



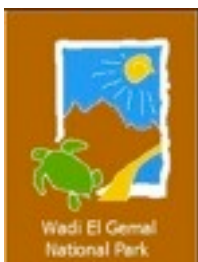
Climate Change and Coral Reef - Environmental Education Component



REPORT 2011

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Introduction

Project Background

The International Union for the Conservation of Nature, IUCN, has contracted Sara El Sayed and Usama El Ghazali to undertake the final component of the Climate Change and Coral Reef Resilience project that deals with the environmental Education section. The objective is to undertake an Environmental Education and Public Awareness Program addressing the impacts of anthropogenic activities (diving impacts, overfishing, pollution, and climate change) on global coral reefs and specifically in Marsa Alam area in Egypt. Furthermore, the sub-objective is to develop and integrate an environmental education program into the curriculum of Marsa Alam schools. The purpose is to ensure that the upcoming generation of youth in the area are empowered about issues in Climate change and coral reefs to be able to make the appropriate decisions and changes to create a better livelihood for themselves and ensure in the conservation of these pristine sites.

- The project is divided into several sub-components:
- Map out existing educational material and identify what is useful and what needs enhancement
- Develop outdoor educational activities that are part of a monitoring program for the Red Sea, that will enhance the educational material developed,
- Create a simple teacher manual that will guide in working on the outdoor activities and will guide in using the educational material.
- Create a monitoring plan for some champion students and create a mini-documentary documenting their experience. (20 students)
- Train students and teachers to deliver activities relating to the monitoring program (20 students – 15 teachers)
- Deliver a Red Sea monitoring day where trained students and teachers lead other youth on a large scale monitoring process. (200 students)



Summary of Outcomes

This subcomponent of the project had some intended outcomes and expectations and in the duration of the past 3-4 months, some of the outcomes were completely fulfilled and surpassed expectations and others will need some further work. In the following document a description of all the activities that have taken place will be explained within the different components of the project.

Educational Material

Mapping out Educational Material

As part of having educational material for this project a survey was conducted to survey what available knowledge there is that could be used for future projects and programs.

There is lack of information that is accessible in arabic for children and youth about both climate change and its impacts on the coastal ecosystem and therefore even less on coral reefs. Some of the books/journals/videos identified in Appendix 1 include material that can be used by Rangers or teachers when developing activities or gathering data, but very little exists for the youth directly.

Recommendation:

More educational material that is relevant for local children and youth needs to be made available, from books, to magazines, websites, but also animation or cartoons, as this medium seems to be incredibly attractive to the youth.

Developing a Training Manual

The Manual consists of two main parts: a theoretical part on climate knowledge, teaching styles and how to conduct activities and a practical part with various activities, including the teachers information and the students worksheets.

The manual was developed over a period of 3 months, with different versions being revisited, based on the trainings given, recommendations from rangers, teachers, but also general observations of how the trainees received the material.

Appendix B is the latest version of the training manual.

Creating an Educational Video

The

Website

The website will become a portal for informing about the project, the partners and the nature activities in the area of the red sea, but will primarily be a place for youth to learn about the Junior Ranger program and know how they can become Junior Rangers. Students will be allowed to download activities, look at organisms and understand characteristics about them and learn about them like in the website ispot. The website will mainly be in bi-lingual with a focus on arabic, since there is a lack of educational material in arabic for this age bracket.

Field guide

As part of the educational material to be provided, a field guide was developed, as an easy tool that can be used by both youth and adults to identify key organisms found in Wadi El Gemal National Park. 1000 copies were printed with the intention of selling a large portion to fundraise for the continuation of the Junior Ranger Program. Annex 5 Field guide

Junior Ranger Program

Monitoring Program for Youth

Students attended a workshop that not only gave them knowledge about coastal ecosystem and problems relating to it, but also gave them some techniques on monitoring.

Students were able to conduct both transects and quadrants to learn how to assess a certain population using ecological techniques and small sample sizes.



Quadrats



Transects

The quadrat - a one meter by one meter quadrat was used to assess the mangroves and the organisms living in it

The transect - a ten meter by one meter belt transect was used to focus the students attention to certain areas under water on the coral reefs and assess both the types of organisms, therefore an introduction to biodiversity, but also percentage death.

Training Rangers and Teachers

Ranger Training

Rangers participated in a 6 day workshop, that consisted of 2 day theory and activities and 4 days shadowing and co-teaching with youth from Abu Khusn and Hamata. The program consisted of following activities:

2 day preparatory workshop -with rangers and facilitators average 14 participants.

- Teaching strategies
- Environmental Education
- Red Sea problems
- Coral bleaching
- Fishing and pollution
- Climate change
- How to develop and deliver workshops
- Monitoring program

4 day workshop - with youth from Abu Khusun and Hamata 24 participants from ages 9-12

- Games and activities on food webs, climate change, carrying capacity, using resources efficiently, pollution, fishing, coral bleaching.
- Monitoring program using belt transects on coral reefs and quadrats on mangroves
- Interviewing 5 different stakeholders to understand their impact on coast and sea.

A few rangers were selected to continue the process and begin training others, namely teachers. The rangers selected were Ahmed Abd El Razek, Ahmed Youssef, Aly Amin, Mohamed Mostafa (from Cairo office) Ayman Gharabawy, Tamer Mohamed.

Teacher Training

A two day training was planned, as half day activities, to allow for teachers that have school to be able to attend after school hours, but it ended up being a one day training, but as an extended day to cover two days of a program. four rangers worked on the training and 9 participants attended. The program is the following:

- Icebreakers and Getting to know program
- Assigning roles to teachers who will participate in the future
- Introduction to Multiple intelligence and learning styles
- Activities included:
 - Fishing behaviour
 - Food web on marine ecosystem



Libraries

Two libraries have been set up. They got painted, and set up with shelves, books, and computers. The contribution for the two libraries have been set up mainly as donations and contributions from the different stakeholders that contributed.

The libraries are set up in Abu Khusun and Hamata, with two Rangers Amra and Nasra supervising them. The libraries will play as hubs to work with the children and youth of the area for future Junior Ranger programs.



Students will be able to do research, work on monitoring plans and do small activities within the libraries.

Diving Certification

As part of the monitoring activities executed by the students, they assessed the health of the reef and identified some of the organisms that were in the reef, many of the students were not good swimmers and were wearing life jackets. Despite this most of the students were totally involved trying very hard to identify the types of organisms that had been discussed previous to entering the water. After exiting the water students were to draw transects of what was observed under water. From these 24 students a select 3-4 students were identified as particularly good swimmers, and also eager learners. For this reason a Junior padi course is intended to teach them diving, with the hope that they can further help in more serious monitoring activities.

Me and My Environment Event

Art Contest

In the hope of raising awareness on marine and coastal issues an art contest was launched. The intention was also to get students involved and excited to be part of an environmental event, the students that participated in the art contest along with the students that were initially part of the Junior Ranger program were to attend an event held at Qulan on the 15th of October 2011. Students and their teachers attended from Marsa Allam all the way to Shalateen. Inviting 4 elementary and preparatory schools to the event.

The theme of the art contest was the following:

Draw about the possible uses of one of the following themes:

- Mangroves
- Coral reefs
- Tourism
- National parks

Winning students got different prizes from an educational yoyo with CD and instructions, to sets of colors. The winning team was meant to go on an educational trip to Aswan.

Activities and Event

The event was organized on the 15th of October 2011 at Qulan. The attendees were 110 youth from Marsa Allam to Shalateen and there were 20 teachers and 30 students from Cairo and 20 Rangers and Organizers. For a total number of attendees of 180 people.

The event took place from 9:30 am till 3:30 pm

The program of the day consisted of

Time	Activity					
8:30	Depart from Meeting points					
9:00	Video "Finding Nemo"					
9:00	Distribution of t.shirts + Registering names + assigning groups					
10:00-10:15	2 groups – 2 large fun games					
10:15 – 1:25	Start activities – Rotation					
Rotation between 5 activities	<table border="0"> <tr> <td>Group 1 – Group 6 Beach Clean up</td> <td>Group 2 - Group 7 Art collage</td> <td>Group 3 - Group 8 Food web and dice</td> <td>Group 4 - Group 9 Fishing game</td> <td>Group 5 -Group 10 Plant quadrat</td> </tr> </table>	Group 1 – Group 6 Beach Clean up	Group 2 - Group 7 Art collage	Group 3 - Group 8 Food web and dice	Group 4 - Group 9 Fishing game	Group 5 -Group 10 Plant quadrat
Group 1 – Group 6 Beach Clean up	Group 2 - Group 7 Art collage	Group 3 - Group 8 Food web and dice	Group 4 - Group 9 Fishing game	Group 5 -Group 10 Plant quadrat		
1:30 – 2:15	Junior Ranger Video - Prize giving ceremony					

2:15 – 2:30	Observing drawings and group picture
2:30 – 3:00	Departure

The activities were conducted by three teams of Cairo School students. The students were from American International School Cairo (AIS) and had been trained in a couple of workshops by Sara El Sayed to conduct the activities and had one session with the Rangers.

The teams of students consisted of:

Activities team: Responsible to deliver the 5 activities, each 3-4 students worked on an individual activity throughout the day and the students rotated amongst them. Each set of students worked with a ranger and was under their supervision and guidance, the rangers involved were Ahmed Youssef, Abdelrehem, Nasra and Tamer Mohamed. Primarily these students were to be coupled with a Junior Ranger, but due to lack of time, this was not achieved.

Logistics team: Responsible to rotate the students, to distribute t.shirts and food and make games in the middle of the day. They were under the supervision of two Rangers, Ayman Gharabawy and Usama Ghazali

Documentation team: Responsible under the supervision of Shantal from Red Sea diving to document the day through interviews, videos, photography. After the event some of the students sent their articles to news papers.

Outcome:

- The event was a great success on an educational level, as it didnt end up purely being one instructor one learner process, but since the AIS students are not completely familiar with the area, the local children were also feeding information back. The rangers were present to support the exchange and ensure that the information was accurate.
- The activities all achieved their intended goals. (All the instructions for the activities are in Annex 3 - the Educational Manual) The students were able to understand the impacts of bad fishing practices, by doing a game that made them simulate the different fishing practices. Students learnt about food webs and food chains, using examples of marine ecosystem to build their web and understand the impact of one organism dying for whatever reasons, pollution, climate change etc... Students were engaged in assessing an ecosystem on a small scale around mangroves, by testing the pH, the temperature, the salinity and drawings out the organisms found around the areal roots. Students were also engaged in a clean up, that was in-

tended to also sort the garbage and collect useful garbage to be used in an art collage. The art work was given to each school and taken as a memory of the day.

- Different stakeholders attended the event and felt the success of creating a network to teach about the coastal ecosystem.

Stakeholders and Impact

Below is a list of all the stakeholders that were involved in one way or another in the success of the day. The true beauty of the event was the ability to bring together different stakeholders to raise awareness.

Marsa Allam National Park

Representative from the national park attended and gave support to have local coverage of the event.

Sukari Gold Mine

Mr. Rakhy was very supportive of the event and donated to the libraries desks and chairs.

Red Sea Diving Safari

- Have been supportive since the beginning with the Monitoring program that took place with the Junior Rangers.
- The allowed students to use equipment, snorkle, and conduct their research in Shagra, along with providing a meal.
- During the event they supported by covering the event through film and pictures, by providing one of their shuttle buses and providing datashow and screen to show films.

AIS school

The students volunteered their time to teach, coordinate and cover the day.

Local Fishermen/Qulan

Were present during the day, and were helping during the clean up.

School Teachers

awareness

Annex 1 - Mapping of Books

Name of Item	Ar/ en	Book	Flyer	CD	Video	Content	Relevance
South of The Red Sea	Ar			X		Images of the Locations in the Red Sea	
Data base on environmental management in the Red Sea	Ar			X		Trainers guide and content	
Beauties of the Nature in the Eastern Desert and the Red Sea	Ar			X		Information about fauna, flora, culture of the region.	
Water and Air	Ar	X				Small experiments on water and air	Can be used by junior Rangers
Alternative Energy	Ar	X				Information about renewable energy	Can be used by junior Rangers
Water Pollution	Ar	X				Information about water pollution	Can be used by junior Rangers
Air Pollution	Ar	X				information about Air pollution	Can be used by junior Rangers
Recycling Materials	Ar	X				Information on how to recycle material and how to keep personal hygiene	Can be used by junior Rangers
Temperature and Climate	Ar	X				Information about Climate and Temperature	Can be used by junior Rangers
Procedures in Managing Coastline	Ar	X				Procedures and strategies used to protect coastlines	Rangers
Climate Change book	Ar	X				Activities for climate change and background information	Junior and Rangers
Information cards on location	En		X			Information on 24 location in the Red Sea	Inspiration for junior rangers to make their field guides
Environmental Stories	Ar	X				Fun stories about the environment	Stories for children
The Red Sea	Ar	X				Information and activities about the beauty of the red sea and diversity of the culture	For Junior and Senior Rangers

Name of Item	Ar/en	Book	Flyer	CD	Video	Content	Relevance
Bakars Adventure in the Red Sea	Ar	X				Story of Bakar at the Red Sea	Can be used on world monitoring day
Our land our Future	Ar	X				Story of tamara and her adventure in dealing with environmental problems	Inspiration for junior Rangers
Egypt's biodiversity	Ar	X				Informative book on Egypt's biodiversity	
Red Sea Reef - Deblus	En	X				Guide to the fish and corals of the red sea	to be used in snorkling activities
Coral Resilience	Ar			X	X	Documentary explaining coral resilience towards climate change	To Teachers and Rangers, to get information and knowledge
http://www.youtube.com/user/GBRclimatechange	En				X	Great Barrier Reef animation about climate change and coral reefs	For children needs to be translated

Annex 2 - Pictures





Children in “Me and My Environment” starting to watch video

Children playing the fishing game simulation



Annex 3 - Organizers and Participants

TYPE	NAME	DAYS PARTICIPATED
Organizer	Usama Ghazali	All
Organizer	Sara El Sayed	All
Organizer	Ahmed El Geneidy	2
Organizer	Ameer Abdouallah	All
Sponsor	Hossam Helmy	2
Participants	Abd El Reheem Ateia	7
Participants	Mohamed Eid	7
participants	Aly Amin Ismail	7
Participants	Ahmed Abd El Razek	7
participants	Mousa Abd El Rehim	4
Participants	Mohamed Saber Ahmed	7
Participants	Mohamed Abdo	7
Participants	Ayman Gharabawy	7
Participants	Mohamed Aly Mohamed	7
Participants	Ahmed Mohamed Youssef	7
Participants	Said Khoudary	7
Participants	Mohamed Mostafa	6
Participants	Samah Mahmoud	3
Participants	Heballah Adel	3
Participants	Amra Mohamed Salah	6
Participants	Nasra Aly Said	6
Participants	Mahmoud Fawzy	4
Participants	Abd El Razek Thakeb	7
Participants	Mahmoud Amr Aly	5
Organizer	Sarah Jane	2



دليل الميسرين



NEPCA **KUONI**
CARING FOR THE RED SEA

Workshop Objectives:

GENERAL

1. Undertake an Environmental Education and Public Awareness Program addressing the impacts of anthropogenic activities (diving impacts, overfishing, pollution, and climate change) on global coral reefs and specifically in Marsa Alam, Egypt.
2. Develop and integrate an environmental education program into the curriculum of Marsa Alam schools

SPECIFIC

1. Understand the Objectives of the 3 month program.
2. Train Rangers and facilitators on working with youth using different tools of active learning, multiple intelligence and hands-on work
3. Exploring creative ways to link environment with fun.
4. Get rangers to experiment and create their own activities relevant to the topic of climate change and impacts on coral reefs and coastlines.
5. Train rangers to create a monitoring program with Junior Rangers
6. Shadow Trainers to do activities with Junior Rangers
7. Shadow Trainers to create monitoring activities on the beach, in the water and with stakeholders
8. Facilitate learning with Junior rangers to create
 - a. Monitoring Website
 - b. Field guides and educational material
 - c. Monitoring program
 - d. Organizing an Event for 200 students for a Red Sea Monitoring Day.

Detailed Program

Same as above

Coral Reefs and Climate Change: Environmental Education Component
Facilitators Handbook

Day 1 – Red Sea Introductory Activities:

Objective:

Understanding some of the main issues concerning the Red Sea in terms of climate change and coral bleaching in an interactive activity based session that tries to bring in the Rangers experience along with lessons learnt from Multiple Intelligence.

Time: 2 hours

Procedure:

1. Rangers will be divided into 2 groups
2. Each group will start in one station with one activity and then will have 15 min chance to present and 15 min for discussion and constructive criticism.
3. Then each group will rotate to the second activity and then will present and discussion will take place.
4. The idea is each group will have some rough instructions, but it is up to them how they will run the activity.
5. Allow rangers to experiment for 30 minutes to try out how they would present the activity that is given to them. They will then get a chance to actually present it to the group.

Instructions per activity:

1. Food chains/Food Web
 - Participants have cards showing simple marine food chains such as plankton – crustaceans - fish. They each begin by making the appropriate links to make food chains.
 - Participants can then start making webs standing in a circle. Have 2 people as plankton or marine producers and another 2 as dead organic matter. Then form links with other people who would be either herbivores or decomposers. The next link would be carnivores and then top carnivores. As you form a link, pass a ball of string around the room.
 - At the end try experimenting with what would happen if all the producers died (They drop the rope and sit down). As soon as your food source disappears, you also drop the rope and sit down to see the knock on effect.
 - This could also be done with other aspects and influences of the tree such as oxygen, carbon dioxide, nutrients, soil. Rather than dropping the rope, they could start pulling on it to show how positive feedbacks can lead the system to breaking point (For example climate change). So what happens when sea water becomes more hot.

Images: Chain 1:



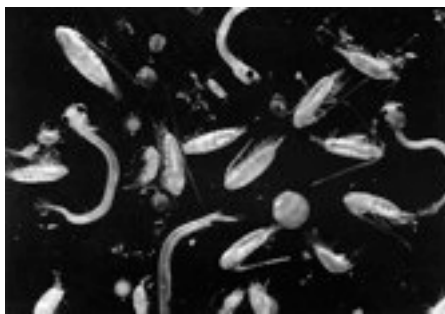
Jelly fish



Green Turtle



Plankton

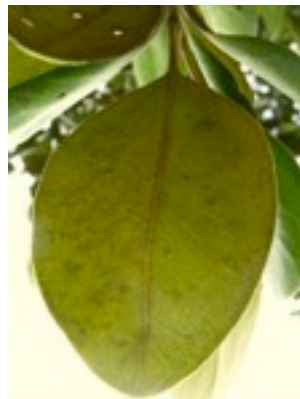


Shark



Small fish

Chain 2:



Mangrove leaf breaking down

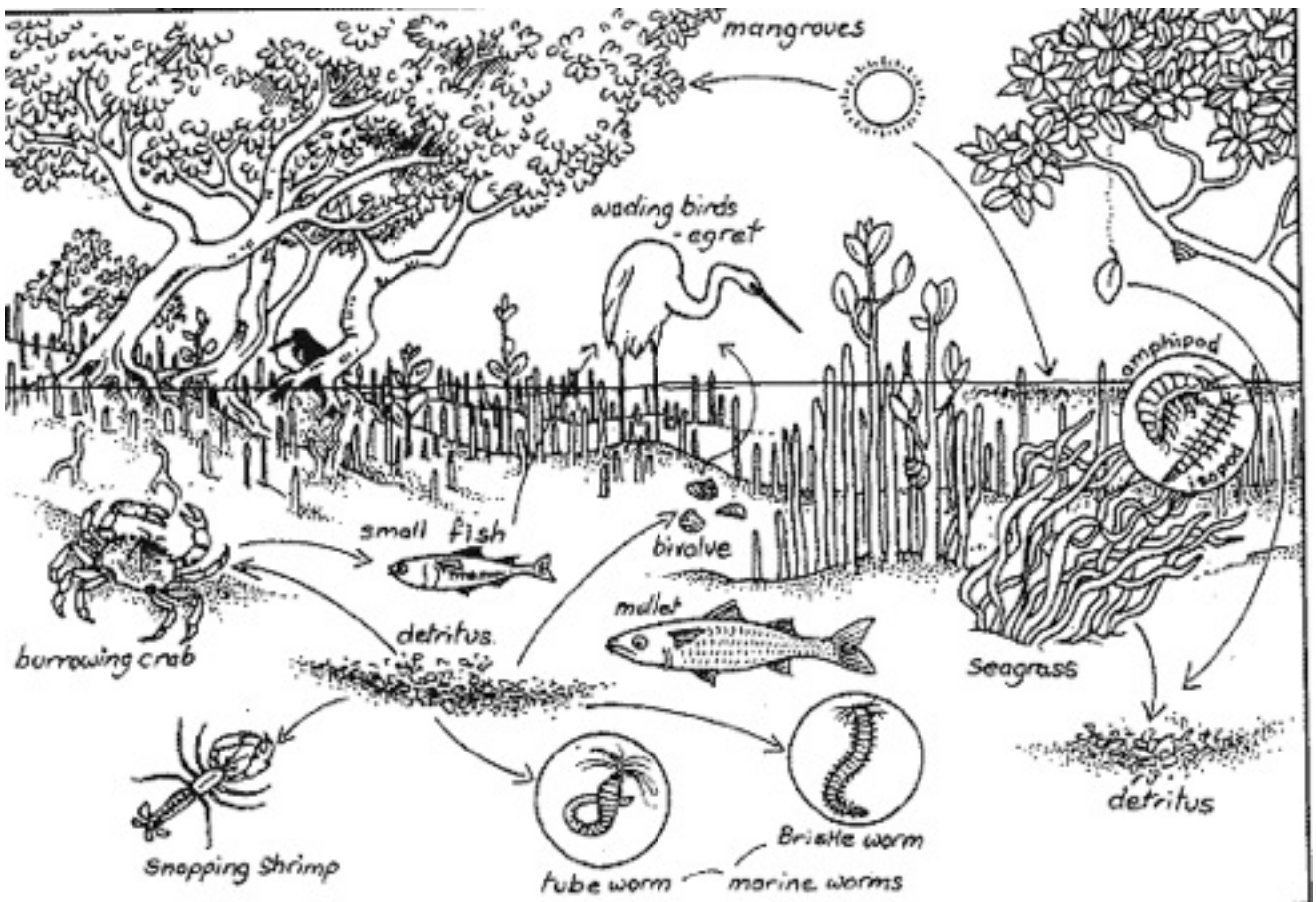


Grey heron



Mullet fish

Below is an example of one of the food webs:



2. Fishing and its implications

Objectives

1. To create an understanding of the different types of fishing that take place
2. To understand the impact of these methods on the marine environment as a whole

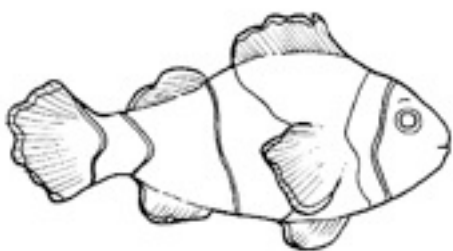
Materials

- o flags to demarcate fishing zone
- o fish cut out of white paper, some with paper clips attached
- o other marine animals cut out of paper, eg turtles, dolphins, sharks, eels etc
- o simple fishing rods (sticks, fishing lines & small magnets)
- o nets for trawlers held by at least 4 people
- o glitter for cyanide poisoners
- o small stickers for fishers using cyanide

Procedure

1. The following materials above describe different types of fishing
2. Use this material in a form of a game to allow students to understand how fishing takes place.
3. Try to allow students to explore and discover which types of fishing are the good ones and the types that are harmful.

Images



3. Coral Bleaching

Objective:

Understand what is coral bleaching and how it can impact tourism

Materials:

Coral piece
Card with written on it Tourist

Card with written on it Reefs
Card with written on it Carbon Dioxide
Card with written on it hot
Card with written divers
Container with hot water
Small finger plankton

Procedure:

- a. Recreate a scenario that links coral reefs, with plankton (zooxanthella), with Carbon dioxide with its impact on reefs and impact on tourism
- b. Try to use all the above materials and set up instructions of how you would do such activities.

4. Lifestyle of Ababda

Objectives:

- o Understand the role of local people such as the Ababda in managing the Red Sea resources

Materials:

- o Pictures of ababda fishing

Procedures:

- o Find a method to describe to students the implication of climate change to Ababda and fishing lifestyle.
- o Try to find a creative and interactive way to illustrate this situation.

Day 2: Activities linking to Multiple Intelligence and Red Sea Issues

Convection Currents

Background Information: Convection currents in the atmosphere are responsible for the formation of thunderstorms as the warm and cold air masses collide. Currents from cold areas reaching warm lands create a cooling effect and currents from warm areas can bring some heat to cold lands.

Hot air balloons rise because warm air is lighter than cold air. Similarly, warm water is lighter in weight or less dense than cold water. When the bottle of warm water is placed on top of the cold water, the more dense cold water stays in the bottom bottle and the less dense warm water is confined to the top bottle. However, when the cold water bottle rests on top of the warm water, the less dense warm water rises to the top bottle and the cold water sinks. The movement of water is clearly seen as the yellow and blue food coloring mix, creating a green liquid.

The movement of warm and cold water inside the bottles (or tank) is referred to as the convection current.

Although the bottles whose colored liquids mix are more interesting to watch, the other set of warm and cold water bottles helps to illustrate another important phenomenon that occurs in the atmosphere during the winter months. During daylight hours, the sun heats the surface of the earth and the layer of air closest to the earth. This warm air rises and mixes with other atmospheric gases. When the sun goes down, the less dense warm air high up in the atmosphere often blankets the colder air that rests closer to the surface of the earth. Because the colder air is more dense than the warm air, the colder air is trapped close to the earth and the atmospheric gases do not mix. This is commonly referred to as temperature inversion.

Objective: The purpose is to provide a general introduction to currents, including how they are affected by density, heat, and the continents

Your leader will instruct you in making the convection device. At the end you should have one, 2L bottle of hot red water and one 2L bottle of cold blue water. The two bottles will be connected via two thin tubes, which will be clamped in the middle to prevent water transfer from one bottle to another.

Materials:

1. Four empty identical bottles (mouth of the bottle should be at least 1 1/2 inches in diameter)
2. Access to warm and cold water
3. Food coloring (yellow and blue) or Fizzers coloring tablets
4. 3 x 5 inch index card or an old playing card

Procedure:

1. Fill two bottles with warm water from the tap and the other two bottles with cold water. Use food coloring or the Fizzers coloring tablets to color the warm water yellow and the cold water blue. Each bottle must be filled to the brim with water.
2. Hot over cold: Place the index card or old playing card over the mouth of one of the warm water bottles. Hold the card in place as you turn the bottle upside down and rest it on top of one of the cold water bottles. The bottles should be positioned so that they are mouth to mouth with the card separating the two liquids. You may want to do this over a sink.
3. Carefully slip the card out from in between the two bottles. Make sure that you are holding onto the top bottle when you remove the card. Observe what happens to the colored liquids in the two bottles.
4. Cold over hot: Repeat steps 2 and 3, but this time, place the bottle of cold water on top of the warm water. Observe what happens.



- What happened when the bottle of cold water is placed on top of the warm water?
.....
- Is this kind of movement considered a current ? Why ?
.....
- Is the hot water rising above or moving below the cold water?
.....
- Was your hypothesis correct?
.....

Marine Pollution Game

Goals:

1. To understand how a water resource can be polluted.
2. To relate water usage to tourism, fishing and industrial use.

3. Understand how water can be wasted.

Objectives:

1. To get a better understanding of water pollution and water allotment.
2. To get a hands on approach in realizing how water can get wasted, polluted and distributed.

Purpose of the Game:

Participants will have to collect as much water as possible into their buckets in 10 seconds. 5 rounds.

Materials:

- 4 large water buckets or container (transparent) with graduation
- 20 small containers (500ml)
- 2 Small food coloring
- 20 sponges of 3 different sizes
- 10 small plastic cups labeled 1980, 1980, 2000, 2010,2020
- 2 Whistles

Process:

(Participants will be divided into four groups, with 7-8 in each group and you will assign a leader for the group)

1. The leader will have one large container with water till the brim in the centre of a large room.
2. Participants will stand one 2 meters away from the bucket making a circle.
3. Each participant will have a small container in front of them and a sponge in their hand.
4. Leader will give each participant a sponge. The largest size represents water used in agriculture, the second represents water in industry and the smallest represents water in households.
5. Leader will blow the whistle and using the sponge participants will collect as much water as they can using the sponge into their container.
6. Leader will blow whistle again and will brief about what happened. Leader will discuss that industry has had the largest impact on water for marine water and discuss what would happen if it were fresh water. Agriculture would be the largest sector
7. Leader will then place a drop on each sponge and tell participants to wash in their basins.
8. Participants will then take turns to empty half the water back to the main container.
9. Leader will add more water to represent rain.
10. Leader will take a sample of water labeled 1970.
11. Repeat several times until 2010.
12. Leader will compare with participants at the end the difference from one year to another. Leader will show how pollution will increase over the years and that the water from the resource which may be the Nile is actually decreasing over the years.

Reminders:

1. 4 groups will happen simultaneously make sure you have enough room and that you have given clear instructions.
2. Leader will need to clear fast for the connectedness, so make sure that the participants are given clear instructions they can help with this.
3. The material for this activity will be shared with the other group, make sure it is all packed.

BACKGROUND INFORMATION:

Fresh water: Comprising over 70% of the Earth's surface, water is undoubtedly the most precious natural resource that exists on our planet. Without the seemingly invaluable compound comprised of hydrogen and oxygen, life on Earth would be non-existent: it is essential for everything on our planet to grow and prosper. Although we as humans recognize this fact, we disregard it by polluting our rivers, lakes, and oceans.

In Egypt we receive most of our water from the Nile, the rest comes from groundwater and very little from rain water on the coast. 55.5 billion cubic meters of water is our share of water from the Nile, but our total is 73 billion cubic meters of water. From this water, the water is distributed into 3 main sectors. Agriculture taking up the largest part with 83%, 10 % for industry and the rest for household or municipal use.

Sea Water: But water pollution also affects Sea water and has determinatenal impacts. Water is polluted from industry, from tourism and from the different types of fishing methods. Also Global climate change is having an impact. Some types of fishing include using dynamite, which destroys whole plots of nurseries for fish. Also global climate change is having an impact on the increased temperature of the sea, which is impacting the corals and bleaching them and finally, pollution from tourist boats and ships.

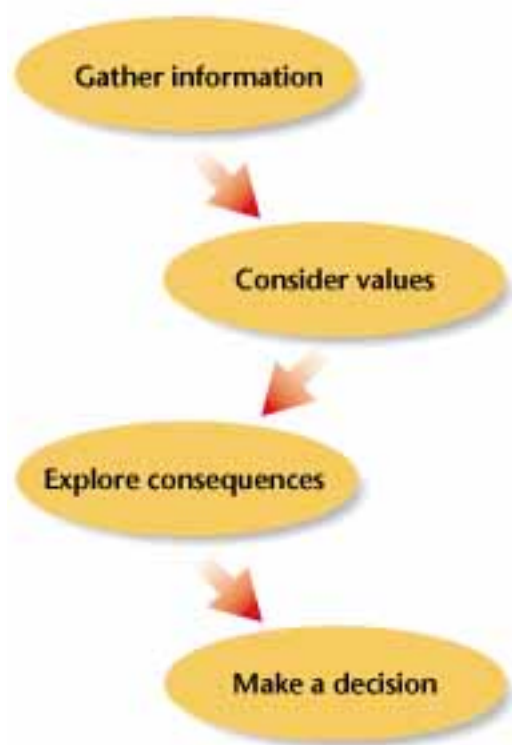
Students will be working on a field component of the workshop:
 The field component will be divided into an interview of stakeholders section and a gathering of data from the field section. Below is a description of some of the material to be used.

Organizing an Ethnography:

Objectives:

To assess the situation of climate change in the Red Sea area, and what impacts does it have on the livelihoods of people living in this area.

Value	Definition
Aesthetic	what is beautiful or pleasing
Economic	the gain or loss of money or jobs
Environmental	the protection of natural resources
Educational	the accumulation and sharing of knowledge
Ethical/moral	what is right or wrong
Health	the maintenance of human health
Recreational	human leisure activities
Scientific	understanding of the natural world
Social/cultural	the maintenance of human communities and their values and traditions



1. Deciding on stakeholders:

- Identify 3 stakeholders that are linked to Climate Change and the Red Sea, who are the main contributors or who are the main groups impacted?
- Decide how you will approach the stakeholders
- Decide on a suitable sample size to interview

2. Deciding on size of Sample: is a group of individuals or events that represents a population.

- The sample must be drawn in accordance with a procedure that ensures a random selection. The sample size must be large enough to provide the degree of measurement precision and accuracy generally accepted by the scientific community.
- Need to select a representative sample of some sort: men/women, children/adults, working/nonworking, literate/illiterate.
- The sample needs to be selected and decided.

3. Selecting data collection methods:

- Quantitative methods include: Questionnaires and Structured interviews
 - Questionnaire: are written questions, requiring only a few minutes, usually Yes/no, or multiple choice questions, fill in the blanks, free choice or there may also be short ended questions.
 - Usually respondent takes them and fills them out, at their own time, or while you are standing
 - Assumes that the respondent can read and write.
 - Should always consider why you are writing this question, therefore you should only choose essential questions.
 - Usually used when you want to collect a larger number of data.
 - It can be anonymous
 - Can be time consuming to analyze, and may require some professional software or system of analysis.
 - Structured Interview: The interviewer will write the questions and they will write down the response.
 - Questions may be like a questionnaire
 - You might want to add open ended questions.
- Qualitative include: is looking at quality of information and not necessarily numbers, this includes Field observation, In depth interview (utilizing open ended questions), (interview with key informants), Focus group (observation and interviews with people who agree to meet).
- We will use both forms for our ethnography. Agree on the structure to be used.
 1. Write the questions for each stakeholder (questionnaire or interview) Ensure questions are achieving the goals of what you want to understand
 2. Decide on the qualitative methods used and assign the time to do so and what observations will take place.

4. Assign roles within the group

- Note taker
- Interviewer
- Observer
- Photographer

Cora Reefs Background Information:

What are corals? ¹

Coral reefs are one of the most biologically productive eco- systems on Earth. Most people have seen images of brightly colored fishes and other reef-dwelling organisms, yet many do not understand why these systems are personally important.

Programs and articles about coral reefs typically point out benefits that include protecting shorelines from erosion and storm damage, supplying foods that are important to many coastal communities, and providing recreational and economic opportunities. These benefits are obviously important to people who live near reefs, but there is another aspect of coral reefs that can benefit everyone: the highly diverse biological communities are new sources of powerful antibiotic, anti-cancer and anti-inflammatory drugs.

The idea of coral reefs as a source of important new drugs is new to many people; but in fact, most drugs in use today come from nature. Aspirin, for example, was first isolated from the willow tree. Morphine is extracted from the opium poppy. Penicillin was discovered from common bread mold. Although almost all of the drugs derived from natural sources come from terrestrial organisms, recent systematic searches for new drugs have shown that marine invertebrates produce more antibiotic, anti-cancer, and anti-inflammatory substances than any group of terrestrial organisms. Particularly promising invertebrate groups include sponges, tunicates, ascidians, bryozoans, octo-corals, and some molluscs, annelids, and echinoderms.

Some of the drugs derived from marine invertebrates are:

- Ecteinascidin – Extracted from tunicates; being tested in humans for treatment of breast and ovarian cancers and other solid tumors
- Topsentin – Extracted from the sponges *Topsentia genitrix*, *Hexadella* sp., and *Spongosorites* sp.; anti-inflammatory agent
- Lasonolide – Extracted from the sponge *Forcepia* sp.; anti- tumor agent

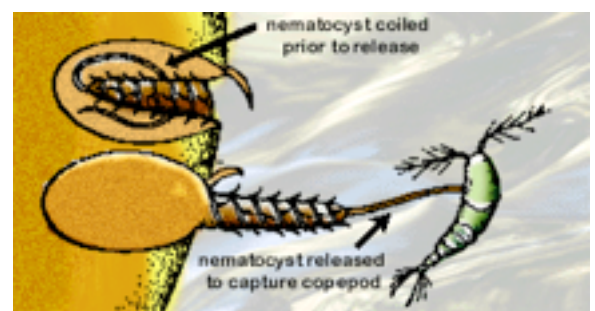
Corals are marine animals. They are invertebrates and belong the same phylum as jellyfish, Cnidarians. All animals in this phylum have a specialized stinging cell called a nematocyst.

Corals live in colonies, although there are a few large solitary ones such as the mushroom coral.

What do corals look like?²

Corals have different colors and shapes. But they all have a coral animal with tentacles called the polyp.

Almost all corals are colonial organisms. This means that they are composed of hundreds to hundreds of thousands of individual animals, the polyps. Each polyp has a stomach that opens at only one end. This opening,



The stinging cells (nematocyst) found in coral tentacles in coiled and released positions.

¹ Albion College. Geology Department. Webpage available at <www.albion.edu/geology/GEO210>

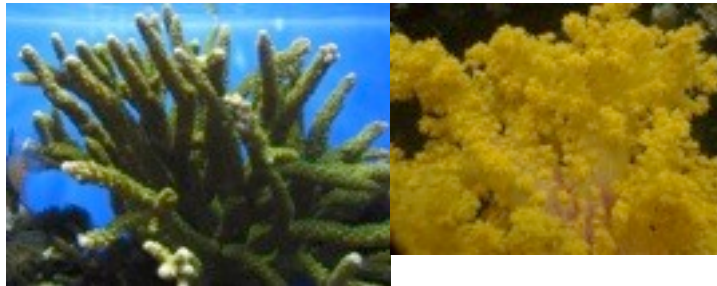
² Florida Museum of Natural History. Ichthyology Department. Webpage <http://flmnh.ufl.edu/fish/southflorida/coral/>

called the mouth, is surrounded by a circle of tentacles. The polyp uses these tentacles for defense, to capture small animals for food, and to clear away debris. Food enters the stomach through the mouth. After the food is consumed, waste products are expelled through the same opening

Nematocysts are capable of delivering powerful, often lethal, toxins, and are essential in capturing prey. A coral's prey ranges in size from nearly microscopic animals called zooplankton to small fish, depending on the size of the coral polyps.

There are two types of corals Hard Corals and Soft Corals .

Hard corals form
skeleton of calcium
carbonate and
their polyps have

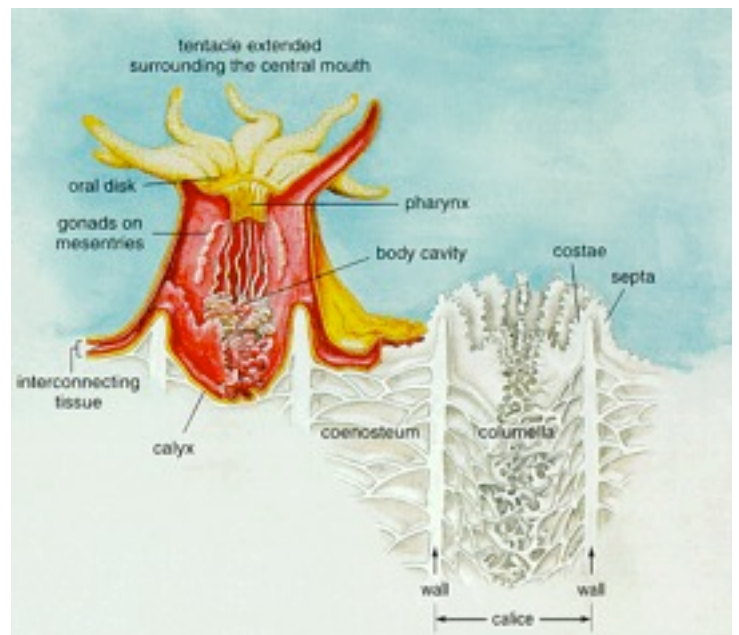


an external skeletal
carbonate and
6 tentacles.

Soft Corals do not
form calcium carbonate
deposits through out the structure. Their polyps have 8 tentacles.

Corals have different colors and shapes. But they all have a coral animal with tentacles called the polyp. The nematocyst is found on the tentacles.

Corals have different colors because a small organism called Zooxanthella which are a kind of algae, which lives inside the tissue and gives the coral its color. This organism forms a symbiotic relationship with the coral, which means a relationship of mutual benefit. The coral provides the algae with a protected environment and compounds they need for photosynthesis. In return, the algae produce oxygen and help the coral to remove wastes.



Most importantly, zooxanthellae supply the coral with glucose, glycerol, and amino acids, which are the products of photosynthesis. It is believed that the Zooxanthella also has a sunscreen effect on coral, protecting it from UV light. It is unknown why, but scientists think it is because of global climate change that polyps start to eject the Zooxanthella, lose their color, and die. This process is called bleaching.



What are the different coral growth forms?³
 Coral growth forms are not species specific. This means that one coral species may have more than one growth form

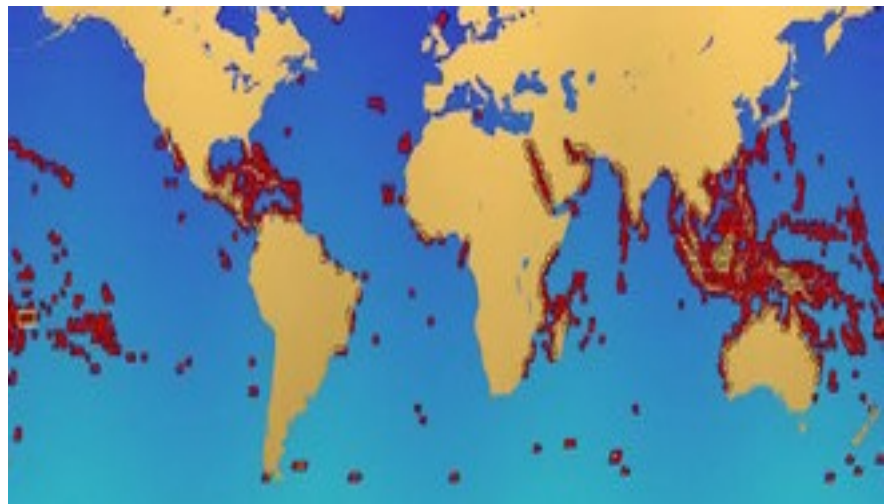
Where do corals grow?⁴
 Corals mostly grow between the Tropic of Cancer and the Tropic of

Capricorn. These tropical and subtropical areas meet the habitat requirements for the corals.

Corals need clear, shallow, warm water to grow. The coral needs light so that the Zooxanthella can photosynthesize and a temperature ranging from 21 – 26 C° for optimal growth.

What do corals do in the ocean?

Corals do a few different things. Because of their symbiotic relationship with Zooxanthella they play an important role in maintaining the levels of Carbon Dioxide and Oxygen in the water. Hard corals build reefs, which provide habitats for fish to breed and multiply; they also act as shoreline protectors from erosion.



What are the different reef structures?^{5,6,7}

Patch Reef: Isolated patches of reef usually within a lagoon or embayment.

Fringing Reef: Reef that is directly attached to shore or borders it with a small lagoon or channel.

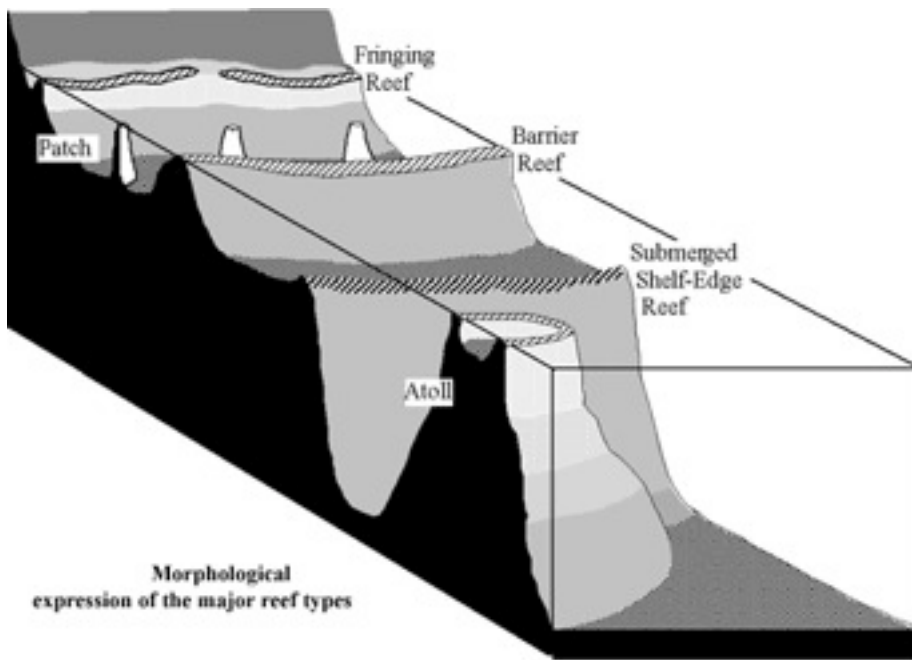
³ University of Evansville. Webpage available at <faculty.evansville.edu.>

⁴ University of Michigan Museum of Zoology. Animal Diversity Web. Webpage <animaldiversity.ummz.umich.edu>

⁵ University of Puerto Rico. Geological Oceanography Program
 Webpage available at <<http://geology.uprm.edu/Morelock/GEOLOCN/>>

⁶ University of the Western Cape. Biodiversity and Conservation Biology.
 Webpage available at <<http://hypnea.botany.uwc.ac.za/marbot/images/nematocyst.gif?>>

⁷ Wikipedia, The Free Encyclopedia. Coral Reefs. Webpage available at:
<http://en.wikipedia.org/wiki/CoralReefs>



Barrier Reef: A reef separated from the shore by a lagoon.

Atoll: A ring shaped coral reef enclosing a lagoon in the center. Usually is a location of a sunken volcanic island.

How do coral reefs form? Coral reefs begin to form when free-swimming coral larvae attach to submerged rocks or other hard surfaces along the edges of islands or continents. As the corals grow and expand, reefs take

on one of three major characteristic structures —fringing, barrier or atoll. Fringing reefs, which are the most common, project seaward directly from the shore, forming borders along the shoreline and surrounding islands.

Barrier reefs and atolls also are some of the oldest organisms. With growth rates of 0.3 to 2 centimeters per year for massive corals, and up to 10 centimeters per year for branching corals, it can take up to 10,000 years for a coral reef to form from a group of larvae. Depending on their size, barrier reefs and atolls can take from 100,000 to 30,000,000 years to fully form.

Despite their numerous benefits to humans, many coral reefs are threatened by human activities.⁸ Sewage and chemical pollution can cause overgrowth of algae, oxygen depletion, and poisoning. Fishing with heavy trawls and explosives damages the physical structure of reefs as well as the coral animals that build them. Careless tourists and boat anchors also cause mechanical damage. Thermal pollution from power plants and global warming cause physiological stress that kills coral animals and leaves the reef structure vulnerable to erosion.

Some of the most severe damage appears to be caused by thermal stress. Shallow-water reef-building corals live primarily in tropical latitudes (less than 30° north or south of the equator). These corals live near the upper limit of their thermal tolerance. Abnormally high temperatures result in thermal stress, and many corals respond by expelling the symbiotic algae (zooxanthellae) that live in the corals' tissues. Since the zooxanthellae are responsible for most of the corals' color, corals that have expelled their algal symbionts appear to be bleached. Because zooxanthellae provide a significant portion of the corals' food and are involved with growth processes, expelling these symbionts can have significant impacts on the corals' health. In some cases, corals are able to survive a "bleaching" event and eventually recover. When the level of environmental stress is high and sustained, however, the

⁸ Coral Reef lesson plan. Caution: Do Not Bleach. oceanservice.noaa.gov
IUCN - Environmental Education Component October 2011 report

corals may die.

Assessment of the Marine Life Student Handbook

Activity 1: Assessing Coral Health

Background Information:

Some corals will die over time for several reasons. Some causes are natural causes such as cyclones, or strong tidal waves, or even long tidal exposures (when the tide is low for a long period thus exposing a reef for a long time) others are caused by human impact (antropogenic causes), including pollution and mal practice in fishing. Some of the effects of human impact include coral bleaching, where the color of the coral is lost and turns white, as the zooxanthela is expelled it kills the reef.

Some corals break due to anchors or people stepping on them. Also some corals may get diseases, including funguses.

Some corals are also eaten by marine fish. 10 years ago the red sea experienced an explosion of a sea star called the crown of thorns that was eating at the reef very rapidly many dive centre would send out volunteers to remove them, but still many reefs were permanantly destroyed.

Other human causes of destruction include, inappropriate fishing methods, although illegal in the seas of Egypt, but some fishermen will still use cyanide poison to kill fish, but also will kill reefs. Some still use dynamite fishing which along with destroying reefs will also destroy breeding grounds of fish.

In terms of anchors, in the Red sea there are strict laws about throwing anchors, it is not allowed, as now there are mooring systems, which are specialized moors that are placed in special locations to allow boats to attach to them and not need to throw anchors.

Educational Objectives:

Differentiating between live coral and dead coral

Understanding basic sampling concepts

Understanding human impact on coral reef systems

Material:

Snorkeling equipment

Slate

Pencil

2 10m Lines marked at every meter

Weights

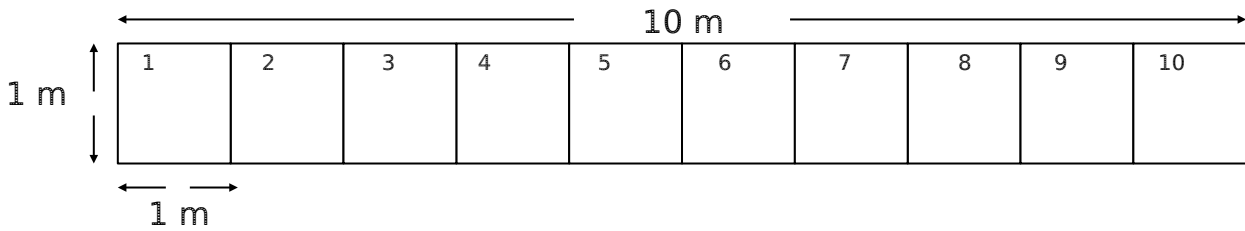
Balloon

Procedure:

1. Write up a hypothesis: _____
2. Leader needs to set up transect parallel to reef crest. 10 m X 1 m. Use weights to hold line down. Caution to be taken not to damage the coral. Tie balloon to mark location.
3. Copy the following onto your slate:

Depth: _____

Date: _____ Location: _____



4. Follow the Belt transect and mark the areas of dead coral on your slate
5. Fill in the following table:

Quadrant Number (Square)	Percentage Damage	Percentage Damage/10
	Sum	

The percentage of damaged coral in this transect is _____ and this is a total area of _____ m²

Reflections:

What would you consider the largest threat to coral reefs in this location?

What do you think can be done to help protect the reef?

Did you notice anything different between the animals around damaged areas and healthy areas?

Did you accept or reject your hypothesis, and why?

Activity 2: Invertebrate Survey

Background Information

In appendix A there are some of the common invertebrates that can be found in this region of the red sea.

Marine invertebrates are very diverse and come in 7 classes:

- Sponges are organisms that are sessile and come in a variety of colors.
- Cnidarians (like corals and jelly fish) organisms that have tentacles and are symmetrical
- Echinoderms meaning fingers with spikes or spines, these are the sea stars and the crown of thorns.
- Mollusks are shelled organisms, these include the mussels.
- Arthropods meaning many pods or hands these include shrimps.
- Insects (these don't live in the sea)

Educational Objectives:

Recognizing the different marine invertebrates

Understanding different field data collection methods

Understanding basic concepts in sampling

Material:

Snorkeling equipment

Slate

Pencil

1 X 10m Line marked at every meter

Weights

Balloon

Procedure:

1. Write up a hypothesis: _____
2. Leader needs to set up transect parallel to reef crest. 1 m X 10 m. Use weights to hold line down. Caution to be taken not to damage the coral. Tie balloon to mark location
3. Copy the following onto your slate:

Quadrant	Invertebrate	Substrate

4. Follow the line transect and record the invertebrates you find in each transect and the substrate under them directly under the line that is laid out.

Reflections:

Pick one of the invertebrates you recorded and explain whether or not you think that there is a relationship between the invertebrate and the substrate.

Did you accept or reject your hypothesis, and why?

Assessment of the Beach

Student Handbook

Activity 1: Assessing Our Location

Objective:

It is important that you record the physical conditions, so that when they return to the data it can all be contextualized. For example if it is raining it may explain why the water maybe turbid.

Procedures:

Fill out the tables below.

Site

Name: _____

Coordinates:

Latitude: _____ N or S Longitude: _____ E or W

Elevation: _____ mete Source of Location Data (check one): GPS

Other _____

Name of Water Body: _____

Water Type:

Salt (> 25 ppt) Brackish (2-25 ppt) Fresh (<2 ppt)

Moving Water:

Stream or river

Sea

Approximate width of moving water: _____ meters

Standing Water:

Pond Lake Reservoir Bay Ditch Ocean Estuary Other:

Size of Standing Water:

Much smaller than 50 m X 100 m

Roughly 50 m X 100 m

Much larger than 50 m X 100 m

Sample Location:

Outlet Bank Bridge Boat Inlet Pier

Can you see the bottom?:

Yes No

Saltwater Habitats Present (Check all that apply):

Rocky shore Sandy shore Mud flats/Estuary

Comments: General description of your study site:

Cloud Cover (check one):

no clouds broken (50%-90%) clear (<10%) overcast (>90%) isolated clouds (10%-24%) obscured scattered (25%-49%)

Water Temperature

Average: _____ °C	Observer Name	Temperature °C
	1.	
	2.	
	3.	

Water pH: Measured with: (check one) paper meter

Average: _____	Observer Name	If salt added, conductivity (µs/cm)	pH
	1.		
	2.		
	3.		

Value of buffers used: pH 4 pH 7 pH 10 (Check all used.)

Activity 4: Biodiversity of Coastal Plants

Background Information

Appendix B has a guide of some of the potential plants that could be found on the Ain Soukhna coastline.

Coastal plants are very sensitive but also some are extremely resilient. Some of the plants that will be found on the coast will be adapted to extreme salty water and will be able to withstand high rates of evaporation by having small and few stomatas decreasing amount of water evapourated.

Educational Objectives:

Understanding the term "Biodiversity"

Noticing the variation in desert plants

Understanding basic sampling techniques for desert plants

Material:

Pencil

Tape Measure

Compass

2 X 30 meter ropes, marked at every 5 meters.

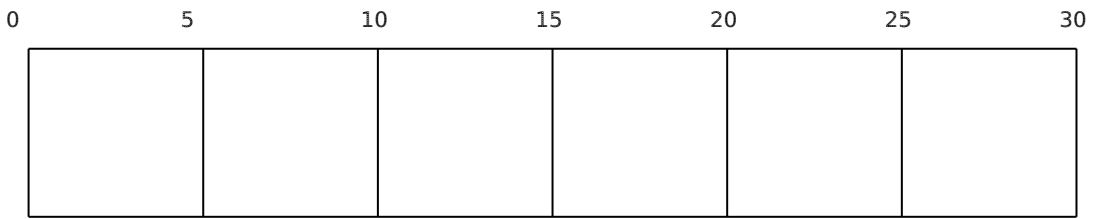
Coloring pencils

Stakes

Procedure:

1. Lay out 30 X 5 m transect in any direction, but note that all the other transects you lay must in the same direction.
2. Take bearing using compass
3. Walk the transect and record the plants inside the transect (species and coverage) in the following datasheet
4. Represent every plant species in a different color and an approximate estimation of its area
5. Include a key of the colors with the name of the plant species or make up a name and the color you chose to represent it.
6. Repeat transect in other site. (don't forget to keep the transect in the same direction)

Date: _____	Habitat Description: _____ _____ _____
Location: _____	
Bearing: _____	



Legend

Annex 5 - Field guide

