The Regional Organization for the Conservation of the Environment of the Red Sea and Gulf of Aden
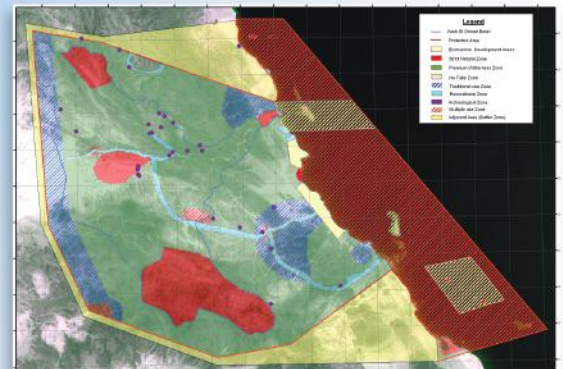
PERSGA

Guideline for Planning and Management of Marine Protected Areas Using Mapping Techniques
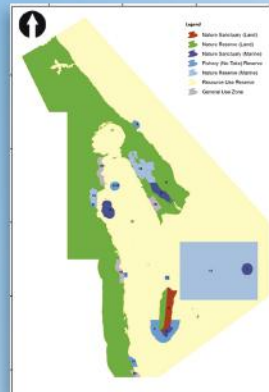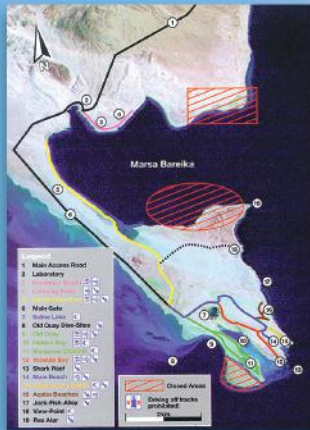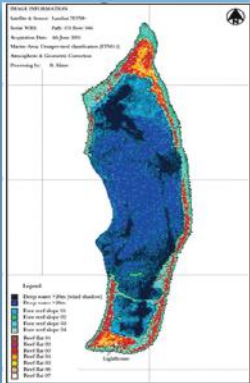
GD.0028
Mar 2016

THE REGIONAL ORGANIZATION FOR THE CONSERVATION OF THE ENVIRONMENT OF THE RED SEA AND GULF OF ADEN

Guideline for Planning and Management of Marine Protected Areas Using Mapping Techniques

Strategic Ecosystem Management of the Red Sea and Gulf of Aden

2016

GD.0028

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Preface

Habitat mapping is a broad term encompassing distribution maps produced from scientific surveys of the substrate, to mapping of defined biological assemblages or 'biotopes' (e.g., coral reef, sea-grass bed, mussel bed, spawning grounds, etc.). It is a new and rapidly expanding field, and thus there are a great many questions to be answered concerning the best techniques and standards to use in acquiring and processing data, habitat classification terms and systems, and the reliability of the maps produced.

Mapping is required to provide a better understanding of the distribution and extent of marine habitats, both in particular protected areas and across the wider environment. Knowledge of the distribution and extent of marine habitats serves to establish sensible approaches to their conservation needs and to facilitate better management of the marine environment through an understanding of how particular human activities are undertaken in relation to these habitats.

Marine habitat mapping is a critical part of moving toward our sustainable use of the marine environment. These maps allow us to visualize what we have and where it is in relation to human use of the marine environment. Thus we can assess if a habitat is rare, or threatened by human activities; we can begin to understand whether particular habitats are important to fish stocks as fish nurseries or spawning grounds; we can identify areas that may need protection as Marine Protected Areas; but most importantly, we can begin to make informed choices about how we manage our marine resources.

The overall objective of this training manual is to introduce a range of techniques and methods that can be used to collect data for use in both the planning and routine management of MPAs. The manual will cover techniques that can be used to map habitats, other key biological resources and assets, as well as socioeconomic information, including patterns of use and other external threats. The manual will demonstrate how these different types of georeferenced data can be used in combination to produce maps to help inform the planning and active management of MPAs.

BACKGROUND

PERSGA has joined efforts with the World Bank for implementation of the GEF funded project "Strategic Ecosystem Based Management of the Red Sea and Gulf of Aden" also known as the SEM project. The SEM project focuses on improving the management of marine resources in the Red Sea and Gulf of Aden through building capacity for resource protection, implementing incentive based systems for communities and harmonization of the knowledge base of marine resources between the PERSGA member countries. This will be achieved through institutional technical assistance with on-ground activities in selected MPAs, including awareness of the participatory approach in using marine resources and applying Ecosystem Based Management principles (EBM). The SEM project has three technical components and a management component, and an implementation time frame of four years starting January 2014. The early stages of the project involve preparing the ground for EBM through detailed assessments of the present status of technical, administrative and legislative aspects of MPA management.

Manual Objective

The overall objective of this training manual is to introduce a range of methods that can be used to collect data for use in both the planning and routine management of MPAs. The training will cover techniques that can be used to map habitats, key biological resources and assets, as well as socioeconomic information including patterns of use and external threats. The manual will demonstrate how these different types of georeferenced data can be used in combination to produce maps to help inform the planning and active management of MPAs.

Software Requirements

There are several different pieces of software that will be used during the training. The software includes:

- Google Earth
- GARMIN BaseCamp
- Quantum GIS (QGIS)

Download the software and install it before the using the manual, following the instructions below.

Install Google Earth

If you do not already have a copy of Google Earth installed on your computer please follow the instructions below to install the software:

- Download the 'GoogleEarth.zip' from the url: www.google.com
- Select either PC or MAC as appropriate for your computer
- Double-click the *.exe file to run the installation
- Follow the onscreen instructions to complete your Google Earth installation

Please note you will need to be online to complete the installation.

Install Garmin BaseCamp(Version 4.4.6 as of December 16, 2014)

Installation Instructions - PC

If you do not already have a copy of BaseCamp installed on your computer please follow the instructions below to install the software:

- Download the 'BaseCamp.zip' from http://www8.garmin.com/support/downl...ls.jsp?id=4435

- Open the 'Basecamp' folder
- Select the sub-folder either PC or MAC as appropriate for your computer
- Double-click the *.exe file to run the installation
- Follow the onscreen instructions to complete the update of your BaseCamp installation

Installation Instructions - MAC

- Download the 'BaseCamp.zip' from the http://www8.garmin.com/support/downl...ls.jsp?id=4435
- Open the 'Basecamp' folder
- Double-click the mdg file to open it
- A new Finder window will open. Locate and double-click on the 'Garmin BaseCamp' icon
- Follow the installer program's prompts to install Garmin BaseCamp

Install Quantum QGIS

Quantum GIS is an open source GIS software that is free to everyone.

Installation Instructions- PC

If you do not already have a copy of QGIS installed on your computer please visit:
http://www.qgis.org/en/site/forusers/download.html

Download the Quantum GIS.zip file.

- Uncompress Quantum GIS.zip onto your hard drive
- Open the sub-folder QGIS 1.8.0 Software
- Double-click the *.exe file to run the installation
- Follow the onscreen instructions to complete the update of your QGIS installation

Please note that version 1.8.1 is not the most recent version of QGIS but it is the version that issued for this training.

A more recent version of QGIS is available for download from the QGIS website:
http://www.qgis.org/en/site/forusers/download.html#

Group exercise 01: Identifying MPA data requirements and data sources

LEARNING OBJECTIVE: In this exercise you will work in two groups to discuss the types of data needed for MPA planning and management and the potential sources of these data types.

EQUIPMENT

- Flip chart
- Pens
- Data scoping sheets

Scoping - Physical / Chemical Environment

PHYSICAL / CHEMICAL			
Data Type	Existing Yes? Source		Existing No? Method to obtain data

Scoping – Biological Environment

Data Type	Existing Yes? Source		Existing No? Method to obtain data

BIOLOGICAL

Scoping - Socio-economic Environment

Data Type	Existing Yes? Source	Existing No? Method to obtain data

SOCIOECONOMIC

Scoping – Threats/ Impacts

THREATS / IMPACTS			
Data Type	Existing Yes? Source		Existing No? Method to obtain data

Group exercise 02: Navigation and data collection

LEARNING OBJECTIVE: To practice using a hand-held Geographical Positioning System (GPS) to navigate and to collect waypoint and track data.

EQUIPMENT:

- GPS preloaded with GoTo waypoints
- Survey slate, survey form, pencil
- Camera
- Walking shoes, sun-hat / sunscreen, etc.

MISSION: You have been asked to carry out a rapid coastal survey. You have been given a Garmin GPSMAP 64s preloaded with 'waypoints' which are the positions where you need to complete the survey.

1. First familiarize yourself with the survey form and make sure you understand what information you are being asked to collect.

2. Collect the rest of your equipment and go outside.

3. Switch on the GPS by pressing the **On** button located on the right-hand side of the unit.

NOTE: If the GPS has been used recently it will be ready almost immediately. If the GPS has not been used for a while, or not been used in the current location, it may take some time for the GPS to locate the correct configuration of satellites. As best practice, it is always a good idea to check that it has found a sufficient number of satellites to give an accurate position before recording waypoints.

4. To check the satellite status use the **Page** button to switch onto the **Satellite** page. To do this, repeatedly press the **Page** button to scroll through the different pages. When you find the correct page just release the **Page** button and the page will display.

5. The satellites that the GPS is using to produce a position will appear as green numbered satellite symbols on the 'Satellite' page. Once the GPS has located 3 or more satellites it will start to give a position. The more satellites located the more accurate the position.

Once you have checked that your GPS is working correctly, you can start your survey.

Selecting a GoTo waypoint to navigate to

6. To locate the first survey point, use the **Page** button to switch to **Waypoint Manager**.

7. The **Waypoint Manager** page shows the list of GPS waypoints already stored in the GPS memory.

8. There are two ways you can search for a waypoint in the Waypoint Manager (i) a text search function where you can type in the name of the waypoint, and (ii) by scrolling through the entire list.

9. Using the text search is good when you have several waypoints loaded into the device. As there are not many waypoints currently loaded into the GPS you can scroll through the list of waypoints to select the one you want to use.

10. To exit the text search function press the **Quit** button. You should now see only a list of waypoints.

'Quit' button

11. Use the **arrow keys** to scroll down and select the first waypoint **'SUD01'.**

12. Once you have selected the waypoint you want to navigate to, press the **Enter** button.

'Enter' button

13. A new screen appears which shows the details about the first waypoint **'SUD01'**.

14. Use the arrows to select **Go** at the bottom of the screen, then press **Enter.**

You have now successfully set up a 'GoTo' waypoint in your GPS that you can use to navigate.

Navigation to the GoTo waypoint

15. To navigate to the first waypoint 'SUD01' use the **Page** button to switch the GPS onto the **Compass** screen.

16. Use the **Compass** screen to navigate to the first waypoint.

17. When you arrive at the first waypoint, you can begin your survey.

18. First record a new 'waypoint' at your current survey location. To do this, first press the **Mark** button, then look at the GPS screen and record the number of your waypoint on the survey form. Then use the arrow keys to select **Done(**if not already highlighted)**,** then press the **Enter** button.

'Mark' button

Please note if you do not select **Done** AND press **Enter** after marking the waypoint it will NOT be stored in the GPS memory.

19. Now observe your environment and complete the rest of the survey form.

20. Finish the survey by taking some photographs that are representative / characterize your location. Record the start and end number of the photographs and record a description of the environment.

You have now completed the survey at the first waypoint.

To continue, repeat the above process for all waypoints 'SUD01' to 'SUD07'.

NOTE: You can also use the **Map** page to navigate but for this exercise you will practice using the **Compass.**

GROUND-TRUTHING SURVEYS - Level 1 Terrestrial and Coastal Surveys

Sheet Number _____

Country:	Location:	Date:	Surveyor:
Weather:	Wind Strength (1-5):	Direction (NSEW):	Temp Air (°C):

GPS Waypoint Number	Physical habitat									Vegetation / Flora							Uses							Photo no. start	Photo no. end	Notes / Description
	Sabkha	Rock	Gravel	Sand	Mud / silt	Wetland (permanent /)	Temporary wetland	Spring (hot, saline,)	Other	Mangrove	Coastal xerophytes	Acacia	Sueda	Grasses	Invasive sp. e.g. Prosopis	Other	Salt pan	Agricultural land	Fish / Shrimp pond	Urban - concrete	Urban - tarmac	Other			

Notes / Description – Tick the column that best suits the description of the physical habitat (e.g. rock, sand etc.) then tick one of the boxes if there is additional vegetation cover. Record the photograph start and end number, and then write a description of the habitat in the box below (e.g. Sand beach). Please use species in the descriptions where possible.

14

Group exercise 03: Downloading data from GPS and viewing points on a map

LEARNING OBJECTIVE: To practice methods to download waypoints and tracks from a hand-held GPS and view the georeferenced data on a map.

EQUIPMENT:

- GPS preloaded with survey waypoints collected in Group Exercise 02and a USB data cable
- Survey slate, survey form, pencil
- Camera and data cable
- Computer with BaseCamp, Google Earth and/or QGIS software loaded

Downloading and Mapping Waypoints and Tracks from GPS

Many handheld GPS units, such as the Garmin GPSMAP 62s, store the waypoints, tracks and routes in a file format GPS eXchange with the file ending *.gpx. You can access these files using different types of software and use them to create a map. The following section describes how you can do this using Google Earth, BaseCamp and QGIS.

Creating a backup of waypoints and tracks from GPS

It is good practice to create a backup of survey waypoints and tracks recorded on the GPS at the end of every survey day (in case you lose the GPS!) and before you start editing them using other software. To create a backup:

To save the current track files on the GPS device

1.   Switch on your Garmin GPS.

2.   From the main menu select **'Track Manager'**.

3.   Use the arrows to select **'Current Track'** press on the '**Enter**' button.

4.   You can change the file name or accept the default; use the arrows to scroll down to '**Done**' and press '**Enter**' to save the track.

Create a backup of the waypoints and tracks from Garmin GPS

6.   Switch on your computer.

5.   With the GPS still switched on, connect the GPS to your computer using the USB cable.

Note: If this is the first time you are using a USB connection to download data from a Garmin, you may need to wait while the GPS installs the drivers for your GPS device. Drivers can be found on the CD that came with your device or downloaded from the device manufacturer's web site.

7.   Using Windows Explorer, create a **new** folder under **My Documents** called /PERSGA/SUDAN/GPS/

8.   Using Windows Explorer, navigate to the folder /Garmin/GPX on the Garmin GPS (which should appear like an external hard drive on your computer when connected).

9.   Inside the folder /Garmin/GPX you will see a file called Waypoints_DATE

10.	Select the file and copy to the new folder /PERSGA/SUDAN/GPS/ on your computer.

11.	Rename the waypoints file with the day's date as 'YYMMDD_waypoints' (e.g. 150106_waypoints).

12.	Navigate back to /Garmin/GPX and click on the folder /Archive, which is where you will find the track *.gpx file you just saved on the GPS.

13.	 Select the track file and copy to the new folder /PERSGA/SUDAN/GPS/

14.	Rename the track file with the day's date as 'YYMMDD_tracks' (e.g. 150106_tracks).

You have now created a back-up of the GPS data in a standard file format. You will now practice the use of different types of software to download and view the waypoints and track file data.

Google Earth can import GPS data in two ways: (i) by opening an existing GPS file, such as the *.gpx files you have just downloaded to your computer, or (ii) through a direct connection to your handheld GPS device. This tutorial will show you how to add GPS data to Google Earth using both of these methods.

Import GPS data from an existing file

1.	Open Google Earth.

2.	If you have GPS data stored in a GPX or another type of file on your computer, you can open it directly in Google Earth.

3.	In Google Earth go to the **File** menu, select **Open.**

4.	In the **Open** window dialogue, change the file type to the GPS file type you want to open by using the **Files of type** list and selecting **Gps (*.gpx, *.loc, *.mps)**.
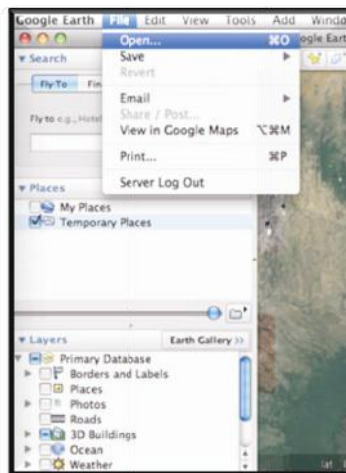
5.	Select *.gpx, then navigate to the appropriate location on your computer and select the GPS file. In this case you stored your *.gpx data in the /PERSGA/SUDAN/GPS folder.

6.	Select the *.gpx file and click **Open** to begin the import process.

7. The **GPS Data Import** dialog box appears; choose to download **Waypoints, Tracks and Routes**.

8. Also, choose to **Draw lines for tracks and routes**, and to **Adjust altitudes to ground height**.

9. Click **OK**. The file is imported and can be viewed in Google Earth.

Remember - in Google Earth waypoints are stored as **'Placemarks'** and indicated by the yellow 'Push Pin' icon.

10. Explore the distribution of the waypoints then close Google Earth.

Import GPS data from your handheld GPS device

You will now try using Google Earth to download your data directly from the Garmin GPS.

11. Connect your Garmin GPS to the computer using the USB connect or; switch the GPS device on.

12. Launch Google Earth.

13. Go to the **Tools** menu and select **GPS**.
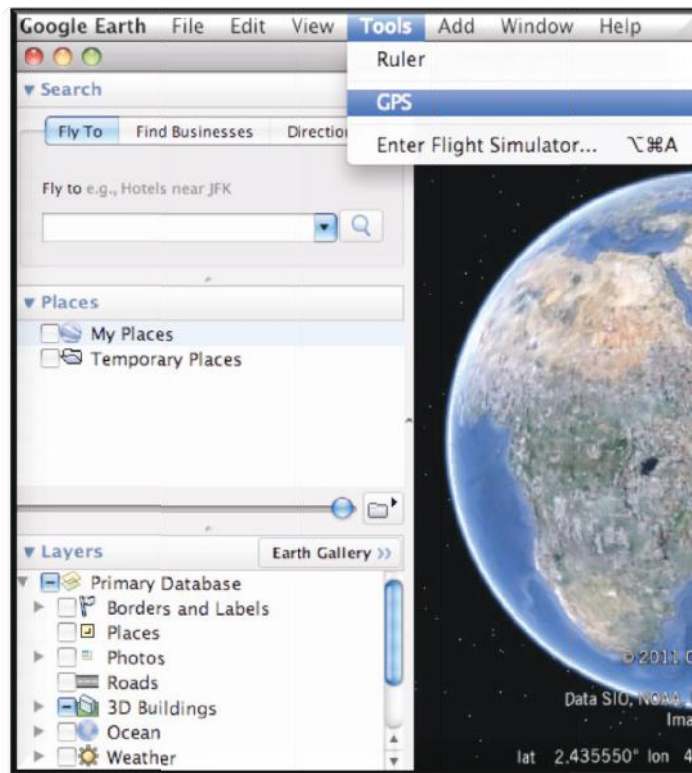
14. In the GPS Import window, go to the Historical tab and choose your device: Garmin or Magellan.

15. Check the boxes if you want to import **Waypoints**, **Tracks** and/or **Routes**.

16. Click **Import**.

17. Your data will be downloaded from your device directly into Google Earth, where you can view and save it into different file formats as described below.

View and edit your GPS data

Once you have loaded your GPS data into Google Earth, you can view and edit the waypoint placemarks and track paths and add more information about the waypoints and tracks in the balloons.

18. To edit a feature in Google Earth, right-click on the feature in the 3D viewer or the **Places** panel and choose **Properties** (on a PC) or **Get Info** (on a Mac). This then allows you to change the name and symbols, etc.

19. Data imported from a GPS handheld device can be animated because it has time stamps (date and time) from when it was collected by the GPS device. To animate your data select the GPS data in the **Places** panel and click **Play** on the Time Controls.
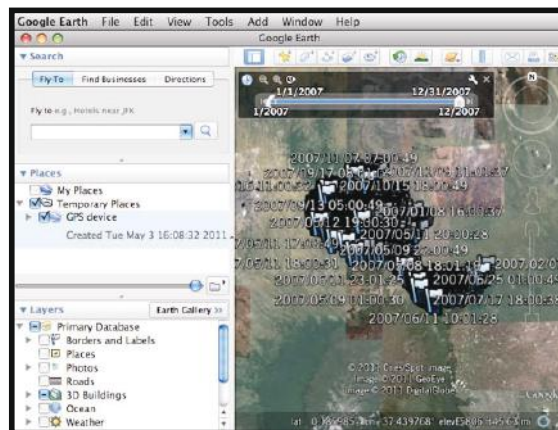
Save your GPS data

20. You now want to save your data as a KMZ file.

21. First create a new folder/PERSGA/SUDAN/KMZ

22. Right-click (Ctrl-click on a Mac) on your GPS data folder in the Places panel and select **Save Place As**.

23. Use the same file naming system to rename the waypoints file with the day's date as 'YYMMDD_waypoints' (e.g. 150106_waypoints)

NOTE: You can also get data from your GPS device in **real time**. Before you disconnect your laptop from the internet and go out in the field, use Google Earth to fly to and view the places you'll be visiting so that the relevant imagery is saved in the cache on your hard drive. Then go out in the field with your laptop and you can view your current location live on Google Earth. From the **GPS Import** dialogue box, select the *Real Time* tab to see options for viewing live data. You'll need to make sure that your GPS device is connected and streaming data using one of the supported protocols (NMEA is the most common).

Downloading and Mapping Waypoints and Tracks in BaseCamp

Garmin BaseCamp is a free mapping application that allows you to transfer Garmin Custom Maps, BirdsEye Imagery, waypoints, tracks and routes between your computer and a Garmin device. It is a useful piece of software that allows you to manage your data on all Garmin products and you can:

- Plan a survey and pick waypoints using your maps
- Transfer waypoints, routes and tracks to and from your GPS device
- Create, view, edit and organize waypoints, routes and tracks
- Download, display and transfer BirdsEye imagery to supported devices
- Print the map, route maps and track profiles
- Geotag photos, etc.

Import GPS data from a file

1. Launch BaseCamp.
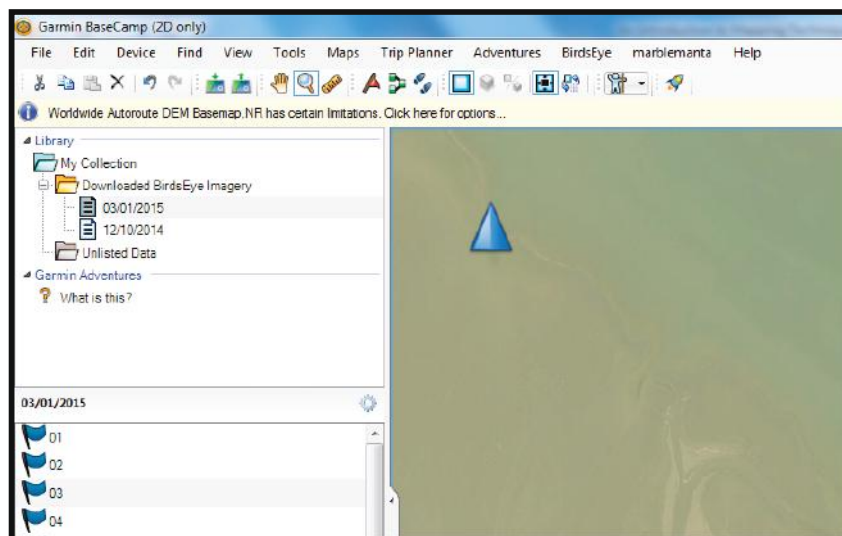
2. Click on **File** menu then **Open**.

3. Navigate to your folder /PERSGA/SUDAN/GPS/

4. Select the GPX waypoint file and click **Open**.

5. Your GPS waypoints will now be displayed on the map.

6. Using the window to the left, you can select a waypoint to zoom to by using **Right Click** and selecting **Show on map**.

7. You can also edit the information about points, delete points and save in another format.

8. To edit or rename the waypoint, right-click on the point and select **Open.**

9. A new dialogue box opens and you can use this to change the names of the waypoints to something more meaningful when you upload them to your GPS and to change the symbols, etc.
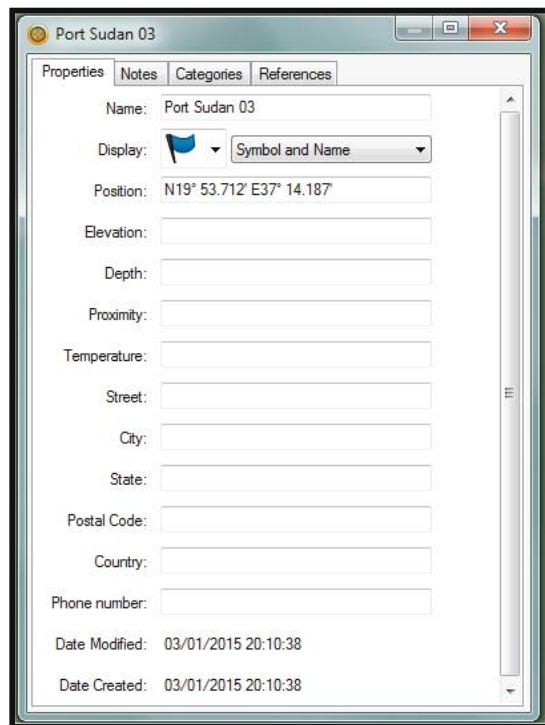

10. When you have finished editing the point, click on the cross at the top right to close the dialogue box.

11. You can save the edited data as a new *.gpxfile,or save as a *.kmz file if you want to re-open it in Google Earth.

12. If you want to save the edited data as a new *.kmz file, start by creating a folder /PERSGA/SUDAN/KMZ if you have not already done so, else navigate to that folder and save the data as a *.kmz file.

13. If you want to save the data as a *.gpx file navigate to the folder where you saved the original *.gpx file and save the data using a different name (e.g. **150106_waypoints_edited**).

Import GPS data from your handheld GPS device

You can also download your GPS data directly from your GPS device using BaseCamp.

14. Connect your GPS device to your computer and make sure that it is switched on and that the computer recognizes the device.

15. Launch BaseCamp.

16. From the **Device** menu select **Receive from Device.**
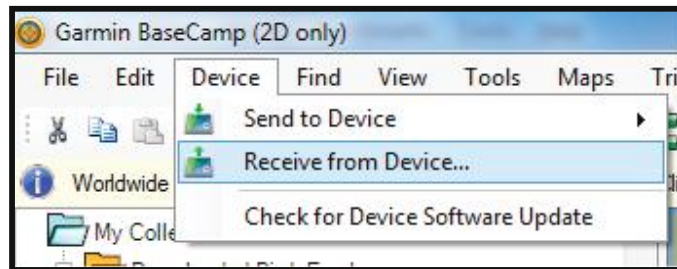
17. A new window should then appear which recognizes your 'Device'.

18. If BaseCamp does not recognize your device check to make sure that it is properly plugged into your computer using the USB cable and that it is switched on.

19. If you are not seeing the window below ask your instructor for help.
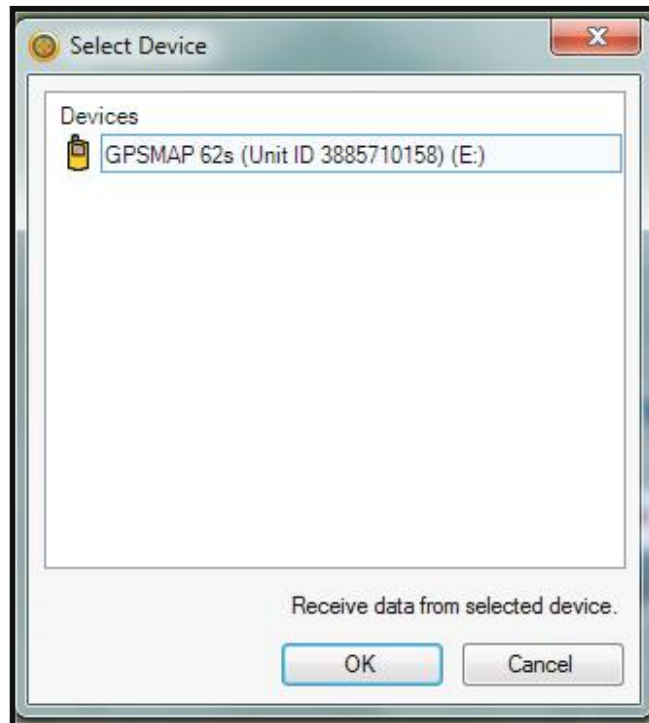
20. If BaseCamp does recognize your device, click **OK.**

21. The data stored on your GPS will now be downloaded to your computer and will appear in the left hand window.
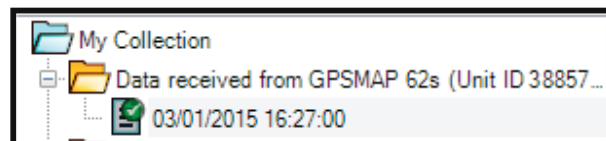
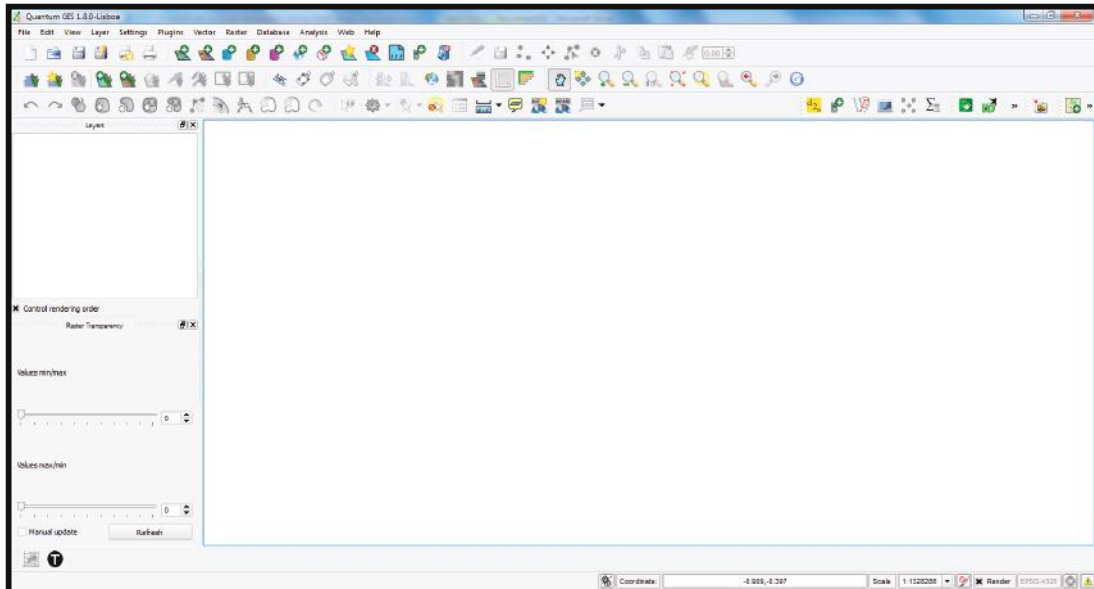22. You can now explore these data in BaseCamp.

23. Take some time to explore the menu options available.

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Downloading and Mapping Waypoints and Tracks in QGIS

In this exercise you will learn how to upload a *.gpxfile to QGIS.

1. Launch QGIS by clicking on the icon on your desktop.

2. From the pulldown menu '**Vector**' select '**GPS**' and then **'GPS Tools'** and a new dialogue box opens.
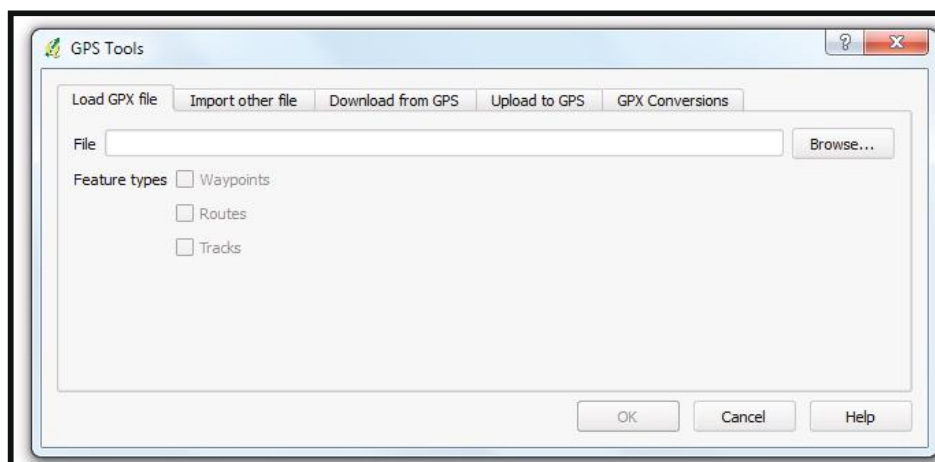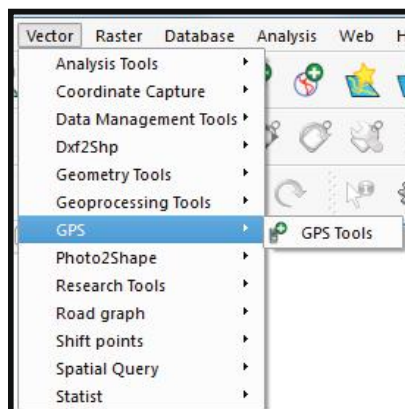
3. If you cannot see the **'GPS Tools'** option, then the plugin is not loaded. If you can see **GPSTools** then proceed to Step 6.

4. To load the plugin click on the '**Plugins**' pull down menu and select **'Manage Plugins'**.
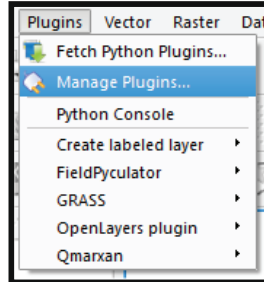
5. A new dialogue box opens; in the box called '**Filter**' type **'GPS Tools'** and **check** the boxbelow to make sure the plugin is loaded (as shown).
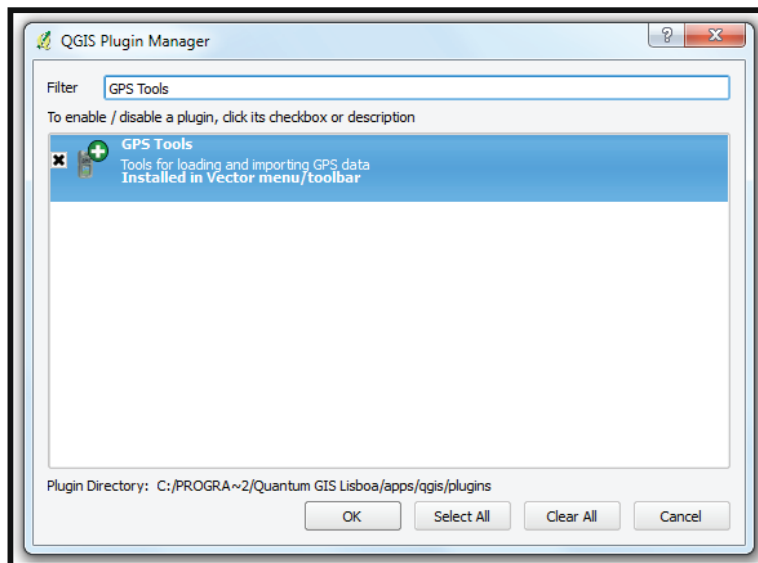
Loading *.gpx files to QGIS

6. From the GPS Tools dialogue box click on the **'Load GPX'** file tab.
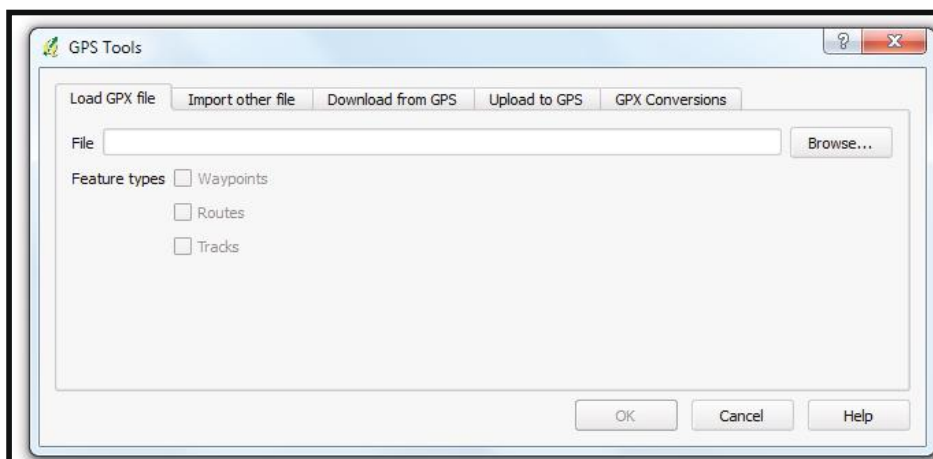
7. Click on '**Browse**' and navigate to the folder /PERSGA/SUDAN/GPS/ where you saved the *.gpx files.

8. **Select** the file and click **'Open'** - notice that the file format should automatically be GPS eXchange format (*.gpx).
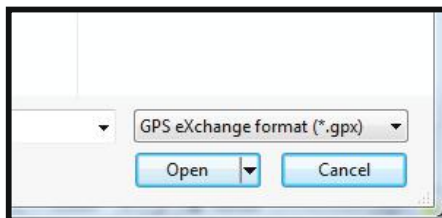
9. Switch the Feature type to 'Tracks'.
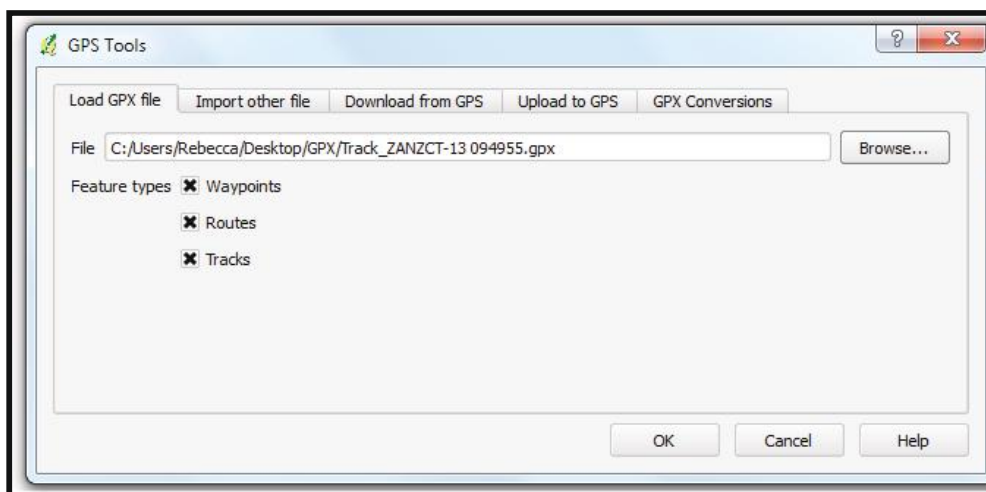
10. Click '**OK'.**

11. The track file should now load in QGIS called YYMMDD_tracks.
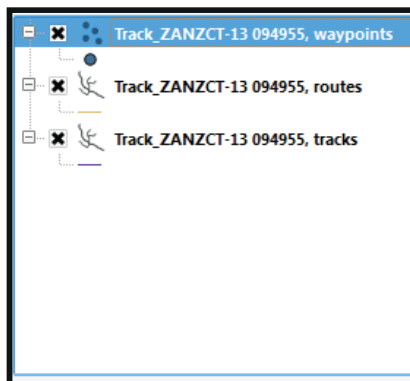
12. You can now repeat this for the waypoint files.

13. From the pulldown menu **'Vector'** select **'GPS'** and then **'GPS Tools'** and a new dialogue opens.

14. Switch the Feature type to **'Waypoint'**
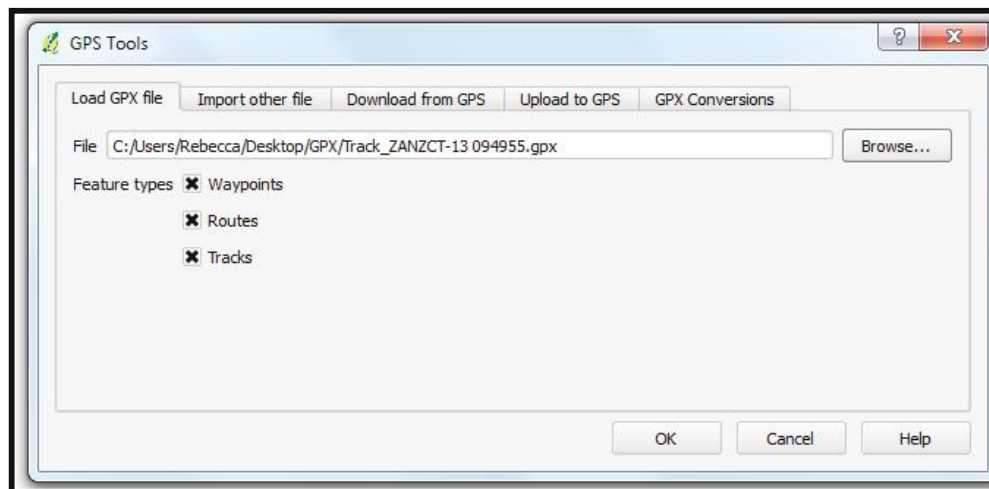
15. Click '**OK'.**

16. The waypoint file should now load in QGIS called YYMMDD_waypoints.

To save GPX files as a shapefiles

You should now have both the track file and the waypoint file loaded in QGIS and these should be visible in the **'Layers list'**. You can now save the file as a GIS shapefile that can be used in different types of GIS software.

17. In Windows Explorer create a new folder called /PERSGA/SUDAN/GIS data.

18. Click on and select the first layer you want to save.

19. Using right click, from the pulldown menu select **Save As.**
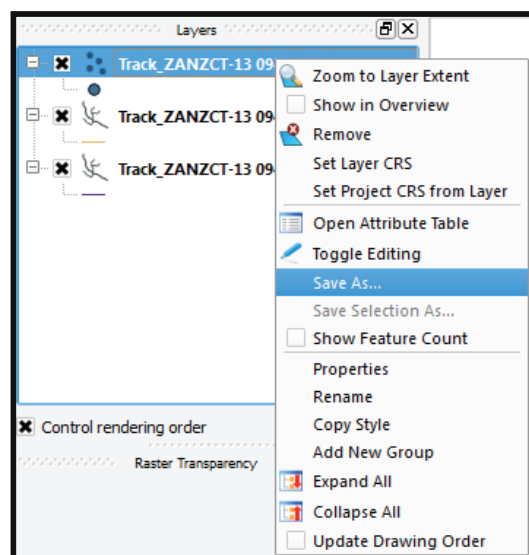
20. The **'Save vector layer as'** dialogue box opens.
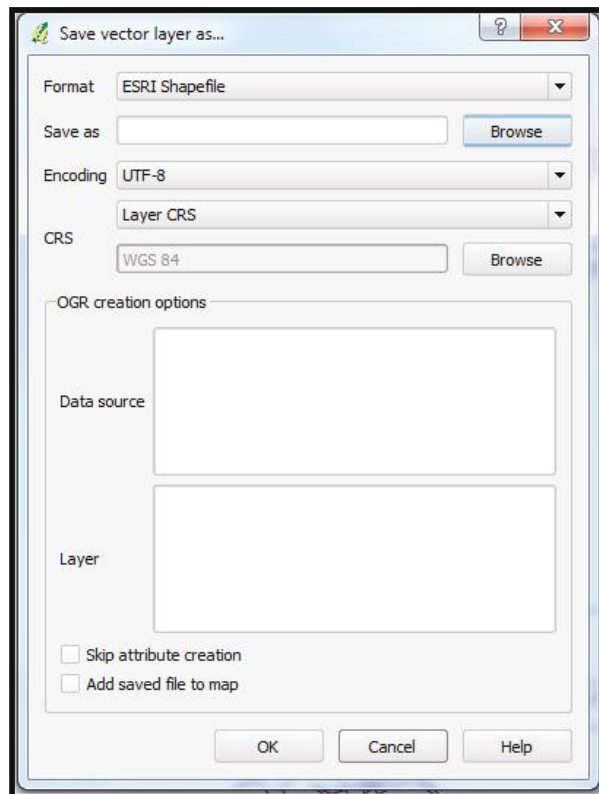
21. Click on the '**Browse**' button.

22. Navigate to the new /PERSGA/SUDAN/GIS data folder and save the file using the same file name you used for the *.gpxfile (e.g. in the format YYMMDD_waypoints e.g. 150106_waypoints for the 6th January 2015).

23. Click '**OK**' and the *.gpx waypoints will be saved as a shapefile file.

24. Repeat this for the track data as well.

25. Close QGIS.

To open a shapefile

You now want to open the shapefiles you just saved in QGIS to look at the distribution of points on a map.

26. Open QGIS.

27. If you already have the 'OpenLayers' plugin loaded in your version of QGIS you can use the satellite image layer as the basemap to view the distribution of waypoints or tracks.

28. If you don't already have the 'OpenLayers' plugin loaded use the **'Manage Plugins'** dialogue to load the 'OpenLayers' plugin.

29. From the Plugins menu then select 'OpenLayers plugin' and **'Add Google Satellite layer'**.
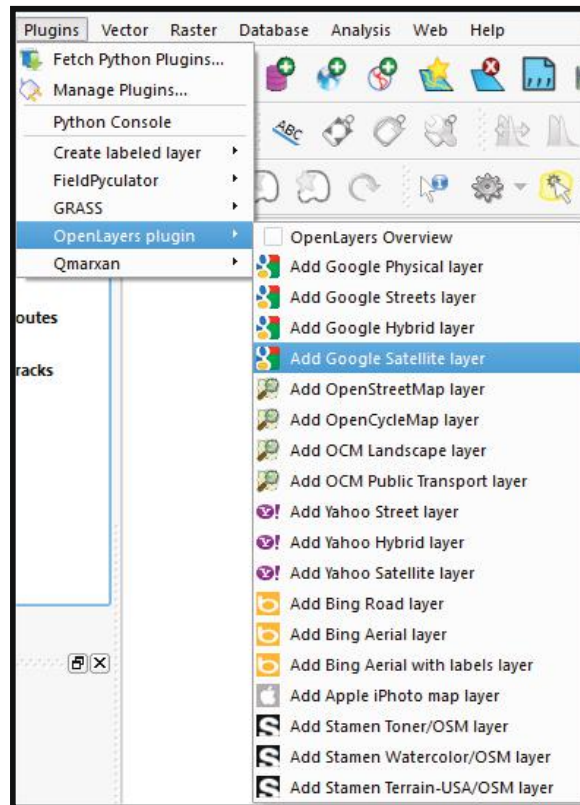
30. The 'Google Satellite layer' loads in the 'Layers list'.

31. Now to open the shapefiles you just created you can either click on the **Add Vector** button or use the pulldown **Layers** menu.

32. Navigate to your shapefiles in the folder /PERSGA/SUDAN/GIS/
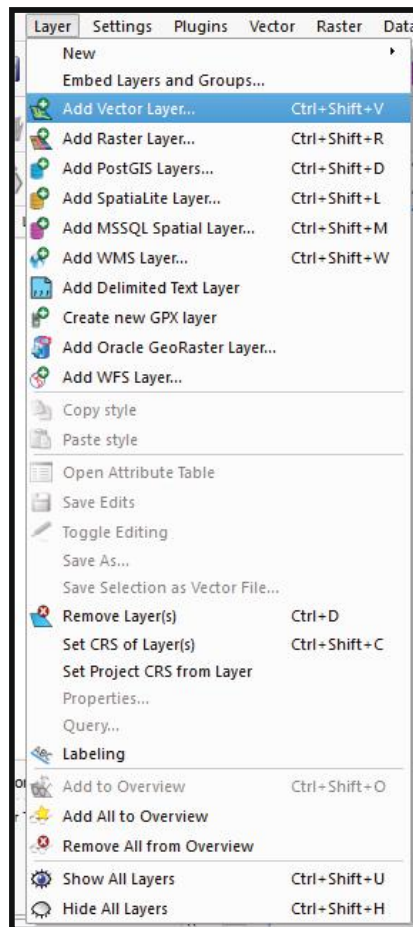
33. Your data points should now be displayed on the map.

34. In the **'Layers list'** to the left, make sure your data layers are displayed on top of the Google satellite layer. If they are not, click and drag the google satellite layer to the bottom of the list so that your waypoints, tracks and routes are visible on top.
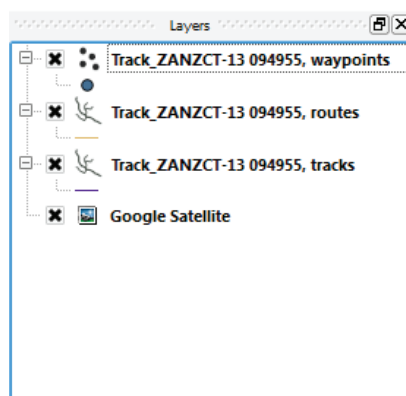
35. Now you can explore the distribution of the waypoints and the tracks.

Group exercise 04: Creating waypoints and uploading to a GPS

LEARNING OBJECTIVE: To practice techniques for creating new waypoints and track files and methods to upload these data to a hand-held GPS for use in the field.

EQUIPMENT:

- GPS and data cable
- Computer preloaded with BaseCamp, Google Earth and/or QGIS software
-

Using Google Earth to create waypoints

You can use Google Earth to identify and create new waypoints and tracks for use as 'GoTo' points in a field survey.

Remember - in Google Earth waypoints are stored as **'Placemarks'** and indicated by the yellow 'Push Pin' icon.

Creating 'GoTo' Waypoints in Google Earth

1. Open Google Earth.

2. Zoom into your area of interest on the map, in this case it is Sudan.

3. Create a Folder in **'My Places'** called **SUDAN** where you will store and organize your data.

4. Browse around the map to find areas you may want to visit (coral reefs, seagrass beds, mangroves, etc.).

When you find a feature of interest then you want to mark this point as a 'waypoint' using a **Placemark** so that you can upload it to your GPS for use in the field.

5. To create a **'Placemark'** you can select the pull down menu **Add** and **Placemark'** tool:
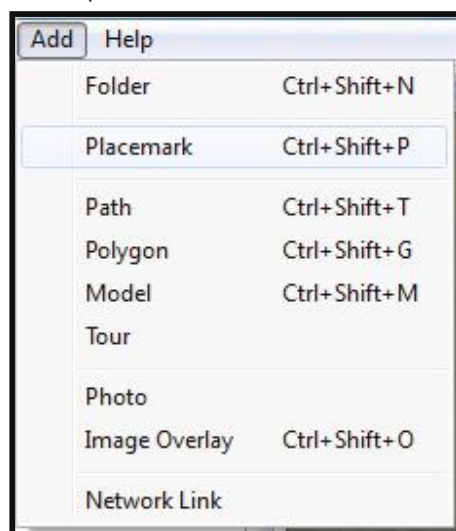
6. Or you can also create a **Placemark** using the yellow placemark button .

7. A **Placemark** will then be automatically added to the map at the center of your view.

8. The new **Placemark** will be indicated by a flashing yellow box.

9. The **New Placemark** dialogue box will also open at the same time.
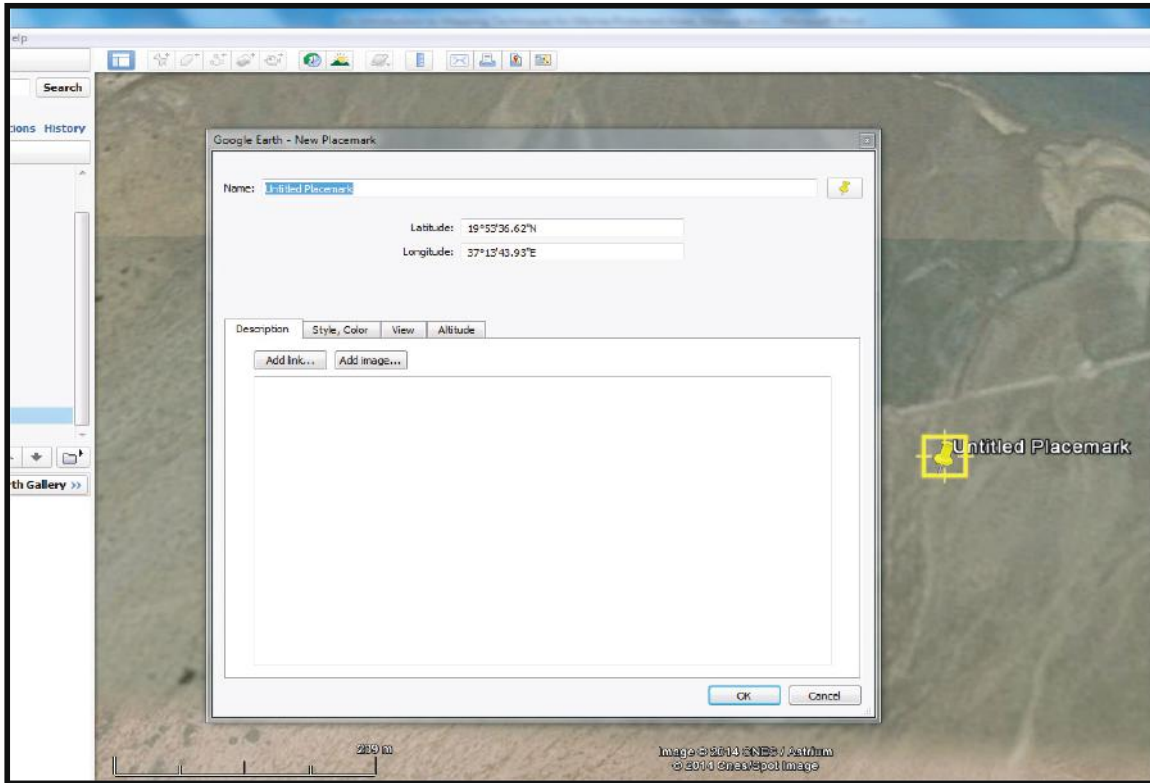
10. To move the new Placemark into position, you can left click and drag the waypoint to the desired location.

11. You can change the name of the 'Placemark' in the **New Placemark** dialogue window to something meaningful.

12. When you are happy with your selection you can click **OK** to close the **New Placemark** dialogue box.

13. If you change your mind once you have positioned a Placemark and want to move or edit the name you can 'right click' on it and select **Properties** to get back into the edit mode.

14. You can also change the icon (NB: these icons will not show the same in BaseCamp or on your GPS).

15. Now try to create a series of **Placemarks** that indicate the location of different habitat types you can see in the satellite imagery. Label these placemarks with the habitat type and a number e.g. coral_001, or SG001 for seagrass.

16. When you have finished entering your **Placemarks** you are ready to send them to your GPS.

Creating a kmz file of waypoints to upload to GPS

You will now create a .kmz file of the survey locations that you can upload to your GPS.

17. If you have not done so already, create a new folder under the /PERSGA/SUDAN/ called /KMZ

18. To save your waypoints as a *.kmz file **Right Click** on your folder in **'My Places'** on the left side of the screen.

19. Select '**Save Place As**' and save a .kmz file to your /PERSGA/SUDAN/KMZ folder.

Open a kmz file in BaseCamp and upload waypoints to GPS

1. Launch Garmin's BaseCamp software.

2. Select 'File' > 'Import' and browse to the .kmz file you just saved.

3. Your Waypoints and Tracks are now imported into BaseCamp, ready to be sent to your GPS.

4. You should see your file in **'My Collections'** under '**Library**' on the left side of your screen.

5. If BaseCamp didn't automatically zoom to your data, you can **left click** on your file under **'My Collections'** - you will now see your data in a table at the bottom of your screen. **Right click** on any waypoint and select **'Show on Map'**.

6. You can edit the names and symbols of your waypoints by **right clicking** the feature in the table at the bottom of the screen and selecting '**Properties**'.

7. When you are ready to send the Tracks and Waypoints to your GPS, plug in your GPS to your computer via USB. Right click on your file in **'My Collections'** under '**Library**' on the Left side of your screen and select **'Send To'** - then select your GPS.

8. Close Garmin's BaseCamp software.

To check that GPS waypoints and tracks have uploaded to your GPS device

9. Disconnect your GPS from the computer and remove the cable.

10. Switch the GPS on.

11. Navigate to the **Waypoint Manager** on the GPS and then scroll to check that you can see your new waypoints in the GPS.

12. If you can see the waypoints you are ready for your survey and you can switch off the GPS.

13. If you cannot see your waypoints ask your instructor for help.

Checking the position of Waypoints in GoogleEarth

You have been sent a word document which contains tables with coordinates. You need to check the position of these coordinates on Google Earth. The first table of coordinates you were sent is as follows:

Side	Latitude	Longitude
North	15° 27' 21.0"	42° 37' 51.4"
South	15° 22' 20.9"	42° 35' 29.8"
East	15° 24' 56.2"	42° 38' 41.7"
West	15° 25' 29.8"	42° 34' 52.9"

1. Before entering these data into Google Earth you first you need to determine the coordinate system.

2. These coordinates are in Degrees, Minutes and Seconds. You can tell this by the symbols used in the table where ° = degree, ' =minute, and " = seconds.

3. Coordinates may also be presented in other formats including:
   - Degrees and Decimal minutes
   - Decimal Degrees

4. Google Earth can accept all of these formats but you need to check which one the software is using before you enter the numbers and create your Placemarks.

5. To check which coordinate system Google Earth is setup to use, select the **Tool** pull-down menu and **Options**.
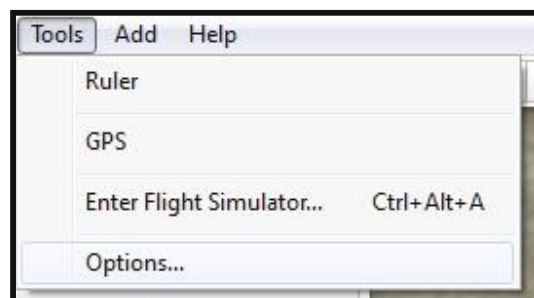
6. The **Google Earth Options** dialogue opens. To the left of the dialogue is a list of check boxes each of which indicates a different coordinate system. The checked system is the one currently being used.
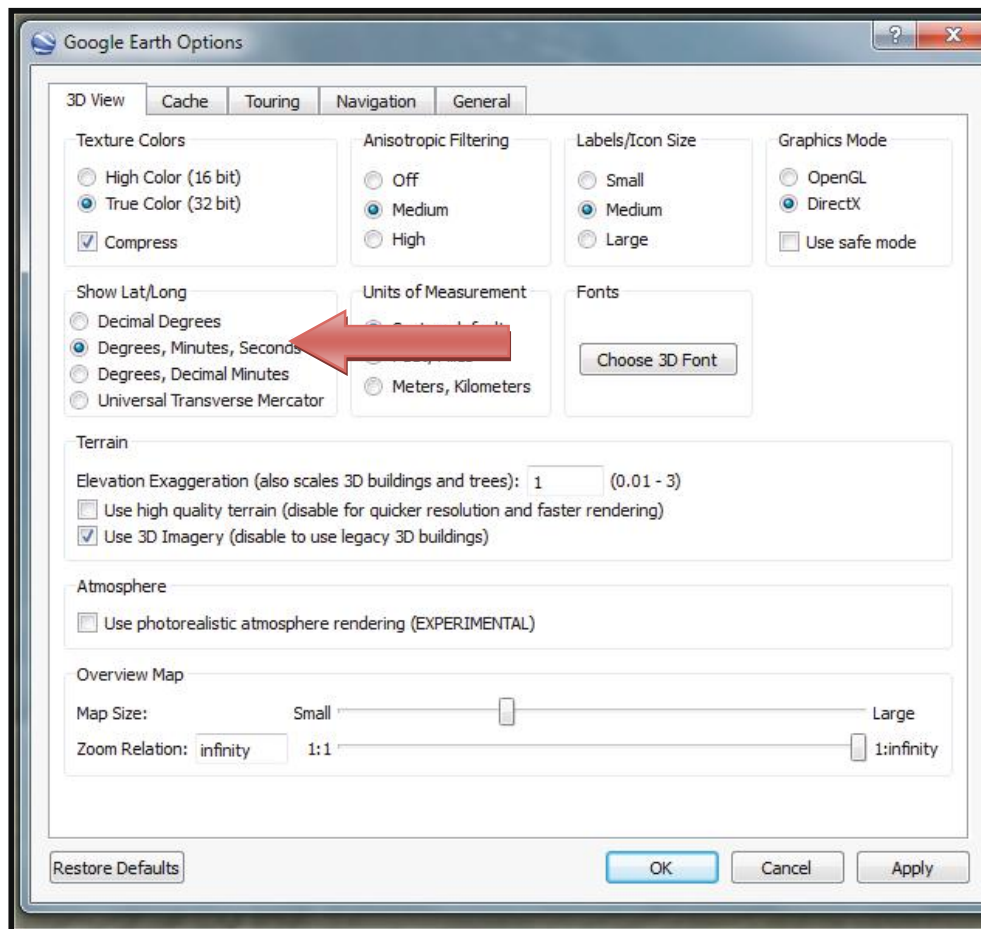
7. The default option is **Degrees, Minutes, Seconds**, so you are good to go and can proceed and add your new Placemarks.

8. Create the first **'Placemark'** by either selecting the pull down menu **Add** and **Placemark** or by clicking on the yellow Placemark button .
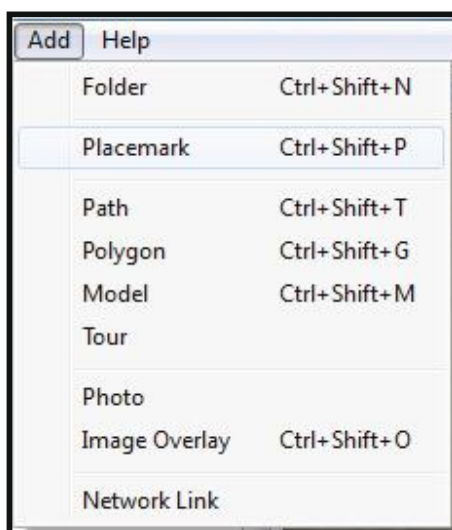
9. A **Placement** will then be automatically added to the map at the center of your view.
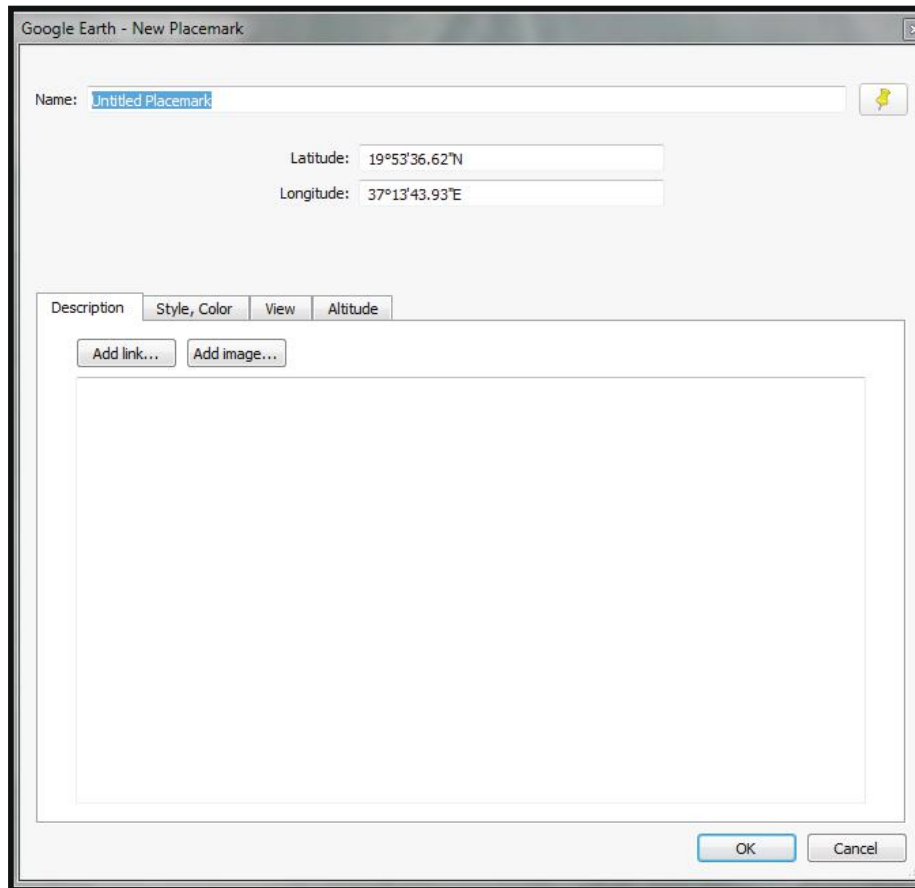
10. Enter the Latitude and Longitude coordinates for the first point, rename it **North**, then click **OK.**

11. Create the **Placemark** for the second coordinate by either selecting the pull down menu **Add** and **Placemark** or by clicking on the yellow Placemark button .

12. Enter the Latitude and Longitude coordinates for the second point, rename it **South**, then click **OK.**

13. Create the **Placemark** for the third coordinate by either selecting the pull down menu **Add** and **Placemark** or by clicking on the yellow Placemark button .

14. Enter the Latitude and Longitude coordinates for the third point, rename it **East**, then click **OK.**

15. Create the **Placemark** for the fourth coordinate by either selecting the pull down menu **Add** and **Placemark** or by clicking on the yellow Placemark button .

16. Enter the Latitude and Longitude coordinates for the fourth point, rename it **West**, then click **OK.**

17. In the menu on the left, double click on the point to zoom to the position.

18. What do these coordinates represent? If you think you know please tell your instructor!

Creating Track file in Google Earth

If you create a series of waypoints you might want to create a Track file to illustrate the route you plan to walk, drive or go by boat that you can use to navigate between the points in the field.

19. To create a Track file first open Google Earth.

20. Zoom into your area of interest on the map.

21. Create a Folder in **'My Places'** called **SUDAN** where you will store and organize your data.

22. Browse around the map to find areas you may want to visit (coral reefs, seagrass beds, mangroves, etc.).

23. Select the **Add Path** Button in the Toolbar at the top of the screen.

24. A **New Path** dialogue window pops up.

    Do not press the OK button - **YOU MUST DRAW YOUR TRACK FIRST.**

25. Move the **New Path** dialogue window to the side and start left clicking on the map where you want to create a track.

26. Continue **left clicking** to add points along the path you want to take.

27. Alternatively, you can hold the **left click** and drag to quickly create a line with a bunch of points.

28. In the **New Path** window type in a suitable name. Select the 'Style, Color' Tab if you want to change the appearance of the line you created. Add a description if you wish, then click **OK.**

Now you have a track to send to your GPS. As with the waypoints we need to save the data as a .kmz file.

29. **Right click** on your folder in **My Places** on the left side of the screen select **Save Place As** and save a .kmz file to your /PERSGA/SUDAN/KMZ folder.

30. Open Garmin's BaseCamp software.

31. Select the **File** pull down menu and **Import** and then **Browse** to the .kmz file you just saved.

32. Click **OK** and your track is now imported into BaseCamp, ready to be sent to your GPS.

33. You should see your file in 'My Collections' under 'Library' on the left side of your screen.

34. If BaseCamp didn't automatically zoom to your data, you can left click on your file under 'My Collections' - you will now see your data in a table at the bottom of your screen.

35. **Right click** on your track file and select **'Show on Map'**.

36. To send the Track to your GPS, plug in your GPS to your computer via USB. **Right click** on your file in '**My Collections**' under **'Library'** on the left side of your screen and select **'Send To'** - then select your GPS.

Using BaseCamp to create waypoints

You can also use BaseCamp to create waypoints and track files to upload and download to your GPS. However the free maps supplied in Basemap are not as good as those available via Google Earth. It is possible to obtain high resolution imagery for use in BaseCamp with a subscription to BirdsEye satellite imagery. A subscription to BirdsEye Satellite Imagery costs <30 USD with BaseCamp™ and it allows the user to transfer **an unlimited amount of satellite images** to your computer and to your GPS device. An example of the resolution of the satellite imagery available from BirdsEyeis shown on the following page.

Your instructor will demonstrate the benefits of a BirdsEye satellite image subscription and how to create waypoints as described below.

Creating 'GoTo' Waypoints in BaseCamp

1. Launch Garmin's BaseCamp software.

2. Under the **'Library'** folder on the left side of the screen, right click on **My Collection** and create a new folder called **Red Sea**.
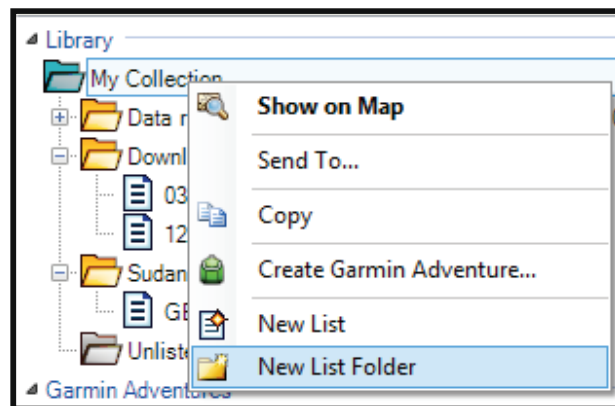
3. Next click of the **'Download BirdsEye Imagery'** folder on the left side of the screen to display the downloaded data.

4. This will then display the satellite imagery in the map.
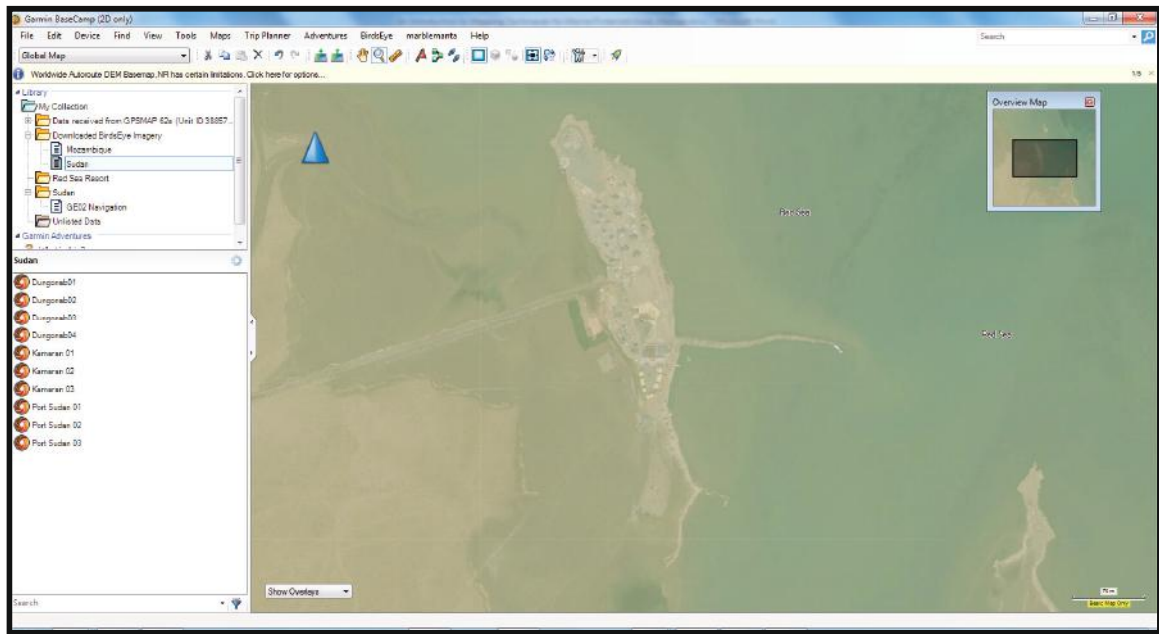
5. You can now zoom in and explore the satellite imagery.

6. To add new waypoints to the map you can either select the pulldown menu **Tools** and select the **Waypoint** tool or you can click on the waypoint button ⚠.
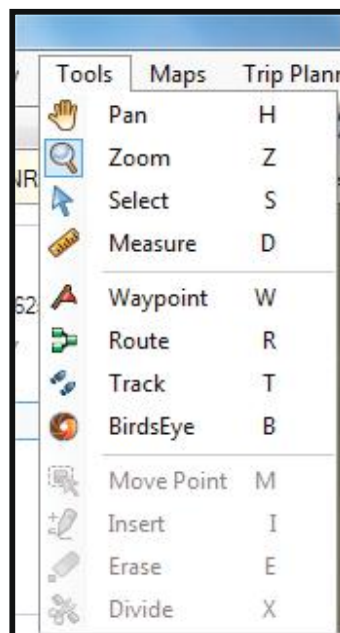
A new waypoint is added to the map (see below).

7. To rename the waypoint, right-click on the point and select **Open.**

8. A new BaseCamp, ready to be sent to your GPS.

9. You should see your file in **'My Collections'** under '**Library**' on the left side of your screen.

10. If BaseCamp didn't automatically zoom to your data, you can left click on your file under 'My Collections' - you will now see your data in a table at the bottom of your screen.

Lat/Lon hddd°mm.mmm' WGS 84

E37° 14.100' E37° 14.150' E37° 14.200'

N19° 53.800'

N19° 53.750'

N19° 53.700'

N19° 53.650'

N19° 53.600'

Red Sea

E37° 14.000' E37° 14.050' E37° 14.100' E37° 14.150' E37° 14.200'

Global Map

0 m   35 m   70 m   105 m   140 m

TN   MN

2.9°
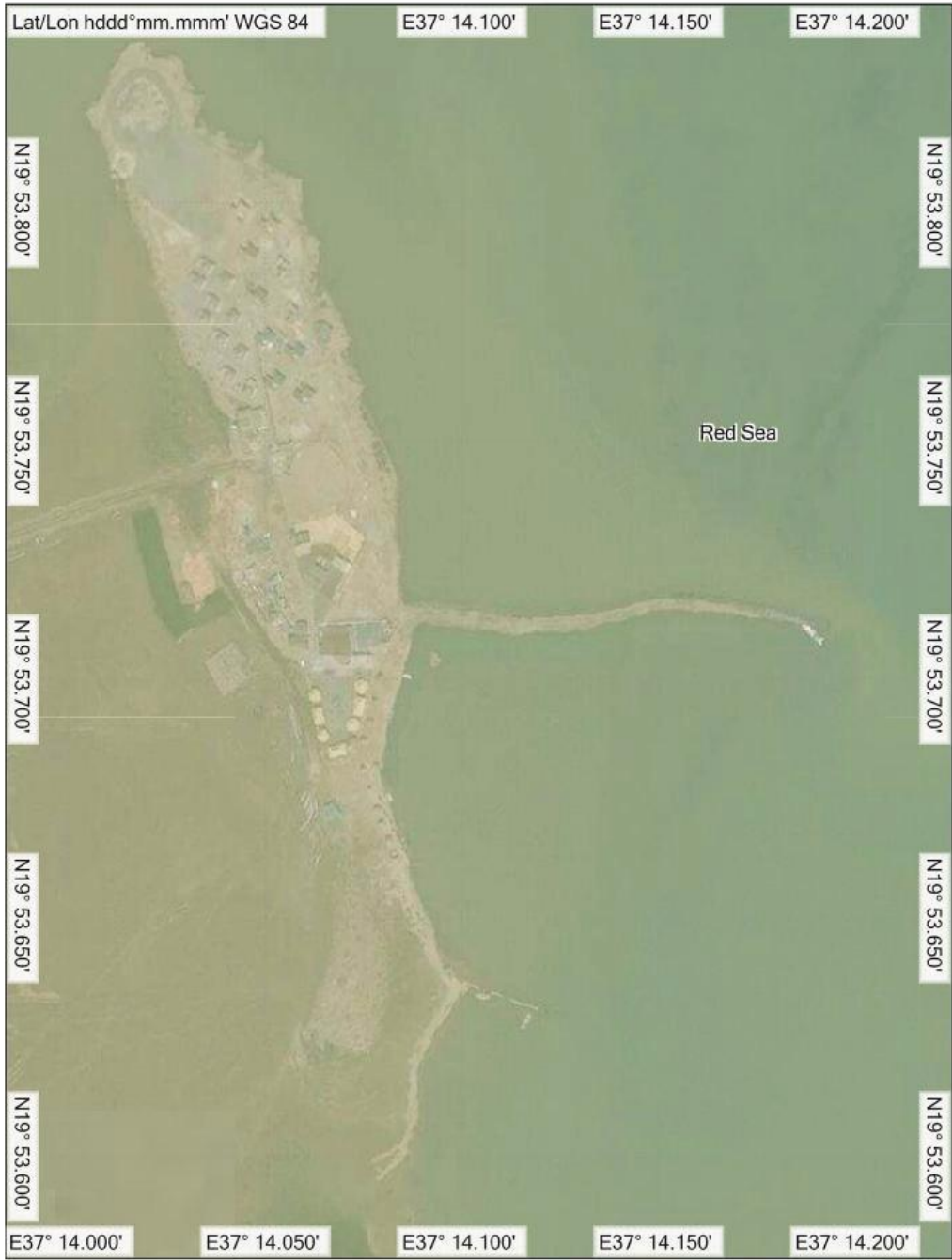
03/01/2015

GARMIN

01/01/2010

Group exercise 05: Rapid assessment survey methods

LEARNING OBJECTIVE: To practice rapid assessment survey methods for collecting data on key biological resources, habitats and impacts.

EQUIPMENT:

- GPS and spare batteries
- Underwater camera and spare batteries
- Survey forms, slate and pencil
- Snorkel kit
- Sunscreen, sunhat, etc.

ERSGA Rapid Coastal Environmental Assessments (RCEA)

Figure 1.1 Schematic diagram showing configuration and dimensions of the 'site inspection quadrats' used in rapid environmental assessment. At each site, estimates are made of the abundance of key ecosystems and species groups, and also of human uses/environmental pressures (impacts) within 250,000 m^2 (i.e. 500 x 500 m).
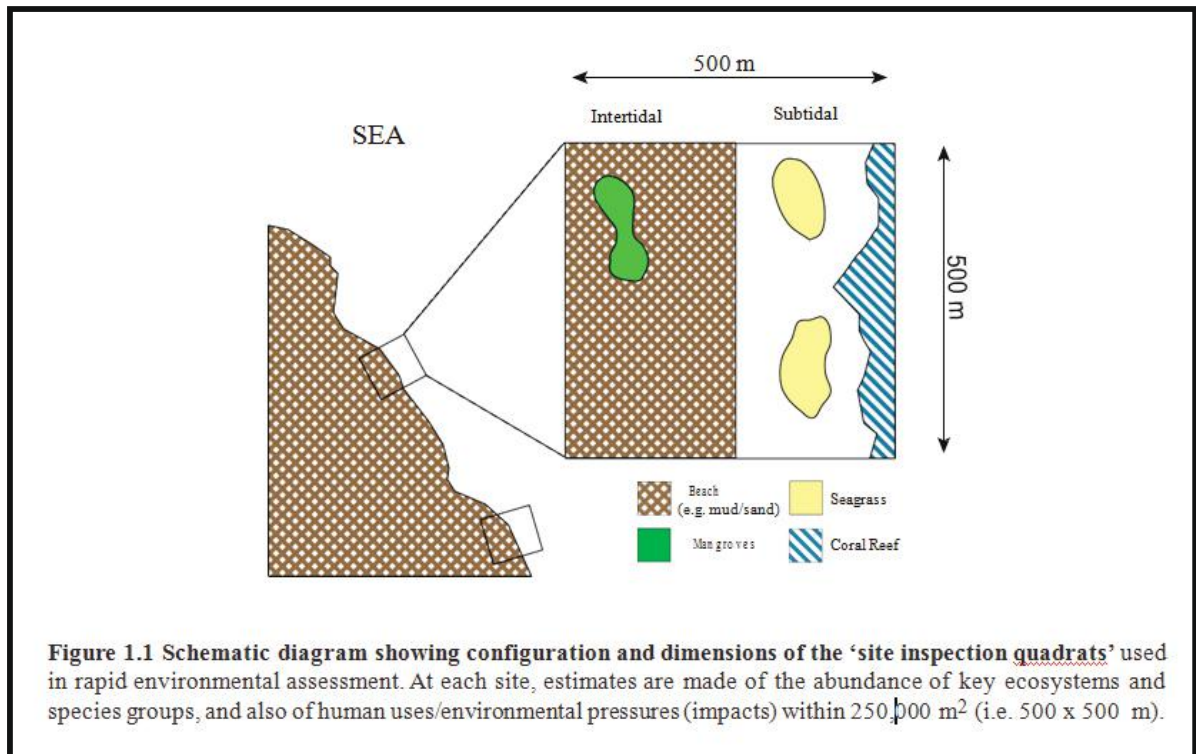
Ranked abundance/magnitude score (log scale)	Areal extent (m^2): flora and reefs or No. of individuals: other fauna (equivalent arithmetic range)
0	0
1	1-9
2	10-99
3	100-999
4^5	1,000-9,999
5^6	10,000-99,999
6	100,000 +

Table 1.4 Logarithmic ranked/ordinal scale of 0–6 used for abundance estimates of coastal ecosystems (flora and reefs) and species groups (fauna). The same scale is used to estimate the magnitude of uses/pressures (impacts).

PERSGA Rapid Coastal Environmental Assessments (RCEA)

Latitude	Longitude	Source	Nearest name on map/chart	Sector Code
Researcher	Details of location			Date Code

P R O F I L E				
F L O R A	**1 Mangroves**			
	2 Seagrass			
	3 Halophytes			
	4 Algae			
	5 Freshwater Vegetation			
	6 Other			
F A U N A	**7 Reefs & corals**			
	8 Birds			
	9 Turtles Nesting females Pits Swimming turtles			
	10 Mammals Terrestrial Marine			
	11 Fish			
	12 Invertebrates			
	13 Other			
I M P A C T S	**14 Construction**			
	15 Fishing/ Collecting Direct Discarded nets Discarded			
	16 Pollution Oil Metal/litter/junk Driftwood			
	17 Other Cr-of-thorns (CoT) CoT (scars) Recent coral bleaching (white) Algal lawn on coral			
O T H E R	**18 Oceanography**			
	19 Meteorology			
	20 Other			
Photographic Record				

GROUND-TRUTHING SURVEY METHODS - LEVEL 1

SURVEY INFORMATION	
Country	Record the country code. e.g. **SUD** = Sudan **YEM** = Yemen **DJI** = Djibouti **etc.**
Location	Record the location of where the surveys are taking place (e.g. nearest village or site name, orientation of coast).
Date	Record the date using the format YYYYMMDD (year, month, day) e.g. 20140312 for the 12th March 2014.
Surveyors	Record the initials for the surveyors involved in the survey.
Weather	Record the weather. Usually this will not change much while surveying, so can be recorded at the top of the survey sheet. Use the following scale: **1**= Sun, no cloud **2**= Sun part cloud (<50% cloud) **3**= Sun and cloud (50% and 50%) **4**= Cloud (full cloud) **5** = Cloud and rain
Wind strength	Record the wind strength. Usually this will not change while surveying, so can be recorded at the top of the survey sheet. Use the following scale: **1**= none (<4kn) **2**= slight (4-6kn) **3**= moderate (7-10kn) **4**= strong (11-15kn) **5**= very strong (>16kns)
Wind direction	Wind direction will often not change much while surveying, so can be recorded at the top of the survey sheet. Use the compass rose to describe which direction the wind is coming from (e.g. SE or SSE)
SITE INFORMATION	
GPS Waypoint	Record the GPS waypoint number (you can use the original waypoint number as stored in the GPS).
Depth	Record the water depth (m)
Water temperature	Record the water temperature (degrees C)
Visibility (m)	Record the water visibility
Land	Tick the box if the dominant ecosystem type is land
Sabhka	Tick the box if the dominant ecosystem type is sabkha
Saltmarsh	Tick the box if the dominant ecosystem type is saltmarsh
Mangrove	Tick the box if the dominant cover is mangrove
Silt (Vase)	Tick the box if the dominant cover is silt
Sand (Sable)	Tick the box if the dominant cover is sand
Rock pavement	Tick the box if the dominant cover is pavement
Algal assemblage	Tick the box if the dominant cover is algae
Live hard coral	Tick the box if the dominant cover is live hard coral
Sparse seagrass (<40%)	Tick the box if the dominant cover is sparse seagrass (<40%)
Dense seagrass (>40%)	Tick the box if the dominant cover is dense seagrass (>40%)
Deep water (>15m)	Tick the box if the point is on deep water >15m depth
Other	Tick the box if the dominant cover is something else (and make a note of what it is)
Photographs	Record the start and end number of the photographs. There are different ways to help distinguish between the photographs from different sites. You can write the GPS waypoint

	number on a sheet of paper and photograph the number. You can photograph the survey form between sites, or the GPS screen showing the waypoint.
Description	Write a brief description of what you observe, mentioning the dominant physical and biological characteristics of the seabed e.g., *'Halophila ovalis* seagrass on flat sand with occasional sparse rubble and no other live cover' or 'Massive hard coral community dominated by *Porites* colonies interspersed by sand'. This description should include the names of the dominant species wherever possible. If there are species that you do not recognize, take photographs of the species.

GROUND-TRUTHING SURVEYS - Level 1 Subtidal Surveys

Country: _____ Survey Sector: _____ Location: _____ Sheet Number _____

Surveyors: _____ Weather: _____ Date: _____

Wind strength (1-5): _____ Wind direction (NSEW): _____

GPS Waypoint	Depth (m)	Water Temp (oC)	Visibility (m)	Silt / Vase	Sand / Sable	Pavement	Algal assemblage	Live coral	Soft coral	Sparse seagrass	Dense seagrass	Deep water (>15m)	Other			Photograph- start#	Photograph- end	Notes / Description (dominant species / genera and % cover)

GROUND-TRUTHING SURVEY METHODS - LEVEL 2

SURVEY INFORMATION	
Country	Record the country code. e.g. **SUD** = Sudan **YEM** = Yemen **DJI** = Djibouti **etc.**
Location	Record the location of where the surveys are taking place (e.g. nearest village or site name, orientation of coast).
Date	Record the date using the format YYYYMMDD (year, month, day) e.g. 20140312 for the 12th March 2014.
Surveyors	Record the initials for the surveyors involved in the survey.
Weather	Record the weather. Usually this will not change much while surveying, so can be recorded at the top of the survey sheet. Use the following scale: **1**= Sun, no cloud **2**= Sun part cloud (<50% cloud) **3**= Sun and cloud (50% and 50%) **4**= Cloud (full cloud) **5** = Cloud and rain
Wind strength	Record the wind strength. Usually this will not change while surveying, so can be recorded at the top of the survey sheet. Use the following scale: **1**= none (<4kn) **2**= slight (4-6kn) **3**= moderate (7-10kn) **4**= strong (11-15kn) **5**= very strong (>16kns)
Wind direction	Wind direction will often not change much while surveying, so can be recorded at the top of the survey sheet. Use the compass rose to describe which direction the wind is coming from (e.g. SE or SSE)
SITE INFORMATION	
Waypoint	Record the GPS waypoint number.
Photographs	Try to take photograph that are representatives of the site and the species present. Take a combination of vertical photographs to illustrate the substrate cover and horizontal photographs to capture the characteristics of the seascape. You can use photo quadrats, to do this throw the quadrat at random within the site, and photograph from directly above. Record the photograph numbers for the site - photograph start number and end number. You can also photograph the survey form.
Depth min (m) & max (m)	Record the minimum and maximum depth at the site in meters. You can do this from the boat using a weighted line (rope with knots) or measuring tape with a lead weight attached. You can use a dive computer set to free diving mode if snorkeling or normally if diving.
Visibility (m) horizontal:	Record the estimated horizontal distance to which you can see underwater in meters
Visibility (m) depth:	Record the depth to which you can see underwater in meters. You can use a Secchi disk to record this if you have one, or you can make one.
Exposure	Try to estimate the exposure: **1**= Zero - fully sheltered from local wave exposure **2**= Indirect/dissipated exposure to wind/ swell **3** = Wave influence, but not extreme **4**= Angled face on to wind/swell **5**= Maximum local - very exposed
Aspect	Record the orientation of the reef relative to north. Is the fore reef slope facing north (0 degrees), east (90 degrees), south (180 degrees), or west (270 degrees).

Slope	Try to estimate the slope of the seabed from horizontal using the following scale: **1**= flat (0 degrees) **2**= <45 degrees **3**= >45 degrees <90 degrees **4**= 90 degrees and **5**= overhanging
Seabed Relief	Try to estimate the macro-topography or relief of the seabed using the following scale: **1**= Flat, no structures **2**= Low relief structures with between 1-10 cm elevation **3**= Scattered low relief structures with 0.5-1 m elevation, separated by > 5 m **4**= Structures with 1-2 m elevation (e.g. bommies) 3-6 m apart **5** = Spur and groove > 2 m relief; major structure, pillars or caves / a diver can pass in between
Current strength	Current strength will often not change too much between surveys. Record the current strength after completing the survey. Use the scale: **1**= None **2**= Light **3**= Moderate **4**= Strong **5**= Dangerous
Current direction	Use the compass rose to record the direction the current is coming from (e.g. SE or SSE)
Reef Type	Record the type of reef where the data was recorded (where possible you can use the Millennium Reef Map categories).
Reef Zone	Record the reef zone where the video transect was recorded (e.g. Lagoon, Reef flat / back reef, Reef crest, Fore reef slope). Where possible you can use the Millennium Reef Map categories zones.
PHYSICAL STRUCTURE (Total cover = 100%)	
HS (Hard substrate)	Estimate percentage substrate composed of hard flat, undulating or indented substrate
LB (Large blocks >1m)	Estimate percentage substrate composed of large blocks >1m (e.g. massive *Porites,* tabular *Acropora,* rock, etc.)
SB (Small blocks <1m)	Estimate percentage small blocks <1m (e.g. massive *Porites,* tabular *Acropora,* rock, etc.)
RB (Rubble / Debris)	Estimate percentage substrate composed of rubble
SN (Sand / Sable)	Estimate percentage substrate composed of sand
SI (Silt / Vase)	Estimate percentage substrate composed of silt
BIOLOGICAL COVER (Total cover = 100%)	
HC (Hard coral)	Estimate percentage (%) substrate covered by hard coral
RDC (Recently dead coral)	Estimate percentage (%) substrate covered by recently dead coral
DCA (Dead coral)	Estimate percentage (%) substrate covered by old dead coral with turf or coralline algae
SC (Soft coral)	Estimate percentage (%) substrate covered by soft coral
MA (Macroalgae)	Estimate percentage (%) substrate covered by macroalgal assemblage
CA (Coralline algae)	Estimate percentage (%) substrate covered by coralline algae on rock / rubble
TA (Turf algae)	Estimate percentage (%) substrate covered by turf algae on rock / rubble
SG (Seagrass)	Estimate percentage (%) substrate covered by seagrass
SP (Sponge)	Estimate percentage (%) substrate covered by sponge
OT (Other)	Estimate percentage (%) substrate covered by other living organisms (record what 'other' equals e.g. zooanthids, corallimorpharians, etc.)
BA (Bare)	Estimate percentage (%) substrate not covered by living biological organisms
Description	Write a brief description of what you observe, mentioning the dominant physical and biological characteristics of the seabed e.g., '*Halophila ovalis* seagrass on flat sand with occasional sparse rubble and no other live cover' or 'Massive hard coral community dominated by *Porites* colonies interspersed by sand'. This description should include the names of the dominant species wherever possible. If there are species that you do not recognize, take photographs of the species.

Country: **Sector:**   **Location:**   **Date:**   **Surveyors:**

Weather: **Wind strength (1-5):**   **Wind direction (NSEW):**

Waypoint: **Photographs:**   **Depth (m) Min:**   **Depth (m) Max:**

Exposure: **Aspect:**   **Slope:**   **Seabed relief (1-5):**

Visibility (m) horizontal: **Visibility (m) depth:**   **Water Temp (°C) surface:**   **Water Temp (°C) deep:**

Current strength (1-5):   **Current direction (NSEW):**

Reef type: **Zone:**

Physical substrate (Total = 100 %)

HS	LB	SB	RB	SN	SI

Biological cover (Total = 100 %)

HC	SC	DCA	RDC	MA	TA	CA	SG	SP	BA	OT

Description:

Waypoint: **Photographs:**   **Depth (m) Min:**   **Depth (m) Max:**

Exposure: **Aspect:**   **Slope:**   **Seabed relief (1-5):**

Visibility (m) horizontal: **Visibility (m) depth:**   **Water Temp (°C) surface:**   **Water Temp (°C) deep:**

Current strength (1-5):   **Current direction (NSEW):**

Reef type: **Zone:**

Physical substrate (Total = 100 %)

HS	LB	SB	RB	SN	SI

Biological cover (Total = 100 %)

HC	SC	DCA	RDC	MA	TA	CA	SG	SP	BA	OT

Description:

Waypoint: **Photographs:**   **Depth (m) Min:**   **Depth (m) Max:**

Exposure: **Aspect:**   **Slope:**   **Seabed relief (1-5):**

Visibility (m) horizontal: **Visibility (m) depth:**   **Water Temp (°C) surface:**   **Water Temp (°C) deep:**

Current strength (1-5):   **Current direction (NSEW):**

Reef type: **Zone:**

Physical substrate (Total = 100 %)

HS	LB	SB	RB	SN	SI

Biological cover (Total = 100 %)

HC	SC	DCA	RDC	MA	TA	CA	SG	SP	BA	OT

Description:

Group exercise 06: Downloading survey data and data management

LEARNING OBJECTIVE: To learn about good practices for managing field survey data and maintaining field survey equipment.

EQUIPMENT:

- Computer
- USB data cable
- Underwater camera and download cable
- Survey forms, slate and pencil

GOOD PRACTICES IN DATA MANAGEMENT & EQUIPMENT MAINTENANCE

While marine field work is a lot of fun it can also be both physically challenging and tough on equipment. Furthermore, the increased availability and resolution of digital underwater cameras has meant that the amount of data collected per survey day has gone from kilobytes to gigabytes in a very short period of time. Establishing a systematic routine to help manage the daily flow of data and maintain the survey equipment helps to ensure that all of the hard work that goes into collecting the data does not go to waste.

FIELD SURVEY CHECK-LISTS

AT THE START OF A NEW SURVEY

- Create a new folder on your computer for your survey data called /XYZ Survey YYDD/ (e.g. PERSGA Survey 1501)
- Under this folder create the following subfolders:
  - /GPS
  - /Photos
  - /Video (if relevant)
  - /Field Data
  - /GIS Data
- This file structure will be used to organize all of the data you collect during the surveys
- Check all the equipment that you will be using (e.g. camera and GPS) to make sure they are still working properly before you go into the field
- Check that you have sufficient batteries and all the relevant chargers
- Check that you have sufficient memory cards / storage devices and a means to create a backup
- Check your personal equipment is still functioning properly and serviced
- Print out copies of the survey forms and any maps that you might need
- Download all the existing waypoints from your GPS as a back-up and then delete
- Use Google Earth or BaseCamp to create a new waypoint file and upload the waypoints to your GPS

AT THE START OF EVERY SURVEY DAY:

Prepare camera:

- Check that you have a new battery in the camera
- If you need a new battery, first remove the LED screen if using a GoPro and replace the battery then replace the LED screen
- Switch the camera on
- Check the battery is good
- Check the camera is set up correctly (7MP MEDIUM)
- Switch the camera off
- Check that you have replaced the plastic cover over the USB connectors
- Remove the camera lens cap, <u>be careful not to touch the lens</u>
- Check that the lens is clean and smear free
- Open the camera housing and check, particularly the o-ring to make sure it is free from dust particles / hairs (look very closely)
- Clean the o-ring gently with a lint-free cloth if dust particles are seen
- Holding the camera on the sides, carefully slide the camera in the housing
- Place a dehumidifying strip in the housing underneath the camera
- Make sure that the clip is properly aligned and carefully close the housing
- Carefully check the o-ring seals around the housing and
- Make sure you put the housing lens cover over the housing lens and on button
- Pack the camera in the case
- Check you have <u>spare charged batteries</u>
- Check you have a soft dry cloth(s) for use if handling camera in the field

Personal equipment

- GPS and spare batteries
- Personal snorkeling equipment (if swimming/snorkeling)
- Survey slate, elastic bands and clips, pencils (including spares)
- 1 x Plastic wallet with new (dry) survey forms
- 1 x Empty plastic wallet for completed (wet) survey forms
- 1 x float and weight for GPS (if being used)
- 2 x underwater notebooks
- Depth sounder or 1 x knotted rope / measuring tape for depth
- 1 x quadrat for photos (if being used)
- 1 x personal dive computer (if needed)
- Thermometer, salinometer (and other measuring equipment as needed)

AT THE END OF EVERY SURVEY DAY

Personal equipment

- Rinse all personal kit in freshwater and leave to dry overnight

Camera

- Check that camera housing is still firmly closed
- Place the camera (still inside the housing) in a bowl of freshwater and leave for about 1 hour to soak
- Remove the camera from the freshwater and leave to dry on a clean flat surface
- When the camera is dry, with dry clean hands carefully remove the camera from the housing

- Close the housing
- Put the lens cap on the camera
- Remove the small plastic cover protecting the USB connector, put to one side
- Switch on your computer
- Create a new photo folder called YYDDMM (e.g. /XYZ Survey YYDD/Photos/140105)
- Connect the camera to your computer
- Using Windows Explorer navigate to the camera storage
- Copy all the photos / videos to the new folder(s)
- Once the download is complete, switch the camera off, remove the batteries and put on charge.
- Charge all the spare batteries

Survey forms

- If the survey forms have become wet, rinse in freshwater and leave to dry flat
- Once dry check that all the survey forms are completed correctly and are readable
- Check that the sheets are numbered in sequence
- If you have time it is always better to enter the survey data into the spreadsheet on the same day while the information is still fresh in your mind
- If you do not have time be sure to get into the habit of photographing each survey form as a back-up and store the photographs in the /Data folder labeled by date (YYMMDD) and survey form number
- File the dry forms in a folder or plastic envelope

GPS

Saving track files

- Switch on your Garmin GPS
- From the main menu select 'Track Manager'
- Use the arrows to select 'Current Track' press on the 'Enter' button
- You can change the file name or accept the default or use the arrows to scroll down to 'Done' and press 'Enter' to save track.

Downloading waypoints and tracks from Garmin GPS

- With the GPS still switched on connect it to your computer using the USB cable
- Switch on your computer
- Using Windows Explorer, create a new folder called /XYZ Survey YYDD/GPS/
- Using Windows Explorer, navigate to the folder /Garmin/GPX on the Garmin GPS (which appears like an external hard drive on your computer when connected)
- Inside the folder you will see a file called Waypoints_DATE
- Select the file and copy to the new folder /XYZ Survey YYDD/GPS/
- Rename the waypoints file with today's date as 'YYMMDD_waypoints' (e.g. 140302_waypoints)
- Navigate back to /Garmin/GPX and click on the folder /Archive, where will find the track *.gpx file you just saved
- Select the track file and copy to the new folder /XYZ Survey YYDD/GPX
- Rename the track file with today's date as 'YYMMDD_tracks' (e.g. 140302_tracks)
- Back up your results
- If you want to view your survey points to check the locations visited then use GoogleEarth or BaseCamp, or QGIS

Preparation for next day

- Charge the batteries for the cameras
- Charge the batteries for the GPS (if using rechargeable) or make sure you have a spare set of batteries

REMEMBER:

When you have finished the survey work, check, clean (and if necessary replace) all parts of the camera and GPS. Remove the batteries from the camera and GPS and pack away.

Group exercise 07: Creating a habitat map

LEARNING OBJECTIVE: To use the survey data that you have collected during Exercise 02 and Exercise 05 to:

- Develop a draft habitat classification scheme
- Identify the habitats on the map

EQUIPMENT:

- Computer
- Maps showing the distribution of GPS positions
- Completed survey forms
- Survey photographs
- Hard copy maps and pens

Creating a draft habitat map

In this exercise you will start thinking about how the field data you have collected can be represented on a map.

The coastal zone of the Red Sea and Gulf of Aden region is bordered by eight major ecosystems. Which of the following ecosystems did you observe in the vicinity of your location?

Ecosystem,	Present	Not found
Sabkha		
Salt Marshes		
Sandy and Muddy Shores		
Rocky Shores		
Mangroves		
Seagrass		

Coral Reefs and Coral Communities		
Soft-Subtidal Bottoms		

Now try to map out where you observed the different habitats on the hard copy maps.

Using the observations you made during the surveys can you add more specific details about the major types of coastal ecosystems found in the vicinity of your location?

Ecosystem	Other Physical Modifiers (e.g. exposure)	Other Biological Modifiers (e.g. species)
Sabkha		
Salt Marshes		
Sandy and Muddy Shores		
Rocky Shores		
Mangroves		
Seagrass		
Coral Reefs and Coral Communities		
Soft-Subtidal Bottoms		

Now try to map out where you made these more specific observations on the hard maps.

Using the observations made during the surveys can you add any more specific details about other biological assetsfound in the vicinity of your location?

Other biological assets	Description

Now try to indicate where you made these observations on the hard copy maps.

Group exercise 08: Socioeconomic survey methods

LEARNING OBJECTIVE: To learn about techniques for collecting data about the socio-economic environment.

EQUIPMENT, PERSONNEL & EXPERIENCE:

The field equipment required for a socio-economic monitoring program depends on the survey methods being used. If the method involves focus group meetings then it is often useful to have surveys forms, a notebook, as well as flip-charts and marker pens. If the method is household surveys, then the surveyors may only need to have the survey forms and pens. A map and handheld GPS and camera are also useful. It is however, always polite to ask before taking photographs of people, whether as individuals or in groups:

- Computer
- Flip charts
- Survey forms, slate and pencil
- Maps

The number of people needed to undertake a socio-economic monitoring program depends upon the size of the human population in the study area and the sampling plan and the methods being used to collect the data. When the monitoring program is associated with an MPA the team would normally include a representative from the MPA management authority.

The initial design of socio-economic monitoring programs will need expert input, especially during the baseline study to help identify and select the key variables most appropriate for inclusion in the long term monitoring program and to assist in the interpretation and analysis of preliminary results. Once the program has been designed, the surveys can be completed by people trained in the survey method. Key informant interviews and household surveys can often be completed by students or rangers, as long as they have been trained, can read and write and communicate in the local language. Holding focus group meetings may need more training in how to facilitate group interactions. Household surveys use structured questions that typically have multiple choice or yes/no answers, and the data can often be efficiently collected by school leavers or students, coordinated by one lead surveyor who helps to organize the data collection process and data entry.

There are four standard methods for collecting socio-economic monitoring data: Key Informant Interviews, Focus Group Interviews, Household or User Group Surveys and Stakeholder registration. These types of surveys may also be completed as part of a planning process for a new MPA. Examples of these surveys forms are provided.

STAKEHOLDER REGISTRATION QUESTIONNAIRE

To be completed by the interviewer for individual stakeholders. If the interviewee is being interviewed in a group, the response must be that of the specified stake holding interviewee without being influenced by others.

1.0 INTERVIEWER DETAILS

1.1	Name, age, sex and contact details of the interviewer	
1.2	Date form completed	

2.0 INTERVIEWEE DETAILS

2.1	Address and Location	Address	Coordinates: N E
2.2	Name	Name:	Provide photo (optional)
2.3	Date and place of birth	Year	Place
2.4	Sex/ Marital Status	Male ☐ Female ☐ Single ☐ Married ☐ Divorced ☐	
2.5	Number and nature of dependents		
2.9	Period and type of residence at the place	Period: <5years ☐ 5-10 years ☐ >10years ☐	Type: Seasonal ☐ Permanent ☐
2.10	ID number and validity	(Optional)	
2.11	Original geographical location	Dungonab ☐ Mohamed Gol☐ other ☐*specify*-----------	
2.13	Electric supply at residence	Permanent ☐ Part of the Day ☐ None ☐	
2.14	Source of cooling drinking water at residence	Refrigerator ☐ *Zir*☐ *Girba*☐ others ☐ specify----------	
2.15	Means and frequency of water supply at residence/quantity consumed	Means: Pipe ☐ Tanker ☐ Frequency: Daily ☐ 2-3 days/week ☐ Less ☐	Quantity of *jerry-cans* /day -----------------------
2.16	Distance to primary health care facility (km)?	Less than km ☐ 1-5 km ☐ More ☐*specify* -------------	
2.17	Distance to midwife(km)?	Less than km ☐ 1-5 km ☐ More ☐*specify* -------------	
2.18	Distance to primary education (km)?	Less than km ☐ 1-5 km ☐ More ☐*specify* -------------	
2.19	Principal type of cooking fuel (oil, gas, wood, charcoal, other)	Gas ☐ Charcoal ☐Wood ☐*specify* source------------- Other ☐ specify ---------------	
2.20	Distance to secure source of principal cooking fuel(km)?	Less than km ☐ 1-5 km ☐ More ☐*specify* -------------	
2.21	Distance to phone(km)?	Less than km ☐ 1-5 km ☐ More ☐*specify* -------------	
2 22	How often do you eat fish?	Daily ☐ 2-3 times/ week ☐ once/week ☐ less ☐	

Socioeconomic– Household Surveys

Country			**District**		
Village			**Date**		
Surveyors name			**Surveyors contact**		

Name of household head		**Sex**	Male	Female
Education?		**Age**		

Home village?		**If not where?**

Type of house?	Mud	Mud-brick	Stone-brick	Rocks	Wood	Cement
Ownership of house?	Owned	Rented	Inherited	**Garden?**	Yes	No

Number of rooms?		**Number of Bedrooms?**	
Kitchen?	Inside	Outside	**Toilet?** Inside / Outside

Water supply in house?	Yes	No	**Number of taps in house?**	
Source of water?	House well	Village well	Tanker	
	Private network	Government network	Other	

If from a well, is it normally covered?	Yes	No			
If from a well, who brings the water?	Father	Mother	Boys	Girls	Other
How do they bring water to the house?	Vehicle	Camel/Donkey	On foot	Other	
Who paid for the construction of well?	Personal	Government	Charity	Other	
Quality of water (all sources)?	Good	Poor	**If poor quality, why?**		
How do you dispose of waste water?	Sewage system	Pit latrine	Open space	Other	
How do you dispose of solid waste?	Collected	Dumped	**If collected, how often?**		
Who disposes of solid waste?	Government	Father	Mother	Boys	Girls

Electricity in house?	Yes	No	**If yes, number of hours?**	per day
If no, source of lighting?	Candles	Gas	Other	
Source of electricity?(tick)	Government	Local participation	Private generator	
	Other?			
Electrical appliances?(tick)	Refrigerator	Freezer	Cooker	Washing machine
	TV	Satellite	Fan	Air conditioning
	Others?			

Roads and transport?	Close	Far	**Distance?**	km
Transport available?	Private	Public	**Transport types?**	
Landline phone in house?	Yes	No	**Distance to nearest landline?**	
Mobile phone coverage?	Yes	No	**Number of mobile phones?**	
Do you own land?	Yes	No	**If yes, what area?**	
Other partners in land?	Yes	No	**What percentage do you own?**	
Is the land farmed?	Yes	No	**If yes, what type of agriculture?**	
Do you farm the land?	Yes	No	**If no, how many people do you employ?**	
If the land is not farmed what is the land used for?				
Do you own livestock?	Yes	No		

If yes, what type of livestock and how many of each?(number)	Camels =	Donkeys =	Goats =	Cows =
	Sheep =	Poultry =	Other =	

Are there disputes about land in the village?					
Are there disputes about water in the village?					
Who resolves disputes?(tick)	Court	Faqeeh	Public notary	Sheik	Other (specify)
Who are the main leaders / personalities in the village?(tick)	Iman	Mamoor	Sheik	Teacher	
	Qadhi	Local Council Member	Council of Deputies	Others	

Are there cooperatives / civil society organizations in the village /district?	
What is their role?	
Are they successful?	
Are you a member of a cooperative?	
What is your role in the cooperative?	

Socioeconomic– Household Surveys

Household composition: List all the people in household by name and/or role (i.e. husband, wife, brothers, brothers in-law, sisters, sisters in-law, sons, daughters, daughters in-law, sons in-laws, nephews (M), niece (F), grand children (M), grand children (F), others

Name / role	Age	Male Female	Education (number of years)	Ethnicity	Religion	Languages	Permanent or Seasonal resident?	How many years? (permanent or seasonal)	Seasonal resident – what months?	Seasonal resident – where from?	Primary occupation	Secondary occupation

Socioeconomic– Household Surveys

INCOME(in local currency, specify)	
Estimated household income per month?	
Primary source of household income?	
Secondary source of household income?	
Tertiary source of household income?	

Monthly expenses: Please enter the amount spent per month in local currency. **Local currency** =				
Water=	Food=	Electricity=	Clothes=	Medications=
Transport=	Telephone=	Qat=	Education=	Other=
Occasional expenses: Please estimate the amount spent per year in local currency				
Feasts=	Birth celebrations=	Other celebrations=	Funerals=	Others=

HEALTH									
What health issues do you and your family members suffer from?									
Malaria		Bilharzia		Tuberculosis		Typhoid		Dysentery	
Diarrhoea		Diabetes		Heart problems		Skin issues		Chest / coughs	
Others									
What type of medical treatmentdoes your family most commonly seek/use when they are sick?									
Doctor		Pharmacy		Herbalist		Hospital		Other	
Distance to nearest midwife?									
Distance to nearest clinic?									
Distance to nearest hospital?									
Distance to other type of treatment?									

Do you or your family use coastal and marine habitats for livelihood? (please circle / tick those used)			Open ocean	Coral reef	Seagrass
Beach (muddy)	Beach (sandy)	Beach (rocky)	Saltmarsh	Mangrove	Algae
If yes, how?	**Use**		**Goods or service**		**Rank important** (where 1 = lowest importance)
Beach (muddy)					
Beach (sandy)					
Beach (rocky)					
Saltmarsh					
Mangrove					
Coral reef					
Seagrass					
Algae					
Open ocean / pelagic waters					

Socioeconomic– Household Surveys

Do you or your family fish / hunt for any of the following groups?(please circle, tick all target groups)						Bony fish (demersal)	Bony fish (pelagic)	Shark / rays	Marine mammals
Seabird / eggs	Sea turtles	Crabs	Lobsters	Sea cucumbers	Squid	Bivalve molluscs	Gastropod molluscs	Sea turtles	Other (specify)

If yes, how do you fish for each group? Please state type of fishing gear used; boat with an engine or without; and please state the importance by ranking which groups are the most important target followed by others.

If yes how?	Fishing gear type	Boat (y/n)	With engine (y/n)	Importance (rank 1= lowest importance)
Bony fish (pelagic)				
Bony fish (demersal)				
Sharks and rays				
Marine mammals				
Seabirds / eggs				
Sea turtles				
Crabs				
Lobster				
Sea cucumber				
Squid				
Bivalve molluscs				
Gastropod molluscs				
Other (specify)				

What happens to the fish you catch? Please state the importance by ranking which groups are the most important by others.

Type of resource	Sold to buyer	Sold in village	Own consumption	Value (high, medium, low)
Bony fish (pelagic)				
Bony fish (demersal)				
Sharks and rays				
Marine mammals				
Seabirds / eggs				
Sea turtles				
Crabs				
Lobster				
Sea cucumber				
Squid				
Bivalve molluscs				
Gastropod molluscs				
Other (specify)				

Condition / Status of Habitats? Please tick the relevant box in relation to the condition of each habitat					
Type	Very good	Good	Neither good nor bad	Poor	Very poor
Beach (muddy)					
Beach (sandy)					
Beach (rocky)					
Saltmarsh					
Mangrove					
Coral reef					
Seagrass					
Algae					
Open ocean / pelagic waters					

Threats to Habitats? Please state the top 5 threats to the habitats					
Habitat type	Threat 1	Threat 2	Threat 3	Threat 4	Threat 5
Beach (muddy)					
Beach (sandy)					
Beach (rocky)					
Saltmarsh					
Mangrove					
Coral reef					
Seagrass					
Algae					
Open ocean / pelagic waters					

Threats to Resources? Please state the top 5 threats to resources?					
Habitat type	Threat 1	Threat 2	Threat 3	Threat 4	Threat 5
Bony fish (pelagic)					
Bony fish (demersal)					
Sharks and rays					
Marine mammals					
Seabirds / eggs					
Sea turtles					
Crabs					
Lobster					
Sea cucumber					
Squid					
Bivalve molluscs					
Gastropod molluscs					
Other (specify)					

Condition / Status of Resources? Please state the condition of the resources					
Type	Very good	Good	Neither good nor bad	Poor	Very poor
Bony fish (pelagic)					
Bony fish (demersal)					
Sharks and rays					
Marine mammals					
Seabirds / eggs					
Sea turtles					
Crabs					
Lobster					
Sea cucumber					
Squid					
Bivalve molluscs					
Gastropod molluscs					
Other (specify)					

In addition to the threats listed above, what are the other main concerns or issues affecting coastal and marine resources?
What are the solutions to this threat?

Do you and your family eat fish? Please state what type of fish and how often (per week) & time of year		
Type	Frequency per week	Months of year
Do you and your family eat sharks? Please state what type and how often (per week) & time of year		
Type	Frequency per week	Months of year
Do you and your family eat seabirds or seabird eggs? Please state what type and how often (per week) and time of year		
Type	Frequency per week	Months of year

Do you and your family eat dugong or marine mammals? Please state what type and how often (per week) & time of year		
Type	**Frequency per week**	**Months of year**
Do you and your family eat sea turtles? Please state what type and how often (per week) & time of year		
Type	**Frequency per week**	**Months of year**

What are the top three concerns to your community?
1.
2.
3.