

This is the second of two books about Aldabra Atoll designed especially for the children of Seychelles. The atoll's environment is "brought to life" through colourful photographs and interesting facts about the animals and plants that live there. Children can also learn about Aldabra's history and about life and work on the atoll. Illustrated activities, games and puzzles provide the fun part of learning. The aim is to arouse or further develop the children's interest in this far away atoll while they enjoy the various activities and games.

This second book is suitable for secondary school level. It builds on the information and activities found in Book 1. The activities are varied in style and level of challenge, so children of both lower and upper secondary ages may enjoy them. Although the book is designed for use as a module about Aldabra, individual activities can easily be used within different subject areas of the school curriculum, such as science, maths, language, art, geography, history. Each complete exercise is contained within two open pages of the book. Teachers and parents will be the best judges of how to use the material. Wildlife Club leaders may also wish to use or adapt the activities for their groups.

Aldabra is a wonderfully unique place and a very precious part of our Earth. The next generation needs to appreciate, support and maintain Aldabra as a World Heritage Site, one of Seychelles' two gifts to the peoples of the world. Hopefully these two books will give the children of today a foundation for conservation work in the future.



2



ALDABRA OUR ATOLL



Published by Seychelles Islands Foundation

Katy Beaver & the Aldabra Children's Book Group

Created by Katy Beaver and the Aldabra Children's Book Group

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Photographs: see Acknowledgements

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Produced by Seychelles Islands Foundation, in part with IUCN and Mangroves for the Future with the financial support of Norad and Sida



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About the Aldabra Children's Book Group (ACBG)

The Aldabra Children's Book Group was created especially to develop two books about Aldabra for children of Seychelles and also a special "toolkit" of activities and games for children who visit Aldabra as prize winners in the Eco-School competition.

The Aldabra Children's Book Group was headed by local biologist and educator Katy Beaver and included five other local educators: Rita Azemia, Dora Ernesta, Christelle Jacques, Jeanette Larue and Lyndy Bastienne.

The project to develop children's activities about Aldabra and for use at Aldabra was initiated by Seychelles Islands Foundation (SIF). It has been funded by SIF and Mangroves for the Future (MFF) with IUCN, Norad and Sida support.

About the Seychelles Islands Foundation (SIF)

Seychelles Islands Foundation (SIF) manages and protects the World Heritage Sites of Aldabra and Vallée de Mai. The foundation was established as a public trust in 1979, with the President of Seychelles as patron. There is a Board of Trustees that oversees the work of SIF. The Head Office of SIF is on Mahé.

The purpose of the organisation is to manage and conserve the natural life of Aldabra Atoll and Vallée de Mai, and to initiate and carry out scientific research into this natural life. SIF also aims to restore the environment where necessary, and to educate the public.

The small Research Station at Aldabra is managed by the Island Manager and a Research Officer. They are assisted by other staff such as rangers, boatmen and cook/housekeeper. Volunteers interested in conservation sometimes spend short periods of time on the atoll assisting the research staff.

Contacts: Seychelles Islands Foundation, P O Box 853, Victoria. Tel: 4321725. Fax 324884
Website: www.sif.sc

About Mangroves For the Future (MFF)

Mangroves for the Future (MFF) is a unique partner-led initiative promoting investment in coastal ecosystems. It builds on a history of coastal management interventions before and after the 2004 tsunami. It has eight member countries: India, Indonesia, Maldives, Pakistan, Seychelles, Sri Lanka, Thailand and Vietnam, as well as dialogue countries that face similar issues. MFF uses mangroves as a flagship ecosystem but is inclusive of all coastal ecosystems.

MFF provides a collaborative platform among the many different agencies, sectors and countries who are addressing challenges to coastal ecosystem and livelihood issues, to work towards a common goal. Through generating knowledge, empowering institutions and individuals to promote good governance in coastal ecosystem management, MFF seeks to achieve demonstrable results in influencing regional cooperation, national programme support, private sector engagement and community action.

Website: www.mangrovesforthefuture.org



We would like to thank many people who have helped us to tell our story and share the wonders of life at Aldabra Atoll in this book.

First we want to thank **Katy Beaver**, a biologist and educator who has visited Aldabra several times. She created many of the activities, drew and painted the illustrations, and brought everything together in a book. **Urny Mathiot** coloured the cartoons of us!



Katy was helped by teachers and ex-teachers who are members of the Aldabra Children's Book Group. They are **Rita Azemia**, **Dora Ernesta**, **Christelle Jacques** and **Jeanette Larue** (and also **Lyndy Bastienne** before she joined the MFF team). All of them have been to Aldabra. They created some of the activities, gave advice, and then read through everything and corrected mistakes. Their help was very important. So was that of **Jeanne Mortimer** who gave valuable advice for the turtle pages, **'Mazaren'** who agreed to be interviewed, **Ruth Watts** for sharing educational ideas, and **Jean-Claude Hollanda** who gave advice on how to use this book in the school curriculum.



Many people contributed photographs to this book and we would like to thank them all for showing you what the environment of Aldabra looks like:

- **Lindsay Chong-Seng**: pages 5 (lower left), 6 (lower left), 10 (top), 12 (lower centre), 13 (top left), 16 (top, lower right), 17, 21 (all except flamingo, grey heron & rail), 23 (J), 24 (lower left), 27, 32 (lower centre), 41, 49 (top centre & right, lower left), 52.
- **Naomi Doak**: pages 28 (all), 29 (F, G, H, K, M, N), 30 (all), 31 (top row), 32 (top centre and right), 34 (left & centre).
- **Seychelles Islands Foundation**: pages 2, 4, 5 (top), 24 (lower right), 49 (lower centre), 54 (top right), 62.
- **Nancy & Christopher Kaiser-Bunbury**: page 31 (lower row).
- **Catherina Onezia**: pages 20, 21 (flamingo).
- **Sam Balderson**: page 29 (I, J).
- **Jeanne Mortimer**: pages 36 (lower right), 45.
- **Rainer von Brandis**: pages 36 (top), 49 (top left).
- **Jeanette Larue and the Eco-school winners**: supplied the photos on page 53.
- **Christina Quantz**: page 54 (lower left), 55 (middle left).
- **Sam Gardener**: page 29 (L).
- **Col Limpus**: page 36 (lower left).
- **Wilna Accouche**: page 40 (lower right).
- **Christelle Jacques**: supplied the photo on page 44.
- **Stephen Blackmore**: page 54 (top left).
- **Katy Beaver**: All photos that are not otherwise credited.



The lyrics of 'Lim Aldabra' on page 6 are reproduced in this book with the permission of Patrick Victor.

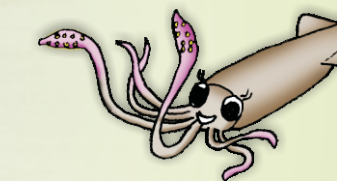
The map on page 12 is adapted from "Biogeography and Ecology of the Seychelles Islands" edited by D R Stoddart (1984)

The activity on page 35 is adapted from "The Usborne big book of science things to make and do" (2007)



We also wish to thank the **Seychelles Islands Foundation staff**, especially **Nancy Bunbury** for coordinating this project, **Frauke Fleischer-Dogley** for her support and some of the **Aldabra rangers** for talking to us about their experiences. And we give special thanks to **Mangroves for the Future** for helping with the funding, which allowed this project to happen. We also love **Urny Mathiot's** colourful design of this book - thank you Urny!

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Note for teachers

Each double page activity can be used within the school curriculum. Suitable subject areas are shown in colour at the top right corner, next to the page number:

CS = Combined Science **B** = Biology **G** = Geography **H** = History **M** = Maths **L** = Language **A** = Art **P** = PSE **TE** = Technology & Enterprise **C** = Careers

Note that some activities may be more suitable for S4 - S6 levels

In Seychelles everyone has heard of Aldabra Atoll and Vallée de Mai. They are unique places in this world. Both sites are nature reserves, where the special flora and fauna that live there are protected. They became World Heritage Sites because of their valuable biodiversity and protected status, and were given as a gift to humanity by the people of Seychelles. Vallée de Mai is on Praslin and it is close enough for many Seychellois to visit. Aldabra Atoll however, is far away and difficult to get to, and few Seychellois have visited the atoll because it is so remote.



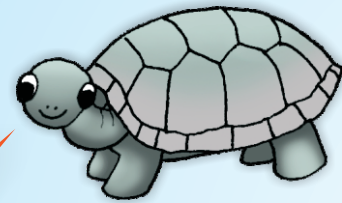
Aldabra Atoll seen from high above the Earth's surface - a remote jewel in a vast ocean. Assumption Island lies about 27km distant. (The white blobs are clouds!)



As well as giving you facts about Aldabra, this book is full of puzzles, games, and things to make and do. We hope it will help you to think a bit more about why Aldabra is so special and why it is a World Heritage Site.



..And for sure you can make decisions that will make a difference to the management of this very precious site.



All Seychellois can contribute to the protection of Aldabra in one way or another. And even though it is difficult to visit, it is a place you can dream about, for it is in all our hearts.



We cannot take you to Aldabra itself, but in this book we introduce you to some of the wonders of the atoll and help you to learn more about its natural life and its interesting history.



There is still much to learn about Aldabra, and much to discuss and debate. Many scientific questions have still not been answered. Maybe in the future YOU will be able to take part in finding some of the answers....

Activity 2 What if

The following activity can be done in small groups through discussion. Each group chooses one of the following five ideas to discuss.

Look at each question. It starts with "What if" : What do you think might happen? Note down some of the different ideas and possibilities your group suggests. There are no right answers and many possibilities, so you can be realistic or as creative as you like!

What if

- Man-eating crocodiles were found at Aldabra?
- A disease killed all the Aldabra Giant Tortoises except two?
- Aldabra became completely covered by the ocean again?
- You are given a chance to visit Aldabra?
- It was possible for humans to breath water like a fish?



Activity 3 Drawing what you read

This activity involves drawing but you don't have to be good at drawing to do it! Squiggles and simple sketches are fine. Work in pairs:

1. One of you reads out loud the text below.
2. Then read the text again slowly, sentence by sentence. After each sentence, both of you sketch on pieces of paper what has been read out.
3. When you have finished, both of you should have a drawing, or several drawings, that represent what you have read.
4. Look at each other's drawings and try to improve both drawings so that they represent a good way of showing the text in pictures.
5. Find another pair of students and discuss how you have represented what is in the text. You could try assessing each other's drawings.

You can also exhibit the pictures in class and discuss the pros and cons of expressing ideas as pictures rather than as words.

Text for Activity 3

It is a bright sunny morning at Aldabra. Flowers have opened on a bush growing near the sea. The brightly coloured flowers attract a small butterfly. It settles on a flower, searching for nectar. Another butterfly of the same species appears and the two butterflies fly off, dancing around each other. Soon a sunbird comes to sip nectar from the flowers one after another. Then the sunbird flies to its nest hanging at the end of a tree branch.



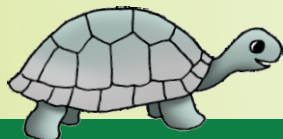
Activity 1 “Is this important for the future of Aldabra or not?”

The following activity can be done as a class, or by small groups of students working together. In the latter case it would still be good to have a class discussion afterwards, with each group prepared to defend their decisions.

Below are ten numbered statements. Which statements do you think are most significant for the survival of Aldabra Atoll as a protected area for the next 50 years?

- Read each statement and rank each one according to how important you think it is for the future of Aldabra - VERY IMPORTANT, MAYBE IMPORTANT, or NOT IMPORTANT.
- Alternatively you could sort them into a priority list, with the most important statements at the top. Make sure you have reasons why you give each statement its rank or position in the priority list.

It may help if you discuss how each statement affects or will affect living things at Aldabra, or the atoll itself. If there is not apparently a direct link with Aldabra e.g. No. 5 and 6, ask yourself if there could be a link in some way. Also you need to think about the management of Aldabra as a protected area. Information given in other parts of this book may help in your discussions.



1. Sea temperatures are rising slowly in all the oceans.
2. Aldabra is outside the main hurricane belt/zone.
3. Frigate birds fly very long distances.
4. Assumption Island is only 27km from Aldabra.
5. Spiralling white-flies and Fruit flies affect many species of plants.
6. Vallée de Mai is at great risk from fire.
7. It is expected that Aldabra will have drier dry seasons and wetter wet seasons in the future.
8. Fresh water floats on the top of sea water.
9. Sea level could be 50cm higher by the year 2100.
10. Giant tortoises can float and swim.



Aldabra isn't just one big flat atoll, with all the same vegetation and a simple fringing coral reef. It is so large that some of the land is 2.5 km from the sea, the same distance as Morne Seychellois from the East or West coast of Mahé! The atoll's limestone rock has different forms too - some is full of holes and has sharp, jagged edges, while other parts are flat and smooth like a pancake or chapatti. Different types of vegetation grow in different parts of the atoll. For example there are groves of trees and bushes, open grassland, thick scrub with tangled branches that are almost impenetrable and forests of tall mangrove trees. Many plant species differ from those of the granitic islands. The animals that live in these various habitats are mostly distinctive too. Some are found nowhere else in the world!

Likewise, the marine habitats of Aldabra are varied - there are coral reefs around the edge but corals grow inside the lagoon as well. There are flat seagrass beds and open sandy areas and deep channels through which the water rushes as the tide enters and leaves the huge lagoon. A huge variety of marine life thrives in the waters of the lagoon and outside the atoll.

Seychelles Islands Foundation (SIF) is the organisation which manages Aldabra Atoll. Because the environment of Aldabra is so special, the main role of SIF is to protect and conserve the atoll and its flora and fauna, allowing the very precious ecosystems to function as naturally as possible. Other functions of SIF are to monitor the environment and to carry out research. You can learn more about all of this in the book.

This is what some famous people have said and written about Aldabra in the past:

- 1) “In 1874, Charles Darwin, along with other leading scientists, appealed to the Governor of Mauritius to take measures to safeguard the Giant tortoise of Aldabra.” (Charles Darwin is known best for his Theory of Evolution)
- 2) “Aldabra is one of the last natural sanctuaries on our planet.” (Jacques-Yves Cousteau, 1964, famous French underwater biologist)
- 3) “As a natural treasure house, Aldabra must belong to the whole world.” (Sir Julian Huxley, 1970, famous British scientist)
- 4) “Certainly the most scientifically interesting atoll in the world oceans.” (S Dillon Ripley, 1967, renowned US scientist)

**A coded message!**

Work out the code so that you can find out what Tony Beamish wrote about Aldabra in his book 'Aldabra Alone' in 1970.

The code is logical. You are given the code for 3 letters:

Code letter R = M;

Code letter P = K;

Code letter D = Y

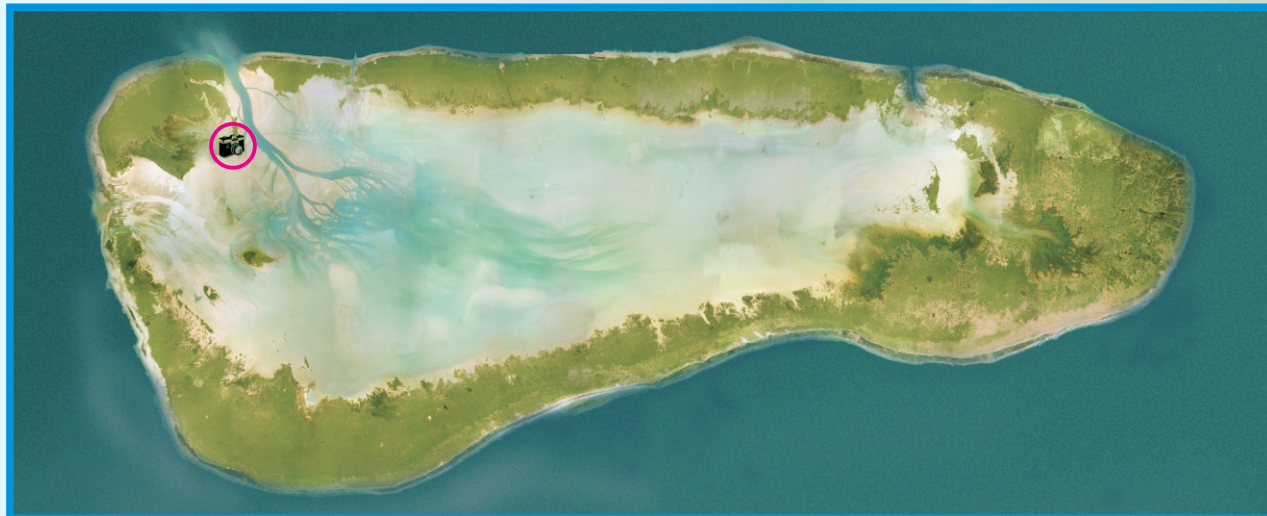


F	R	T	S	L		N	S	I	N	F	S		T	H	J	F	S		N	X	Q	F	S	I	X		
F	Q	I	F	G	W	F		F	Q	T	S	J		M	F	X		F		Q	F	W	L	J	Q	D	
N	S	Y	F	H	Y		J	H	T	X	D	X	Y	J	R												

Write the appropriate letter in the box beneath each code letter and read the sentence.

Aldabra Atoll is one of the Republic of Seychelles' most remote and southerly islands.

- Fill in the space in each sentence (a - e, below) with one of the following numbers (use books and maps to help you). *Note that these numbers are approximate only:*
153 345 420 640 1100
 a. Aldabra is _____ km North West of Madagascar
 b. Aldabra is _____ km East of Tanzania
 c. Aldabra is _____ km South West of Mahé
 d. Aldabra has a total land area of _____ km²
 e. Aldabra has a total area of _____ km² (including mangrove, lagoon and channels)
- Which large island of the granitic Seychelles would fit into the lagoon of Aldabra because it is about the same size (area)? _____ (there are two main steps to this calculation: What do you need to do first? Next, what do you need to do? I hope you get the right answer!)
- The total natural land area of all the Seychelles islands together is 455 km². What proportion (or %) of Seychelles natural land area does Aldabra represent? _____



Aldabra's sweeping tides

Why 'sweeping' tides? Look at the map of Aldabra and see where the four channels are, between the four islands forming the rim of the atoll. The darker blue line shows you where the water is deeper. This is the channel known as Grande Passe.

Remember that at each turn of the tide, the water of the whole lagoon has to pass in and out of the atoll. A huge volume of water travels through the relatively narrow channels. The speed of the water is very fast, so everything gets carried along at a tremendous pace; there is no need to swim! Fish, turtles, jellyfish, seaweed, boats, divers..... Which is why it is very dangerous to swim in the current!

At Aldabra, many activities depend on the tides and winds. For example, landing supplies or people at the Research Station is only easy at high tide. Crossing the lagoon is only possible at the highest tides, on a few days near full moon and new moon. Travelling around the outside of the atoll is not possible in small boats when the winds are strong, especially when the South East wind blows.

Many people who have worked at Aldabra tell stories of getting stuck in the lagoon at low tide!

1. Aldabra is a wonderful site for scientific research that helps us to understand how animals and plants live in their natural environment without human disturbance.	9. The tourists who come to see Vallée de Mai and the Coco de Mer bring us good business on Praslin. They stay in our hotels, hire our taxis and cars, buy our crafts, bring foreign exchange, and so on.
2. How does Aldabra contribute to our economy? We get nothing from it! It just costs us money.	10. In the Visitors' Book at Vallée de Mai, no-one complains about the entrance fee. Almost all comments are full of praise and wonder.
3. The entry fee for Vallée de Mai is too high and yet we Praslinois get no benefits at all.	11. We can develop the other outer islands but keep Aldabra as the 'jewel' in our environmental crown.
4. I am very proud that my small country has two World Heritage Sites.	12. I think Vallée de Mai is being spoiled by having too many visitors.
5. Now that the number of sea turtles is increasing in Seychelles, we should be allowed to catch them again.	13. If we do not use the Vallée de Mai site to earn money to help manage Aldabra, where will the money come from - our taxes?
6. Aldabra costs more than SR 6 million per year to manage, so the UNESCO World Heritage people should give us money to care for it.	14. We don't get anything from the outer islands now and we don't even get to visit them. What a waste of good land.
7. If we don't catch the fish around Aldabra, people will come from the Comoros and Madagascar and steal our fish from us!	15. I had a wonderful time at Vallée de Mai. Even if I cannot visit Aldabra, I am happy that my entrance fee helps to preserve the atoll.
8. Aldabra is a breeding site and nursery for valuable marine fishes, which then move out into the Indian Ocean where we can fish.	16. The new Visitor's Centre at Vallée de Mai gives our Wildlife Club lots of opportunities to learn about both Vallée de Mai and Aldabra.

I have an opinion too! Our atoll is for us, the native animals and plants that live there. We have a right to live at Aldabra undisturbed.



Aldabra has always been seen as a 'living laboratory'. What is meant by this?

As climate change begins to impact our tiny nation, we know that we will have to adapt to the changes. It is important that Aldabra remains as a 'living laboratory' in which we can study the effects of climate change on a remote atoll, unaffected by any other negative human activities.

SIF is happy if all Seychellois contribute to the protection of Aldabra, in any way possible, including reading and enjoying the activities in this book, and including having a dream about one day visiting Aldabra. SIF will be even happier if you, the next generation can continue to care for and protect Aldabra and Vallée de Mai, especially if you will consider working at either of these special sites.

How do you measure the value of the environment?

Measuring the value of the environment is very difficult. It is a bit like trying to measure the value of your family or your best friend. Is it possible to value such things? Do we think of the word 'value' as meaning only money: Seychelles Rupees, Dollars, Pounds, Yen....? Many plants and animals do not have a money value as they are not crops or food; they are not bought and sold. Scientists and economists have tried to give money values to the environment, e.g. calculating how much a forest is worth or how much a wetland is worth. It is difficult because many of the benefits of the environment are 'hidden'. For example, how do you calculate the value of insects that pollinate our crops? What about the huge numbers of bacteria and other soil organisms that decompose wastes and turn them into nutrients that plants use to grow? How do you give a money value to nature's wonderful recyclers? Why is it even necessary to give them an economic value? Perhaps we should be valuing nature in other ways - the ways of poets and writers, of artists and scientists, philosophers and musicians. **What do YOU think?**

How are our two World Heritage Sites linked?

As you know, Seychelles has two UNESCO World Heritage Sites. Aldabra Atoll was declared a World Heritage Site in 1982 and Vallée de Mai in 1983. Aldabra has a total area of 345 **square kilometres**, while Vallée de Mai has an area of only 19.5 **hectares**.

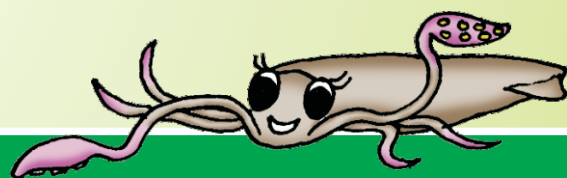
Seychelles Islands Foundation (SIF) manages both of these protected sites. Vallée de Mai receives many visitors who pay to visit the site (Seychelles residents get in free!). A study in 2008 found that 24% of visitors to Vallée de Mai came because it is a World Heritage Site and 40% came to see Coco de Mer. Some of the money raised from entry fees is used for work at Vallée de Mai itself. But the rest of the money is used to conserve and manage Aldabra. Sometimes Vallée de Mai is called SIF's 'honey pot'. **Can you guess why?**



Amazing fact
Aldabra atoll has an area about 1,770 times the area of Vallée de Mai!

ACTIVITY: Opinions

1. On the opposite page are the opinions of different kinds of people. Read each of the 16 opinions. What kind of person do you think might have each of the opinions? (e.g. a fisherman, visitor, child, scientist, businessman). Are the opinions positive or negative?
2. Read Opinion No. 2. What would the opposite or contrasting opinion be? One opposite opinion could be "How does Aldabra contribute to our economy? We get many benefits from it as a country, even though we have to spend money to conserve it." This is not the only possible answer of course. You could use different words. Choose four of the other opinions in the table and turn these opinions around so that they have a contrasting meaning or give the opposite view.
3. A) Who is paying most towards managing Aldabra, is it Seychellois or is it visitors to our islands? B) Who benefits from having foreign visitors in Seychelles? C) Why is it difficult for people to get to Aldabra?



Different perspectives

The photo of Aldabra on the opposite page is taken from an aeroplane using a special kind of camera. Look at the width of the channel called Grande Passe on this map.

Then look at the photo of Grande Passe on the right. This photo was taken from a Flying Inflatable Boat (FIB) which was flying low over the lagoon. The pink circle on the map shows the approximate position of the FIB when the photo was taken. You can again see the deeper water as a darker blue.

Does this help you to realise how large Aldabra is?



Sand dunes - an interesting feature of Aldabra

Sand dunes occur behind the beaches of the South coast of Aldabra. For example, Dune Jean Louis is about 13 m high, whereas most of the atoll is around 3 metres high.

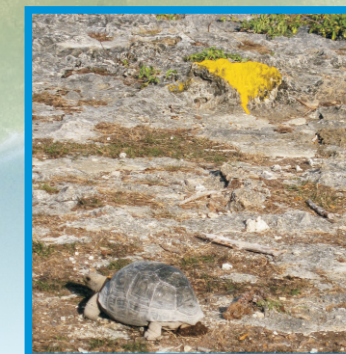
What causes the sand to build up into such a huge pile?

Why don't we have such dunes in the granitic islands?
Can you think of any possible reasons?



Which statements describe Mahé and which describe Aldabra?

1. There are mountains and hills.
2. There are no mountains or hills.
3. The dry season is May to November.
4. The dry season is June to September.
5. The temperature ranges between about 23 and 32 degrees centigrade.
6. The temperature ranges between about 18 and 35 degrees centigrade.
7. Average yearly rainfall is 1,000 mm.
8. Average yearly rainfall is 2,300 mm.



It is easy to get lost on Aldabra, so wooden posts and yellow paint marks on the rocks guide rangers and scientists.... And maybe the animals use them too..?!



This song about Aldabra was written by Patrick Victor, the well-known Seychellois singer and song writer.

Patrick was inspired to write this song when he was looking at the photos of Aldabra in a book by Claude Pavard, called "Seychelles - d'îles en îles".

At the time, he had never visited Aldabra. Some twenty five years later, in 2007, when Seychelles Islands Foundation celebrated the 25th anniversary of the declaration of Aldabra as a UNESCO World Heritage Site, Patrick was invited to be present at the celebration on the atoll. In the photograph below you can see him singing while he was at Aldabra.



Refren

O Aldabra, moniman pour limanite
O Aldabra, prezerve a zanmen
Pour leternite

Maren pa apros ou si fasilman
Syantis i dir ou en dokiman
Natir i beni ou atraver laz
Ozordi nou tour pour protez ou zimaz

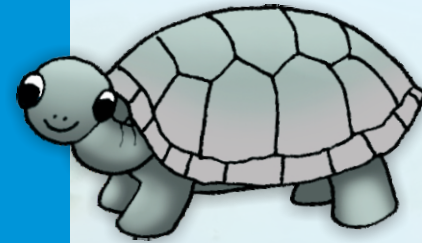
Tou sa milye torti ki'n fer zot rwayonm
Pwason ki sant dan pli gran lagon dimonn
Fregat, egret, ral, pizon ble, fou
Zwazo rar pli presye ki en bizou

Ou'n bliye dan bote sovaz
Dan ou vant en zarden sanpinyon koray
Rwayonm trankilite domenn lape
Natir renny an plenn liberte

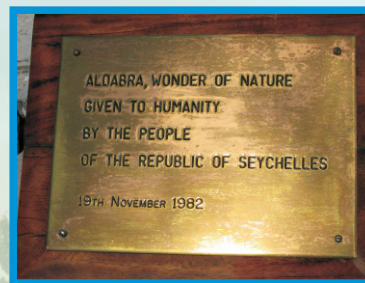
Dan Losean Endyen kot ou plase
Lorizon Nor Lazi, Lafrik lot kote
Ou delo menn Arab in goute par rafal
Ozordi lemonn pe travers ou kannal

Ou temwen lorizin kiltir oubliye
I'n annan lalit ki ou ganny prezerve
Mon dedye sa lim pour ou o non tou seselwa
Byennere selwi ki krwar ou dan ou laglwar.

Par Patrick Victor



The two plaques commemorating the declaration of Aldabra as a UNESCO World Heritage Site.



Continued from previous page: There is also a SCIENTIFIC PROJECT COMMITTEE, made up of people with different scientific and conservation backgrounds. They are responsible for reviewing all scientific research and monitoring programmes. The members also give advice on science and conservation activities at Vallée de Mai and Aldabra Atoll.

The Aldabra Research Station is managed by the ISLAND MANAGER and a Research Officer. They are assisted by other staff such as rangers, boatmen and cook/housekeeper. Volunteers, who are interested in conservation, sometimes spend short periods of time on the atoll, where they assist the research staff.

ACTIVITY 2: Who first decides?

Fill in the table below. For each question, put a tick in the column which represents the **first** person or group who will make a decision:

Column A = Board of Trustees; Column B = Island Manager; Column C = CEO of SIF; Column D = Science Project Committee

	Question	A	B	C	D
1	A group of International scientists wants to carry out a research project on the atoll. Who will look at their project proposal?				
2	One of the rangers' Field Camp huts needs repair. Who does the ranger talk to?				
3	Three pirates land on the atoll, unarmed. Who does the ranger first contact?				
4	A ranger is badly hurt and needs to go to Mahé for medical assistance. Who organizes the transportation from Assumption to Mahé for the injured staff?				
5	Two boatmen have applied for a job as skipper on the atoll. Who interviews them and gives the final approval?				
6	A local organization is organizing a lottery to raise funds for a charity project. They want SIF to sponsor a trip to Aldabra as the star prize. Who decides whether this will be possible?				
7	One of the rangers feels that there are some items missing in the Research Station shop, which she would like to have. Who does she talk to first?				
8	An international television station wants to make a documentary on Aldabra. Who approves its request?				
9	An international funder wants to donate a large sum of money to carry out work on the atoll. Who agrees how it will be spent?				
10	A returning graduate seeks employment on the atoll. Who does he write to?				
11	One of the rangers wants to carry out a small research project and the Research Officer agrees. Who recommends if the project can go ahead?				

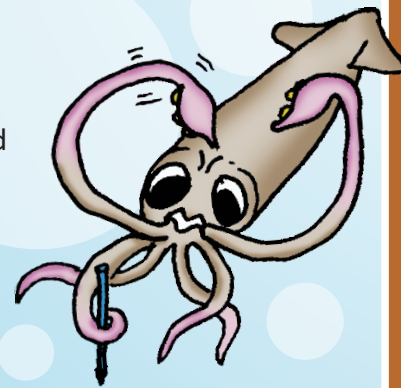
R	E	A	W	A	R	E	N	E	S	S	M
E	R	O	T	I	N	O	M	L	E	P	A
H	G	N	I	S	I	A	R	D	N	U	F
C	U	E	E	N	S	E	M	A	S	B	E
R	N	V	D	C	R	A	T	W	I	L	V
A	A	R	U	O	N	C	V	E	T	I	R
E	L	E	T	A	E	E	T	E	I	C	E
S	P	S	G	T	F	A	I	R	S	A	S
E	E	E	O	Y	C	G	T	C	E	T	N
R	D	R	A	U	G	E	F	A	S	I	O
O	P	P	D	S	T	U	D	Y	D	O	C
M	S	E	V	R	E	S	E	R	Y	N	T

Between 1969 and 1979, Aldabra was managed by the Royal Society of London. Then in February 1979, Seychelles Islands Foundation (SIF) was established by presidential decree to manage Aldabra Atoll.

SIF formally took over the management of Aldabra In 1980. The purpose of the organisation is to manage and conserve the natural life of the atoll, and to initiate and carry out scientific research into this natural life. SIF also aims to restore the environment where necessary, and to educate the public. SIF's mandate was extended in 1983 to also manage Seychelles' second World Heritage Site, Vallée de Mai. Today, management and research projects at Aldabra depend heavily on the money which is raised from Vallée de Mai.

SIF has a BOARD OF TRUSTEES. Members of this Board meet monthly to decide on policy matters associated with the management of the two World Heritage Sites. Decisions made at the meetings are carried out by the CHIEF EXECUTIVE OFFICER (CEO) of SIF and a small group of support staff on Mahé, where the organisation's headquarters is based. When necessary, the CEO then gives directions to the Managers of the two World Heritage Sites. *(Continued on the next page)*

- Awareness
- Conserve
- Data
- Educate
- Fundraising
- Manage
- Monitor
- Plan
- Preserve
- Protect
- Publication
- Research
- Reserve
- Restore
- Safeguard
- Save
- Science
- Sensitise
- Study



ACTIVITY 1: Word Search

Search for these 19 words which are associated with policies or duties of Seychelles Islands Foundation in its management of Aldabra Atoll as a World Heritage Site.

Then choose one of the following exercises to do:

1. Write the 19 words, saying which are nouns and which are verbs. Note that some words can be both a noun and a verb!
2. Write the meaning of each of the 19 words as it relates to the management of Aldabra. Some of the words are quite similar in meaning. Use a dictionary to help.
3. Choose any 10 of the 19 words. Write a sentence for each word, describing an action that SIF might carry out with respect to that word. E.g. "Researchers collect scientific data that help SIF to understand Aldabra's ecosystem."

1. « Aldabra, moniman pour limanite »
Dan sa lekspresyon, ki ou konpran par moniman pour limanite ?
2. Donn en lot mo « pour leternite ».
3. Akoz ki maren pa apros Aldabra fasilman ?
4. Ki ou konpran par sa fraz' « Syantis i dir Aldabra i en dokimen » ?
 - a. Dan ki sans ki Aldabra i en dokiman ?
 - b. Donn 3 lekzanmp ki montre ki Aldabra i vreman en dokiman.
5. « Natir i beni ou atraver laz ». Ki mannyer Aldabra i ganny beni par lanatir ?
6. « Atraver laz ». Donn en lot lekspresyon.
7. « Ozordi nou tour pour protez ou zimaz ». Ki i ou lopinyon lo sa fras e aköz.
8. Ordinerman lekel ki abit dan en rwayonm. Dan sa sanson lekel ki abit rwayonm Aldabra ?
9. Ki loter i oule dir par « ou'n bliye dan bote sovaz » ?
10. « Dan ou vant en zarden sanpinyon koray ». Loter pe fer referans avek kwa ?



1. TREBILE
2. KRETINALIT
3. AAKLNN
4. WALLGRA
5. SALONE
6. EEEPRRVZ

a. Desifre sa sis mo; tou sa bann mo i ganny trouve dan kouple 3 a 5 sa sanson.
b. Servi sak sa sis mo dan en nouvo fraz.



Aldabra

The name 'Aldabra' possibly comes from the Arabic word "Ah-khadra" or "Al-khadra" meaning 'The Green'. Perhaps this was because the large atoll looked green to Arab sailors passing close by. But it might be called 'The Green' because the huge lagoon is sometimes reflected onto clouds floating above the atoll, making them appear green at the base. This phenomenon can be seen from a boat passing far from Aldabra.

Another possible origin of the name 'Aldabra' is "Al-daharan" or "Al-dabaran", the Arabic name for the brightest star in the constellation Taurus, which the Arabs used for navigation.

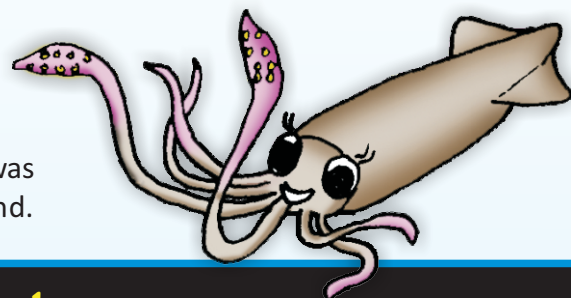
It is easy to see how either of these two names could have become altered by Europeans to "Aldabra".



The main atoll islands

We also know how the four main islands that make up the rim of Aldabra Atoll were named:

- Grande Terre** is by far the largest island of the four islands, so it is easy to see how it got its name;
- Malabar** was named after a ship called Le Malabar;
- Picard** was named after the commander of a ship;
- Polymnie** was named after the daughter of a captain who settled in Île de France (Réunion). His daughter was named after a Greek goddess. Perhaps the captain was thinking about his daughter when he named the island.



Did you know?

When the British made Aldabra part of the British Indian Ocean Territory, they called the islands **South Island**, **Middle Island** and **West Island**, but they kept the name **Polymnie**. They also changed the names of the sea passes. For example, Passe Femme became **West Channel** and Passe Gionnet became **Johnny Channel**. But aren't the French names much more fascinating?

Activity 1

Find a map of Aldabra with place names on it, for example in a book. See if you can locate all the places named above. Write as many of these names as possible on the map on the next page. Add more place names if you can, e.g. Settlement Beach, Cinq Cases, Dune Jean-Louis.

Action	Possible effect or consequence
1. A fisherman on a large fishing boat finds some of his nets are tangled, so he cuts them loose and leaves them in the sea.	A. An outbreak of Spiralling Whitefly affects an area around the Research Station and spreads all over the atoll.
2. A visiting scientist notices that the rainwater collection tank at the Cinq Cases field camp is leaking. On returning to the Research Station he forgets to tell the Island Manager.	B. A turtle successfully laid a batch of eggs at an Aldabra beach. When rangers checked her tag number, they found it was SCQ0124.
3. A small yacht suffers an engine breakdown close to Aldabra. The Aldabra Engineer helps to fix it so that the crew can go on their way.	C. Several frigate birds notice some empty nests in the colony, so they quickly fly in and steal nesting material from the abandoned nests.
4. Fresh fruits are bought on Mahé to take to Aldabra, where they are unloaded without inspection.	D. A severe drought occurs on Aldabra during the dry season but there is enough freshwater for everyone to use for drinking and cooking.
5. A boatman carefully poles a small boat through the frigate colony so that tourists can photograph the birds. Then he starts the boat engine suddenly and scares the frigate birds off their nests.	E. A large piece of fishing net is washed up on an Aldabra beach. Rangers find many dead fish, two dead turtles and a dead dolphin tangled in the net.
6. Rangers rescue a female turtle stranded on Aldabra beach rock. They tag her with tag number SCQ0124.	F. SIF has enough money to invest in setting up a renewable energy scheme on Aldabra. No more heavy fuel has to be imported for the generators.
7. The Island Manager informs all staff and visitors to the atoll that they must be careful with their use of fresh water. He also fixes one of the large water collecting tanks before the rainy season.	G. A group of scientists visit Cinq Cases field camp to do two weeks of research work. The rainwater tank was supposed to be 3/4 full but they find it is almost empty, so they can only stay for three days and cannot complete their work.
8. A cruise ship anchors off Dune Jean-Louis and allows tourists and ship staff to explore Grande Terre even though this is against regulations.	H. A yacht owner sends a computer to SIF for use at the Aldabra Research Station, and also sends some videos and DVDs for the staff.
9. Vallée de Mai receives 10,000 visitors, so that Seychelles Islands Foundation earns plenty of money.	I. A sudden storm at Aldabra damages one of the boats but fortunately all the passengers are wearing life jackets and the boat manages to return to Aldabra safely.
10. The Aldabra Head Boatman checks his boat before setting out, to ensure that all the safety equipment is in good condition.	J. An investigation reveals that the staff of a cruise ship have been selling baby giant tortoises from Aldabra on 'e-bay'.

Why are there regulations at Aldabra?

Aldabra is a Special Reserve and a World Heritage Site. The role of Seychelles Islands Foundation (SIF) is to MANAGE the atoll of Aldabra. SIF is therefore responsible for providing accommodation, food, health and safety for the few people who work there. But SIF is also responsible for all the plant and animal life there, and for the land itself and the surrounding sea. **If everyone was allowed to do what they like at Aldabra, do you think it would still be a World Heritage Site?**



SIF knows that if the natural life of the atoll is to be preserved, then some rules are necessary.
Here are just two examples. I am sure you can think of more!

1. Aldabra is a protected area, so it is a place where marine animals can breed in safety. But what if fishermen come from Mahé, Comoros or Madagascar to take fish and other sea creatures from the sea around Aldabra? Will marine animals still be able to breed in safety there? The wide protected zone around the atoll helps to prevent this exploitation of marine life.

2. One of the tasks of SIF is to educate the public. SIF wants people to visit Aldabra, but visitors must not damage the environment during their visit. For example, what will happen if visitors pick plants, or take baby tortoises away, or get too close to birds and frighten them off their nests? One way to prevent this is to ensure that a ranger always accompanies visitors round the atoll. Another solution is to have some areas (zones) where visitors **can** go and other zones where they **cannot** go.

BUT Even when there are regulations, sometimes people do silly things without thinking of the consequences. On the other hand, there **are** people who **do** think before they act. These people can have a very positive effect. Try the following activity to see how this can work for Aldabra.

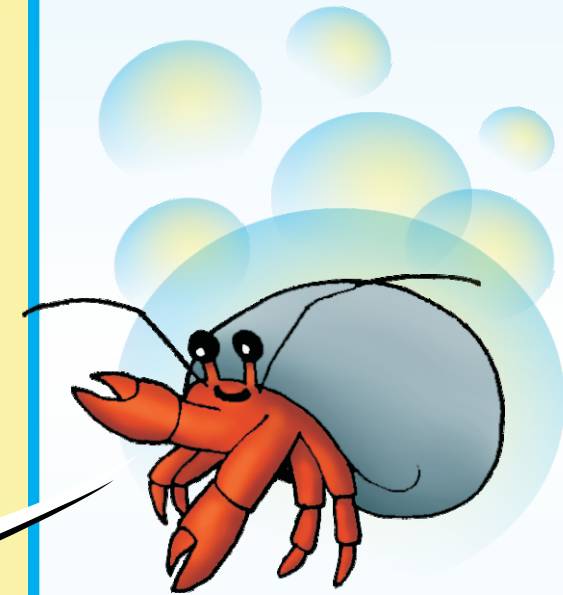
Activity: Is this a good or a bad action?

Look at the Table on the next page. Actions that can really happen on Aldabra are described in the boxes on the LEFT of the Table. On the RIGHT side of the Table are boxes which show the possible consequences of these actions.

1. Firstly, match up each action with its probable effect or consequence. To do this you may find it is easier to photocopy the Table and cut out the separate boxes, and then you can place them on a table and sort them out into pairs.
2. Next, decide whether each action is a **good** action (with a positive outcome) or a **poor** action (with a negative outcome).
3. Discuss in small groups why you have made these decisions - how does each action and its consequences affect Aldabra?
4. People sometimes think that regulations are created by decision-makers to make life more difficult for the rest of us! Discuss in your class why rules and regulations are sometimes necessary in society.



This is a map of Aldabra Atoll



Other place names - hey, this is interesting!

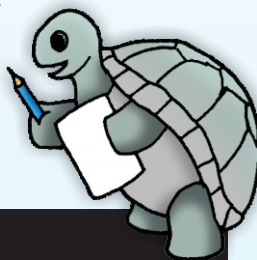
There are some very descriptive place names at Aldabra Atoll. For example, some names relate to plants and animals that are found in a place, such as Takamaka Grove, Bassin Flamants, Bassin Cabri, Camp Sousouri, Anse Cèdres, Îles Moustique.

Other places bear common Seychellois names. Examples are Passe Houareau (note the spelling), Île Michel, Point Hodoul, l'Îlot Emile and Bras Monsieur Clairmont. Some of these were definitely named after people who worked there, e.g. Clairmont Hoareau was a manager on the atoll and Monsieur Emile was probably another manager.

Some places have the most curious names! One wonders how these came about. For example, Coffee Camp, Trou Nenez, Champignon des Os, Îlots Salades, Pique Mazarin. **Use your imagination and try the following activity:**

Activity 2

Choose one of the curious names given in the last paragraph and write a creative story about how that place got its name.



Why does Aldabra have such prickly rocks?

Aldabra is made of a type of rock known as LIMESTONE, which formed from the remains of corals, sand, mud, and the shells and bones of animals that once lived in the sea. Limestone is a relatively soft rock, which is quite easily eroded by water, especially water that is very slightly acidic. Erosion produces the holes in the rocks you see in the photos. Not all the limestone is so prickly. On the next page you will find out why.

Try the following experiment, which will show in a few minutes what can happen to limestone over hundreds of thousands of years:

Activity - an experiment

1. Find a small piece of clean coral (a piece from the beach is fine if you wash and dry it first). Use a magnifying glass to look at it closely.
2. Prepare a test-tube containing a small amount of 2M or 4M Hydrochloric acid.
3. Slide the coral into the test-tube gently, so that the acid does not splash.
4. What happens? Leave the coral in the acid for about 30 minutes.
5. Pour away the acid, washing it down the sink with lots of water. Rinse the coral with water, dry it and tip it out of the test-tube.
6. Look at the coral again with a magnifying glass. What does it look like now? If you know what chemical reaction has taken place, write the formula.

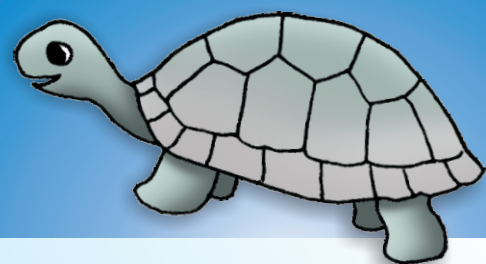


An animal? A monster? What can YOU see in this eroded limestone rock?

Is this what you imagine the surface of the moon must look like? If you look carefully at the photo below, you can see fossils. You can learn more about fossils on page 13.



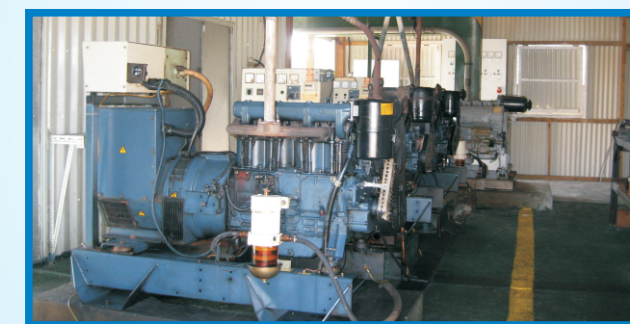
Sharp edges, and holes in the limestone make some parts of Aldabra dangerous for walking



Aldabra energy supply

People need electricity for lighting, cooking, computers, communications equipment, air conditioning in the library and main offices, water pumps, and for other machinery. It takes many barrels of fuel to run the generator to provide power for the Research Station! The supply of fuel must last for 3 or 4 months, until the next supply boat comes..... maybe even for 6 months if there are problems with boat schedules.

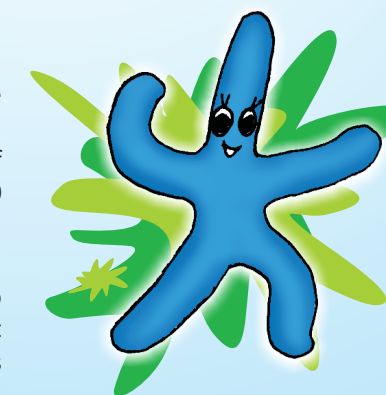
3. One barrel (like those shown in the photo below) holds 200 litres of fuel. The small generator uses about 200 litres in two days. **Calculate how many barrels of fuel are needed to run this generator for six months.**
4. The large generator has to be used when there is a need for greater power, such as when welding metal, and also when the small generator requires maintenance. The large generator is less efficient than the small one, so it uses more fuel. Remember that each barrel of fuel must be loaded onto the supply boat on Mahé and then be taken off the boat at Aldabra and rolled up the beach to the storage area! SIF is building 2 large storage tanks that will each hold 10,000 litres of fuel for the generator. Fuel will be pumped directly from the supply boat into the tanks. **Work out approximately how long this amount of fuel will last.**



And of course boats need fuel too

Boat engines use a different kind of fuel than the generators. Boat fuel barrels are shown in the photo on the right. Four-stroke boat engines are 50% more efficient than two-stroke engines. However, small boats with two-stroke engines are usually used to cross the lagoon for monitoring trips and to take visitors around. Their efficiency depends on the number of passengers and the speed of travel. SIF plans to build 2 storage tanks, each holding 5,000 litres, for boat fuel. So a lot of human energy (rolling barrels) will be saved!

5. Are there other alternatives? What do you think are the next steps that SIF can take to make the atoll more self-sufficient in power supply? Is renewable energy a possibility at Aldabra? **What are your suggestions? What factors must you keep in mind?** (e.g. costs and benefits, time scale)



Fuel tanks outside the boat shed at Aldabra

The Research Station in the 1970s and now

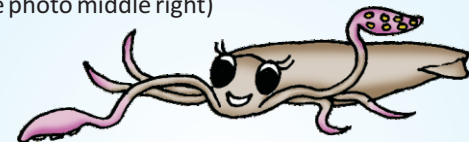
The Royal Society of London completed the building of the first Research Station at Aldabra in 1971. Twenty five years of constant use and the effects of Aldabra's coastal climate resulted in deterioration of many of the buildings. Consequently, much of the Station was rebuilt in the 1990s. **Why can buildings deteriorate so badly in a coastal climate?** (Think about the effects of rain and salty wind on different materials.)



Left: Part of the Research Station as seen from a boat in 1976

Right: A different view of the Research Station, seen from the Flying Inflatable Boat (FIB) in 2005

In **both** photos the arrow points to the water tower (shown also in the photo middle right)



How do people collect and store freshwater when there are no mountains, rivers and dams?



Water tank from the old days of settlement (above) - and two relatively new water tanks at the Research Station (below and at below right)

On Mahé life is easy. You simply open the water tap in your house to drink water, shower, wash dishes, do laundry, water plants and for flushing the toilet. But you have to pay for this water supply. On Aldabra life is different. The atoll receives only half the amount of rainfall you get on Mahé and there are no mountains or rivers. So freshwater on Aldabra is precious and limited. That is why Aldabra residents flush their toilets with salt water from the ocean. For drinking, showering and washing, rainwater is collected from the roofs and stored in huge water tanks. All the main buildings have rain gutters, including the field camps. And best of all, rainwater is for free! BUT people have to be very careful how much they use!



Try the following calculations:

1. **Water tank No. 4 is 11m long and 3.5m wide and 1.5m high. An old Settlement tank (No. 7) measures 11.5m x 6.5m x 1.4m.**

In each case calculate the volume of the tank. How much water does each tank hold: a) in m³ (cubic metres)?; b) in litres?

2. In one month the people on Aldabra use about 40 m³ of fresh water. How many m³ of fresh water do they need for 1 year?

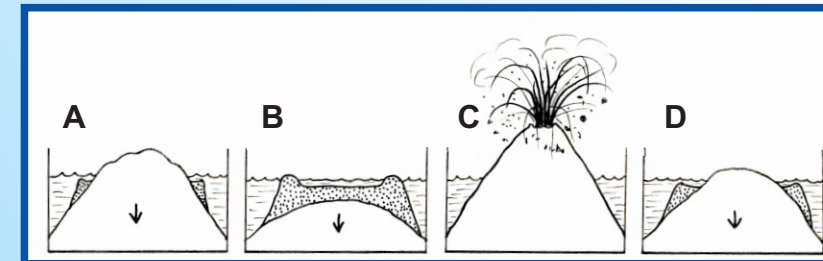


Water tower - 1 salt water tank,
1 fresh water tank



How did Aldabra form as an atoll?

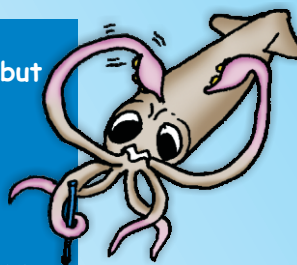
A GEOLOGIST is someone who studies the rocks that make up the Earth's outer crust. Geologists studied the rocks of Aldabra during the 1970s when there were many scientists at Aldabra. Since that time, geologists have been able to measure more accurately the age of rocks and the timing of geological events. It is now thought that the history of Aldabra as an atoll stretches back about 1 million years. This means that Aldabra is quite young! Remember that the granitic islands of Seychelles used to be part of a super-continent called Gondwana. The granite rocks of Gondwana are about 750 million years old! It is very difficult for a human mind to imagine this. For us even 100 years seems a long time! The geological events shown in the pictures below took place over thousands or hundreds-of-thousands of years.



The four pictures on the left represent the formation of a coral atoll, but they are in the **WRONG** ORDER!

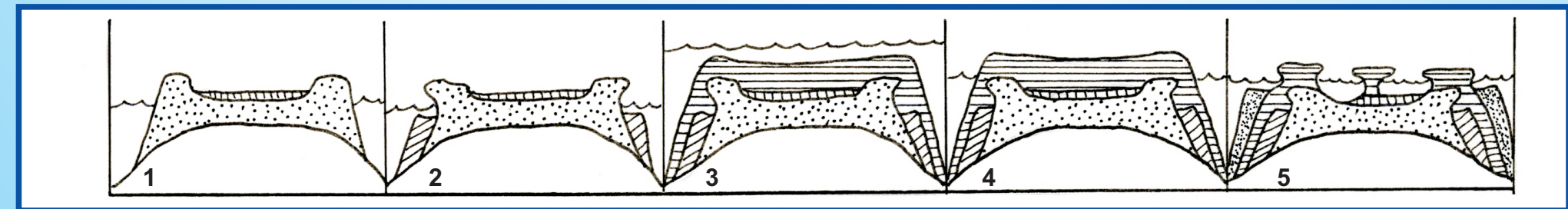
Can you put the four pictures into the right order?

1st =; 2nd =; 3rd =; 4th =



How did Aldabra then become a raised atoll?

The old volcano, on which Aldabra rests, lies deep beneath the Aldabra that we see today, perhaps about 500m below the atoll. On the top are several different layers of limestone, not just one, and all of them a bit different. How could this have happened? In the history of the Earth in the last million years, there have been several periods of GLACIATION. During these periods, large areas of the Earth were covered with ice, and the level of the ocean was lower than it is today, sometimes by as much as 100 metres. Aldabra was then a relatively high island! But when the ice melted, the ocean level rose again and covered Aldabra with sea once more. Thus, the reefs and limestone of Aldabra were formed at different times. The pictures below give you an idea of how this might have happened for one cycle of sea level fall, rise and fall.



1) Sea level falls. 2) New coral reef forms at the edges of the atoll. 3) Sea level slowly rises and as it does so, coral grows on top of the old atoll and lagoon area. 4) Sea level falls again, leaving Aldabra as a visible island, high above sea level. 5) Erosion of the limestone by sea and wind creates a raised atoll with undercut edges and islets in the lagoon.

The different types of limestone

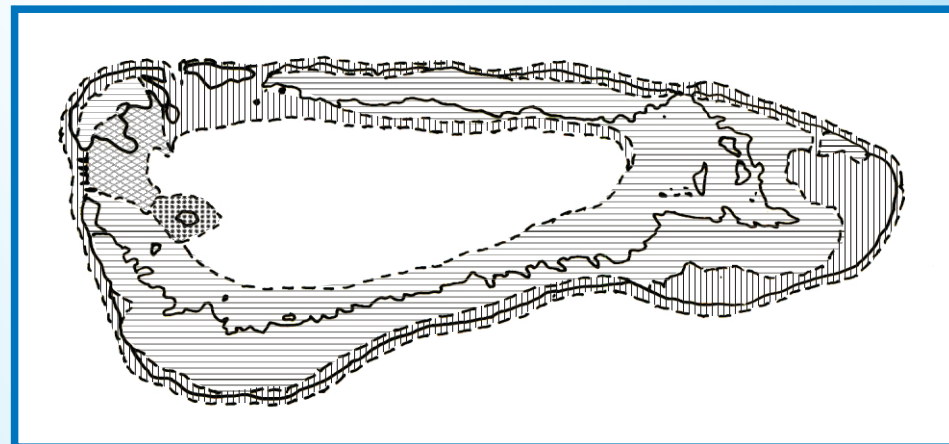
What you now see as Aldabra Atoll has a geological history of about one million years. In that time, Aldabra has been submerged beneath the ocean and then raised above sea level again about six times! How this happened is explained on page 11. As a result of its geological history, Aldabra is made up of different LAYERS of limestone. It is difficult to see the differences in the limestone of different ages but geologists can date the different types using special techniques.

Geologists recognise FOUR types of limestone at Aldabra. The oldest is **Esprit limestone**, which is found on the lagoon island of Esprit. The next oldest is **Picard Calcarenite**, then comes **Takamaka limestone**, and the youngest rock is **Aldabra limestone**. The limestone from these different ages can be of the rough **champignon type**, with many holes and with sharp jagged edges. Or it can be relatively smooth and flat, and is known as **platin** (see photos opposite).

ACTIVITY - Aldabra geology map

On the right is a map of Aldabra showing where the different types of limestone are found. Using the key, colour each type of limestone a different colour.

1. Which type of limestone makes up the greatest area of Aldabra?
2. Which type of limestone makes up the least area of Aldabra?



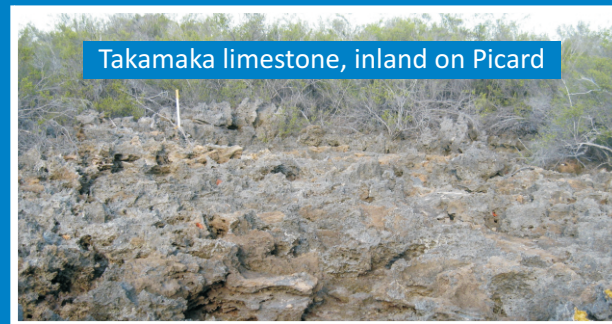
- Aldabra limestone
- Takamaka limestone
- Picard calcarenite
- Esprit limestone



Esprit limestone on Ile Esprit in the lagoon



Aldabra limestone on the Grande Terre coast



Takamaka limestone, inland on Picard

What is your feeling about working at Aldabra as a ranger?

- It is very hard at times. You have to love your work.
- The work is demanding but you do things because you want to.
- Being a ranger or a boatman is tough so you have to love what you are doing.
- I hope maybe I can influence others to change their thinking about the environment, especially younger people.
- It feels like it is 'in my blood'.
- I love the scenery and enjoy working with people.
- You get to love the place.
- It was always a dream to come to Aldabra.



What gave you a love for the environment?

- I was born on an outer island and lived on several of them, so nature was a playground for me and gave me the interest.
- I always had an interest in the sea and fishing but wanted to work for a more environmental purpose.
- I saw a sea turtle and it was special, and then I got to learn about them at school.
- I was influenced by my parents and teachers, and then I met people working in the environmental field.

ACTIVITY: Choose a ranger for Aldabra

You are the Chief Executive Officer of SIF and you need to employ two new rangers to work at Aldabra. Read through the list of features and abilities in the table below. Put a circle around the 5 most important characteristics you would look for in the applicants for the ranger posts. Be prepared to explain your choices.

	Tall	Male	Strong hands	Computer literate
	Married with family	Previous ranger experience	Swims and/or dives	School leaver's certificate
	Sociable	Independent	A leader	Single person
	Education up to A-level	Talkative	Slim	Female
	Has strong opinions	Fit	Good team worker	Kind



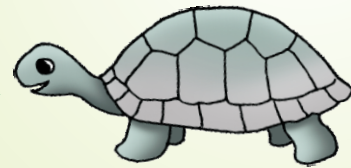
As you can read in the previous four pages, there is a lot for rangers to do while they work on Aldabra. The work can be tough, with lots of walking over rough ground. Sometimes you have to carry heavy loads of equipment and food when visiting the Field Camps. If you look at the map on page 48, you can see that there is often some distance to walk between the boat landing place (at the lagoon edge) and the Field Camp. Rangers get up early and try to work in the cooler parts of the day, taking a break in the hot midday sun (like the Giant Tortoises!). But sometimes it is necessary to work throughout the day in order to get all the work completed before the tide changes. If you miss the tide, you may have to wait until the next high tide or push the boat through the mud to get to where there is enough water for it to float. Rangers also have to be able to record measurements accurately and enter their results into computer databases. Usually they are encouraged to take up a small research project of their own.



The field hut (camp) at Dune d'Messe

There are many good things about living at Aldabra too. Rangers often like the challenges. They learn much about the plants and animals. They often learn new skills, especially when working with visiting research scientists. Of course they may miss their family but SIF tries to let them come back to Mahé every six months or so. SIF provides books, games and cable TV and there are sometimes social events. All the staff love it when the Eco-school winners get to visit Aldabra!

Read in the boxes what different rangers say about their work



What were your reasons for coming to work at Aldabra?

- Enthusiasm for the environment and for plants. I had worked as ranger before.
- It was a chance to work in the field.
- A chance to have a more practical impact and to get away from Mahé.

What sort of work did you do before coming to Aldabra?

- I started as a nurse, then the police and then a ranger on Cousin.
- I worked as a chambermaid at Aldabra, then I got a chance to train as a ranger.
- After maritime school, I came as a volunteer to Aldabra for 4 months and then returned to work as a ranger.



Walking from the boat in the lagoon to the field camp on land, with all the food and equipment



On the left, the lagoon islets are shaped like mushrooms. They gave their name to **champignon** rock. The lower parts have been eroded by the sea.

On the right is limestone that is relatively smooth and flat. It is known as **platin** and was formed mainly from sand, not coral.



Fossils at Aldabra

Have you ever seen a FOSSIL? Perhaps you have, if you have visited the Natural History Museum in Victoria. Fossils aren't found in the granite of the high islands of Seychelles because the rock was formed from molten material that came from inside the Earth. There was unlikely to have been any life in the molten rock 750 million years ago. But Aldabra is made of coral reefs and sand that have turned into rock over thousands of years. In the limestone can be found creatures that lived thousands of years ago, but they have been changed to stone - corals and shells, and the bones of tortoises, crocodiles and birds that lived on the land when Aldabra emerged from the sea at different times in the distant past (see page 11). **IF YOU HAVEN'T VISITED THE NATURAL HISTORY MUSEUM, GO THERE TO LOOK AT THE FOSSILS!**



DID YOU KNOW?

You can find the remains of ancient coral reefs in a few places on Curieuse and La Digue. These remnants are stuck to granite boulders about 10 metres above sea level. Why do you think they are there?



The photos show a fossil clam and fossils corals - all part of an ancient coral reef that is now dry land in the middle of one of the islands of Aldabra!

C	R	I	S		E
B	A	O	E	G	L
A	R	T	E	R	T
T	O		T	U	R

I	B		L	I
S	I	A	I	Z
P	E	R		A
I	D	N	O	R
	O	G	R	D

A. Find the English names of FIVE different Aldabra animals in this grid.

Start at **C** in the top left corner. You can move from one letter to the next by going up, down, left or right, but not diagonally. The last letter of one animal name becomes the first letter of the next.

Write the names of the animals as you find them. (You should finish at **E** in the top right corner.)

- (Kreol =
- (Kreol =
- (Kreol =
- (Kreol =
- (Kreol =

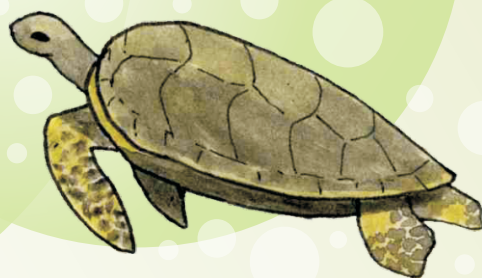
Find the Kreol names of these five animals and write them in the brackets.

B. Now try this second grid and find FIVE more animal names.

Start at the letter **I** in the top left corner. You should finish at the letter **O** on the bottom line. The names in the grid are again in English.

When you have finished, write the Kreol name for each animal.

- (Kreol =
- (Kreol =
- (Kreol =
- (Kreol =
- (Kreol =



What would YOU like to know more about?

Aldabra is a fascinating place and there is still much to learn about the atoll, its geological history, and about the animals and plants that live there. For example, we know very little about the biology and ecology of most of the invertebrates and many of the plants. We know even less about how everything is interlinked - the plants with the animals, the sea with the land, the lagoon with the outer sea, Aldabra with the rest of the Indian Ocean. So there are still many unanswered questions, large and small. If we are to conserve Aldabra in the best possible way, we need to understand better how everything interacts. We also need to know how best to keep a human presence on the atoll. Are there ways in which SIF can leave a smaller environmental footprint? **What are you interested in?**

ACTIVITY - your questions about Aldabra

- Get together in groups of between 4 and 6 people.
- Brain storm for about 10 to 15 minutes and think of some interesting questions that you have about **Aldabra**. Your question can be simple or complex. It can be as broad or as narrow as you like: e.g. questions about a particular species or about something as big as climate change; about interactions or human history; about physics, chemistry, engineering, economics, social values, conservation..... ANYTHING that you think is relevant to the study of Aldabra. As you brainstorm, write your ideas as very brief notes, or as a "spider diagram".
- Go through your list or spider diagram and spend some time discussing your ideas so that you can choose **5** ideas or questions that you would like to work on. Include one or two simple questions and perhaps one or two more complex questions.
- As a class, list all the questions from each group. From this list, together choose about 8 to 12 questions.

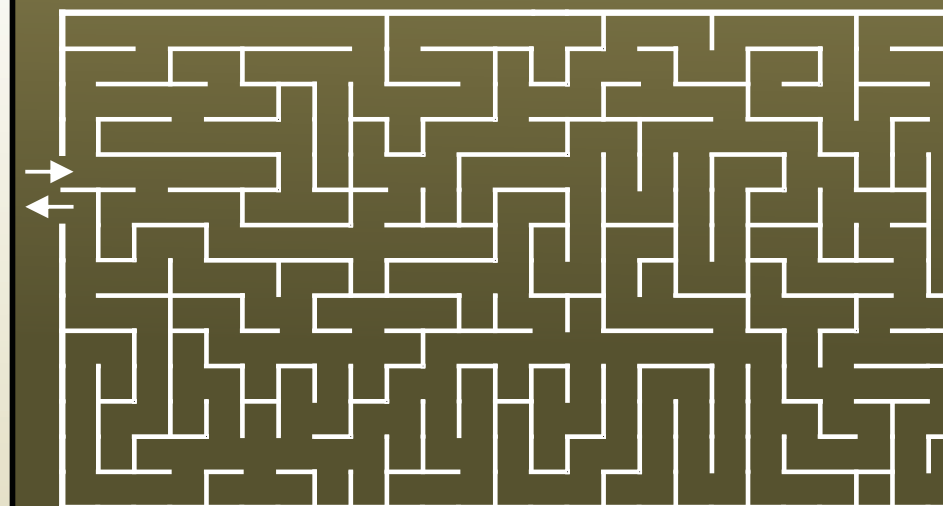
- Each person chooses 1 question to work on, perhaps as a homework exercise. You can either try to find out the answer (someone else may have already done some research on this question), or you can describe **how** you will go about your research in order to find an answer to your question. This can include field work at Aldabra!
- At the next class, each person gives a short presentation of their research. You can mark each others presentations.



Find your way through this maze, making a light pencil line as you find the correct path.

When you have finished, make the pencil line darker and thicker. You should find the outline of one of the famous animals of Aldabra.

Quite a lot of research has been done on this animal, but there are still questions, which the monitoring programme will help to answer. For example, what is happening to the population of this animal on the different islands of the atoll?



Another chance to be a research scientist

As mentioned on page 36, the turtle monitoring programme at Aldabra has been going on for about 40 years. There are about 50 beaches at Aldabra, and it is impossible to monitor each beach every day. So certain beaches have been chosen as INDEX BEACHES, which are used as an example or index of what happens to Green turtles at Aldabra over the years. The index beaches are monitored as regularly as possible, usually **four times per month**. At each monitoring, the number of **fresh** turtle tracks is counted on the index beaches. This represents the number of turtles that came onto the beaches in **one day**.

The table shows turtle track counts at the index beaches at Aldabra for each month in 1982 and each month in 2008.



Month	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1982	1	2	3	4	3	5	2	2	1	1	1	0
	2	1	5	2	3	4	2	2	3	2	0	2
	1	2	2	2	4	1	4	2	2	2	2	3
	2	3	2	4	2	2	2	2	2	1	1	1
Average daily count												
Month	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
2008	3	4	5	6	4	6	4	3	3	2	3	4
	5	8	10	11	8	5	8	4	6	5	2	2
	6	9	8	8	10	7	7	5	5	3	4	3
	2	3	5	5	6	8	5	4	2	2	1	3
Average daily count												

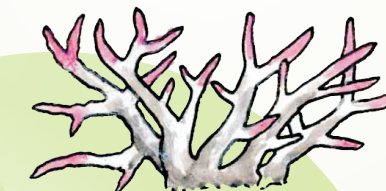
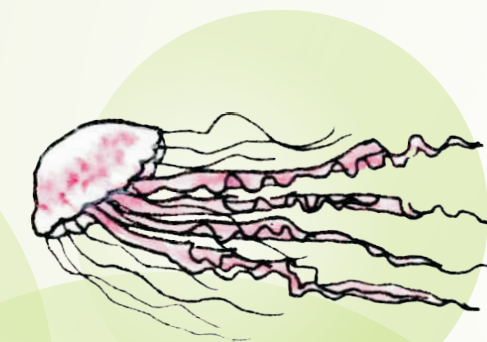


1. Calculate the average (median) number of daily track counts for each month of 1982 and for each month of 2008. Add these figures to the table.
2. Draw a graph, putting the twelve months of the year along the horizontal axis, and the average daily track counts along the vertical axis.
3. Fill in the data points for 1982 on the graph. Then draw a curve through the points to show how the daily track count varies over the year.
4. On the same graph, use a different colour or symbol to fill in the data points for 2008. Draw a second curve through these points.
5. Now try answering the following questions:
 - a) In which months do Green turtles come to the beaches at Aldabra to lay their eggs?
 - b) Do more turtles come to the beaches in some months? If so, which months are these?
 - c) Compare the number of turtles coming to the beaches in 1982 and in 2008. Can you explain what has happened and why?

C. Odd one out

Here are some sets of animals found at Aldabra:

1. Blue pigeon, Rail, Kestrel, Drongo, Grey heron
2. Snail, Bee, Fly, Beetle, Grasshopper
3. Sponge, Shrimp, Flat worm, Turtle, Octopus
4. Surgeon fish, Eel, Shark, Butterfly fish, Starfish
5. Ray, Parrot fish, Crab, Jellyfish, Whale



- a) The animals in **set 1** are all BIRDS. But one of them cannot fly. Which is it?
- b) All the animals in **set 2** are INVERTEBRATES but one does not belong to the same group as the others. Which is it?
What type of animal is it? Is it: a) an insect; b) a crustacean; c) a worm; d) a mollusc
- c) The animals in **set 3** are all found in the sea. They are all MARINE animals. But one belongs to a different major type or group of animals. Which is it?
Why is it different?
- d) The animals in **set 4** are also all MARINE animals, but one belongs to a different major group of animals. Which is it?
Why is it different?
- e) Which is the odd one out in **set 5**? (clue: this time think about the behaviour of each animal)
Why is it different from the others?
.....



Note: there are at least 2 different answers to question (e) !

Heating up and cooling down



Giant Tortoises spend a lot of time in the shade. This helps to keep their body temperature down in the very hot part of the day. Shade helps, but so does hanging their neck out (look at the tortoise at the right of the picture). This way the tortoise loses heat by radiation from the exposed neck skin.

Also, look carefully where the arrow points and you will see a small metal disc. It is made from Titanium and is stuck onto the back of the tortoise with special glue. The discs were put on many tortoises during the 1970s, when scientists were studying tortoise populations on the different islands of Aldabra. These numbered discs are still very useful to the SIF science staff at Aldabra when they are monitoring the tortoises on a regular basis.

What does a giant tortoise eat?

Tortoises can be quite choosy about what they eat! They like grazing grass and small plants. They also eat fallen leaves and fruits and they even eat dead animals.

One of their favourite foods is **Tortoise Turf**. This is the name given to a mixture of small herbs, grasses and sedges that grows in many of the flatter areas of Aldabra. The photo on the next page shows tortoises grazing Tortoise Turf at Cinq Cases. Some of the species that make up Tortoise Turf always grow as very tiny plants, even when there are no tortoises around to eat them. The flowers of these species are produced very close to the soil, and the seeds are probably spread by tortoises. These plants have evolved to survive grazing by Giant Tortoises at Aldabra.

Tortoise Turf in the wet season looks like a nicely mown lawn. In the dry season it becomes dry and brown, like in the photo below. Sometimes food becomes scarce in the dry season. Tortoises may eat Casuarina needles and the toughest sedges (e.g. the large tufted sedges in the photo below and on the next page). They can digest very little of this material, so cannot grow during the dry season.



Tortoises do not digest food very efficiently. You can easily see the leaves this tortoise has been eating, even when they have come out at the other end!

Data collection in the field

One of the most important activities at Aldabra is the **collection of scientific data**. Measurements and observations are recorded first on paper and then transferred to record cards and/or computer files. Accuracy is vital for good scientific work, so rangers have to be trained in the appropriate methods for each type of monitoring programme. Results can be analysed by scientists and SIF managers in order to know what is happening in the Aldabra environment. Digital photography is also an important way of providing evidence for the presence of certain species.



Measuring a young turtle in the lagoon



Rangers work in pairs to measure Giant tortoises and record the measurements

Monitoring of Sea turtles and Giant tortoises are two important Aldabra activities for Rangers. Both Green turtles and Hawksbill turtles are monitored. The information obtained helps us to understand how these animals live and reproduce, and which places they go to around the atoll.



Checking one of the island rain gauges



Measuring the length and weight of each fish which is caught for food (= subsistence fishing)



Checking weather measurements at the Research Station

Climate measurements are vital. We need to understand one of the major factors influencing life at Aldabra - the weather. Rainfall in particular, plays a large role in vegetation growth, and therefore also on animal life.

I am sure you know why animal life depends on plant life, don't you?



The automatic weather station at Aldabra

Now try the activities on page 50 and 51

What is it all about?

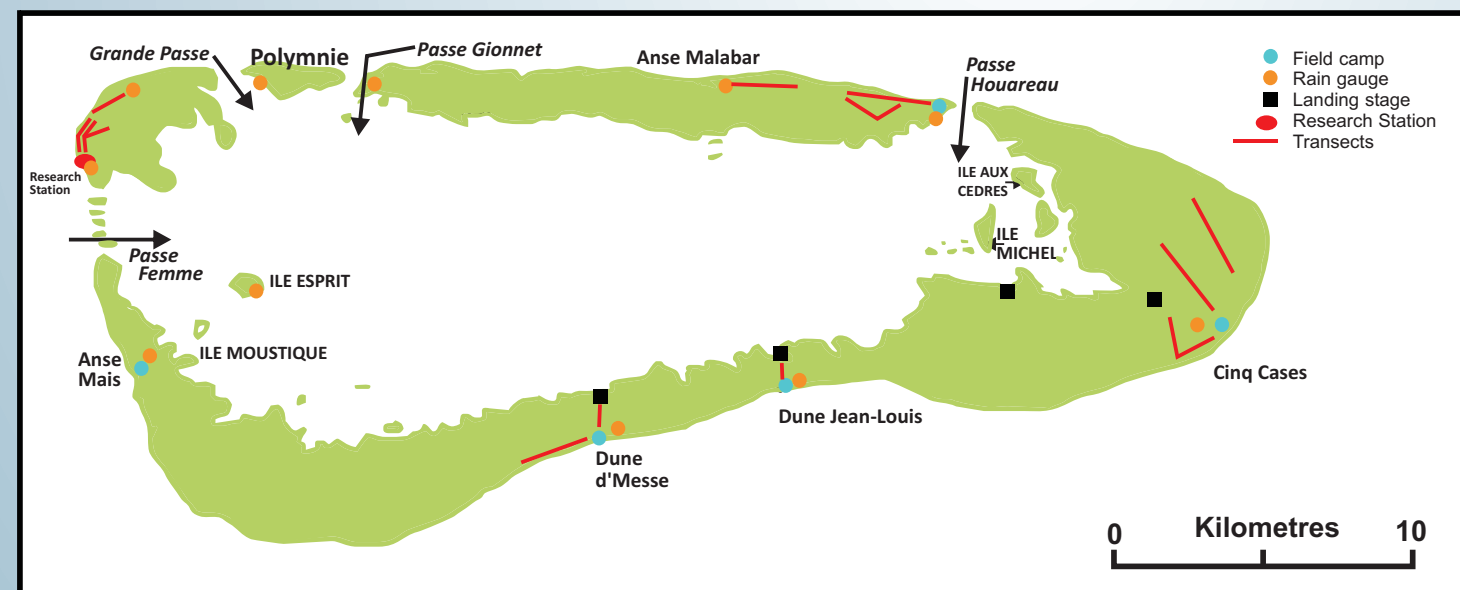
Seychelles Islands Foundation has a Research and Monitoring Policy for Aldabra: **“All research and monitoring should be related to conservation, restoration and maintenance of a healthy ecosystem.”**

The science programme at Aldabra is therefore focussed on finding out more about the populations of key species, such as the Giant Tortoise and Sea Turtles, which were exploited in the past. Questions are asked, such as “How fast are young animals growing?” “What is happening to the populations? Are they increasing or decreasing? What does this tell us?”

The monitoring programmes are designed to answer such questions. Some of the programmes have been going on for the past 40 years, therefore much can be learned. Some of the information is included in this book!

Other important species to monitor are shown in the list in the Box. But ecosystems change and other animals and plants may require monitoring for various reasons (see examples at the bottom of the Box).

Some of the important monitoring is done along special paths known as TRANSECTS. The main transects are shown in the **map below**, along with other information relevant to the science programme at Aldabra.



Some of the monitoring programmes at Aldabra

- Giant Tortoise transects - counting and measurements
- Sea Turtle track counts
- Sea Turtle tagging and measurements (nesting females and young animals)
- Land bird counts
- Wader counts
- Seabird monitoring
- Vegetation monitoring
- Subsistence fishing measurements
- Coconut crab counting and measurements
- Coral reef fish
- Rainfall measurements
- Other climate measurements
- Others, e.g. butterflies; White-throated rails; Coral reef recovery after the 1997/1998 coral bleaching event; Small projects of local staff, volunteers and visiting scientists.



ACTIVITY

Tortoise Money Box Puzzle - figure it out!

In the currency used on the atoll of Aldabra, 100 crabs (the symbol for which is c) are equal to one Rail (the symbol R), so that one Rail + 28 crabs is written as R1.28. Using the pieces of money scattered around the tortoise money box, fill the money box in such a way that each line of five squares (down, across and diagonal) contains a sum total of R1.63. Some coins have already been placed in their correct boxes - just to give you a start.



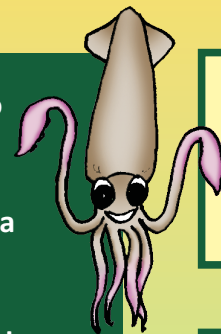
Tortoises feeding on Tortoise turf, with tufted sedges and scrub in the background. See previous page for explanation

ACTIVITY 1: Find the Kreol names of Aldabra birds in this Word Search

Search in this grid for the Kreol names of birds which are found at Aldabra. Names may be written horizontally, vertically or diagonally and in either direction. Put a line through a name when you find it in the grid and cross it off the list below.

F	A	B	N	A	L	U	O	M	K	E
F	R	O	L	N	A	M	N	A	Y	D
I	L	E	F	O	U	A	K	N	B	N
L	K	O	G	R	M	A	O	N	L	A
E	O	I	R	A	V	Y	S	I	T	L
R	R	I	L	A	T	O	Z	K	O	O
T	B	F	L	I	N	E	A	S	U	N
R	O	Y	M	M	D	T	M	R	L	O
U	E	O	E	B	I	E	E	E	O	Z
O	Y	Y	I	T	R	B	S	N	U	I
T	E	N	I	L	O	Z	A	W	Z	P

- Tyomityo
- Merl
- Toulouz
- Moulamba
- Korbo
- Sren
- *Fou / bet
- Pizon olande
- Zwazo linet
- *Tourtre / dezil
- Fregat
- Dyanman
- Flaman
- Floranten
- Kavalye
- Sonmey
- Mannik
- Katiti



On page 20 you will find an activity in which you can match the Kreol names of birds with their English names. And on page 21 are pictures of some of the birds.

Seabirds and Coastal birds

The term SEABIRD is used for birds that spend much of the time at sea. Seabirds have to come to land to breed, i.e. build a nest, lay eggs and raise chicks. WADER is a common name used for birds that live and feed in coastal areas, often along the shore line. Many of them are **MIGRANTS** which breed in the northern hemisphere during the summer months, when food is plentiful. Before winter arrives, they fly south (migrate) to places where food is still plentiful. Some of them fly thousands of kilometres. They look for places to rest and feed along the way. Aldabra is a very safe and wonderful place for them to stay for a while. Some young birds stay for a whole year.



* These names are split into two parts in the grid.

Did you find all the names in the grid? Next, write down all the letters that have not been used. You will find the names of two other birds that live on Aldabra:

(Sometimes the second bird is spelt with an R at the beginning of the word)

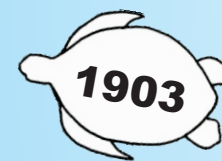
The Arabs know that Aldabra exists in the Indian Ocean

The Arabs travelled a lot so they could trade with many countries



Seychelles Islands Foundation is established to manage Aldabra

The Research Station built by the Royal Society (British) is officially opened



This is when humans realised that studying us is better than killing us!

Aldabra (called Alhadra) appears on a Portuguese map of Madagascar



Seychelles becomes an independent nation and Aldabra again becomes a part of Seychelles

I wonder why they called it Alhadra rather than a Portuguese name!

Aldabra becomes a UNESCO World Heritage Site

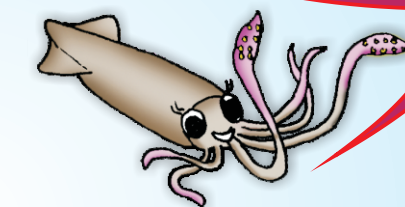
Hooray!

A gift from Seychelles to the whole world!



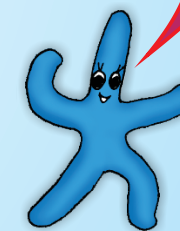
Plans for a military base on Aldabra are abandoned

Thank goodness! Giant tortoises do a lot more good on the atoll than hundreds of buildings and soldiers

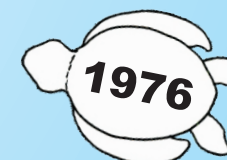
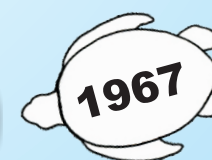
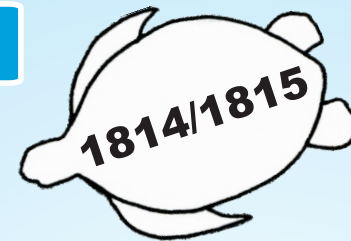


The first set of picture postcards of Aldabra appears, with black and white photos

They show what life was like on the atoll at the time



Aldabra, as part of the Seychelles, becomes a British Colony separate from Mauritius



On these two pages you can find the dates (as years) when something happened in the history of Aldabra. Each DATE (year) is in a TORTOISE or a TURTLE shape. Each special EVENT is in a coloured RECTANGLE. But they are all mixed up on the pages. Can you match the correct event with each date? (Hint: it may be easier to photocopy the pages, cut out each tortoise, turtle and rectangle and then sort them all out on a flat surface.)

Use your knowledge of Seychelles history! Use pictures and information in this book too. The comments and questions added by your Aldabra cartoon friends may help you too!

Aldabra becomes part of the British Indian Ocean Territory (BIOT), separate from most of the rest of Seychelles

Seychelles (including Aldabra) becomes a part of the British Colony of Mauritius

Aldabra becomes a Special Reserve under Seychelles law

Aldabra becomes a RAMSAR Site


First Eco-School prize winners went on a trip to Aldabra

Aldabra is leased for the first time, turtles are taken and the 1st Settlement is built


Lazare Picault (French) finds Aldabra and writes about the atoll

Leasing continues for many more years - and lots of other things are taken too!


2000



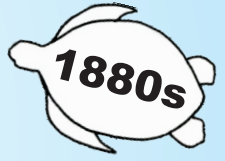
1742



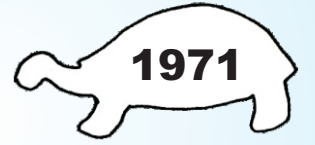
1965



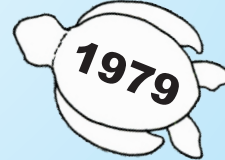
1880s




1971




1979




1907




2010



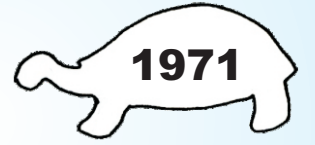
11th - 14th centuries



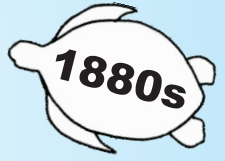
1965



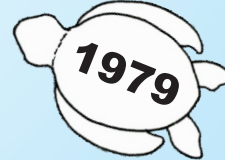
1971




1880s




1979




1907



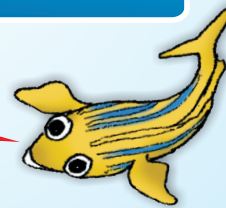
2010



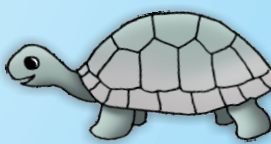
Now we can all become protected species!




That was FUN!




People recognise that the wetlands of Aldabra are very special



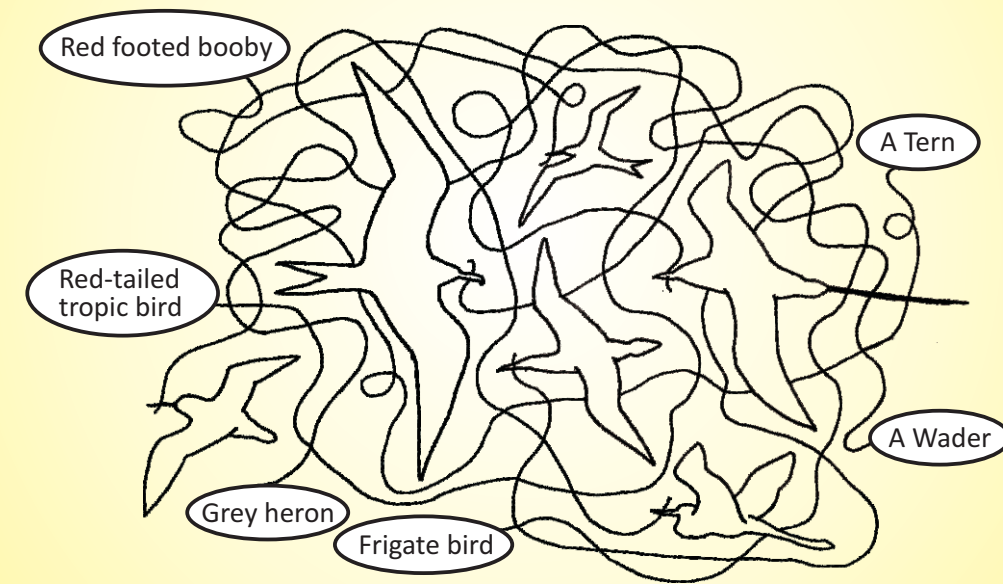
But he thinks he is on Farquhar!



Leasing continues for many more years - and lots of other things are taken too!



ACTIVITY 2: Each flying seabird or coastal bird is holding a string in its beak. Follow the string to find the name of the bird.



CRAB PLOVER (KAVALYE)

I nest in mangrove trees. My neighbours steal my nest materials if I don't keep a close watch! I look after my chicks well, feeding them for up to 18 months.

RAIL (TYOMITYO)

I live at Aldabra all the time. I make a cup-shaped nest lined with soft grass. I feed my chicks with insects.

FLAMINGO (FLAMAN)

My nest is a pillar of mud built in an inland water pool. It is rare for me to breed at Aldabra. My chicks are fed on a special milk I make myself!

ACTIVITY 3: The weirdest nest.... No nest at all.... Nest thieves.... Nests not where you might think.... 'Rat-free land only please'.... 'I never nest at Aldabra'....

Link the facts and information in each box with the correct Aldabra bird. Draw a line between the information box and the box with the name of the bird.

I make a domed nest. The entrance is a round hole in the side. This helps to keep my chicks safe from predators.

CRESTED TERN (DYANMAN SARDIN)

I am a bird with very long legs and a long neck so you might think that I should nest on the ground. But I actually build my nest in trees!

GREY HERON (FLORANTEN)

I don't make a nest. I lay my eggs on bare earth. Small islets at Aldabra are one place where rats will not get my eggs!

FRIGATE (FREGAT)

DRONGO (MOULANBA)

SUNBIRD (KOLIBRI)

I am a migrant wader. But I am different from most waders because I breed in Somalia and on islands in the Red Sea and Persian Gulf.

My nest is built in bushes near the ground. I can fight off any land crabs or black rats that try to get my eggs!

ACTIVITY 4:

Kreol and English - which names do you know best?

Can you match the Kreol name of each bird with its English Name?
Draw lines between each pair of names. If you do not know, try looking in a Seychelles bird book or ask older people.

*Tyomityo	Blue pigeon
Merl	Red-footed booby
*Kolibri	Pied crow
*Toulouz	Rail
*Korbo	Bulbul
Moulamba	White-eye
Kardinal / Sren	Sunbird
*Fou bet	Fody
*Katiti	Frigate bird
*Ribis	Tern
*Pizon olande	Coucal
*Zwazo linet	Drongo
*Tourtredezil	Nightjar
*Fregat	Kestrel
Dyanman	Flamingo
*Flaman	Ibis
*Floranten	Green-backed heron
*Kavalye	Turtle dove
*Sonmey	Grey heron
*Mannik	Crab plover



ACTIVITY 5: I live on Aldabra. Do I live on the granitic islands?

Look carefully at the pictures of these 16 birds, all of which are found at Aldabra. (You will find their Kreol names marked * on the previous list)

- Some Aldabra birds have a similar **name** to those found in the granitic islands (e.g. Kolibri / Sunbird) but they are **different species** (or types). **Put a circle (O)** in the small box on the photo of these birds. If you aren't sure, compare these photos of Aldabra birds with pictures of Mahé and Praslin birds in a book about Seychelles birds.
- Put a cross (X)** in the small box of each bird which is found at Aldabra but **not at all** in the granitic islands (one has been done for you).
- Some of the birds look exactly the same when they are seen at Aldabra **and** when they are seen at Mahé or Praslin, e.g. 'Floranten', 'Kavalye'. **Put a triangle (Δ)** in the small box of these birds. These are shore birds and they are able to fly long distances. The 'Kavalye' is a migratory bird (see page 18).
- 'Fregat' can also fly long distances. They breed in the mangrove trees which grow around the lagoon of Aldabra. The 'Fregat' we see around the granitic islands are usually young birds that do not have their adult plumage yet. Sometimes they come close to the high islands, especially when there is a storm around. **Why is that do you think?**



Aldabra staff first saw a Flamingo chick in a remote inland pool in 1995. This photo, from 2006, shows two brownish coloured young birds among the adults. We hope they continue to breed.

What was life like at Aldabra when its resources were still being exploited? Listen to what 'Mazaren' has to say:

Mazaren: "Mon ti travay avek Harry Savy an 1956, ziska ler SIF ti pran ladministrasyon zil. Mon'n travay avek bann angle ler zil ti ganny administre par 'Royal Society'. Dan letan Harry Savy mon ti ranmas birgo, fer salezon, lavyann kabri, bat mangliye, fer pwason sale e atrap torti pour anvoy Mahé. Nou lartik (lontan nou pa ti apel li kontra) ti pour en an. Mon ti ganny SR 15 par mwan. Nou ti ganny peye osi pour sak torti ki nou atrape. Apre ou lartik en an ler ou desann Mahé ou ti annan anviron SR 1,800."

"Ou ti ganny rasyon: mai, diri, lantiy, lafarin, disik. Ou ti manz manyer oule, si ou ti plante ou ti kapab rekolte ou legim. Magazen ti ouver dan sanmdi e la ou ti kapab aste savon, disik, diri, dile, labyer e menm diven. Pli gran dezavantaz ti delo bwar. Ti annan moman, ou ti al dan bato, naz zaviron ziska Takamaka (Grande Terre). Bann madanm ti anmenn zot lenz pour lave laba."

"En lot dezavantaz ler ti annan travay ki ou bezwen fer an group, pa tou dimoun ki ti met sa lenerzi, parey pour al plonze pour anmas birgo. Si ou ti konn travay out ti kapab anmas ziska 3 tonn par zour! Pandan letan Harry Savy, ti annan anviron 100 dimoun ki ti travay Aldabra. Mon ti ansarz en group 10-12 dimoun. De keksoz ki fodre toultan ou ti annan avek ou ti disel e delo. Dan ka ki delo ti fini mon ti bezwen organiz nou pour retourn Picard."

"Dan ka ki letan ti move nou ti rod en lapas pour nou rantre e ti reste la ziska ki letan ti amelyore. Si nou ti ariv dan en landrwa ki ti napa kanpman nou ti devir pirog e ti reste anba sa pirog. I ti annan de ka nou ti ganny pri dan disab."

"En fwa nou ti'n al varer Cinq Cases. Divan vandnorwas ti pe soufle e nou ti war nou pe diriz ver Dune Jean Louis e pe bouz pli pre ek Assomption ki Aldabra. Erezman divan pa ti pe soufle tro for. Nou ti fer sir pou nou pa perdi vi Aldabra. Antou nou ti'n drive pour 4 zour. Lo Aldabra zot ti'n krwar nou ti'n perdi."

Diskisyon

- Get lalis danre ki zot ti ganny rasyon e sa ki zot ti kapab aste. Eski ou, ou ti pou kapab sirviv lo sa bann danre. Rakonte ki mannyer ou ti pou fer.
- Dan ka move tan, ou'n ariv dan en landrwa kot napa kanpman, M. Mazaren i dir i ti devir pirog e reste anba la ziska ki letan ti amelyore. Met ou dan plas M. Mazaren ki ou ti pou fer e koman?



ALDABRA PERSONALITIES



There are many, many people who have contributed to the history of Aldabra, whether as overseers, workers, technicians or scientists. In more recent times, a few people have had a longer association with the atoll than most:

- 'Mazaren' (Antonio Constance) - worker from 1956 to 1979.
- Harry Charles - worker from 1956 to 1989.
- 'Ton Ben' (Bernard Leggaie) - worker from 1956 right up to the 1990s, on and off.
- Dr David Stoddart - influential in 'saving' Aldabra, setting up the Research Station and a long-time member of the Seychelles Islands Foundation (SIF) Board of Trustees.
- Lindsay Chong-Seng - associated with Seychelles Islands Foundation (SIF) since it was set up in 1979.
- Dr Jeanne Mortimer - responsible since 1981 for the continued long-term monitoring and research on sea turtles at Aldabra.

You might wonder how such a peaceful, beautiful and remote atoll can have a scary history. But read the following excerpts from various written sources...

"Even on Aldabra there was exploitation [of tortoises] and by 1878 the numbers of tortoises had been severely depleted. By the end of the 19th century giant tortoises were close to extinction." Fortunately soon after that, giant tortoises were given some protection at Aldabra and *"... by 1930 the overall population had grown."* = **Escape number 1!**

"By the 1890s the atoll was being leased out. One lessee is said to have killed 12,000 turtles. He also brought in Chinese workers to harvest sea cucumbers." *"As lessees changed, other commercial exploits were attempted, such as coconut, cotton, sisal, although not very successfully. The mainstays of exploitation continued to be fishing, [mangrove] timber and unfortunately the catching of green turtles and giant tortoises."*

"In 1955, Aldabra was leased.... to Mr Harry Savy. Under the terms of his lease, ...Grande Terre was to be kept as a reserve, without human settlement, where all animal life was to be respected and no new animals could be introduced." Note that goats had already been introduced long before! There was some control over the numbers of turtles caught but little control over anything else. Result: **a little Escape = number 2!**

"Most raised atolls have extensive deposits of phosphate, derived from seabird guano, which has formed the basis of highly destructive mining industries on islands such as Nauru..." And also Assumption, which was much affected by guano mining - fortunately Aldabra lacks phosphates worth mining = **Escape number 3!**

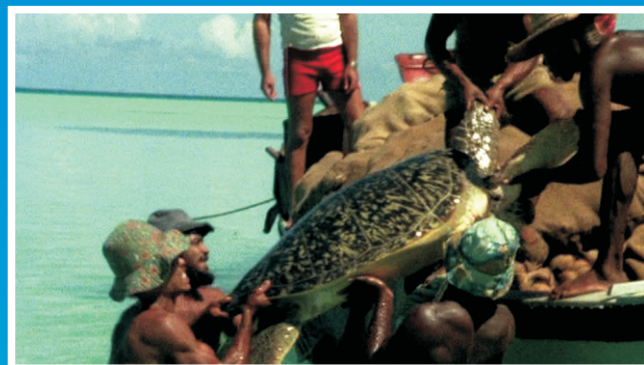
"By far the greatest threat that Aldabra ever faced was in 1962 when the British military conducted a secret survey to evaluate the atoll's potential as an Anglo-American military base." *"Conservationists in Seychelles and in the international community, spearheaded by the Royal Society of London, conducted successfully a crusade to save Aldabra..."* Also the British government ran out of money = **Escape number 4!**

After that, lots of GOOD things happened:

The Royal Society of London set up a RESEARCH STATION. Between 1971 and 1979, about 100 scientists from seven countries did about 50 man-years of research! Much was discovered and understood about the geography, geology, and flora and fauna of Aldabra.

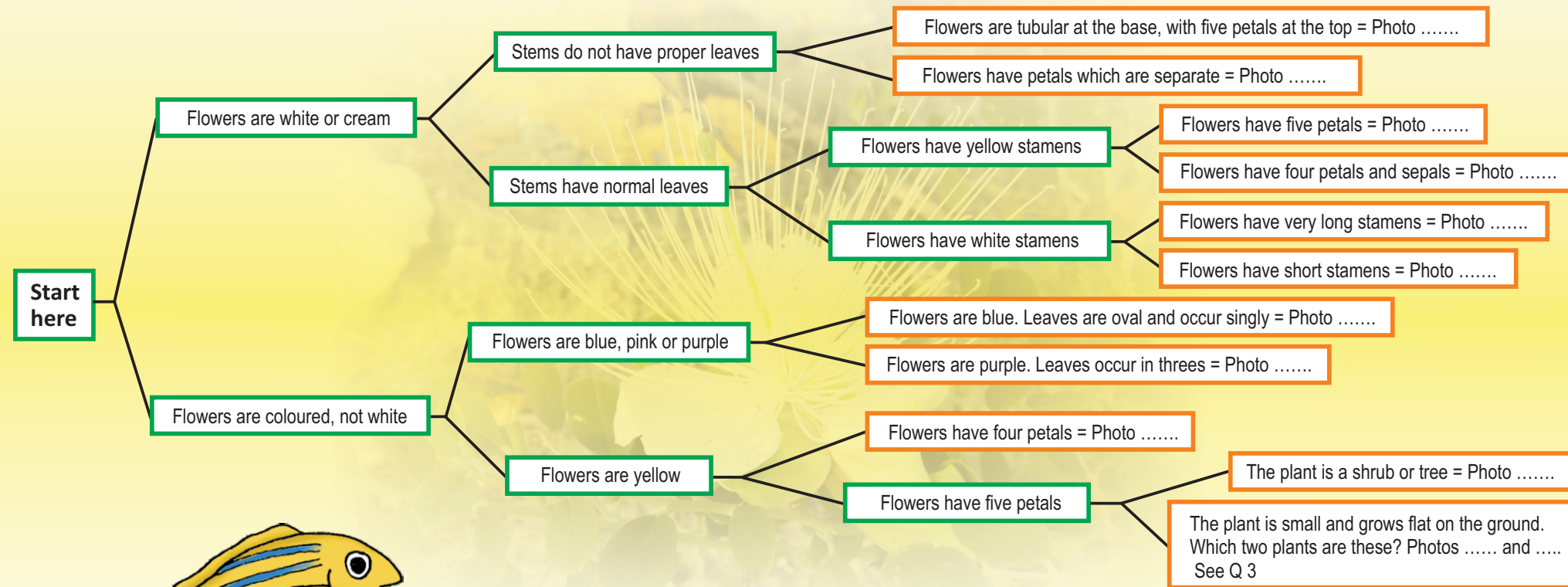
Next, in 1979, SEYCHELLES ISLANDS FOUNDATION (SIF) was established to manage and conserve the atoll, and Aldabra was officially declared a SPECIAL RESERVE under Seychelles law. Then in 1982 Aldabra Atoll became a UNESCO WORLD HERITAGE SITE, which shows how very special this wonderful part of Seychelles is on our earth.

YOU MIGHT LIKE TO TRY THE ACTIVITY ON PAGES 46 AND 47



On the opposite page are photos of a few of the flowering plants found at Aldabra. Don't be surprised if you do not recognise most of them! Many of the plant species at Aldabra are different from the species growing in the granitic islands.

Identify the plant in each photo, using the key below to sort out which species is which. Look carefully at the photo of each species and use the key to identify each plant. For each plant, start at the left side of the key and gradually work your way through the choices until you have only one photo for each orange box.



- The plant with blue flowers (A) and the plant with purple flowers (E) show other differences besides the colour of the flowers. **Describe two other differences between the two plants.**
- Two of the plants are mangrove species. They are found around the granitic islands as well as around the edges of the Aldabra lagoon, so you may recognise these plants. These 2 mangrove species are shown in photos with the letters and
- The ranger who found the two plants shown in Photo K and Photo L was not sure whether they are the same species of different species. Look carefully at the two plants. What do YOU think? Give reasons for your answer.

B. Write a press release

Work in small groups and prepare a short Press Release about this accident. **Each group writes from a different perspective:**

- Seychelles Islands Foundation management**
- Seychelles news reporter**
- Local environmental NGO**
- Public relationships officer for 'The Oil Queen' (or its owners)**
- Public relationships officer for 'The Ship of Plenty' (or its owners)**

Start with the most important points from 'your' point of view.

Each group reads aloud their press release. What was emphasised in each press release?

Compare the different points of view. Did some of the press releases leave out important points? Why was that?



C. Research: How? What? Why?

For you to discover:

- How are large oil spills cleaned up when they happen at sea?
- If an oil spill really happens close to Aldabra, how will Seychelles deal with this disaster? (Hint: there is a National Oil Spill Contingency Plan)
- We all use oil in one way or another! If you have a TV or a fan or a toaster or a computer at home, these appliances use **electricity**. Electricity is generated mainly from **oil** at the power stations in Seychelles. If you travel by bus or by car, then you are using **oil**. If you have things made from plastic, then you are using **oil** because plastics are made from petroleum (**oil**). Many of our clothes are made from synthetic cloth and are dyed with colours that come originally from petroleum **oil**. And how do all the imported goods we eat and use in Seychelles reach us?and what is the source of energy for sea and air transport? You got it ... **oil!**

So are WE partly to blame for such oil spill accidents?

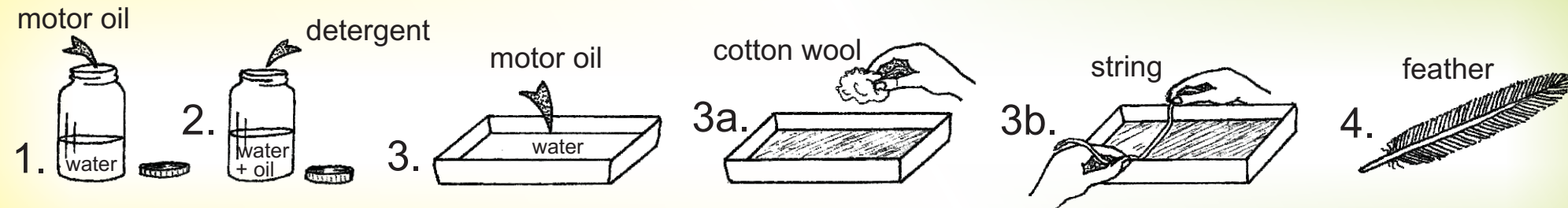
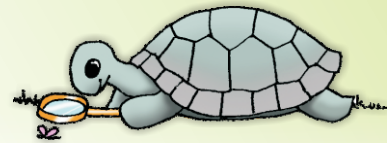
Is there anything YOU can do about this?

- A lot of waste oil is produced during the generation of electricity and also when buses, trucks and cars are serviced. What happens to this waste oil in Seychelles? Is it thrown away somewhere, or is it collected? If it is collected, what happens to it after that?

First try these small experiments:

You will need a glass jar with a lid, shallow trays (e.g. oblong ice cream boxes), water, motor oil, detergent, cotton wool, string, feathers.

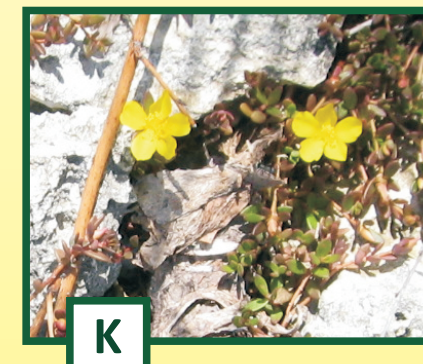
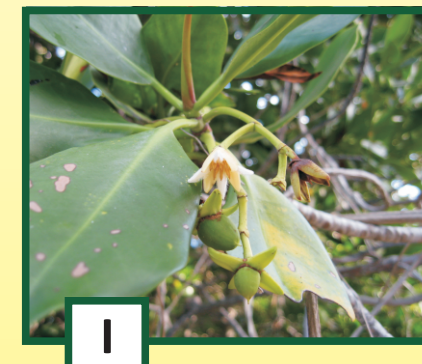
1. Half-fill a glass jar with water. Add a few drops of motor oil. Put on the lid tightly and shake the jar. What happens when you stop shaking?
2. Add a few drops of detergent to the jar. Put on the lid and shake again. What happens to the oil? You can add more oil and/or more detergent and try again.
3. Put some water into a shallow tray. Add a little motor oil. a) Try to "mop up" the oil with a piece of cotton wool; b) Try moving the oil into one small area of the tray by using a piece of string.
4. Dip a feather into some oil. What happens to the feather? Can you wash the oil off the feather?
5. Discuss your results.



A. A news release!

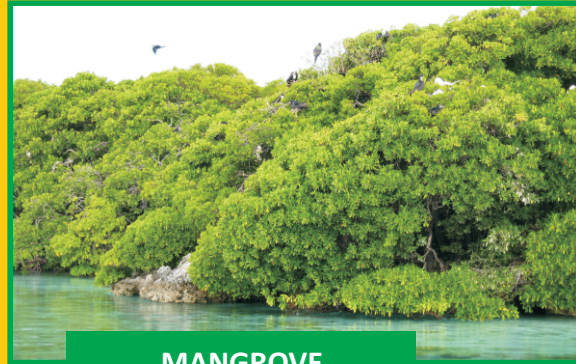
One student reads aloud the following (imaginary) press release:

"News is coming in of an oil spill close to Aldabra Atoll, a World Heritage Site and important nature reserve. The spill happened during the night of 23 July when an oil tanker "The Oil Queen" collided with a container ship "The Ship of Plenty" about 50km West of Aldabra. According to first reports, there has been considerable damage to the tanker, resulting in the leakage of thousands of litres of oil. Although there are few people living on the atoll, there are fears that sea life around the protected atoll could be seriously affected. Coastguards in Seychelles, Comoros and Madagascar have been alerted. It is rumoured that the captain of one of the ships had not slept for 24 hours due to poor weather conditions and a very strong South-easterly wind."



The easy answer is that Aldabra animals live at or on Aldabra.....! But many species do have **preferences** as to where they live or where they feed. They don't live everywhere on the atoll, nor do they feed in every habitat. Even those animals which live in the **same** habitat do not use the habitat in exactly the same way. For example, a Sunbird living in the habitat known as mixed scrub feeds on the nectar of many flowering shrubs and makes its nest in the branches. A Grasshopper living in the mixed scrub eats the leaves of certain shrubs and may lay its eggs in crevices in the bark. We say that each species occupies a different **NICHE** in the mixed scrub habitat. Together, all the plants and animals form a **COMMUNITY** within the mixed scrub habitat, and they interact with each other.

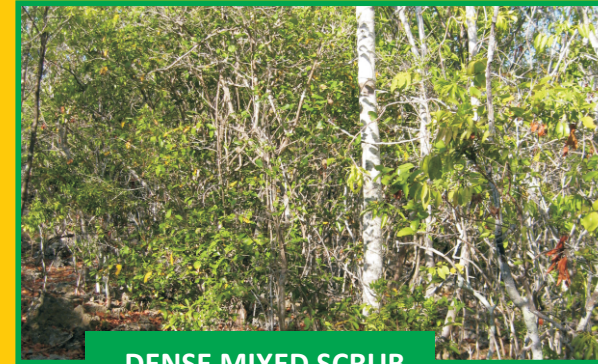
Notes: a) Pemphis scrub consists of only one plant species: *Pemphis* is the Latin name for 'Bwadamann'. b) Some animals use one habitat for one purpose and another habitat for another purpose. For example, Frigate birds use the mangrove habitat for nesting, but eat fish and squid which they get from the sea.



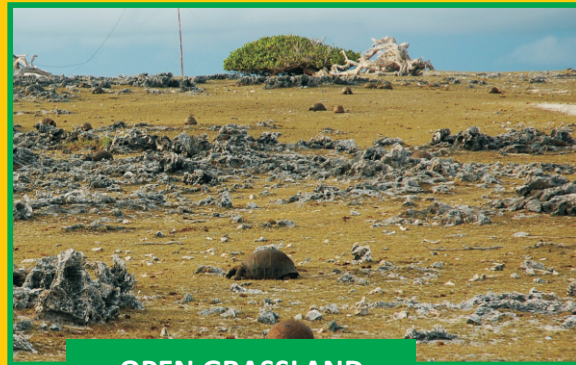
MANGROVE



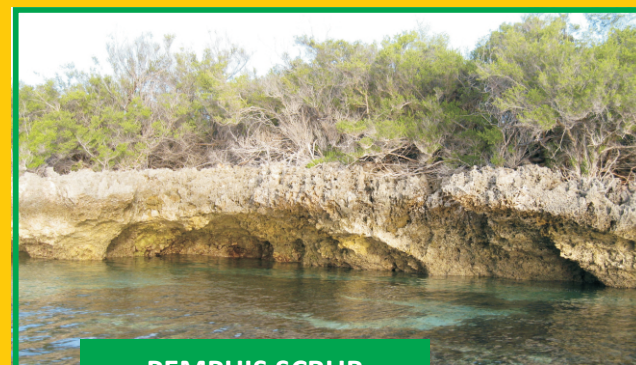
OPEN MIXED SCRUB



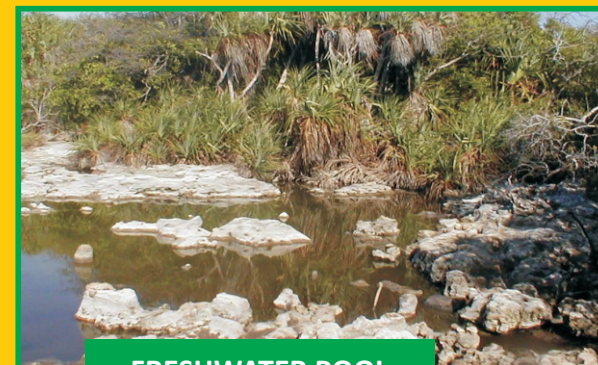
DENSE MIXED SCRUB



OPEN GRASSLAND



PEMPHIS SCRUB



FRESHWATER POOL

What can be done about these alien species?

Once a plant or animal has become well established in the environment, it is difficult to control, especially in a protected area. Pesticides, for example, cannot be used, because of the harmful effects of the chemicals on other organisms in the environment.

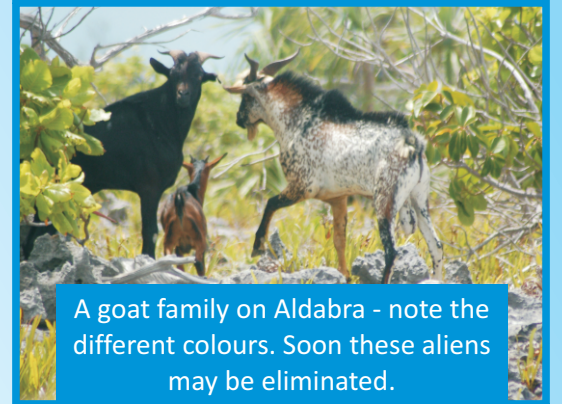
For example, a kind of MEALY BUG ('lipou blan') somehow reached Aldabra in the 20th century and had a devastating impact on some plant species, causing loss of leaves and sometimes death, including of rare species. There were no natural predators of this mealy bug at Aldabra. What to do? In many parts of the world **BIOLOGICAL CONTROL** has been used to control this species. So a scientific study was done. The scientist ensured that there would be no harmful side effects. He then introduced a specific ladybird species as a predator of the mealy bug. Slowly the population of mealy bugs decreased, and although there are occasional small outbreaks, control has been successful. Biological control must be done very carefully but has been used successfully all over the world. **Try to find examples of biological control in Seychelles that worked well and other examples where it went wrong.**

GOATS compete with Giant tortoises for food. Shooting was used to try to keep them under control but the numbers kept increasing. A recent programme to eradicate goats will hopefully be successful. But getting the last few goats is very difficult. If even one pregnant female remains hiding in the thick bush, the number of goats will slowly increase again. So it is essential to get rid of the last one. Will SIF be successful this time?

Are there still some possible threats?

The island of Assumption is only about 27km from Aldabra. On Assumption there is at least one alien species that could reach Aldabra quite easily - the **RED-WHISKERED BULBUL** ('Merl konde'). **How could it get from Assumption to Aldabra? Which Aldabra birds would be most threatened by its presence?**

SPIRALLING WHITEFLY is an insect pest that reached the granitic islands relatively recently. It is a nasty pest for farmers; but this whitefly also attacks native species. If it reached Aldabra, the impact could be worse than that of the Mealy bug! Are there other agricultural pests and diseases that could reach Aldabra and become a problem? What can SIF do to keep them out? **Devise some suitable policies for SIF.**



A goat family on Aldabra - note the different colours. Soon these aliens may be eliminated.

QUICK QUESTION

One of the following animals is **NOT** considered to be an alien species because it arrived by itself before human settlement. Which animal is it? How did it reach Aldabra?

**RAT / CAT / GOAT / PIED CROW /
COCKROACH / HOUSE GECKO**

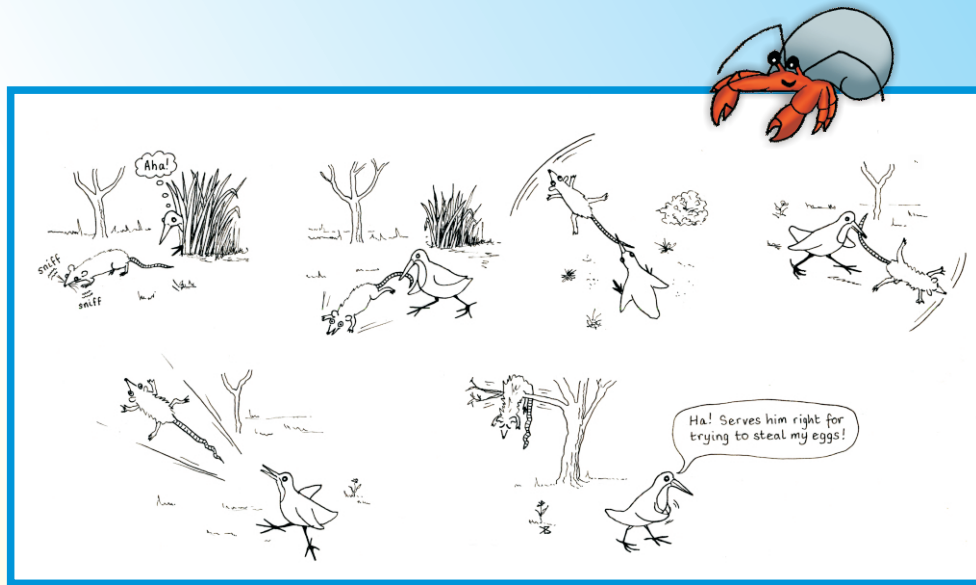


Why cat trapping is not so easy at Aldabra....!

How can there be alien species in a World Heritage Site? Unfortunately there are alien species on Aldabra, and some of them are affecting the native species. But how did these aliens get to the atoll? First you need to remember that humans lived on Aldabra for many years before it became a World Heritage Site

When people arrive at an uninhabited island and decide to settle there, they almost always bring new plant and animal species to the island. Sometimes the plants and animals are introduced for a specific purpose, for example as food or for medicinal purposes. Sometimes they are introduced by accident, e.g. rats and cockroaches. Aldabra is no exception. In the past, plants such as maize, sweet potato, coconut, vegetables and herbs were brought to the atoll so that people could feed themselves and be self-sufficient. Chickens and pigs were kept in enclosures. But goats were allowed to roam free. Goats and cats established themselves on the atoll, and so did a few of the introduced plants.

When Aldabra became a protected area, some of the alien species were removed, e.g. chickens and pigs. Attempts were made to control others, for example by means of trapping (rats, cats), shooting (goats, cats), cutting (sisal). But it is only more recently that serious attempts to eradicate or control alien species have been carried out. Interestingly, some native bird species seem to be able to keep rats away from their nests. Perhaps this is because they were already familiar with fighting off large crabs that tried to steal their eggs or chicks!



Sisal - 'Lalwa'



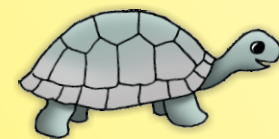
'Zepible' - Stachytarpheta



Madagascar periwinkle - 'Roazanmer'



Mealy bugs - 'lipou blan' on 'Mangliye blan'



For what purposes did people probably introduce these three plants to Aldabra: Lalwa, Zepible and Roazanmer?

Six habitats of Aldabra are shown in **photos on the opposite page**. In the table below are some of the animals that live in these habitats. Can you place each animal in its appropriate habitat? Some of the animals can live in more than one habitat. Put a tick in each habitat where the animal lives. If you aren't sure, look at other pages in this book; or find out more about the animals and the habitats in books and on the internet.

ANIMAL	MANGROVE	OPEN MIXED SCRUB	DENSE MIXED SCRUB	OPEN GRASSLAND	PEMPHIS SCRUB	FRESHWATER POOL
Sunbird						
Land crab						
Fruit bat						
Butterfly						
Frigate bird						
Millipede						
Green gecko						
White-throated rail						
Coconut crab						
Water beetle						
Giant tortoise						
Hermit crab						
Coucal						
Snail						
Red-footed booby						
Grasshopper						
Mosquito						
Sacred ibis						
Spider						
Blue pigeon						



THAT'S ODD !

Do you notice something about the names of these animals? Each bird name is of **one** of these animals, e.g. Sunbird (meaning the Aldabra sunbird), Red-footed booby (i.e. not another species of booby such as the Brown booby).

But some of the other animal names refer to a **group** of animals, e.g. butterfly, spider, snail. There are many different species of spider and snail and butterfly on Aldabra.

The reason is because we know **more** about the biology of larger and more colourful or obvious animals such as the green gecko and the giant tortoise. We know **less** about the biology of invertebrate animals.

Discuss how this may affect the way you fill in this table.

“Freshwater is essential for the survival of all terrestrial organisms”

Since there are no rivers on Aldabra, all organisms rely on rainwater. This may be in the form of:

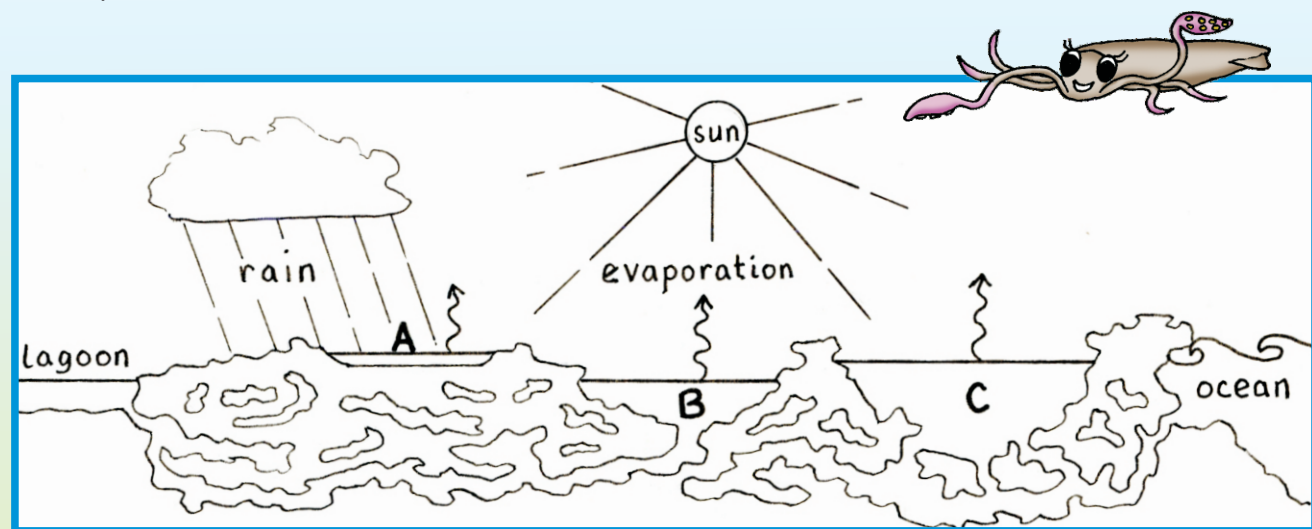
- a) Rainwater that lies in pools on the surface of the rock;
- b) Rainwater that finds its way underground through cracks in the limestone rock. This water forms a layer of fresh water known as the FRESHWATER LENS, which floats on top of any sea water that lies beneath the rocks.



Did you know?

Fresh water is less dense than sea water, so it floats on top of sea water. It is similar to oil floating on top of water. But, if there is mixing of fresh water and sea water, for example by strong water currents, the mixture is called BRACKISH water.

The limestone of Aldabra has been eroded by sea and rain for thousands of years, resulting in the very sharp and dissected kind of limestone known as 'champignon' (see pages 10 and 13). Erosion by waves causes the undercut edges of this raised atoll and the champignon islets in the lagoon. However, erosion is also going on **underground** as well. There is a network of underground channels which allows seawater to penetrate far inland. There are therefore many inland pools at Aldabra, some of them filled with freshwater, some with sea water, and some with brackish water.

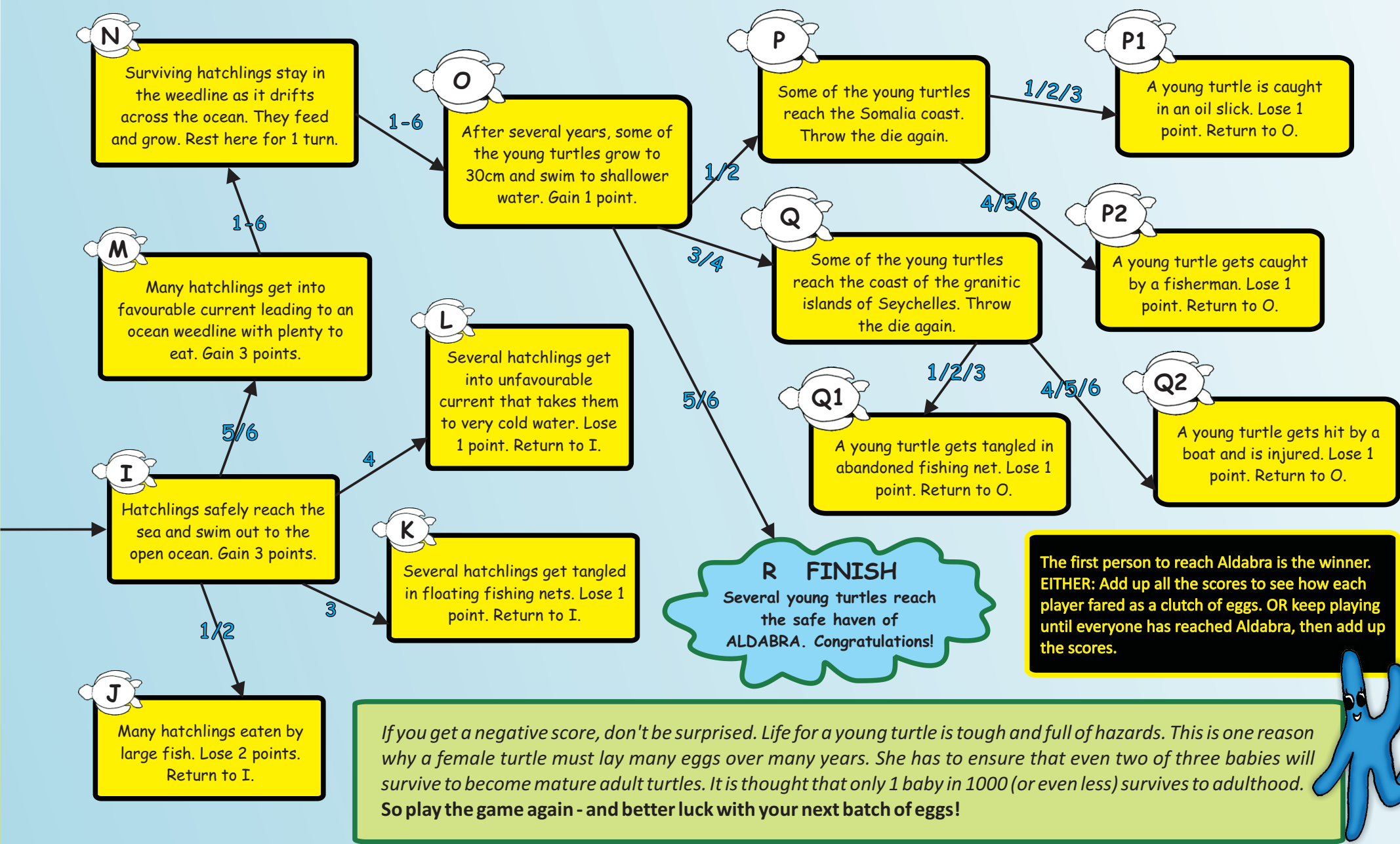


The diagram shows the underground network of channels in one section of the atoll rim, between the lagoon on the left and the ocean on the right.

1. Use two different coloured pencils to shade in:
 - a. the channels that are linked to the ocean;
 - b. the channels that are linked to the lagoon.
2. The diagram also shows the 3 different types of pools: A = Freshwater pool; B = Brackish water pool; C = Saltwater pool. What do you notice about the level of the water in A, B and C?

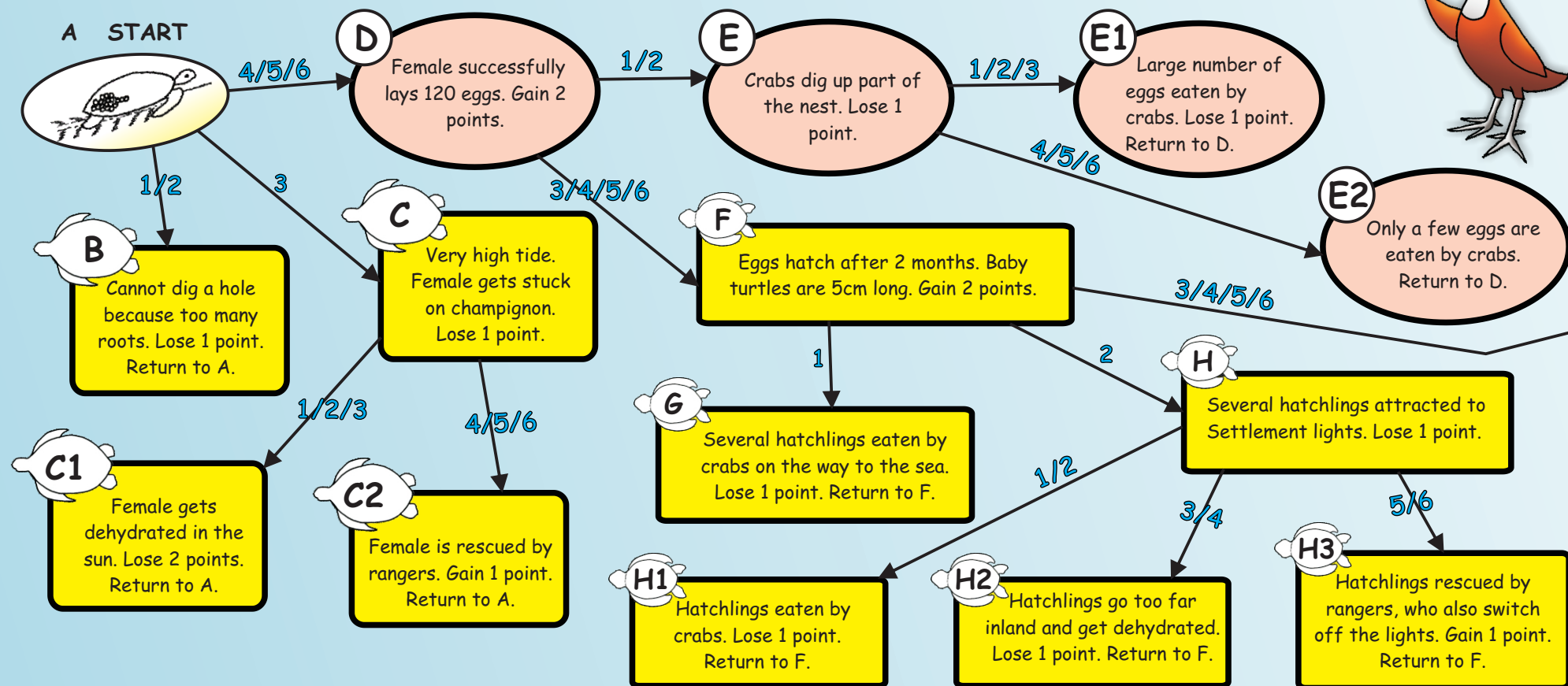
In Seychelles there is a tide cycle in which there are two high tides and two low tides every day. At Aldabra, there are only four main passages linking the lagoon to the ocean (check the map on page 9). The lagoon is **huge** and contains millions of litres of water. This water moves from the inside of the atoll to the outside (and back again!) **twice** every day. It takes **so long** for the lagoon to fill and to empty that when there is high tide outside the atoll it may still be low tide in the most distant parts of the lagoon! Another interesting fact is that the level of the pools can go up and down according to the level of the tide! **Can you work out why?**

3. Can you now explain why the water levels are different in each of the 3 pools in the diagram above?



In this game you follow a clutch of green turtle eggs laid at an Aldabra beach and see how they get on in the environment. Each player is one clutch of eggs inside a female Green Turtle. Your female turtle has reached Settlement Beach, which is the largest beach at Aldabra. What happens to your clutch of eggs? Do they hatch safely? Do the babies (hatchlings) survive and grow? Throw a die to find out!

First choose one person to keep the scores for all the players. Each player takes a button or other small object to represent one clutch of eggs to move him/her across the game. Put all the buttons in the 'Start' shape. Take it in turns to throw the die. Use the number on the die, and follow the arrow with that number on it to another shape. Read the information in the shape and carry out the instructions. Note: if you are returning to a shape that you were in before, you do not gain extra points - your score remains the same. Good luck!

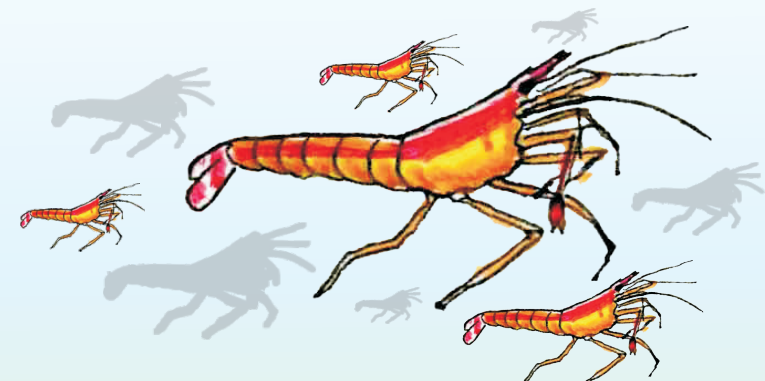


What lives in the inland water pools?

When the rainy season starts, the colonisation of **new** freshwater pools is very rapid. Microscopic life grows and multiplies fast. Eggs hatch and larvae feed on the abundant plankton. However, one of the problems for small freshwater pools is that they **dry out** when there is no more rainfall, especially if there is hot sun shining on them. When a pool dries up, what happens to all the organisms living in it....?

Try the following exercise in small groups:

Pretend you are animals living in a pool. You are living happily in your small environment, but after a while, the place seems to be more and more crowded. There is less and less water for each animal. You realise that the water is evaporating away. Will you die? Will you run away? Or can you protect yourself in some way? What can you do if you want to survive? Think of as many possible solutions to this problem as you can (have fun - use your imagination! Think of new creative solutions!). Then discuss all the ideas as a class.



Many **small freshwater pools** have special plant species. They grow quickly, flower and produce seed. Then, as the pool dries, the plants die and will only reappear in the next wet season. Animals may escape from one pool and find another, but the second pool may disappear too! Therefore many plants and animals have some kind of **resistant stage** in their life cycle. For example they may produce seeds, fruits, eggs or spores which have a thick or hard outer covering that prevents loss of water. In this way they are protected and can resist dry conditions.

Semi-permanent freshwater pools exist at the eastern end of Aldabra, where there is more of the flatter 'platin' limestone. These pools are larger and often surrounded by vegetation such as *Pandanus* (Vakwa). Algae grow well in these pools and the tortoises love to eat the algae.

Brackish water pools are also abundant at Aldabra. The flora and fauna are often different because of the presence of salt water as well as freshwater. The mangrove tree 'Mangliye pti fey' and the land crab 'Tyangoman' often live around the edges of these pools. Flamingos also find their food in these pools.



Seawater pools on the other hand often contain marine organisms, such as marine fish, shrimps and the upside-down jelly fish (see picture on the right).



Often, these shallow water pools, whether freshwater, brackish or seawater, have high phosphate and nitrate concentrations in the water. **Can you work out why?**

CLUE: Compare Aldabra with Cousin and Aride islands, which also have large numbers of sea birds.

Search in this grid for the Kreol names of marine creatures found at Aldabra. Names may be written horizontally, vertically or diagonally and in either direction. Put a line through a name when you find it in the grid and cross it off the list at the side of the grid.

D	R	E	M	D	I	T	R	O	T	B	A
Y	K	A	P	T	E	N	N	R	O	U	Z
A	Y	O	L	O	E	K	I	N	R	E	B
B	R	E	K	E	N	O	O	T	A	L	P
D	W	N	Y	I	E	R	N	N	O	O	L
E	A	E	X	V	Y	A	O	U	G	G	A
M	W	M	T	E	Z	Y	M	G	E	R	G
E	T	A	R	E	I	A	R	R	I	I	R
R	A	A	S	P	R	W	A	A	E	B	A
V	K	R	A	B	I	L	N	B	O	Z	T
O	A	P	W	A	S	O	N	A	R	M	E
V	K	Z	O	U	R	I	T	N	F	A	L

Write down the letters that are left over. You will find two more kinds of animals that are found in the sea around Aldabra. They are fun to watch, if you see them!

The first person to really look at marine life at Aldabra was Jacques-Yves Cousteau in 1954



- Bernik
- Bigorno
- Birgo
- Bweter
- Dyabdemer
- Graban
- Kakatwa
- Kaptenn rouz
- Kare
- Kokiy
- Kong
- Koray
- Krab
- Laf
- Lagratel
- Lare
- Oumar
- Papiyon
- Pwason arme
- Reken
- Sirizyen
- Tortidmer
- Vov
- Vyey / plat
- Zob
- Zourit



Look at the photos on these two pages. Try to fit the correct name to each photo. Then choose 3 of the animals and find out as much as you can about each one (or each type).

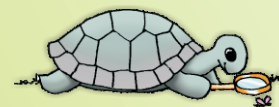


Here you can be a research scientist! Use monitoring data to answer some turtle nesting questions

On an Aldabra beach which is checked daily, a female turtle was tagged after she had laid her eggs on the 2nd of March 1996. Her tag number was SCS0007. She was **recorded** coming onto this beach on the dates shown in the table below. If she comes onto a beach, this is called an EMERGENCE. It is possible there were **other occasions** when she came up the beach but was not seen, and therefore was **not recorded**.

Nesting season	1995					1996	1997	1998	1999	2000					2001
Emergence	1	2	3	4	5					6	7	8	9	10	
Date	02 March	14 March	16 March	31 March	02 April	---	---	---	---	15 Feb.	16 Feb.	03 March	18 March	01 April	---

Nesting season	2002	2003	2004					2005	2006	2007	2008	2009		2010	2011
Emergence			11	12	13	14	15					16	17		
Date	---	---	20 Feb.	06 March	20 March	20 April	21 April	---	---	---	---	23 Feb.	28 March	---	Turtle tag returned



How often does a turtle come on land to lay eggs?

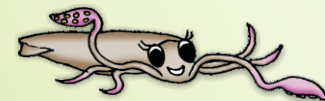
Studies have shown that a turtle returns to the beach after a two-week interval. But it is hard to meet the same turtle every time she emerges.

- From the figures given in the table, calculate how many days there are between each emergence, i.e. between emergence 1 and 2, then between emergence 2 and 3, etc. Make a list showing each emergence, the date of the emergence and the number of days.
- Do the figures in your list show that approximately two weeks passes between each emergence? Are some intervals much less and some much more? Is this puzzling? In order to work out what might be happening, scientists had to try to answer the following questions:
- What do you think might have happened: a) on 14 and 31 March 1995, on 15 February 2000, and on 20 April 2004? b) between emergences 13 and 14, and also 16 and 17? c) between emergences 5 and 6, 10 and 11, 15 and 16?
- Results such as those shown in the table made scientists ask the question: **Where** was the turtle during the gap years? Was she at Aldabra or somewhere else? In 2011, a tag with the number SCS0007 was returned to Seychelles from Kenya. As all turtle tags are unique, it must have come from this female turtle. a) What could have happened to her in Kenya? b) Is this proof that Aldabra Green turtles leave the atoll during the gap years, or not? Explain your answer.

A Green turtle typically lays between 100 and 200 eggs in each clutch. That sounds like a lot of eggs! But we also know that a turtle hatchling takes 30 to 40 years to become a sexually mature adult. Out of a thousand eggs, only 1 or 2 will survive to adulthood. **Why? Play the game on Pages 38 and 39 and then make a list of all the dangers that a turtle faces from the time it hatches to the time it becomes a mature adult.**



In Seychelles in the past, humans EXPLOITED sea turtles. They killed turtles to get products such as the shell for ornaments (from the Hawksbill turtle or 'Kare'), and calipee (from the Green turtle or 'Tortidmer') which is used for making turtle soup. Turtle eggs were used in artists' paint, or for food. Not only were Seychellois killing turtles for their own use, they were killing them in order to earn money by exporting the products overseas. Aldabra is one of the islands from which many thousands of turtles were taken, in particular Green turtles.



A tagged turtle covering her nest

RANGERS at Aldabra spend a lot of time monitoring turtles. There are about 50 beaches on the Aldabra coastline, with many small ones and one very large one known as Settlement Beach. Rangers must visit the beaches close to the Research Station at least 4-8 times per month. All other beaches are checked once per month. This is what the rangers have to do:

- 1) Go out early in the morning and count the number of fresh tracks left by turtles coming up the beach. Note whether or not each turtle dug a hole.
- 2) Go out at night to tag female turtles, either on the nest or after they have nested (if the turtle is tagged before she has laid her eggs, she may not lay them). The tags are made from titanium and are similar to the tags used for tagging cows on their ears!

Find out what is special about titanium. Why is this metal used and not another metal?

Why tag turtles? Because it allows you to follow the behaviour and fate of individual animals. When all the information is put together, you can learn more about the turtle species as a whole.

When Aldabra became a Special Reserve in 1981, one of the first questions asked by scientists was "Will protection of Aldabra help turtle populations recover?" Therefore one of the first long-term MONITORING PROGRAMMES to be set up was designed to find out:

- a) How many turtles nest on Aldabra beaches each year and which beaches turtles prefer.
- b) Whether the number of nesting turtles changes over time (Increases? Decreases? Stays the same?).
- c) When is the peak nesting season at Aldabra?
- d) How often a female turtle lays eggs.
- e) Where do turtles go after they have nested?

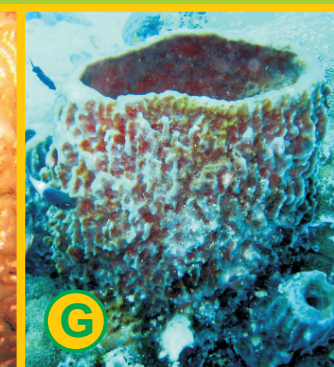
This programme has now been running for around 40 years, with various other studies being added as time went on. A lot of information has been gathered about turtle numbers, nesting behaviour and growth rates.



Tag fixed to a turtle front flipper



Turtle tracks up and down



TURTLE
DUGONG
CHRISTMAS TREE WORM
GORGONIAN
FLATWORM
SEA URCHIN
CONE SHELL
SPINNER DOLPHIN
HUMPBACK WHALE
MANTIS SHRIMP
POLYCHAETE WORM
BARREL SPONGE
FEATHER STAR
OCTOPUS BABY

DID YOU KNOW?

Dugongs are more closely related to elephants than to dolphins or whales! They feed on sea-grasses and need to eat lots of them to stay alive. Dugongs were only recently discovered at Aldabra. Perhaps they have found a refuge in the lagoon, free from human exploitation.

Fish life around Aldabra is amazing. Some of the fish species occur in huge numbers, swimming in vast shoals. Fish display a huge range of shapes and sizes and colours. They have many different ways of feeding and are adapted to many different lifestyles. In this activity you will look at only a few fish lifestyles and adaptations.



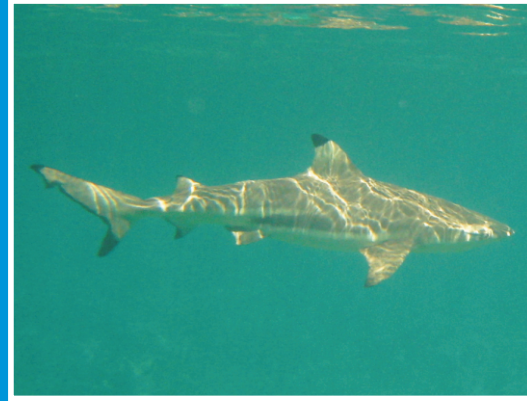
Box fish
(feeds on invertebrates)



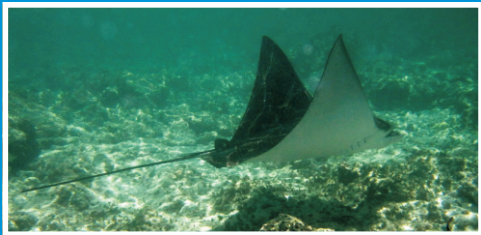
Trevally (predators)



Maypole butterfly fish
(feeds on coral polyps)



Black tip reef shark (a predator)



Eagle ray
(eats molluscs and crustaceans)

Look at all the fish pictures on these two pages. Answer the following questions

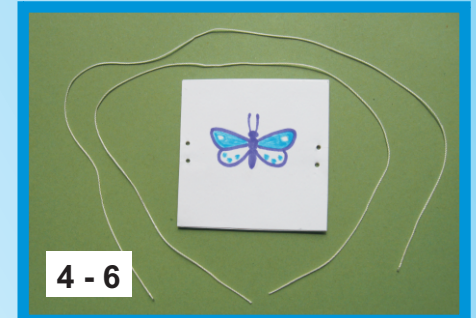
- Two of the pictures show fish that sometimes swim away from the reef into deeper water. They can swim very fast. a) What do you know about the **shape** of these fish that helps them to swim fast? Why do they need to swim fast? b) What **colours** are these fish? What might happen if they were brightly coloured?
- Many reef fish have bright **colours**. The reasons are not completely understood. See what you can find out about this subject.
- Shape:** a) Some of these fish are flattened from side to side. Write their names. b) Some fish are flattened from top to bottom. One is shown here. Which is it? c) Other fish are not flattened at all. Write their names. d) What does this tell you about the **lifestyles** of all these different fishes?
- a) Find out how the **tails** of fish help them to swim. b) Compare the tails of these fishes; One is very different from the rest. Which one? Why?
- a) What are the **fins** of a fish used for? b) Some fish have sharp spines in their fins. What are these spines for?
- What **other vertebrates** do you know that swim and feed in the marine environment and have similar adaptations to fish?



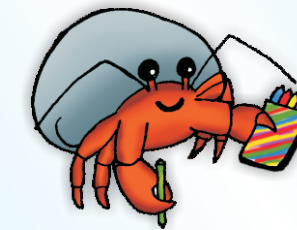
Did you know? A healthy coral reef is one of the most biodiverse ecosystems in the world. Can you name another ecosystem, found on land, which also has huge diversity of species?

ACTIVITY 2 : Create some relationships of your own

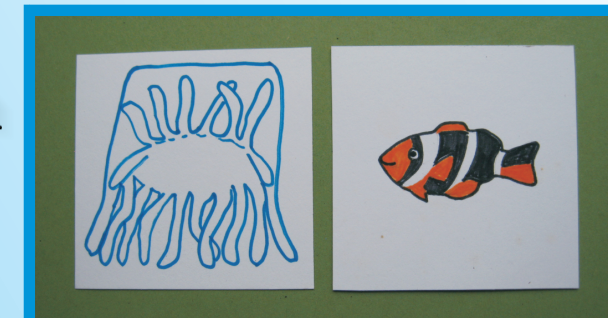
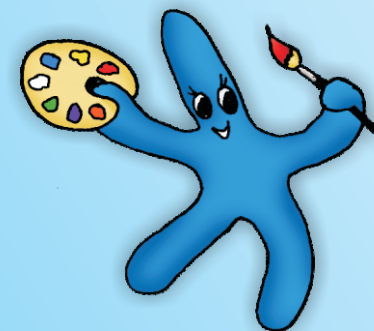
- Cut out two 7 cm squares of thin white card.
- On one of the squares use coloured markers to draw a circle of brightly coloured flowers around the edge.
- On the other square draw a butterfly in the centre.
- Glue the two pieces of card together so that the pictures are on the outside. White glue is best.
- Cut two pieces of thin string or thick thread, each about 35cm long.
- When the glue is dry, make two small holes near the centre of one edge of the joined squares, on one side of the butterfly. Then make two similar holes on the other side of the butterfly. Be **VERY** careful when making the holes as you will need to use something sharp.
- Thread one piece of string through the two holes on one side of the butterfly. Then thread the other string through the other two holes.
- Hold the ends of each thread tightly together. Flip the square over and over to twist the threads, then pull the threads tight to make the square spin.



As the square spins, you should be able to see the butterfly inside the circle of flowers. This is because the pictures are moving so fast that your eyes see both at once. The brain merges the two pictures into one.



Try other relationships
Use the other ideas shown: on the left is a clown fish in a sea anemone; on the right is a bird in a tree; or how about drawing a big fish with a little one inside it!



NOTE: If the picture is upright, like the bird in a tree, you must glue one picture **UPSIDE DOWN** onto the other. That's why the tree and the sea anemone are shown upside down!



All organisms are in relationships with other organisms in their environment. Here is just **one** simple example, a **butterfly**:

- A butterfly sips nectar from a flower. The nectar is the butterfly's food.
- The flower may also gain from this relationship because in the process of getting the nectar, the butterfly brushes its head against the pollen of the flower. The pollen sticks to the butterfly's head and when it goes to another flower to get more nectar, the pollen gets transferred to the stigma of this flower. The flower has been pollinated, so now it can produce seeds.
- At night the butterfly needs to shelter somewhere, usually it settles in amongst plants.
- The butterfly also needs plants on which to lay its eggs. They must be plants which the caterpillars can feed on when they hatch.
- Both the butterfly and its caterpillars are food for predators such as spiders, praying mantis and chameleons.



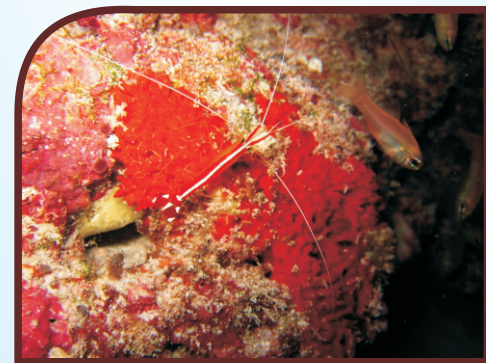
1. **Work in pairs.** Choose TWO examples of animals that you know. What relationships does each animal have with other organisms in its environment, both plants and animals? Note down as many relationships as you can. These sorts of relationships form THE WEB OF LIFE.



When two different species live in a close relationship for a long time, the relationship is called SYMBIOSIS.

In the example on the left, a **Clown Fish** is living with a **Sea Anemone**. The tentacles of a sea anemone have stinging cells in them. Normally fish are killed when they come near the tentacles. But the Clown Fish is not affected, so it is protected from predators by hiding in the tentacles. In return, the Sea Anemone is able to keep its tentacles open to collect food, and it seems to flourish in the presence of the Clown Fish.

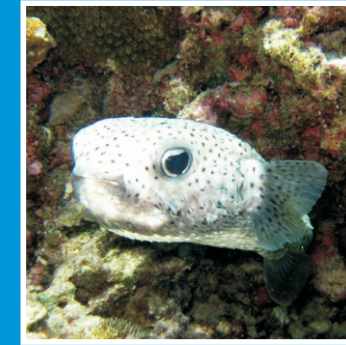
The shrimp in the photo on the right is a species of **Cleaner Shrimp**. It forms symbiotic relationships with **fish**. The shrimp cleans the fish, taking small parasites and damaged tissue off the fish's scales, mouth and gills. The shrimp gets food and in return the fish does not eat it, recognising the shrimp by its special behaviour. Notice that the shrimp is camouflaged.



As soon as a **Giant Tortoise** leaves behind some dung ('kaka') on the ground, along come these small **hermit crabs** to see what they can find to eat! It may not be your idea of what is nice to eat, but just think what an important role these crabs play, breaking up the dung and recycling the material.



Emperor angelfish
(eats sponges)



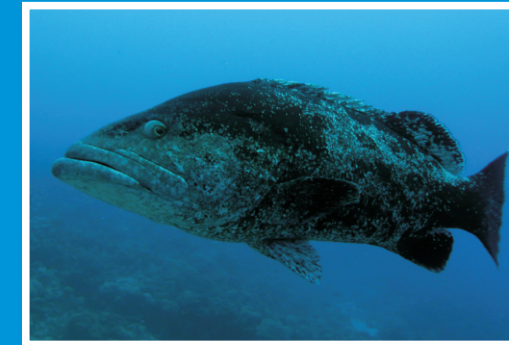
Puffer fish (eats algae and invertebrates)



Longfin banner fish
(feeds on small invertebrates)



Emperor angelfish
(eats sponges)



Potato grouper (eats fish)



Parrot fish (graze algae on corals)
But can you see another fish in this photo?
Do you know what it feeds on?



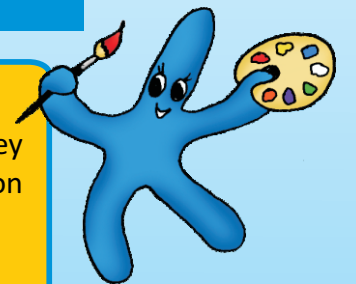
Convict surgeonfish
(a herbivore)



Two of these fish pictures have the same name. **Can you spot them?**

You might think this is a mistake! In fact, scientists who found these two fish thought they were two different species. Later they found out that one of them is the juvenile fish and the other is the adult fish. **Do you know which is which?** In nature there is a reason for everything. **Can you think why this fish might change colour as it grows?**

Draw and colour a picture of an imaginary brightly coloured coral reef fish.





Six marine habitats are shown here. Three of them are inter-tidal habitats. In inter-tidal habitats the water level varies between high tide and low tide. The water level also depends on the phase of the moon (= the lunar cycle).

OPEN WATER



CORAL REEF



SEA GRASS



MANGROVE



MUD AND SAND FLATS



SANDY AND ROCKY SHORE



Passe Femme at low tide (left) and about six hours later (right) at high tide

The 30 animals named on this page are all **marine** animals. But do you know **where** in the sea they live?

Try to match each animal to one of the six habitats shown on the opposite page. **Some** of them can live in **more than one habitat**.

If you are not familiar with any of the English names, discuss as a class, or look in books to find out more about the animals.

- | | | | | | |
|------------------|--------------------|------------------|------------------|----------------|----------------|
| 1. Dugong | 2. Octopus | 3. Periwinkle | 4. Angel fish | 5. Crab plover | 6. Eel |
| 7. Sponges | 8. Flying fish | 9. Crabs | 10. Cone shell | 11. Barnacle | 12. Sea urchin |
| 13. Snapper | 14. Jellyfish | 15. Sea cucumber | 16. Chiton | 17. Shark | 18. Starfish |
| 19. Feather star | 20. Giant clam | 21. Squid | 22. Green turtle | 23. Ray | 24. Tube worm |
| 25. Dolphin | 26. Burrowing worm | 27. Brittle star | 28. Parrot fish | 29. Shrimp | 30. Egret |