins (Bluedot Associates Ltd), Alan Rees and Brendan Godley (Centre for Ecology & Conservation, University of Exeter)

Beach / Survey details	
Country / Location Name:	<input type="text"/>
Coordinates (x.x Lat, y.y Lon):	<input type="text"/>
Date (dd/mm/yy): <input type="text"/>	
Beach suitability assessments (select from drop-down categories and enable editing if prompted)	
Beach sediment (to 50cm)	<input type="text"/> Please Select
Beach elevation (above high tide)	<input type="text"/> Please Select
Beach width (above high tide)	<input type="text"/> Please Select
Beach slope	<input type="text"/> Please Select
Beach length	<input type="text"/> Please Select
Human impact assessments (select from drop-down categories and enable editing if prompted)	
Fixed or semi-fixed development behind the beach (houses, huts, bars, cantinas, sheds, fences, pipe lines etc.)	<input type="text"/> Please select
Obstructions on beach (boats, furniture, logs etc.)	<input type="text"/> Please select
Disturbance on the beach (e.g. access, recreation, fishing, livestock rearing, beach excavation, Evidence of Light pollution on the beach (direct lighting [up to 1.5 km away for large developments] and skyglow)	<input type="text"/> Please select
Tool Predictions	
Beach Suitability:	<input type="text"/>
Human impacts:	<input type="text"/>

Download from:

<http://bluedotassociates.com/rapid-data/>

Published in:

Marine Turtle Newsletter (#153, 2017)

<http://www.seaturtle.org/mtn/PDF/MTN153.pdf>

Africa Sea Turtle Newsletter (#8, 2017)

<http://oceanecology.org/african-sea-turtle-newsletter/>

State of the Worlds Turtles (SWOT) Report, Vol. XIII

<http://seaturtlestatus.org/report/swot-report-vol-13>

Indian Ocean Turtle Newsletter

<https://www.iotn.org/wp-content/uploads/2018/03/IOTN-26.pdf>

Rapid assessment predictive remote tools

Satellite derived imagery intertidal and subtidal habitat mapping, topography and bathymetry: spectral analysis, textural analysis, water column correction, ground truthing etc.

For example: remote sensing of sea turtle nesting habitats and offshore foraging area.

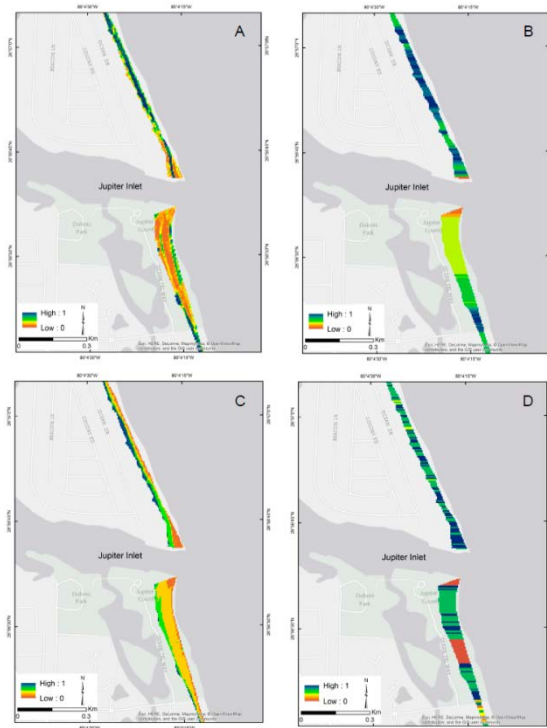


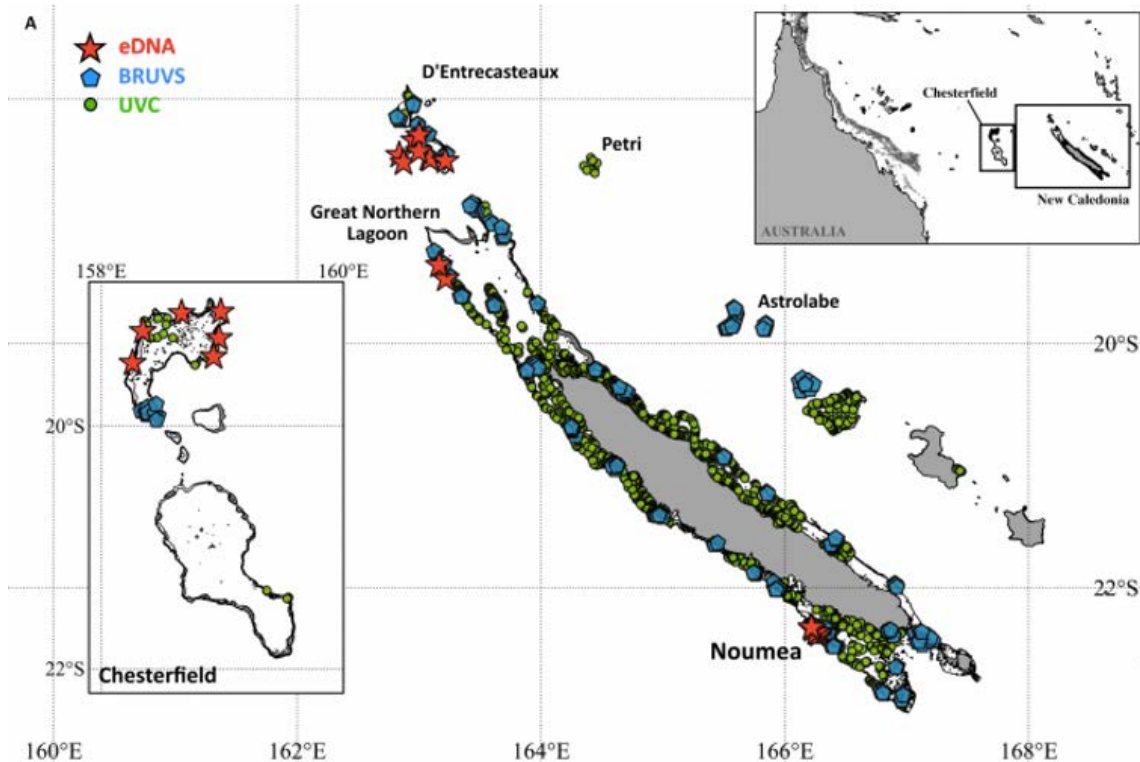
Figure 4. Rasterized model grids for: (A) slope; (B) beach width; (C) elevation; and (D) dune elevation for the area around Jupiter Inlet, FL.



Figure 8. Nesting suitability, Model 17 (A); approximate dune vegetation (B); and potential artificial light pollution (C).

Source: Lauren Dunkin, Molly Reif, Safra Altman and Todd Swannack (2016). A Spatially Explicit, Multi-Criteria Decision Support Model for Loggerhead Sea Turtle Nesting Habitat Suitability: A Remote Sensing-Based Approach

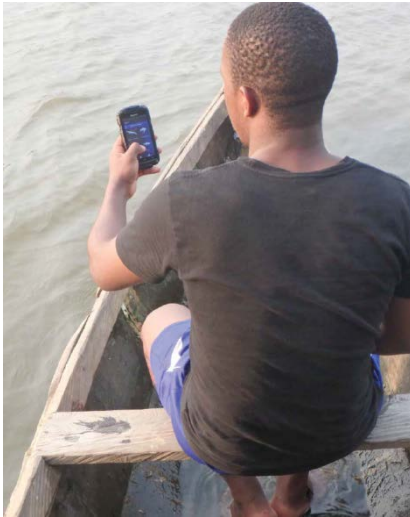
eDNA – rapid assessment indicators



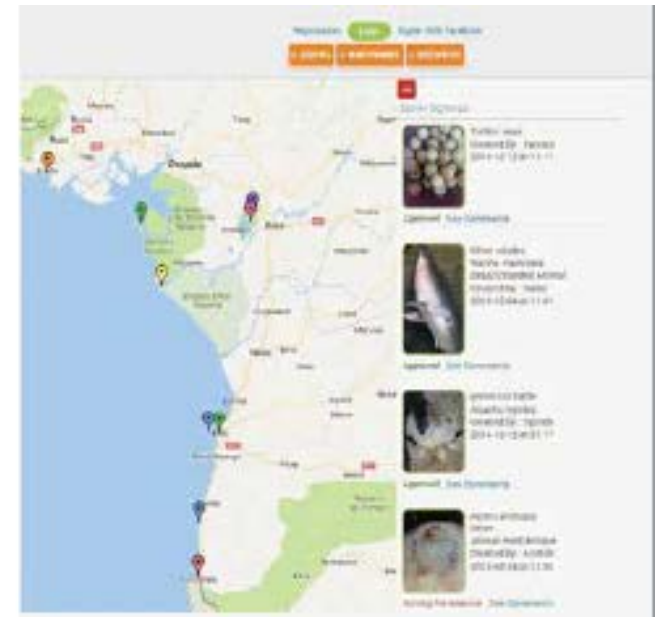
22 eDNA water samples (red stars) detected more sharks than numerous camera recordings (blue) or scuba dives (green). (Boussarie & Bakker et al (2018))

Source of image: <https://www.smithsonianmag.com/science-nature/scientists-have-new-way-knowing-how-many-sharks-are-in-sea-180968964/#p9X3kFQor13wkpPi.99>

Using networks and building capacity



THIS PAGE: Screenshots from the SIREN-Turtles mobile phone application, which is designed to facilitate sea turtle nesting data collection, and the online map interface displaying reported observation data. © AMMCO.
AT RIGHT: A SIREN app user reports an observation in Lake Ossa, Cameroon. © AMMCO



Images sourced from SWOT XII:

http://seaturtlestatus.org/sites/swot/files/report/0420517_SWOT12_p42-43_SIREN.pdf

Accepting scale and delivering broad understanding with conservation research

Received: 9 January 2017 | Revised: 19 June 2017 | Accepted: 17 July 2017
DOI: 10.1002/aqc.2833

WILEY

RESEARCH ARTICLE

Cetacean rapid assessment: An approach to fill knowledge gaps and target conservation across large data deficient areas

Gill T. Braulik^{1,2} | Magreth Kasuga¹ | Anja Wittich³ | Jeremy J. Kiszka⁴ |
Jamie MacCaulay² | Doug Gillespie² | Jonathan Gordon² | Said Shaib Said⁵ |
Philip S. Hammond²

¹Wildlife Conservation Society Tanzania Program, Tanzania

²Sea Mammal Research Unit, Scottish Oceans Institute, University of St Andrews, St Andrews, Fife, UK

³23 Adamson Terrace, Leven, Fife, UK

⁴Department of Biological Sciences, Florida International University, North Miami, FL, USA

⁵Institute of Marine Science, University of Dar es Salaam, Tanzania

Correspondence
Gill T. Braulik, Wildlife Conservation Society Tanzania Program, Zanzibar, Tanzania.
Email: gillbraulik@downstream.vg

Funding Information
Pew Marine Fellows, Grant/Award Number: 2013

Abstract

- Many species and populations of marine megafauna are undergoing substantial declines, while many are also very poorly understood. Even basic information on species presence is unknown for tens of thousands of kilometres of coastline, particularly in the developing world, which is a major hurdle to their conservation.
- Rapid ecological assessment is a valuable tool used to identify and prioritize areas for conservation; however, this approach has never been clearly applied to marine cetaceans. Here a rapid assessment protocol is outlined that will generate broad-scale, quantitative, baseline data on cetacean communities and potential threats, that can be conducted rapidly and cost-effectively across whole countries, or regions.
- The rapid assessment was conducted in Tanzania, East Africa, and integrated collection of data on cetaceans from visual, acoustic, and interview surveys with existing information from multiple sources, to provide low resolution data on cetacean community relative abundance, diversity, and threats. Four principal threats were evaluated and compared spatially using a qualitative scale: cetacean mortality in fishing gear (particularly gillnets); cetacean hunting, consumption or use by humans; shipping related collision risk and noise disturbance; and dynamite fishing.
- Ninety-one groups of 11 species of marine mammal were detected during field surveys. Potentially the most important area for cetaceans was the Pemba Channel, a deep, high-current waterway between Pemba Island and mainland Africa, where by far the highest relative cetacean diversity and high relative abundance were recorded, but which is also subject to threats from fishing.
- A rapid assessment approach can be applied in data deficient areas to quickly provide information on cetaceans that can be used by governments and managers for marine spatial planning, management of developments, and to target research activities into the most important locations.

KEYWORDS

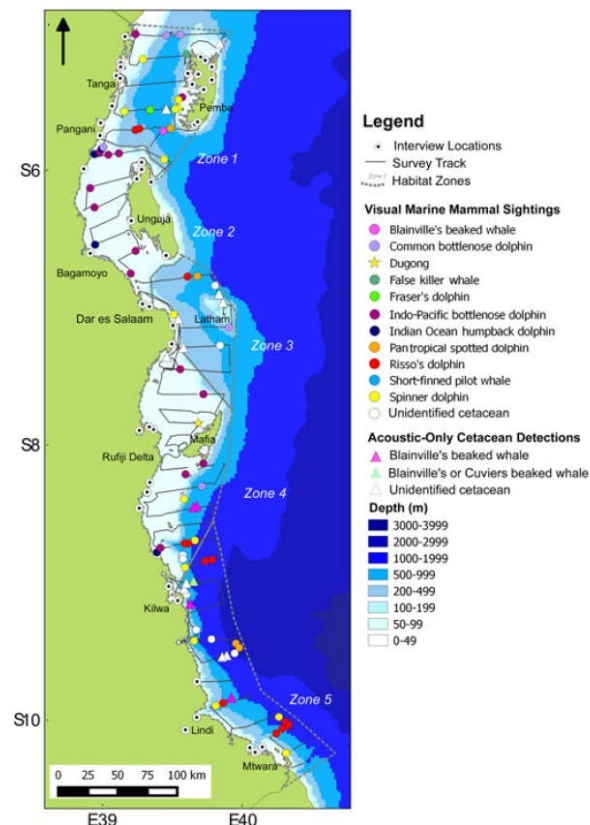
cetaceans, distribution, environmental impact assessment, management, marine spatial planning, rapid assessment, Tanzania

1 | INTRODUCTION

Marine megafauna, such as elasmobranchs, marine mammals and sea turtles are some of the most iconic components of ocean biodiversity,

yet many populations are undergoing large and unprecedented declines owing to unsustainable direct exploitation or incidental mortality in fisheries (Heithaus, Frid, Wirsing, & Worm, 2008; Lewison, Crowder, Read, & Freeman, 2004). Beyond their flagship status, these species

FIGURE 1 Boat survey track and the location of visual and acoustic marine mammal group detections made during the vessel-based cetacean survey of the entire coast of Tanzania conducted between 4 March and 6 April 2015



Form the options and framework to make better decisions



Better
Screening



Rapid
Data



Showing
Significance



Common
Guides



Accounting for
Mitigation

Mitigation is not always reliant on data if common issues are known and we understand how they can be managed

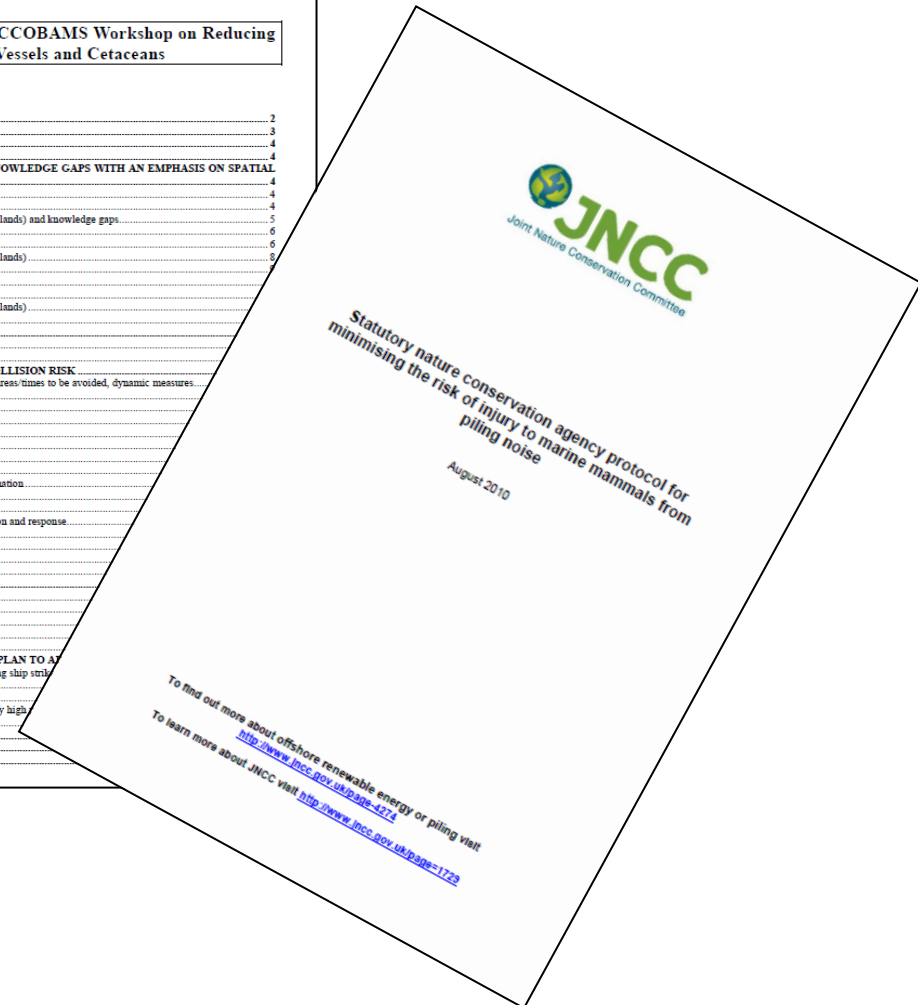


REPORT OF THE JOINT IWC-ACCOBAMS WORKSHOP ON SHIP STRIKES

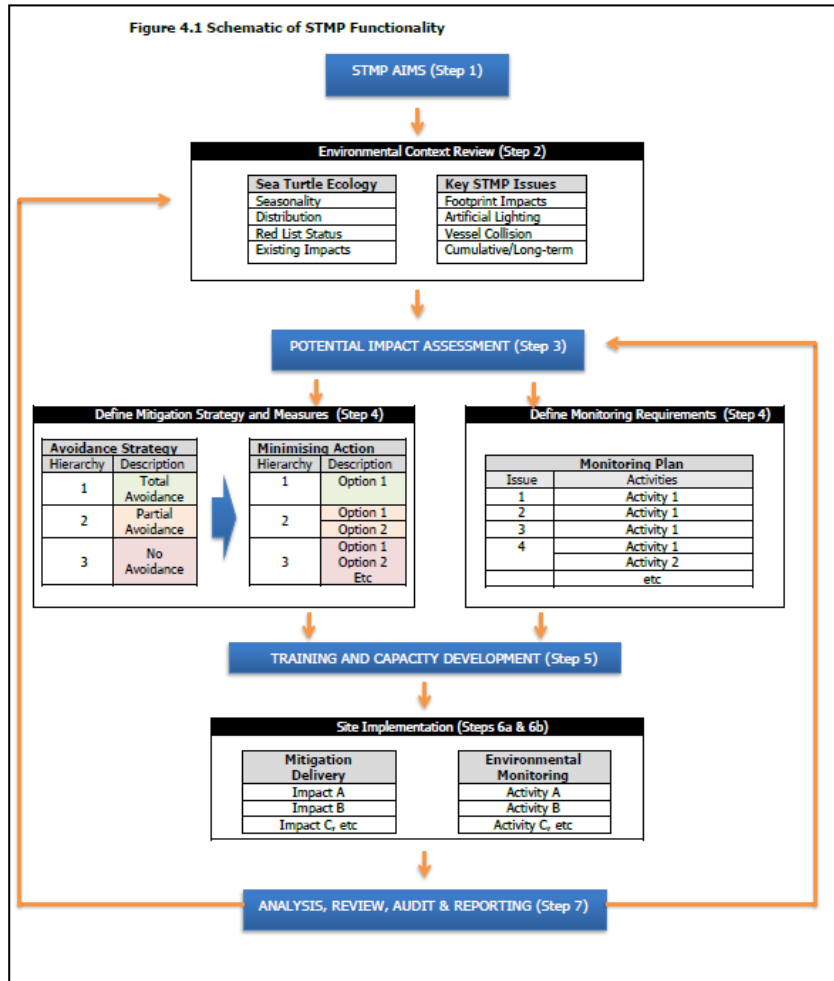
Report of the Joint IWC-ACCOBAMS Workshop on Reducing
Risk of Collisions between Vessels and Cetaceans

Contents

1. INTRODUCTORY ITEMS	2
2. OBJECTIVES OF THE WORKSHOP	3
3. ADOPTION OF THE AGENDA	4
4. PRESENTATIONS	4
5. DATA REQUIREMENTS, EXISTING DATA, KNOWLEDGE GAPS WITH AN EMPHASIS ON SPATIAL AND TEMPORAL CONSIDERATIONS	4
5.1 Data on cetacean abundance, density and movements	4
5.1.1 Methods (collection and analysis)	4
5.1.2 Existing information (esp. Mediterranean and Canary Islands) and knowledge gaps	5
5.2 Data on collisions	5
5.2.1 Methods (collection and analysis)	6
5.2.2 Existing information (esp. Mediterranean and Canary Islands)	6
5.2.3 Summary and conclusions on reporting	6
5.3 Data on shipping density	6
5.3.1 Methods (collection and analysis)	6
5.3.2 Existing information (esp. Mediterranean and Canary Islands)	6
5.4 Recommendations	6
6. RISK ASSESSMENT	6
6.1 Examples of shipping and whale data and overlap	6
6.2 Factors affecting risk and recommendations	6
7. MITIGATION MEASURES FOR REDUCING COLLISION RISK	6
7.1 Routing options including traffic separation schemes, areas/times to be avoided, dynamic measures	6
7.1.1 Case studies	6
7.1.2 Evaluation of implementation/compliance	6
7.1.3 Evaluation of effectiveness (& knowledge gaps)	6
7.2 Speed restrictions	6
7.2.1 Case studies	6
7.2.2 Evaluation of implementation/compliance	6
7.2.3 Evaluation of effectiveness	6
7.3 Mandatory ship reporting systems and relay of whale information	6
7.3.1 Case studies	6
7.3.2 Evaluation of implementation & effectiveness	6
7.4 Dedicated observers including training of crew in observation and response	6
7.4.1 Case studies	6
7.5 Technological approaches	6
7.5.1 Case studies	6
7.5.2 Evaluation of implementation and effectiveness	6
8. RECOMMENDATIONS	6
8.1 Priority species/populations/areas	6
8.1.1 Recommendations at scientific level	6
8.1.2 Conservation measures	6
8.1.3 Reporting	6
8.2 Other	6
9. PROPOSAL FOR A JOINT TWO-YEAR WORK PLAN TO A	6
9.1 Development of a protocol for investigating and documenting ship strike	6
9.2 Mediterranean basin wide survey in the summer of 2012	6
9.3 Improved reporting to the IWC global ship strike database	6
9.4 Development of appropriate modelling techniques to identify high	6
9.5 Review of progress	6
10. PUBLICATION OF REPORT AND PAPERS	6
11. ANY OTHER BUSINESS	6
12. ADOPTION OF REPORT	6



Establishing new guides for commonly encountered issues



Issue 1: Footprint Impacts Management Plan

Potential Impact 1: Loss or damage to nesting habitat and/or nests; injury/mortality to turtles and disturbance to nesting habitat

1. Avoidance Strategy		2. Mitigation Hierarchy	
Item	Avoidance Level	Item	Impact Minimisation Measures / Responsibility / Timeframe
1	Total avoidance. The Operational Consequence of total avoidance would be to relocate to another site where sea turtle nesting does not occur. This is unfeasible.	N/A	N/A
2	Partial avoidance. Nest all nesting habitat can be avoided, but nesting beach habitat peripheral to the main construction footprint and individual nests can hardly be avoided.	2a	Investigate options to time construction or long term beach nourishment works so that areas of beach that host denser nesting (i.e. currently noted to the western and eastern edges of the nest area) are avoided during the nesting season (Oct-Mar). In addition, night-time working in these areas could be avoided if it is feasible to limit the potential for incidents to occur. If this is not possible, then adjust the appropriate measures that are recommended below to minimise impacts.
	GOTO Impact Minimisation Measures	2b	Minimise the size of working areas in the turtle crawl and nesting zone.
		2c	Zone areas for storage/lay-down of all equipment and materials away from the nesting beach, wherever feasible. Designated areas should be defined in the terrestrial zone away from nesting areas. These should be located outside of the turtle crawl and nesting zones - ideally be located in inland screened areas that

Issue 2: Artificial Lighting – Mitigation Plan

Potential Impact 1: Disruption/deterrence of nesting females and misorientation and disorientation of hatchlings

1. Avoidance Strategy		2. Mitigation Hierarchy	
Item	Avoidance Level	Item	Impact Minimisation Measures / Responsibility / Timeframe
1	Total avoidance. The Operational Consequence of total avoidance would be to use no artificial lighting at all during the main sea turtle nesting season (Oct-Mar) and potentially all year round for any nesting that may occur outside of this main season. This is unfeasible.	N/A	N/A
2	Partial avoidance. Although artificial lighting is essential to the port both during construction and operation, partial avoidance of lighting impacts can be achieved such that unnecessary lighting is avoided (especially in denser nesting areas and at times, and in areas where there is no construction activity being undertaken) lights are strategically positioned and best available technology is implemented. It may be necessary to develop a specific detailed Sea Turtle Lighting Plan based on detailed lighting proposals to enable construction phase and especially operation phase lighting issues to be 'designed away' as far as possible. This plan should aim to implement the recommendation for mitigation set out here. During the construction phase, flexibility around lighting	2a	Prior to the start of each construction activity, and at any time that new lighting is required either during construction or operation, review lighting plans in consideration of potential impacts to sea turtles and modify accordingly to reduce overall lighting needs, intensity and glow.
		2b	Ensure that the best available technology is in place to minimise lighting impacts, such as low pressure sodium (LPS) or LED luminaires as appropriate - GOTO Annex 6 for details.
		2c	Regularly check for specific lighting features - 'problem lights' - that may be causing impacts through 'moonlighting' - GOTO Annex 6 for protocol and refer to

Issue 3: Vessel Collision and Dredger Entrainment – Mitigation Plan

Potential Impact 1: Vessel collision with sea turtles at sea resulting in injury or mortality

1. Avoidance Strategy		2. Mitigation Hierarchy	
Item	Avoidance Level	Item	Impact Minimisation Measures / Responsibility / Timeframe
1	Total avoidance. The Operational Consequence of total avoidance of collisions is desirable, but is considered unlikely due to the difficulty in detecting sea turtles, especially in adverse weather/sea conditions. Total avoidance of this impact is therefore unfeasible.	N/A	N/A
2	Partial avoidance. Avoidance of collisions with sea turtles is possible during calm weather when detection is possible. Avoidance of serious injury and mortality can be achieved through careful assessment of conditions by maintaining vessel movements and speed, and using best available technology.	2a	As part of wider marine mammal monitoring proposals for offshore construction works, undertake observation on board all vessels, using trained crew member(s), to visually detect the presence of sea turtles in the path of approaching vessels during daylight hours during the main nesting season (Oct-Mar). Take avoiding action by slowing or diverting vessel course if it is safe to do so - GOTO Annex 6 for protocol.
	GOTO Impact Minimisation Measures	2b	Restrict vessel movements in and out of construction area or operational port according to established routes/approach channels. Speed limit of 10kts to be recommended and communicated to vessels on approach to port, during both day and night, during main nesting season (Oct-Mar).
		2c	Ensure that best available technology is in place on construction vessels during main nesting season (Oct-Mar) to minimise risk of injury/mortality on collision

- Loss and Damage
- Obstructions
- Pollution and entanglement
- Off-duty workforce

- Disruption, deterrence,
- Mis-orientation and disorientation

- Vessel collision
- Entrainment

Avoidance is simple - it then gets complicated...

More questions we must tackle and answer to make progress....

- If uncertainty undermines accurate definition of effects how do we measure implementation of the rest of the hierarchy if avoidance is not possible?
- Is no residual effect ever likely?
- If you have uncertainties should we seek to measure no net loss and net gain against these unknowns or by something else?
- Will accepting that no net loss and net gain is uncertain or immeasurable promote better avoidance?
- Will accepting uncertainty and changing the measurement of success improve offset implementation?
- If the processes we use for decision making are undermined should we continue to rely on it, endorse it and accept the outcomes?
- When are we going to start working on the alternatives?