Garden Route Dolphin Research Project

Background

The Garden Route is located along part of the southern coast of South Africa. Its coastal zone is characterized by highly diverse marine fauna including a variety of marine mammals, seabirds, fish, and invertebrates. To conserve the precious coastal ecosystems found in this region three Marine Protected Areas (MPAs) have been proclaimed: Goukamma (14km, Est. 1990), Robberg (9.5km, Est. 2000), and Tsitsikamma (57km, Est. 1964 and South Africa's oldest MPA). MPAs serve as vital refuges for both fish and marine top predators (e.g. whales and dolphins), but their coverage may be inadequate to meet the conservation needs of some of these species.

Study area

The project takes place from the western boundary of the Goukamma MPA through to the eastern boundary of the Tsitsikamme MPA; this area includes the Robberg MPA. The total research area covers approximately 170km of coastline.

Why this project

The International Union for Conservations of Nature (IUCN) currently lists the Indo-Pacific Humpback Dolphin (*Sousa chinensis*) as a near-threatened species and the Indo-Pacific Bottlenose Dolphin (*Tursiops aduncus*) as a "data deficient" species, meaning that too little is currently known about the status of this marine mammal.

The Garden Route Research Project aims to better understand how these marine top predators use their habitat along South Africa's coast. It looks at the role of existing MPAs in terms of whether particular cetaceans are of conservation concern and require some form of management intervention. This project will assess the role and effectiveness of MPAs for cetacean conservation; improve knowledge and understanding of the ecological and conservation status of two marine mammal species; and provide scientific information of practical relevance to regional conservation management.

Aims

This project aims to improve the understanding of the population abundance, movement, habitat use and genetic structure of the Indo-Pacific Humpback Dolphin (*S. chinensis*) and the Indo-Pacific Bottlenose Dolphin (*T. aduncus*) in the area. Furthermore, this project aims to assess the connectivity between MPAs in terms of cetacean movements in the study area and identifying cetacean feeding hotspots and associated areas of high ecosystem productivity.

Methods

Bi-monthly boat surveys will be done for two years to locate dolphins and conduct detailed observations. Animals are photographed and GPS co-ordinates, environmental variables, group size / composition and behavior is recorded. Every second month aerial surveys are conducted (inshore and up to 3 nautical miles offshore) to search for the presence of the animals. An identification catalogue of Bottlenose and Humpback Dolphins is being created based on both archived and new photos. DNA laboratory analysis of skin and blubber samples will improve the understanding of the different groups of Bottlenose Dolphins present in the area throughout the year.

Your contribution

The identification catalogue of Bottlenose and Humpback Dolphins will allow individual dolphins to be identified by unique patterns and markings (e.g. fin deformities, unusual fin shapes, nicks, scratches, etc.). This in turn will allow individuals to be tracked through space and time. However, the creation of the catalogue involves the preparation and analysis of thousands of photos. Your assistance in preparing these photos and sorting them into a catalogue will be vastly helpful.

Photo-identification

Dorsal fin photo-identification allows individual dolphins to be identified by unique patterns in naturally occurring mark. Long lasting dorsal fin marks (versus temporary markings) enables identification of individuals over long periods of time. Long lasting marks includes fin deformities, unusual fin shapes and nicks in the trailing edge. The acquisition of dorsal fin nicks and other long lasting marks in small cetaceans is cumulative, therefore animals with these marks will tend to be the older individuals, especially adults. Temporary markings includes major and minor scratches, active and healed disease and white fin-fringe, which allow for identification of animals over short periods. Major scratches and white fin-fringes have been shown to last a minimum of 309 and 380 days respectively, and other temporary markings last at least 2-3 months.

There are important issues concerning matching individuals using photo-identification, and a strict protocol is essential to minimize false negative errors (missing a match) or false positive errors (calling two different individuals the same). Photographic quality and mark distinctiveness are correlated; well-marked animals appeared more frequently in better quality photos. The rate of error increased with decreasing photograph quality, with no errors observed in photographs of high quality. A weaker relationship between error rate and distinctiveness of markings, which may result from non-independence in coding for image quality and distinctiveness. Estimates of abundance decreased as poor-quality photographs were removed.

Photo processing

Photos are processed and filtered through two graded systems, and only if they meet certain criteria are they placed in the correct category in the catalogue. It is very important that copies are made at every stage of this process. You will receive a folder of photos from a specific year (e.g. 2014), within which is subfolders of photos taken at certain dates throughout the year (e.g. 2014-05-21) within which are the photos you will be processing.

1. Within the YYYY (e.g. 2014) folder you should put all the dated subfolders (e.g. 2014-05-21) into a folder called 'Originals'.
2. Within 'Originals' - Rename the photos (and subfolders if necessary)
    - Subfolders are named by date (YYYY-MM-DD)
    - Photos are named by date and photo number (YYYY-MM-DD (photo number)). Please ensure there is a space between the date and (phot number).
        - To do this select all the photos in the folder (Ctrl + a) and right click on the first photo in the folder, select Rename. Rename the photo as suggested above (YYYY-MM-DD (1)) and press enter, all photos should be renamed consecutively.
    - **Example**
        - Folder by year 2014
        - Subfolder by date: 2014-05-21
        - Photos by date and photo number: 2014-05-21 (1)
          2014-05-21 (2)
          2014-05-21 (3)
3. Make a copy of the 'Originals' folder – call this folder 'Renamed'
4. Within the folder 'Renamed' - delete any photos that are irrelevant
    - Ocean/scenery photos
    - Marine mammals/seabirds/people
    - Duplicate photos or folders/photos of the same animal in various stages of breaching
5. Of the remaining photos any with multiple animals need to be further duplicated
        - If a single photo contains three different animals make three copies (in this case) of the photo and differentiate each with letters after the photo number. Animals are named according to the direction they are travelling. Animal 'a' is first, swimming in front, and animal 'c' is swimming last.
        - Photos by date and photo number: 2014-05-21 (1a)
          2014-05-21 (1b)
          2014-05-21 (1c)
6. Make a copy of the 'Renamed' folder and call it 'Cropped' – crop each photo within the dated subfolder
    - Make sure the entire fin is in the photo, and do not crop any of the animals body that is out of the water out of the image – this may be useful for identification purposes
    - Pay attention to images with more than one animal, and crop the image according to the numbering system
7. Make a copy of the 'Cropped' folder and call it 'Photo quality' – sort each photo according to the photo quality guidelines (at this stage photos are not separated by dated subfolders)
    - Photo quality ranges from 1-5: 1 being the lowest quality and 5 being the highest. The PQ is based on the following characteristics: focus, size, orientation, exposure, and the percentage of the fin that is visible in the frame
    - Pictures graded 1 or 2 represent lower quality and will not be considered further. Grade 3 pictures will be well lit, in focus, free from spray, and taken parallel with the exposed flank of the animal. Grade 5 photographs will require to be well exposed, without water droplets, in sharp focus, with the dorsal fin orientated parallel to, and occupying a large proportion of, the frame
    - At this stage photos do not need to be restricted to the dated subfolders, but will now be mixed into 5 folders of photo quality 1 to 5

PHOTO QUALITY GUIDELINES

1 - Really blurry photo - Partial fin - Swimming towards/from you (180®) - Fin behind other fins			
2* - Blurry photo - Partial fin - Blurry notches - Swimming diagonally (120®-180®) - Large water splashes			
3* - Okay photo - Whole fin - Notches visible - Swimming with you (90®) - Blurry but very distinctive feature			
4 - Sharp photo - Whole fin - Notches clear - Swimming with you (90®)			
5 - Very sharp - Whole fin - Notches sharp - Swimming with you (90®)			
***If you are not sure whether to put a photo in category 2 or 3, please put it in category 3 as these will be further assessed.**			

8. Make a new folder ‘Mark distinctiveness’ and copy the photos from the subfolders of high quality photos (quality 3-5) from ‘Photo quality’ into this - sort each photo according to the mark distinctiveness guidelines
    - Markings will be graded from 1-5: 1 with no markings and 5 with very distinctive markings

MARK DISTINCTIVENESS GUIDELINES

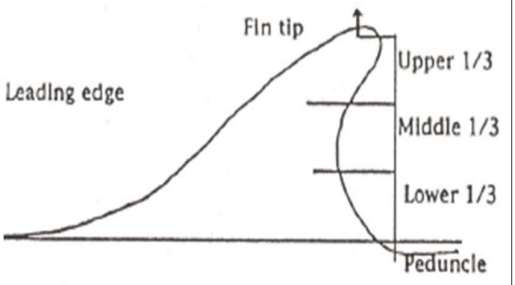
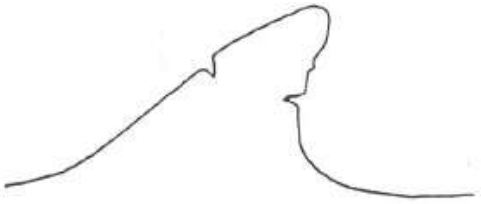
1 - No markings - Blurry fin - No ID possible			
2* - Minor markings - Unclear markings - Too poor for ID			
3* - Moderate markings - ID possibilities			
4 - Clear markings - ID very likely			
5 - Very distinctive markings - Positive ID			

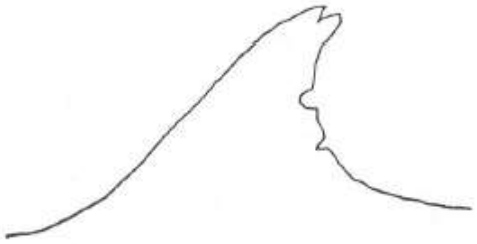
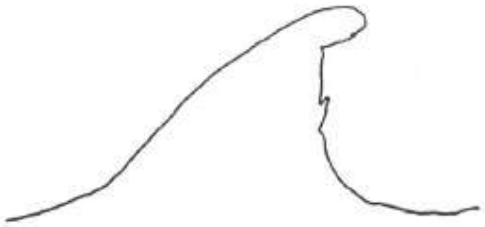
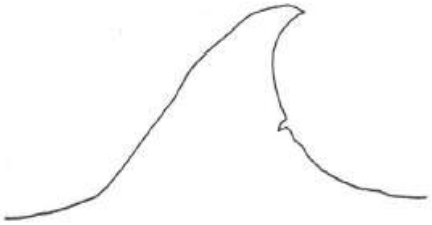
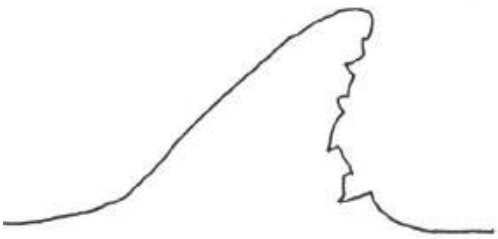
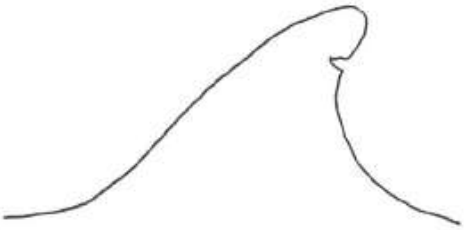
***If you are not sure whether to put a photo in category 2 or 3, please put it in category 3 as these will be further assessed.**

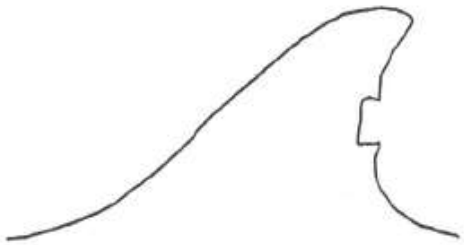
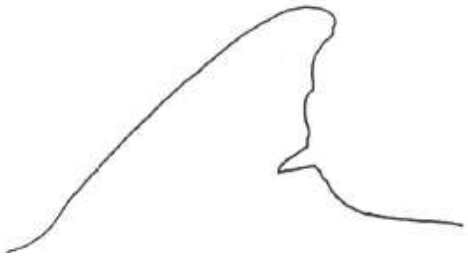
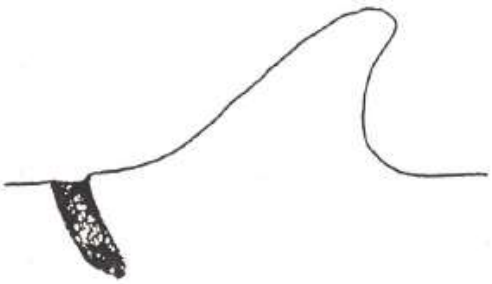
9. Make a new folder ‘Catalogue’ and copy the distinct fin photos (group 3-5) from ‘Mark distinctiveness’
10. Within ‘Catalogue’ make two folders ‘Left’ and ‘Right’ – sort all photos according to which side of the animal is photographed
11. Within ‘Left’ and ‘Right’ photos are catalogued according to the distinguishing feature that will lead to identification

- Each photo will be allocated in to one of the 6 different categories: Leading edge, tip, fin bend, trailing edge notches, peduncle notch, and miscellaneous
- Some fin photos may fall into more than one category but these are ranked in importance and will thus be placed into the highest ranked category
- Within each category there are further subcategories, these are also ranked

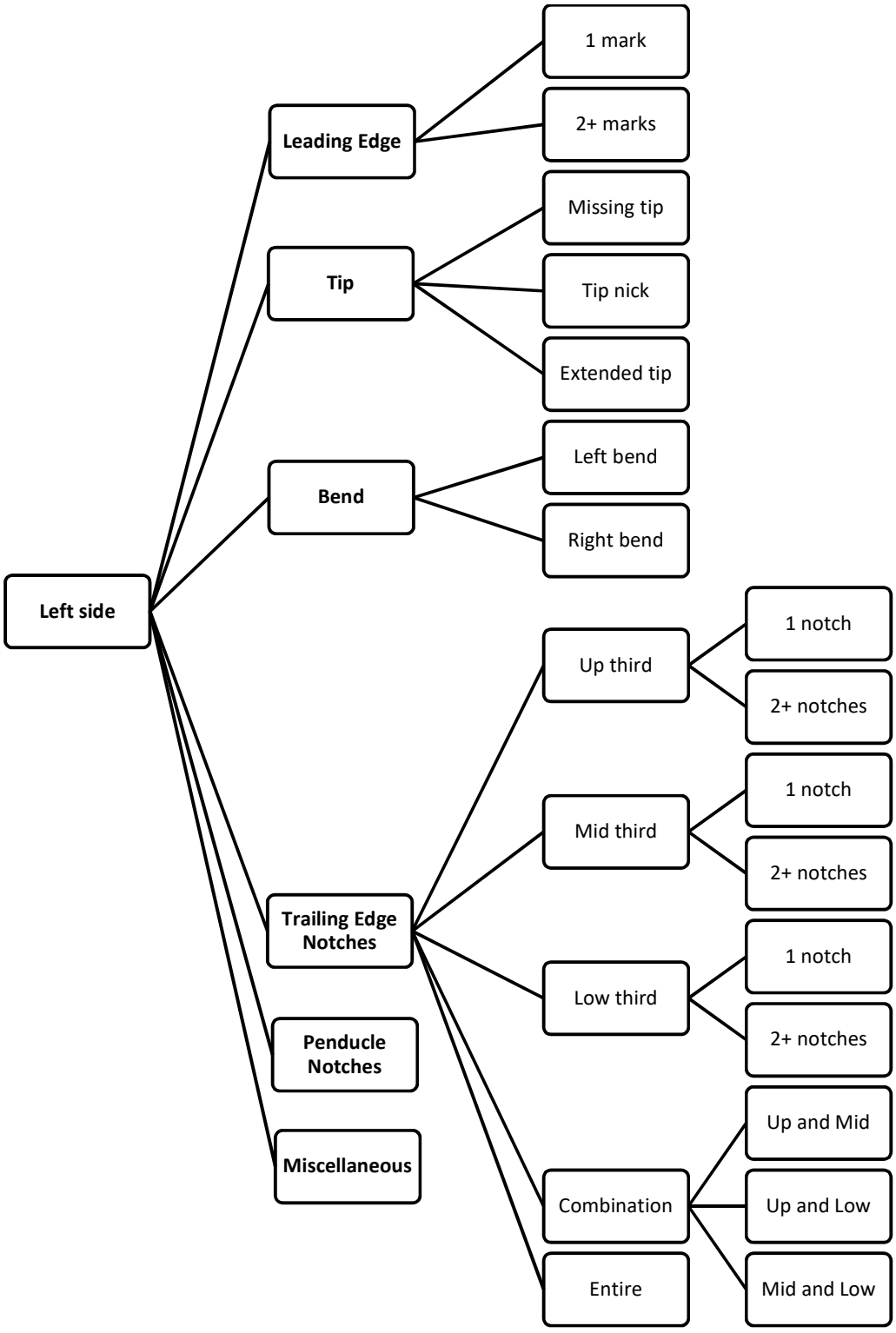
Throughout this process keep an eye out for fins which show signs of disease / have barnacles. These photos will be copied and placed into a totally separate folder 'Barnacles/disease' which is part of a collaboration on another project.

Fin category	Fin shape	Fin description
General information		Each category of the catalogue is based on: – Division of the trailing edge of the dorsal fin into thirds – Distinctive features on the leading edge of the fin from the anterior insertion to the fin tip – Distinctive features on the peduncle
General information		Fin with "typical" intact shape – No distinctive characteristics – Not identifiable
Lead (LD)		**Category: Lead (LD)** – Leading edge of fin has distinctive notch, nick or slice – LD is ranked above all other categories: fins with distinctive features on the leading edge are placed in LD regardless of other features
Tip		**Subcategory: Missing Top/Tip (MT)** – Missing a large portion of the fin tip – Tip of fin is missing – MT is ranked above all other categories except for LD; even if there are other features, the MT takes precedence over all other categories

Tip		**Subcategory: Tip nick (TN)** – Tip of fin has nick, notch or scoop – TN is ranked above all other categories except LD & MT – TN takes precedence over all other trailing edge features
Tip		**Subcategory: Extended tip (ET)** – Tip of fin extends past remainder of trailing edge
Bend		**Subcategory: Right Bend (RB)** – Fin canted or bent noticeably to the right
Bend		**Subcategory: Left Bend (LB)** – Fin canted or bent noticeably to the left
Notches		**Subcategory: Entire (ENT)** – Each third of the trailing edge has equally distinctive features
Notches		**Subcategory: Upper Third (UP)** – Upper third has most distinctive feature – When there are equally distinctive features in more than one third of the trailing edge, the location of the lowest feature takes precedence over the higher feature

Notches		**Subcategory: Middle Third (MID)** – Middle third has most distinctive feature
Notches		**Subcategory: Lower third (LOW)** – Lower third has most distinctive feature
Peduncle notch (PED)		**Category: Peduncle notch (PED)** – Most distinctive feature is on the peduncle – An individual classified in this category must also be placed in a second catalogue based on features of the fin in case the peduncle notch is obscured
Miscellaneous (MIS)		**Category: Miscellaneous (MIS)** – The most prominent feature is located elsewhere, the body, the back, etc

An overview of the folder organization within the catalogue of photos of the left side of dolphins


Left side
Leading Edge
1 mark
2+ marks
Tip
Missing tip
Tip nick
Extended tip
Bend
Left bend
Right bend
Trailing Edge Notches
Up third
1 notch
2+ notches
Mid third
1 notch
2+ notches
Low third
1 notch
2+ notches
Combination
Up and Mid
Up and Low
Mid and Low
Entire
Penducle Notches
Miscellaneous

Garden Route Dolphin Research Project

Lead institutions

Nelson Mandela Metropolitan University
for tomorrow

environmental affairs
Department:
Environmental Affairs
REPUBLIC OF SOUTH AFRICA

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