

Contents

What Is in Planet Earth?	2
Additional Components	4
Ideas for Using Planet Earth	5
Learning Goals	6
Unit 0 Introduction	8
Unit 1 From Pole to Pole	12
Unit 2 Mountains	20
Unit 3 Fresh Water	28
Unit 4 Caves	36
Unit 5 Deserts	44
Unit 6 Ice Worlds	52
Unit 7 Great Plains	60
Unit 8 Jungles	68
Unit 9 Shallow Seas	76
Unit 10 Seasonal Forest	84
Unit 11 Ocean Deep	92
Answers	100
Acknowledgements	122
Atlas Section (Colour Maps of the World)	125



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What Is in Planet Earth?

One unit per episode. Each unit has a full Myanmar glossary of key words.

Five sections per unit, each with "Before you watch", "As you watch" and "After you watch" activities.

"Before you watch" activities include texts and diagrams to help learners understand the main ideas in that section.

"As you watch" activities are comprehension questions for students to answer while watching.

"After you watch" activities are additional texts, diagrams and questions, to check understanding, present additional information and expand on key ideas from the section.



A single thorn tree, growing in the Namib Desert, Namibia.

Unit 5 Deserts

Key words

antennae (n) - အင်ဆက်ပိုးမွှားများတွင်ရှိသော အာရုံခံအင်္ဂါအပိုင်း
desert (n) - သဲကန္တာရ
dew (n) - နွေဇက် နွေခေါက်
drought (n) - ရိုးခေါင်သည့်နှစ်
exoskeleton (n) - အနွယ်အမြွှာ (ကျားရိုးသတ္တဝါများ၏ ဓာတ်ကိုင်အင်္ဂါအားကားအဖွဲ့အစည်းများ)
flood (n) - ရွက်တရားရေလွှမ်းမိုးခြင်း
food insecurity (n) - အဟာရခြုံငုံစုံလင်မှုမရှိသော အခြေအနေအထားကို လုံလောက်စွာရရှိနိုင်သော အန္တရာယ်ရှိခြင်း
fur (n) - သားမွေး၊ အမွေး (ဥပမာ ခြင်္သေ့)
irrigation (n) - ဆည်မြောင်း
invertebrate (n) - မျက်နှာမဲ့ သတ္တဝါ
mammal (n) - ရွက်တရားသတ္တဝါ
mate (nv) - မိတ်လိုက်ခြင်း
plague (n) - လူသိမ်မွေ့ခြင်း
rain shadow (n) - မိုးကွယ်ရောင်ခြည် (တောင်တန်းများကားရောင်ခြည်ကို မိုးများမရောက်နိုင်သော ဓါတ်ငွေ့သွား)
rainfall (n) - မိုးရေချိန်

rainstorm (n) - မိုးသက်လွန်တိုင်း
river bed (n) - မြစ်၊ မျောင်း များတွင်း
root (n) - အမြစ်
sand dune (n) XX
swarm (n) - ပျံသန်းနိုင်သော ပိုးကောင်များ
warm-blooded (adj) - သွေးအေးသော (သွေးအပူသတ္တဝါ)

5.1 Rainshadow Deserts (00:00 - 6:00)

Before you watch

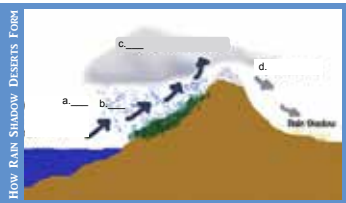
1. What do you know about **deserts**?
2. Find the Gobi Desert on the map on pages 138 and 139. In which countries is it?

As you watch

1. How much of the Earth's land is desert?
2. Which deserts do not have any life in them?
3. What surprising weather is there in the Gobi Desert?
4. What are the highest and lowest temperature in the Gobi Desert?
5. What is the Bactrian camels biggest problem?
6. How do they solve that problem?
7. When do Bactrian camels breed?

After you watch

1. The Gobi Desert is a **rainshadow** desert. Label the diagram which shows how rains shadow deserts form.
 - i. clouds forced upwards and rain falls on the mountains
 - ii. hardly any moisture remains when the wind gets over the mountains.
 - iii. clouds form over the sea
 - iv. wind blows clouds into the mountains



ANIMAL CLASS: A GUIDE TO ANIMAL CLASSIFICATIONS

2. MAMMALS

There are more than 4,000 different species of mammals. The smallest is the hog-nosed bat. It weighs 0.07 ounces (2 grams) and the largest is the blue whale, which weighs 132 tons (120 tonnes). Some live on land and some live in water, but all mammals share some common characteristics.

- All mammals:**
- are vertebrates (have a backbone).
 - are "warm-blooded" (create their own body heat).
 - give birth to live babies
 - feed milk to their young

- Most mammals:**
- have hair or fur on their bodies

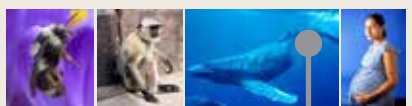
Camels are mammals which have adapted to living in the desert.



IS IT A MAMMAL?

Are the following animals mammals? Why?

- a. a bumble bee
- b. a monkey
- c. a whale
- d. a human



"Animal Class" boxes, which explain the main scientific animal classifications, and help students understand the differences between classes.


Planet Earth: A Study Guide to the BBC Natural History Series is designed for classroom and self-study use. It features complete guides to all 11 episodes of the series, and additional components for reference purposes. A full answer key is at the back of the book.

Skills-building activities at the end of each unit, so that students can practice map-reading, reading and creating charts and graphs, and other useful skills.

Myanmar-related texts, to link students' learning to their own country and context.

UNIT 7: GREAT PLAINS -
ADDITIONAL ACTIVITIES

MYANMAR RICE
The most important cereal in the country | Information from <http://ricepedia.org/myanmar>



Rice farmers working in the fields in Myanmar.

Myanmar is the world's sixth biggest rice producer. Rice is the staple food of everyone in Myanmar. The average person in Myanmar eats 310 pounds (141 kg, 86.5 vibs) of rice per year. Because rice is the staple food of Myanmar, it is necessary for the food security of the whole country.

It is also an important crop for Myanmar's economy: In colonial times Myanmar was the biggest exporter of rice in the world. In 2010, Myanmar produced 33

million tons of rice and exported 122,000 tons to other countries.

There are many different types of rice in the world and they have evolved to grow in their local climate. Therefore, different kinds of rice can grow in different parts of Myanmar and at different times. Some types are sown during the monsoon. Some types, such as deepwater rice only grow in the lowland of the Ayeyarwaddy Delta. Rainfed rice is sown in lower Myanmar, in Yangon and Bago Regions. In upper Myanmar, irrigation is needed to grow enough rice.

Since 2010, the Myanmar government has been trying to increase rice production and rice exports, but the country still faces problems. Many farmers are poor, and can't buy modern equipment. Transporting rice is difficult because of poor roads and railways.

To increase rice production, more money for farmers (such as microloans, where farmers borrow small amounts of money), improved roads and new storage buildings are necessary. Additionally, if the price of paddy increased, farmers would make more money from rice farming, and be able to grow more.



- Answer the questions.
 - Why does food security in Myanmar depend on rice?
 - How much rice did Myanmar sell abroad in 2010?
 - What kind of rice can only grow in the Ayeyarwaddy Delta region of Myanmar?
 - What needs to change to make Myanmar a bigger exporter of rice?
- Discuss the questions.
 - What do you think has happened to Myanmar's production since colonial times?
 - List the ways Myanmar could help farmers to improve rice production.
- Choose three areas of Myanmar on the map – one where you come from, one you have visited before, and one where you hope to go one day.
 - What is the highest number of hectares (ha) sown (farmed) with rice in these places?
 - How many tonnes of rice/cereal grains are produced in these places? Use the average amount (if the chart shows 300,000 - 400,000, use 350,000).
- Put your data about the number of hectares sown and amount of grain produced into a bar chart.
- Which of the three areas has the highest yield of rice and cereals? Why do you think that is? Use evidence from the data and graphs to form your conclusion.



An atlas section with full colour physical maps of all major continents and regions of the world. Students will refer to these maps in every unit.

Additional Components

BBC Planet Earth (essential)

You will need the complete BBC TV series *Planet Earth* to properly use this course. For copyright reasons, we are not able to supply legal copies of *Planet Earth* with this book. It should be available, however, in any good DVD store. Additionally, it may be available online, on sites such as [YouTube](#) or [Vimeo](#), for download or streaming.

Mote Oo Education has edited subtitle files for each episode, so that students can more easily understand the series.

Contact Mote Oo Education for more information about the TV series and the edited subtitles: info@moteoo.org or moteooeducation@gmail.com.



Wikipedia and Simple English Wikipedia (useful)

Wikipedia is an open-source, user-updated online encyclopedia. It is possibly the biggest free online encyclopedia in the world. Several units of this book have research questions, and it may be useful for students to have access to the Simple English Wikipedia (or another encyclopedia) for those questions.

The URLs for the sites are:

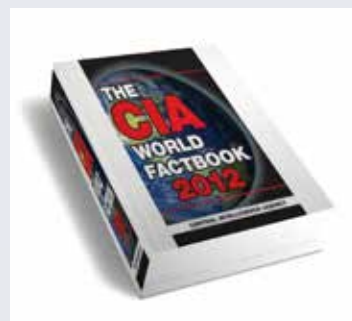
- English Wikipedia – en.wikipedia.org
- Simple English Wikipedia – simple.wikipedia.org

There are also several applications and pieces of software which can help you to download Wikipedia and use it offline (with no internet connection). You can contact Mote Oo Education staff if you need assistance with this.



An Atlas (useful)

This book comes complete with a basic atlas showing major continents, land masses and regions, and there are several thematic maps of Myanmar. However, for students who wish to learn more about the many countries featured in this course, a more complete atlas is recommended. There are free atlases online, including at the CIA World Factbook (cia.gov). The regional and continental maps in this book were also sourced from the CIA World Factbook.



Ideas for Using Planet Earth

For Students and Teachers:

This book is designed to be fun, friendly and flexible. There are many different situations where teachers and/or students could use this book. We encourage you to use this book in whichever way suits you.

Watch the series more than once to gain a better understanding. As you go through the book and series, you will learn more vocabulary and understand the ideas better. Many words and ideas are repeated, from the first episode to the last, but we have introduced them slowly, so that learning happens naturally.

For Students:

This book gives you real-world knowledge and skills. As well as the watching and reading activities, there are 11 *Additional Activities* sections. In each section are additional reading comprehension and skills activities, and many of these focus on Myanmar. These are essential life and study skills, which we hope you can apply to your study or work, and link to your understanding of your country.

We have also included an atlas (map collection) at the back of the book, and many sections of the book ask you to find places before or after you watch. This will help you to gain more knowledge of our planet, and where important places are.

For Teachers:

This book is adaptable. Every teacher has his or her own teaching style, but for teachers who are looking for tips on how to best teach this book, here are some simple ideas:

1. Introduce the section with some questions, a brainstorm, a quiz or some other way of generating interest in the topic. This will also help you to find out how much students already know.
2. Check each section for words in **bold**, these are keywords. Definitions are at the start of each unit.
3. Give students enough time to do the *Before you watch* activities. Clarify anything they don't understand, and explain concepts which they might find difficult.
4. As a class or in groups, encourage students to predict or guess the answers to *As you watch* activities, so that they are familiar with the questions before they begin watching the video clip.
5. After watching (more than once, if necessary), check students' answers together and discuss issues that might arise. Use *Simple English Wikipedia* if necessary and possible.
6. Give students time to do the *After you watch* activities (in pairs, groups or as a class, perhaps) and check and discuss the answers together.
7. Provide additional activities, practice or discussion where necessary.
8. Use the *Additional Activities* section to promote discussion of the concepts and encourage further research by students.

Planet Earth:

Note: This is not an exhaustive list of all the learning goals of the course. It focuses only on the key concepts, ideas and theories discussed in the course, and the key skills learned and practised. Below are some of the general aims

General Aims of This Course

This course aims principally to introduce a number of broadly connected subjects to the learner in a general yet interesting way. Throughout the series and the related units in this book, students will be introduced to some of the basic concepts and theories which are central to many different areas of study, such as Earth sciences, geography, biology, and paleontology. Although it is not meant to be an academic course, students who complete the book should have a broader understanding of:

- **the Earth** and elements of the natural environment such as rivers, seas and oceans, mountains and volcanoes, and forests and deserts.

Unit	1	2	3	4	5
Knowledge and Skills Goals To increase understanding of... To increase ability to...	<ul style="list-style-type: none"> • longitude and latitude • how the tilt and rotation of the Earth affects the seasons • climate and climate zones • how the oceans affect weather • the water cycle • communities, habitats and ecosystems • Myanmar's climate • <i>relate climate to latitude and elevation</i> • <i>locate places on maps using latitude and longitude</i> • <i>read topographic maps</i> 	<ul style="list-style-type: none"> • what the Earth is made of • how mountains and volcanoes are formed • predation and predator-prey relationships • what causes avalanches • glaciers • adaptation in animals • migration • how the Rakhine Yoma/ Chin Hills were formed • <i>identify behavioural and physical adaptations in animals</i> • <i>map reading</i> • <i>research</i> 	<ul style="list-style-type: none"> • the parts of a river system • the water cycle • the features of a reptile • great rivers and lakes of the world • the importance of, and problems facing, Inle Lake • the importance of the Ayeyarwaddy River • <i>draw diagrams</i> • <i>read maps</i> • <i>research</i> 	<ul style="list-style-type: none"> • cave environments • the formation of limestone • why most caves are found in limestone • food chains • evolutionary theory • the chemistry of cave environments • caves in Myanmar • <i>sequence events logically</i> • <i>reason from cause to effect</i> • <i>interpret context clues</i> • <i>draw diagrams</i> 	<ul style="list-style-type: none"> • the location of deserts • the types of deserts • the formation of deserts • the features of mammals and insects • the role of competition in evolution • the causes and effects of flash floods • Myanmar's Dry Zone • annual rainfall in different areas of Myanmar • <i>read maps</i> • <i>find averages in groups of data or statistics</i> • <i>draw graphs and charts</i>

Learning Goals

of the course, and beneath that are the main knowledge and skills learning goals of each unit of the course. The key technical vocabulary used in the book and series is provided at the beginning of each unit.

- **ecology (study of the plant and animal world)**, including major classifications of both plants and animals; the ways in which plants and animals reproduce and interact with each other; plant and animal interdependency.
- **the natural history of Earth**, including evolutionary theory and the ways in which science can learn more about the Earth's past.
- **the geography and geology of Myanmar** in relation to the topics introduced in this course.
- **the world as it looks on a map**, and where countries, continents and oceans are in our world.
- **humanity's reliance on, and impact on, nature**, and the major issues facing the natural world

6	7	8	9	10	11
<ul style="list-style-type: none"> • the location of the Arctic and Antarctica • the differences between the Arctic and Antarctica • the features of birds • animal species found at the Arctic and Antarctica • the breeding cycle of penguins • climate change • the climate of Hkakabo Razi • the possible effects of climate change on food production • <i>infer using context clues</i> • <i>reason from cause to effect</i> • <i>read thematic maps</i> 	<ul style="list-style-type: none"> • different grasses and their uses • the structure of grass plants • food webs • trophic levels • how plants reproduce • food pyramids • the importance of rice to Myanmar • cereal production in Myanmar • <i>classify components of food charts</i> • <i>analyse food charts</i> • <i>draw diagrams</i> • <i>read maps</i> • <i>draw graphs and charts</i> 	<ul style="list-style-type: none"> • the layers of a rainforest • photosynthesis • reproduction in animals and plants • the role of reproduction in supporting life • the features of amphibians • the importance of decomposers • plant and animal specialisation • evolution • chimpanzees and humans • the Tanintharyi forest complex • <i>identify steps in the evolutionary process</i> • <i>draw diagrams</i> • <i>compare and contrast generalist and specialist species</i> 	<ul style="list-style-type: none"> • symbiosis and interspecies cooperation • the evolution of sea mammals • algae • the features of fish and invertebrates • sea winds in the southern hemisphere • the importance of krill to the food chain • coral reefs off the coast of Myanmar • <i>identify evolutionary process</i> • <i>infer reasons for changes to sea life</i> • <i>find averages</i> • <i>draw pie charts</i> 	<ul style="list-style-type: none"> • the types of trees which can grow at different latitudes • the food chain in taiga forests • the life cycle of the 17 year cicada • the seasons in temperate climates • herbivores, carnivores and omnivores • the relationship between herbivores and carnivores • forest coverage in Myanmar • <i>read maps</i> • <i>create column charts</i> 	<ul style="list-style-type: none"> • deep ocean food chains • deep ocean organisms • the role of scavengers in the food chain • submarine volcanoes and seamounts • the role and effects of plate tectonics • the life of the blue whale • tectonic activity in the Indian Ocean/Andaman Sea • <i>convert metric measures to imperial</i>



■ Sunrise over Osan, South Korea.

Unit 0 Introduction

Key Words

- aquatic (adj)** – ရေတွင် နေထိုင်သော
- biome (n)** – သဘာဝအတိုင်း ပေါ်ပေါက်လာသော အပင်များနှင့် သတ္တဝါများ စိုးမိုးထားသည့် နေရာဒေသ
- climate (n)** – ရာသီဥတု
- compass rose (n)** – အရပ်မျက်နှာများကို ညွှန်ပြသော သံလိုက်အိမ်မြှောင်
- continent (n)** – တိုက် (ဥပမာ - ဥရောပတိုက်၊ အာရှတိုက်၊ အမေရိကတိုက်)
- episode (n)** – ဖြစ်ရပ်များ (ဇာတ်လမ်းတွဲ)
- terrestrial (adj)** – ကုန်းပိုင်းတွင် နေထိုင်သော

0.1 Maps, Oceans and Continents

1. Look at the map of the bottom of the page. Answer the questions.
 - a. What is this map?
 - b. Identify north, south, east and west.
2. Use these words to label the map (i-viii).

a. title	e. Europe
b. compass rose	f. Africa
c. Australasia	g. South America
d. North America	h. Asia
3. What are the names of the five oceans?
 - i. P_c_f_c
 - j. _t_an_c
 - k. In_____
 - l. Sou____rn
 - m. A_c__ic
4. Label them on the map (ix-xiii).
5. Read the text and check your answers to 1-4.
6. What continents are these countries on?
 - a. The United States of America
 - b. Brazil
 - c. France
 - d. Nepal
 - e. Ethiopia

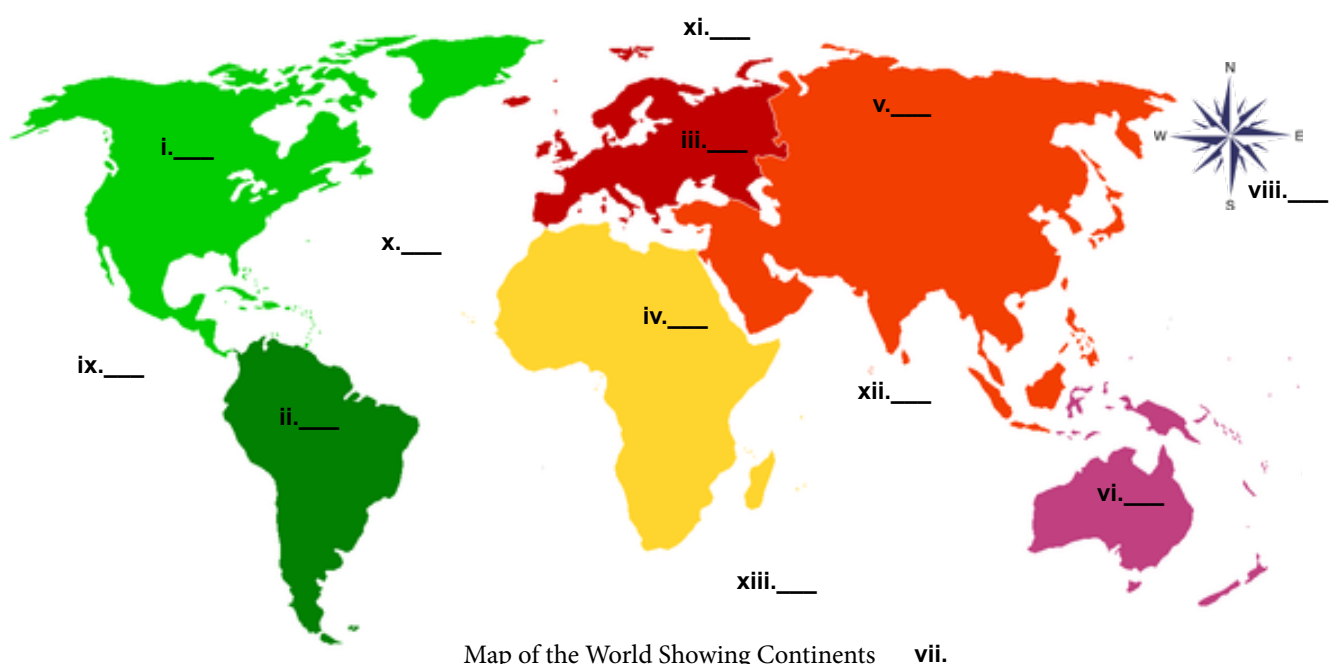


Maps are important and useful tools. They show us where in the world things are. Some maps show streets, some show countries and some show **continents**. Some, like the map below, show the whole planet.

The map below shows each continent in a different colour. On this map, North America is light green, South America is dark green, Europe is red, Asia is orange, Africa is yellow and Australasia is purple. The seventh continent, Antarctica, is not shown.

Between the continents is water. This water is called the oceans. There are five oceans: between the Americas and Europe/Africa is the Atlantic Ocean; south of Asia is the Indian Ocean; between Asia and the Americas is the Pacific Ocean; in the north of our planet is the Arctic Ocean and in the south is the Southern Ocean

Like most maps, north is at the top of the map and south is at the bottom (and east is on the right and west is on the left). Some maps have a compass rose. A compass rose is the object on the right of the map, which looks like a clock. It shows north, east, south and west.



0.2 Earth's Biomes

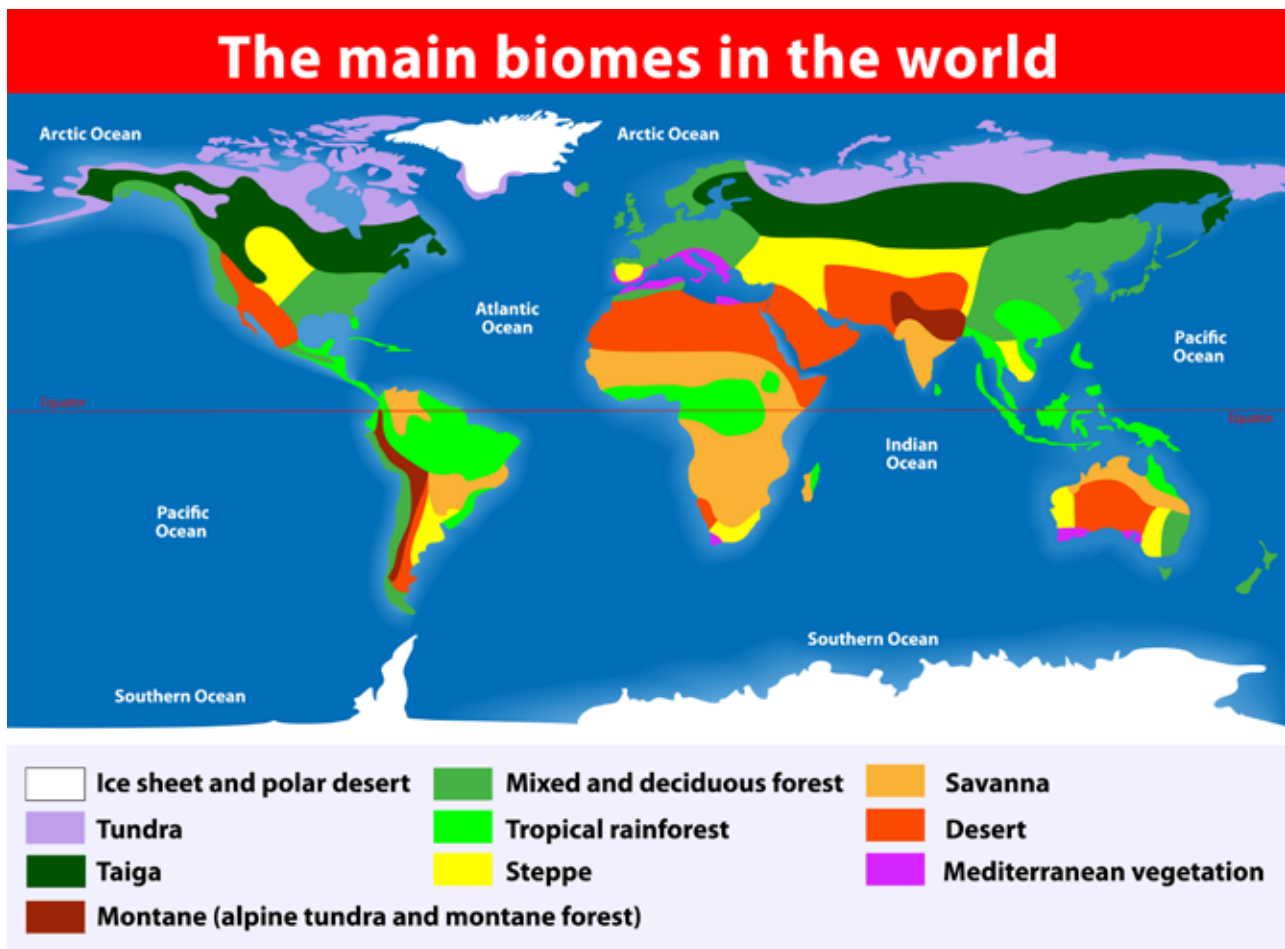
- 1. Discuss:** Look at the map below. What does the map show?
- Read the text and mark the statements true or false. If false, explain why.
 - There are 12 episodes of Planet Earth.
 - A biome is a place where there is mostly similar plant and animal life.
 - Some examples of biomes include desert and ice sheet.
 - There are only two types of biome, terrestrial and aquatic.
 - Terrestrial biomes are on the land.
- Look at the map of biomes below. Use your understanding of the world to predict what the weather and the plant and animal life are like in each biome. For each biome, say *why* you think this.

What Is a Biome?

Planet Earth has 11 **episodes**. Many of the episodes look at different **biomes** on our planet. A biome is a place where the plant and animal life is similar over a large area. For example, *forests, deserts or ice sheet*. There is a reason that different biomes exist on our planet, and that reason is **climate**. You will learn more about climate in Unit 1.

The map below shows ten **terrestrial** biomes. However, not all scientists agree that there are ten; some argue that there are more, some think that there are fewer. In this course you will watch and read texts about many terrestrial biomes, and several **aquatic** biomes – rivers, lakes, shallow seas and deep oceans.

As you continue through the course, you may need to look at this section again, to remind yourself of the different biomes. You can also look on Wikipedia (or another encyclopedia) for additional information about this or any other topics in the book or TV series.



0.3 Time-lapse and Slow-motion Photography

- 1. Discuss:** How long does it take for these things to happen?
 - a. the Sun to rise
 - b. a person to cough
 - c. a caterpillar to become a butterfly
 - d. a football player to score a goal
- 2.** Read the text and match the two main ideas to the pictures below. There are two pictures to match each type of photography.
- 3.** Which type of photography would be the best for the four examples above?

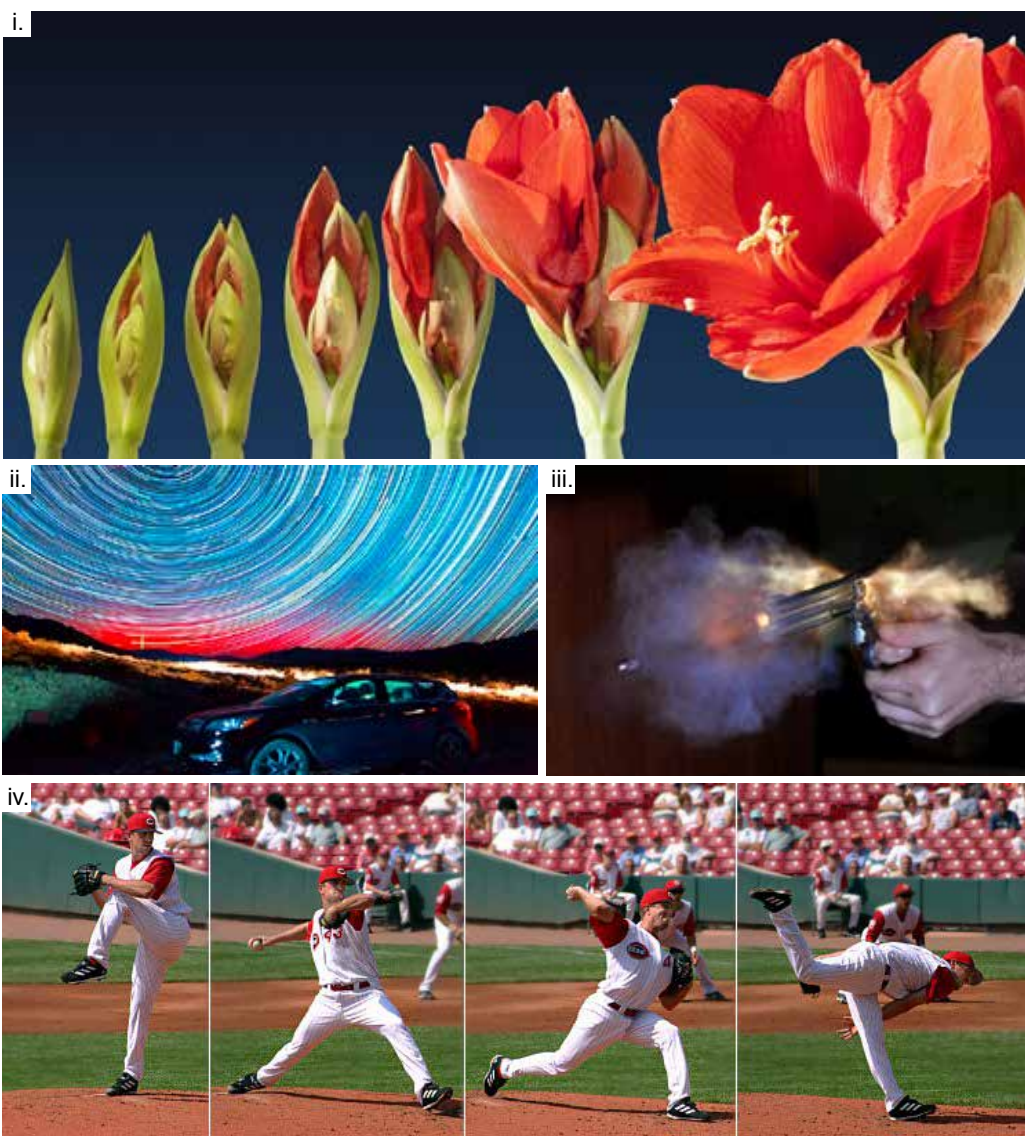
Time-lapse Photography

Time-lapse photography is used to photograph or record things which happen very slowly. It is often used in TV shows about nature or the environment, because many things in the natural world happen very slowly. For example, we know that the moon travels across the sky each night, but it moves too slowly to see. Time-lapse filming records events like this, then we can watch them much more quickly.

Slow-motion Photography

Slow motion photography is the opposite of time-lapse. We use it to film things which happen very quickly. It is often used in movies, for example in a fight or a car crash. Slow-motion filming allows us to slow down these quick events and watch exactly what happens.

Both of these types of filming are used often in Planet Earth, to help you clearly see what is happening.





■ View of the northern Antarctic Peninsula from the air.

Unit 1 From Pole to Pole

Key Words

air pressure (n) – လေထုသိပ်သည်းမှု
altitude (n) – ပင်လယ်ပြင်ထက်အမြင့်
axis (n) – စိတ်မှန်းဝင်ရိုး
breed (v) – (တိရစ္ဆာန်) သားပေါက်သည်။ သားဖောက်ရန် ဈေးမြူသည်။
climate zone (n) – မတူညီသော ဥတု၊ ရာသီအခြေအနေ
condense (v) – ငွေ့ရည်ဖွဲ့သည်
current (n) – (ရေ၊ လေ) စီးကြောင်း
ecosystem (n) – အပင်နှင့် သတ္တဝါတို့ သဘာဝပတ်ဝန်းကျင်နှင့် လိုက်လျောညီစွာ ဖွဲ့တည်မှုစနစ်
elevation (n) – ပင်လယ်ရေမျက်နှာပြင်အထက်အမြင့်
equator (n) – အီကွေတာ
evaporate (v) – အငွေ့ပြန်သည်
habitat (n) – (သက်ရှိတို့) နေရာ၊ တည်နေရာ၊ ဘုံ
hatch (v) – သားပေါက်သည်
highland (n) – ကုန်းမြင့်ဒေသ၊ တောင်တန်းဒေသ
interact (v) – တုံ့ပြန်သည်။ အပြန်အလှန် အကျိုးပြုသည်
latitude (n) – လတ္တီတွဒ်၊ မျဉ်းပြိုင်
legend (n) – see "map key"
longitude (n) – လောင်ဂျီတွဒ်မျဉ်း၊ ဒေါင်လိုက်
map coordinates (n) – မြေပုံညွှန်း

map key (n) – မြေပုံညွှန်း
moisture (n) – ရေငွေ့၊ အစိုဓာတ်
monsoon (n) – မိုးရာသီ
northern hemisphere (n) – ကမ္ဘာမြောက်ဘက်ခြမ်း
organism (n) – ဇီဝရုပ်၊ သက်ရှိ
pole (n) – ကမ္ဘာ၊ ဂြိုဟ်တို့၏ ဝင်ရိုးစွန်း
precipitate (v) – နှင်းကျသည်၊ မိုးရွာသည် (ကောင်းကင်မှ အရည်ဖြင့် ဖွဲ့စည်းထားသော အရာများ မြေပြင်သို့ ကျလာခြင်း)
ray [of sun] (n) – (နေ) ရောင်ခြည်
rotate (v) – လှည့်သည်
southern hemisphere (n) – ကမ္ဘာတောင်ဘက်ခြမ်း
species (n) – မျိုးစိတ်
swamp (n) – စိမ်း၊ ညွန်ပျောင်း၊ ရွံ့ညွန်
terrain (n) – မြေ၊ မြေအနေအထား
tilt (n) – တိမ်းခြင်း၊ စောင်းခြင်း
upland (n) – see "highland"
vegetation (n) – သဘာဝပေါက်ပင်
water cycle (n) – ရေများ၊ နှင်းများမှ တစ်ဆင့် မြစ်ထဲ၊ ချောင်းထဲသို့ ပျော်ဆင်းပြီးနောက် တိမ်များအဖြစ် အငွေ့ပျံတက်သွားခြင်း စက်ဝန်း

1.1 The Arctic and Antarctica (00:00 – 09:00)

A Before you watch

1. **Discuss:** What and where are the poles?
2. Read the text about the Earth's rotation and label the diagram.
 - a. North Pole
 - b. South Pole
 - c. the equator
 - d. direction of Earth's rotation
 - e. Earth's axis

From Pole to Pole

What Are Poles?

The Earth **rotates** around an **axis**. An axis is a line through the middle of the Earth. The places at the north and south (where the line starts and ends) are the **poles**. They are called the North Pole and the South Pole.

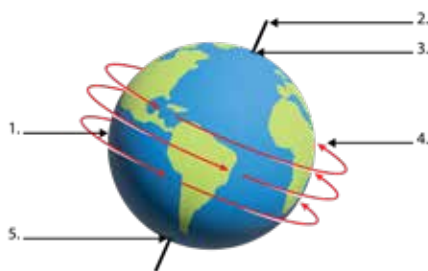
Why are they so cold?

The poles are cold because the energy from the Sun's **rays** is not as strong as at other places. The **equator** gets more energy from the sun, so it is hotter.

Arctic or Antarctic?

The region around the North Pole is called the Arctic (or Arctic Circle) and the area around the South Pole is Antarctica (or the Antarctic).

The Earth's rotation on its axis



B As you watch

1. How cold is winter in Antarctica?
2. How long is it dark for in Antarctica?
3. Where is the female polar bear trying to go to?
4. What animal is the female polar bear going to hunt for?
5. What percentage of polar bear cubs die in their first year?
6. How long are the days during the Arctic summer?

C After you watch

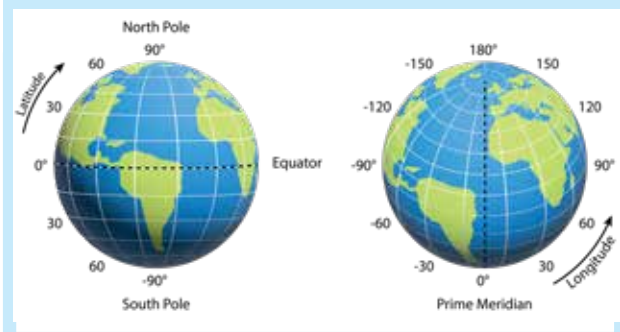
1. Which of the two animals lives in the Arctic and which lives in the Antarctic?
2. Read the text and answer the questions about **map coordinates** using the maps at the back of the book.
 - a. Is Australia north or south of the equator?
 - b. Is Russia north or south of China?
 - c. Which country is further west, Australia or New Zealand?
 - d. What are the map coordinates for Yangon, Myanmar?
 - e. What are the map coordinates for New York City?

Latitude and Longitude

Our Earth is very big, so we need a way to describe location easily. We do this with map coordinates called **latitude** and **longitude**. Together, they are like an "address" for everywhere on Earth.

Latitude tells us how far north or south a place is. We measure north and south from the equator, which is 0°N. The North Pole is 90 degrees north of the equator (90°N) and the South Pole is 90 degrees south (90°S).

Longitude tells us how far east or west a place is. We measure east and west from the meridian line. This is called the prime meridian and is 0°E. It passes through a place called Greenwich, in London, England. If you want to find Ulaanbataar, Mongolia on a map, it is 47 degrees north (47°N) and 107 degrees east (107°E).



3. Look at the map on pages 132 and 133. Find London.
4. Look at the map on pages 136 and 137. Find Ulaanbataar.

1.2 Tundra, Taiga and Broadleaf (deciduous) Forests (09:00 – 18:55)

A Before you watch

1. Read the text and label the diagram. You can use each label more than once.
 - a. tropical zone
 - b. polar zone
 - c. temperate zone
2. Where are the subtropical zones? Draw two lines on the map.

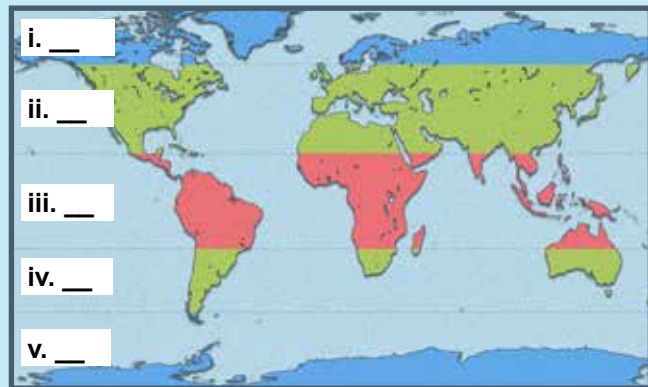
Climate and Climate Zones

Climate is the weather in an area over a long period of time. There are many different things which affect the climate of a place, such as latitude, height and **terrain**.

There are four basic **climate zones** on Earth: polar zones, temperate zones, tropical zones and subtropical zones. The North and South Poles are in the polar zones of our planet. These are the coldest parts of Earth. Beyond the polar zones are the temperate zones. Temperate zones have four seasons – spring, summer, autumn and winter. They change between warm and cold throughout the year.

Nearer the equator is the tropical zone. The tropical zone has no real seasons, only wet and dry periods. The tropical zone is the hottest part of our planet.

The subtropical zones are not usually shown on climate zone maps. They lie approximately 30-45° north and south, between the tropical and temperate zones.



B As you watch

1. Complete the table using information from the video.

	Arctic Tundra	The Taiga	Deciduous/Broadleaf Forest
1. Are there trees? (Y/N)	No		
2. Describe the trees.			
3. Are there many animals? (Y/N)			
4. Give examples of animals.			

C After you watch

1. Look at the map of biomes on page 10 and find the tundra, the taiga and the deciduous (broadleaf) forests. Which climate zone(s) is each in?
2. Which supports the most life? Why?

1.3 Seasons (18:55 – 26:16)

A Before you watch

1. **Discuss:** What causes the seasons on Earth?
2. Read the text and diagram about the seasons and answer the questions.
 - a. Why is it winter at the North Pole when it is summer at the South Pole?
 - b. What difference does latitude make to the climate?
 - c. What difference does elevation make to the climate?
 - d. Which parts of the Earth get more of the Sun's rays?

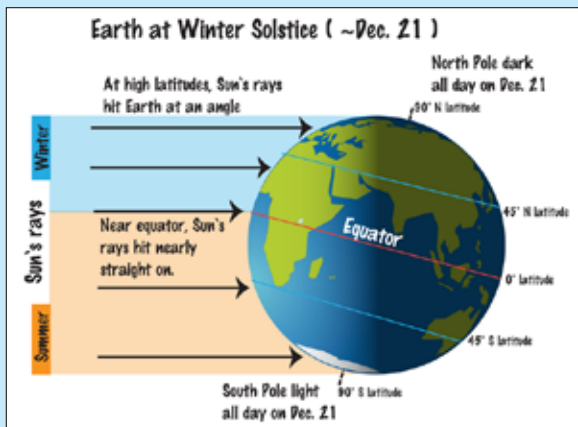
Seasons and Climate

The Earth travels around the Sun once every year. If the axis of the Earth was straight up and down, there would be no seasons. However, the axis of the Earth is not straight up and down, it has a **tilt** of 23°. Therefore, at some times of the year the Sun's rays hit the **northern hemisphere** more and at some times they hit the **southern hemisphere** more. This tilt gives us the seasons.

The Sun's rays always hit some parts of the Earth more directly than others. Land near the equator always gets more direct sun than land near the poles. This helps to create the climate zones.

Additionally, the **elevation** can also affect climate. Lowland usually has a warmer climate than upland. **Air pressure** is lower at higher **altitudes** (at the top of mountains, for example) and this reduces the temperature.

The diagram below shows how the tilt of the earth and latitude affect the seasons and the climate at different places on Earth.



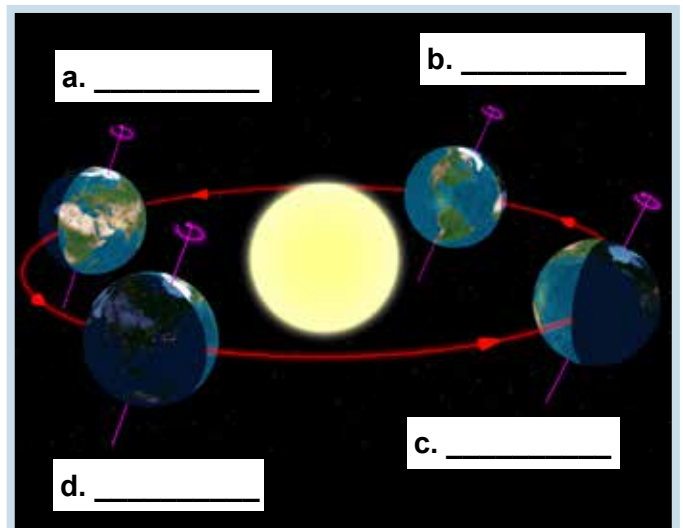
B As you watch

1. What happens in spring in Japan?
2. What happens to the deciduous trees in America at the end of the summer?
3. Match the numbers and percentages to the things they relate to.

a. 300,000	1. percentage of Earth covered by jungle
b. 3%	2. amount of sunlight reaching jungle floor
c. millions	3. insect species in the jungle
d. 2%	4. population of Baikal teal in the world

C After you watch

1. The diagram shows the seasons at the North Pole. Use the information in the video, text and previous section.
 - i. spring
 - ii. summer
 - iii. autumn
 - iv. winter



2. Why are there no seasons in the tropical zones (tropics)?

1.4 Oceans and Weather (23:31 – 33:23)

A Before you watch

1. Match the words below with the description or explanation.

- | | |
|---------------------------|-------------------------------------|
| a. condense (v) | 1. a small amount of a liquid |
| b. precipitate (v) | 2. to rain or snow |
| c. evaporate (v) | 3. to turn from a liquid into a gas |
| d. moisture (n) | 4. to turn from a gas into a liquid |

B As you watch

1. Answer the questions about the seal and the shark
- What season do the seals around South Africa start to **breed** in?
 - How long does a great white shark's strike last?
 - Which animal is faster, the shark or the seal?
 - Which animal can turn more quickly, the shark or the seal?



2. Listen (31:05 – 32:55) and fill the gaps.

The Sun's Influence on the Oceans

"The Sun, beating down on tropical waters, powers the weather systems of the globe. _____^a _____^b from the warming ocean and rises to create great storms.

"The winds generated out at sea sweep inland across the continents. As they travel across the Sahara, they create the biggest of all sandstorms, blowing sand halfway round the world, to fertilise the Amazon jungle.

"Winds blowing across the Indian Ocean collect _____^c and move north towards the Himalayas.

"As the air rises, it cools. The water it carries _____^d into clouds and then falls as the life giving _____^e of the **monsoon**. So air **currents**, powered by the sun, carries wet air to the middle of continents."

C After you watch

1. Label the diagram of the **water cycle**. Use the information from the video and the text in **B**.



2. Find South Africa on the map on pages 130 and 131. What oceans are to the east and west of South Africa?

1.5 Habitats and Ecosystems (33:23 – End)

A Before you watch

1. Read the text and label the diagram with the words in the box.

[plant] community ecosystem habitat

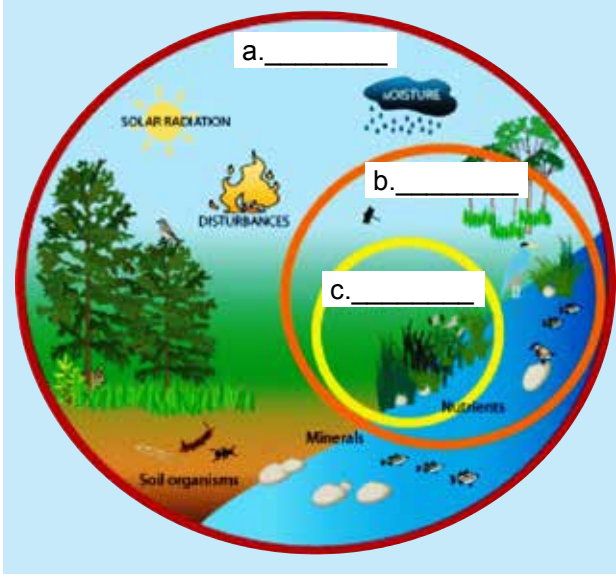
Habitats, Communities and Ecosystems

Habitat is the word we use for the natural home of an **organism**. Different animals and plants can have the same habitat. A habitat must allow an organism to find food, water and shelter. If animals cannot live in one habitat, they will move to a better one. If a habitat cannot provide the needs of an organism, it may die.

Different plants and animal species together in one habitat are called a community. The communities of living things **interact** with each other and the world around them – with the air, the water and the sunlight. These interactions form the **ecosystem**.

Riverbank Ecosystems

A riverbank is an example of an ecosystem. The water itself is the habitat of fish and birds. Near the water are other animals, and plants, such as grasses and trees. The animals together are the animal community and the plants are the plant community. They all interact with the water, the air and each other. This interaction of living and non-living things is a riverbank ecosystem.



2. Read the text again and answer the questions.
 - a. What is the difference between a habitat and an ecosystem?
 - b. If a fish lives in the sea, is the sea the fish's habitat or its ecosystem?
 - c. What is the habitat of a cow?

B As you watch

1. Circle the correct word in each sentence below.
 - a. Deserts cover one third / three quarters of the land's surface.
 - b. Many animals are moving to another habitat because they need water / food.
 - c. The Okavango is a desert / swamp.
 - d. Water comes to the Okavango in the rainy season / dry season.
 - e. Animals can get lost in the darkness / dust storms on the way to the Okavango.
 - f. Water in the Okavango comes from the Atlantic Ocean / highlands of Angola.
 - g. Hunting dogs hunt alone / in large packs.
 - h. Hunting dogs usually kill and eat an animal about once a day / once a week.
 - i. After many hundreds / thousands of miles, the elephants arrive at the Okavango.
 - j. Baby penguins **hatch** when the Sun / snow returns to the Antarctic.

C After you watch

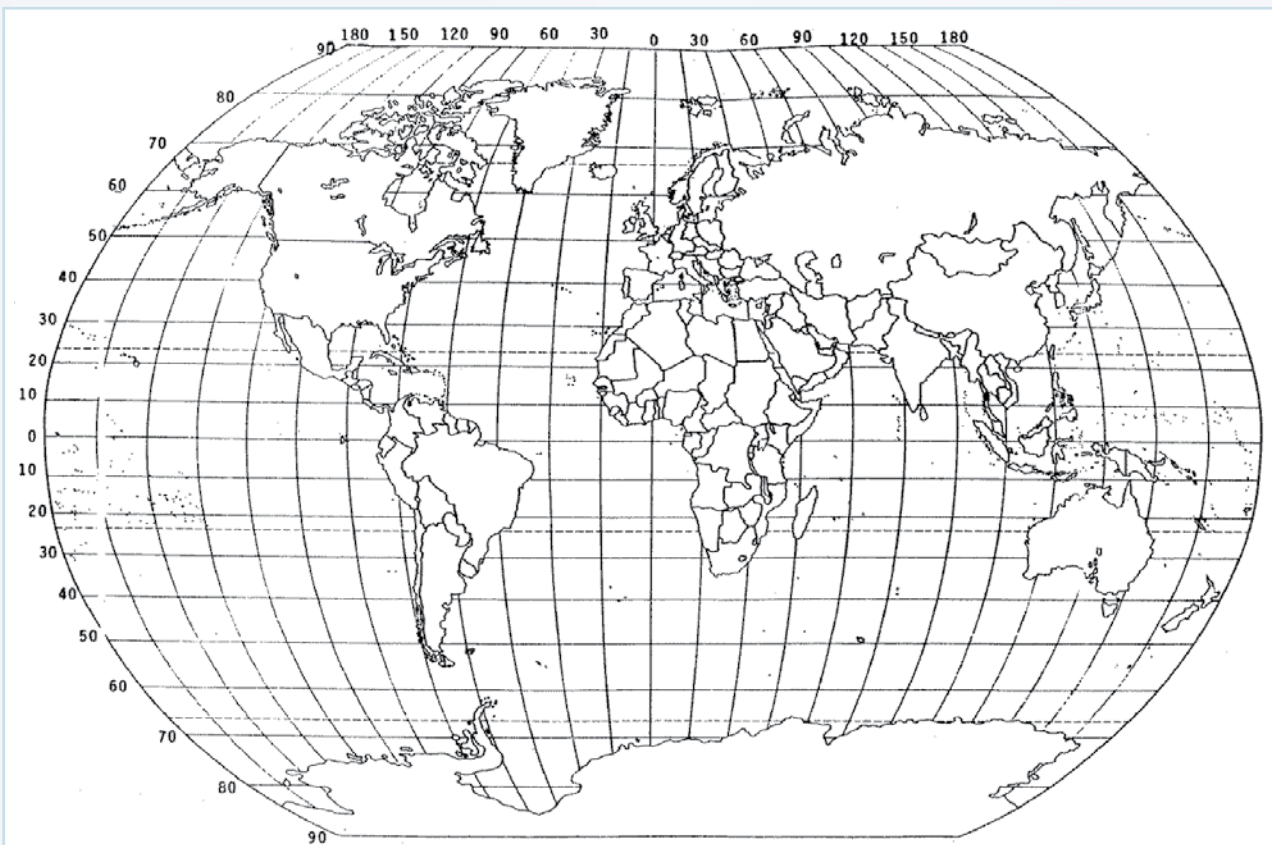
1. What do these animals (from the video) need in their habitats to be comfortable? Why?
 - a. elephant
 - b. catfish
 - c. impala
 - d. hunting dog
2. What would make each of the animals leave their habitat to find a new one?
3. Find the Kalahari Desert on the map on pages 130 and 131. Where is Angola in relation to the Kalahari Desert?

UNIT 1: FROM POLE TO POLE -



SKILLS WORK

1. Colour in the countries or continents that match the coordinates and give their names below:
 - a. 20°N , 105°W : _____
 - b. 30°S , 135°E : _____
 - c. 30°S , 30°E : _____
 - d. Between 40°N and 35°S : _____
 - e. Between 80°N and 10°S : _____
2. Are these countries in the northern hemisphere or southern hemisphere? Colour them on the map.
 - a. Greenland
 - b. Australia
 - c. India
 - d. Myanmar
 - e. Madagascar
3. Which climate zone (or climate zones) do these places lie in? Colour them on the map.
 - a. Russia
 - b. Brazil
 - c. Alaska
 - d. China
 - e. New Zealand

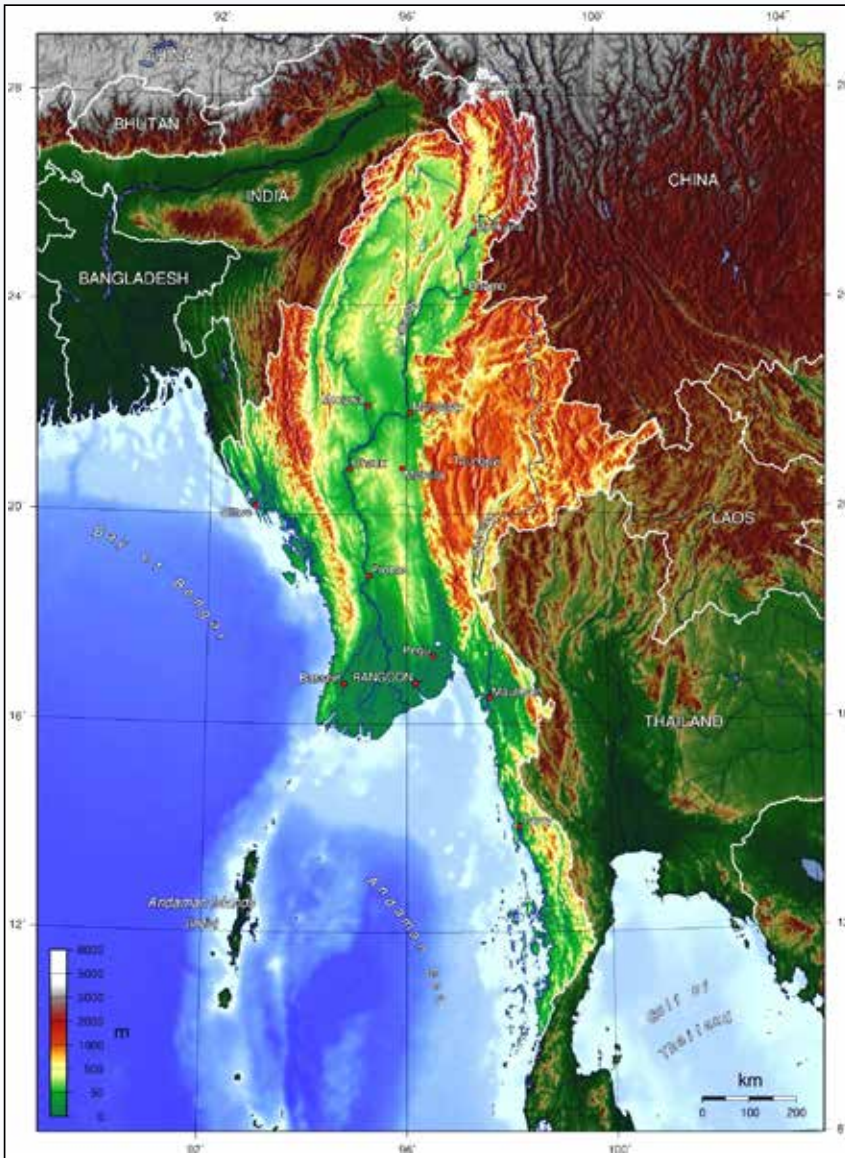


ADDITIONAL ACTIVITIES



FOCUS ON MYANMAR

1. Look at the map, read the text box below it and answer the questions.
2. Read the text about climate in Myanmar and answer the questions.



The map above is a *topographic* map. It shows the elevation of different areas of Myanmar. At the bottom, on the left, is a **legend (map key)**, which shows how to read the map. The green area is the lowest land, the yellow is higher, the brown is even higher, and finally the white is the highest-lying land in Myanmar.

- a. Find Yangon on the map. About how high above sea level is it?
- b. Find the city which is 21°N, 97°E. What is its name, and how high above sea level is it?
- c. Where is your home town. What is its elevation?

THE CLIMATE OF MYANMAR

Many people think that Myanmar is a “tropical” country, but really its climate is more complicated. The climate of Myanmar is different in different parts of the country. In the lowlands of Myanmar, the climate is mostly tropical. There are “hot” and “wet” seasons. Further north, the land becomes higher and the climate changes, because of both the elevation and the latitude. In some places, there is a subtropical climate. This is usually where the land is 8,202 ft (2,500 m) above the sea level. In higher places – 9,843 ft (3,000 m) – there is a temperate climate. Hkakabo Razi, in northern Kachin State, is the highest place in Myanmar at 19,294 feet (5,881 metres). It is also the furthest north. The climate in this part of Myanmar is temperate in the hot season but polar in the cold season.

- a. What two things affect the climate of Myanmar?
- b. What kinds of climate are there in Myanmar?
- c. Is the temperature usually hotter or colder further north?
- d. Which area of Myanmar has the coldest climate?
- e. Which area of Myanmar has the warmest climate?



■ A view of Mount Saint Helens, an active volcano in Washington, USA

Unit 2 Mountains

Key Words

adaptation (n) – ပတ်ဝန်းကျင်နှင့် သဟဇာတ ဖြစ်အောင်နေထိုင်ခြင်း
agriculture (n) – စိုက်ပျိုးရေး
avalanche (n) – တောင်ပေါ်မှ နင်းထု၊ ရေခဲထုနှင့် ကျောက်တုံးများ တစ်ဟုန်ထိုး လျှောက်ကျခြင်း
camouflage (n) – ပတ်ဝန်းကျင်နှင့် တစ်သားတည်းထင်စေရန် ကိုယ်ယောင်ဖျောက်ခြင်း
collide (v) – အပြင်းအထန် တိုက်မိသည်၊ ဆောင့်မိသည်
den (n) – သားရဲတွင်း
erosive (adj) – တိုက်စားတတ်သော
erupt (v) – (မီးတောင်) ပေါက်ကွဲသည်
flock (n) – တိရစ္ဆာန်အုပ်
fur (n) – သားမွေး၊ အမွေး (ဥပမာ - ငှက်မွေး)
glacier (n) – ရေခဲမြစ်
grazers (n) – အရွက်စားသတ္တဝါ
herd (n) – တိရစ္ဆာန်အုပ်စု
hibernate (v) – သားငှက်တိရစ္ဆာန်များ ဆောင်းခိုသည်
land mass (n) – မြေထု၊ ကုန်းမြေစိုင်
lava (n) – ချော်ရည်၊ ချော်ခဲ
magma (n) – ကမ္ဘာ့မြေလွှာအောက်တွင်ရှိသော ကျောက်ရည်ပူ

migration (n) – ပြောင်းရွှေ့ နေထိုင်ခြင်း
molten (adj) – ချော်ရည်ကဲ့သို့ အရည်ပူဖြစ်သော
mountain range (n) – တောင်စွယ်၊ တောင်တန်း
nesting ground (n) – ငှက်များ ဥရန် နေရာ
peak (n) – အထွတ်အထိပ်
predator (n) – သားရဲ၊ ငှက်ရဲစသည် သားရဲတိရစ္ဆာန်
prey (n) – သားကောင်
rift (n) – ငလျင်လှုပ်ခတ်မှုကြောင့် ဖြစ်ပေါ်လာသော မြေကြီးအက်ကွဲရာ နေရာ
summit (n) – အထွတ်အထိပ်
sphere (n) – စက်လုံး
tectonic plate (n) – ကမ္ဘာ့ကျောက်လွှာထုကြီး၊ ကမ္ဘာ့ဆန့်ကျင်ဘက် မြေလွှာကြီးများ
volcano (n) – မီးတောင်

2.1 Rift Valleys and Mountains (00:00 – 03:26)

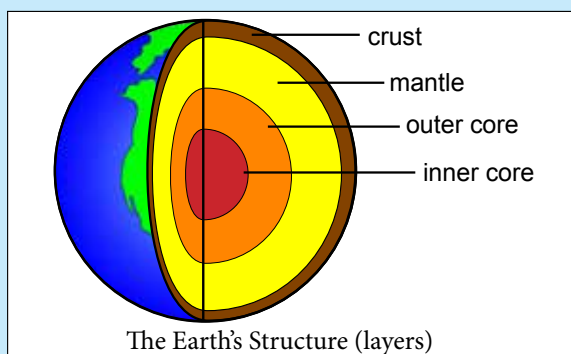
A Before you watch

- Match the words and their definitions.

a. molten (adj)	1. melted rock
b. volcano (n)	2. large pieces of land
c. lava (n)	3. to explode upwards
d. land masses (n)	4. a mountain with lava inside it
e. erupt (v)	5. hot and liquid
- Complete the text about the structure of the Earth using the diagram.

The Structure of the Earth

The Earth is a **sphere**, but it is not solid. It consists of four layers, inside each other. The outer layer is called the _____^a and all the land and sea on Earth sits on it. Under this is the _____^b. It is made of hot, liquid rock called **magma***. The third layer is the _____^c, which is made from molten iron and other metals. Finally, at the centre of the Earth is the _____^d. This is made of super-hot, solid metal.



* Magma and lava are the same thing: hot, liquid rock. However it is called *magma* when it is under the ground and *lava* when it comes out of the ground.

- Read the text and mark the statements true or false. If false, explain why.
 - The Earth's crust is made from pieces of rock called tectonic plates.
 - Some move towards each other and some move away from each other.
 - Volcanoes can form where plates push together.
 - Magma cannot come out of the Earth's mantle.

Mountains and Volcanoes

How mountains are made

Mountains are formed when pieces of the Earth's crust – called **tectonic plates** – push together. One of the plates pushes up and creates mountains. Most of the great **mountain ranges**, such as the Himalayas and the Rockies were made in this way. (You will see these mountain ranges later in the video.)

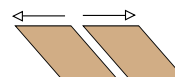
When plates push together, mountains form. Often, volcanoes are created in these places because magma can push through the crust.



What are volcanoes?

Volcanoes exist all over the world. They are places where the Earth's crust is open and the magma from the mantle can come to the surface. When magma comes out of a volcano, we call it lava. Most volcanoes are mountains, but some, like Erta Ale, in Ethiopia, are not. They form at **rifts** – places where the Earth's plates pull apart. In these places, lava comes out from between the plates.

When plates pull apart, magma can come up to the surface.



B As you watch

- Fill the gaps with words from A.

In Ethiopia, giant _____^a are pulling away from each other. _____^b rises to the surface from a crack in the crust. It creates a chain of young _____^c. Erta Ale is the longest continually _____^d volcano in the world. It is a lake of lava that has been _____^e for over 100 years.

C After you watch

- Find Ethiopia on the map on pages 130 and 131. What additional information can you see?

2.2 Predators and Prey (03:30 – 13:30)

A Before you watch

1. **Discuss** the questions
 - a. What kinds of animals usually eat plants?
 - b. What kinds of animals usually eat other animals?
2. Read the text about predation. Can you think of some more example of predators and prey?

Predation

Predation is the relationship between a predator and its prey. A **predator** hunts and kills other animals (the **prey**) for food.

Some examples of predators are big cats (such as lions, pumas and jaguars), wolves, sharks and some birds (such as eagles). Land predators often hunt alone or in small packs, and many hunt their prey at night.

Prey animals are usually, but not always, **grazers** (animals which eat plants) such as deer, small monkeys or caribou. These animals often live in large **herds** and graze together. When predators attack they will try and kill young, weak or slower animals.

■ A leopard catching and killing a deer.



B As you watch

1. What do the Gelada baboons eat?
2. Why do the Walia Ibexes and the Gelada baboons graze together?
3. When will Ethiopian wolves not attack their prey?
4. Is it usual to see a group of pumas together?
5. How long does the mother puma have to teach her cubs their survival skills?
6. What is the relationship between the guanacos and the pumas?

C After you watch

1. Compare the features of the predators and the prey animals and complete the table using the phrases in the box. You can use phrases more than once.

- very fast runners
- live in large groups
- defences (horns, etc) on their bodies
- sharp teeth and claws
- **camouflage**
- eyes on the side of their head so that they can see all around
- eyes at the front of their head see what is in front of them

a. What makes wolves and pumas good predators?

b. What helps Ibexes and Huanacos to stay alive?

2.3 Creation and Destruction (13:30 – 26:18)

A Before you watch

1. **Discuss:** What do you remember about the formation of mountains from 2.1?
2. Read parts A and B of the text and find the following on the map below:
 - a. North America
 - b. the North American Plate
 - c. the Pacific Plate

The Rocky Mountains

A. Location and Length

The Rockies are a mountain range in the west of North America. They run from Canada down to Southwestern USA. They run for over 3,000 miles (4,830 km).

B. Formation and Height

The Rockies formed between 80 and 55 million years ago. The Pacific Plate was moving north and the North American Plate was moving west. They collided and the Pacific Plate began to slide under the North American Plate. This pushed up the North American Plate and began to raise the Rockies. The highest **peak** (or **summit**) in the Rockies is Mount Elbert. It is 14,400 ft (4,400 m) above sea level.



C. Avalanches

One danger in the Rockies is **avalanches**. An avalanche is a large amount of loose snow and rock which falls down a mountainside. As it falls, it makes more snow loose, and gets heavier and faster. Avalanches can move at more than 200 miles (320 km) per hour.

3. Read part C of the text and answer the questions.
 - a. What is an avalanche made up of?
 - b. Why are they dangerous?

B As you watch

1. How many avalanches are there in the Rocky Mountains each winter?
2. What animal would kill and eat a baby grizzly bear if it found one?
3. Why does the adult grizzly bear want to eat moths?
4. What three things wear down mountains over time?
5. When were the Alps formed?
6. Which two continents **collided** to form the Alps?

C After you watch

1. Complete the text by filling the gaps with the numbers and words in the box.

Glaciers

"Glaciers are moving rivers of _____^a and _____^b. They move down mountains, creating deep _____^c. They're the most powerful **erosive** force on _____^d.

The Baltoro glacier (below), in the mountains of Pakistan, is the biggest mountain glacier on Earth. It is _____^e miles long and _____^f miles wide, and it can be seen from space."

valleys 43 rock Earth three ice



2. Find the Alps on the map on pages 132 and 133. What countries are the Alps in?

2.4 Surviving in the Mountains (26:18 – 42:26)

A Before you watch

- You saw in 2.2 that predators and prey have different bodies, skills and lifestyles, to help them survive. This is called *adaptation*.
 - Read the text about adaptation. Which example is about *behavioural* adaptations and which is about *physical* adaptations? Complete the titles.
 - What kind of adaptations do you think would help animals in the mountains?

B As you watch

- Are these animals predators or grazers?
 - markhor
 - snow leopard
 - golden eagle
 - wolf
 - giant panda
 - golden snub-nosed monkey
 - musk deer

Adaptation

“**Adaptation**” describes one or more useful features of an animal. Animals' bodies change over millions of years ("evolve", see Unit 4). Their bodies adapt so that they can live more easily in their habitat. Many species of animals have adapted to only live in one specific habitat. There are two main kinds of adaptations:

- Behavioural: changes in the behaviour, diet, lifestyle, etc, of the animal.
- Physical: changes in the body – size and shape of feet, body shape, kind of eyes etc.

i. Examples of _____ adaptation in grizzly bears

- They have long, sharp claws to attack animals and to dig animals out of their homes to eat them.
- They have thick **fur** to keep them warm in the winter.
- They have a good sense of smell, and can smell a dead body two miles away.
- They have strong legs for running and chasing prey.

ii. Examples of _____ adaptation in grizzly bears

- They dig **dens** in autumn to keep them warm during the cold season.
- They **hibernate** for 5-7 months of the year, in cold climates.
- They travel long distance, to hunt for different prey animals.

C After you watch

- Complete the table of animals' adaptations. The grizzly bear is done as an example.
- Research an animal (from the table or another) and write a paragraph about its adaptations.

Animal	Adaptation(s)	Behavioural /Physical?	Purpose
Grizzly bear	thick fur	P	to keep them warm in the cold
	hibernates 5-7 months of year	B	because not enough food to eat
	climbs mountains	B	to find food in new habitat
	strong sense of smell	P	so they can smell food far away
a. Markhor	large horns on their heads		to protect them
b. Snow leopard		P	to help them climb mountains
c. Golden snub-nosed monkey		P	to keep them warm
	stay very close together		to keep them warm
d. Giant panda	stays for three weeks in a cave	B	

2.5 Migration over the Mountains (42:26 – End)

A Before you watch

1. Read the text and mark the statements true or false. If false, explain why.
 - a. A migration is a yearly journey.
 - b. All birds migrate.
 - c. Flocks of migrating birds can be very large.
 - d. Birds usually migrate because they want to die in a warmer place.

Bird Migration

Bird **migration** is a behavioural adaptation that can be seen in many species of birds. A migration is a long flight, usually from north to south, every year. During a migration, large **flocks** of many hundreds or thousands of birds fly together to another region or to another continent. The reason for the flight is often to find food, but some birds breed in the warmer climates of the Earth's southern hemisphere. Migrations are often dangerous and many birds die before they reach their destination.



B As you watch

1. How many demoiselle cranes cross the Himalayas each year?
2. Where are they going?
3. What dangers do they face on the way?

C After you watch

1. Read the text about demoiselle cranes and fill the gaps with the numbers and words in the box.

Demoiselle Cranes

Demoiselle cranes have one of the most difficult _____^a in the world. In August and September, they meet in flocks of _____^b and prepare for their flight south. They migrate to escape from the cold winters in the north. During their flight, demoiselles fly with their head and neck straight forward and their feet and legs straight behind.

On their journey they have to cross the Himalayas. They reach _____^c of 16,000-26,000 feet (4,875-7,925 m). Many die from _____^d and hunger. Others are killed by golden eagles.

At their destination, demoiselles have been seen with common cranes, in giant flocks of up to _____^e individuals.

In March and April, they begin their long spring journey back to their northern **nesting grounds**.

20,000 tiredness 300-400
heights migrations

2. What is the predator/prey relationship between the demoiselle cranes and the golden eagles?
3. What other migrations happen in the world? Look back at 1.5. What migrations were happening in that video?
4. Find the Himalayas on the map on pages 136 and 137. Which countries are the Himalayas in?

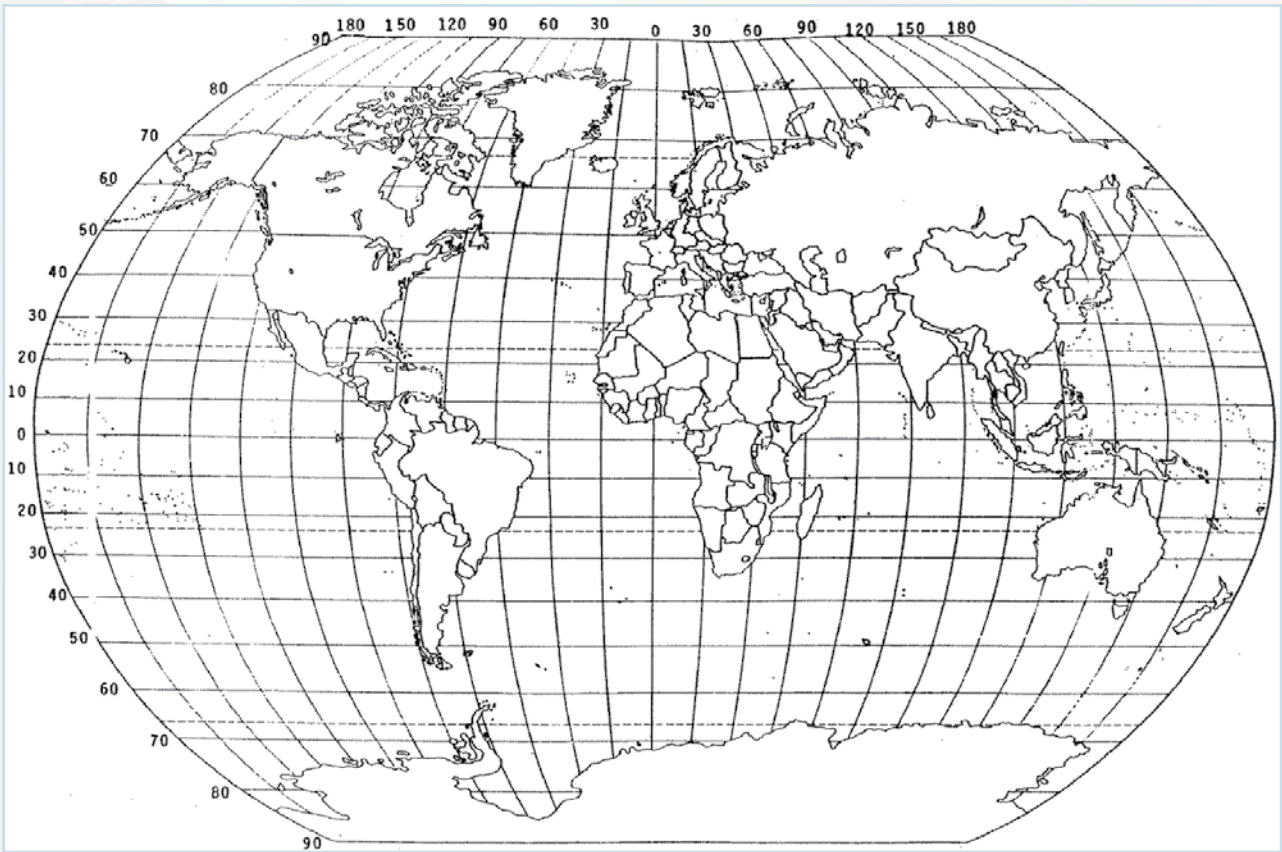
■ Migratory demoiselle cranes at Chhapar, India

UNIT 2: MOUNTAINS -



SKILLS WORK

1. Research the locations of the mountains and mountain ranges in the documentary and add them to the blank map.
2. What other mountain ranges are there in the world? Research them and add them to the map.
3. Research the mountain ranges (listed in the table below) in Myanmar, label them on the map and complete the information in the table.
4. Choose one of the mountain ranges and write a short essay about its location, how it was formed, its climate, etc.



Name	Location	Highest Peak	Height
a. Chin Hills	Rakhine and Chin States	Mount Victoria	3,053 m
b. Bilaukaung			
c. Daen Lao Range			
d. Dawna Range			
e. Karen Hills			
f. Pegu Range			
g. Shan Hills			

ADDITIONAL ACTIVITIES



FOCUS ON MYANMAR

1. Read the text about the Chin Hills and answer the questions.
2. Read the text about tectonic plates and fill the gaps using the diagram.

THE RAKHINE YOMA/CHIN HILLS

The mountains in the west of the country

In the picture of Myanmar on the right, the Ayeyarwaddy Valley is the light brown area in the middle. The Ayeyarwaddy Valley is mostly lowland, and most of the population of Myanmar live in this area.

There is also a large green area to the west. This is the Rakhine Yoma/Chin Hills range of mountains. They run from the Himalayas to the south of Myanmar. Altogether they are 600 miles (950 km) long. The highest peak in the range is Mount Victoria, which reaches 10,500 feet (3,053 metres). Their height decreases in the south and the range continues under the Bay of Bengal. The Andaman Islands are actually the peaks of underwater mountains in the Rakhine Yoma range.

The climate in the Rakhine Yoma/Chin Hills changes with the elevation. There are tropical, subtropical and temperate climates, and different types of forest at different elevations (see Unit 10, Seasonal Forests).

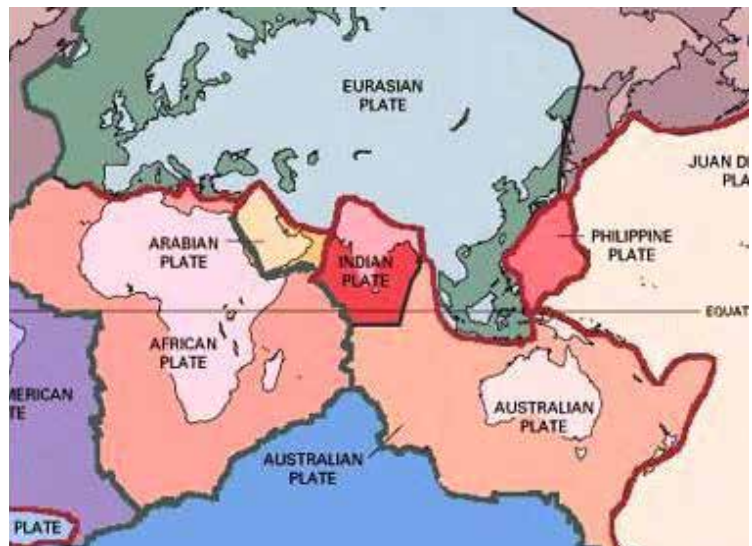


- a. Are the Chin Hills east or west of the Ayeyarwaddy Valley?
- b. Where do the Chin Hills begin and end?
- c. Are they higher or lower in the north of Myanmar?
- d. Why are some parts of the mountain range tropical and some temperate?

Tectonic Plates and Myanmar

The diagram shows the tectonic plates, which form the crust of the Earth. We can see that Myanmar sits on or near three of these plates: _____^a, the _____^b and the _____^c. This is why many parts of Myanmar have lots of mountains.

The Chin Hills were formed between 70 and 50 million years ago. Two of the Earth's tectonic plates – the Indian Plate and the Eurasian Plate collided. The Indian plate was – and still is – moving north. This collision also formed the Himalayas and the Andaman islands.





■ The delta of the Yellow River in China, taken from a US satellite.

Unit 3 Fresh Water

Key Words

abyss (n) – အသူတစ်ရာနက်သော ချောက်
agriculture – စိုက်ပျိုးရေး
canyon (n) – နက်ရှိုင်းသော ချောက်
cold-blooded (adj) – သွေးအေးသတ္တဝါ
drain (v) – ရေမြောင်း
floodplain (n) – စီးဆင်းလာသော ချောင်းများ၊ တောင်ကျရေများက မြစ်ကြောင်းသို့ ဆုံဆည်းသွားရာမှ ကျယ်ပြန့်သော မြစ်နေရာတစ်နေရာ
gravity (n) – ကမ္ဘာမြေထု၏ ဆွဲငင်အား
hydroelectric plant (n) – ရေအားလျှပ်စစ်ဖြင့် လျှပ်စစ်ထုတ်လွှတ်ခြင်း
lifeless (adj) – အသက်မပါသော
mangrove (n) – လမုပင်
mate (v) – မိတ်လိုက်ခြင်း
mouth [of a river] (n) – ချောင်းဝ၊ မြစ်ဝ
nutrients (n) – အာဟာရဓာတ်၊ ဩဇာဓာတ်
rapids (n) – ရေမော်
scales (n) – အတိုင်းအတာ၊ ပမာဏ။ စကေး၊ စံအမှတ်အသား
sediment (n) – အနည်အနှစ်
source [of a river] (n) – မြစ်ဖျားခံရာ

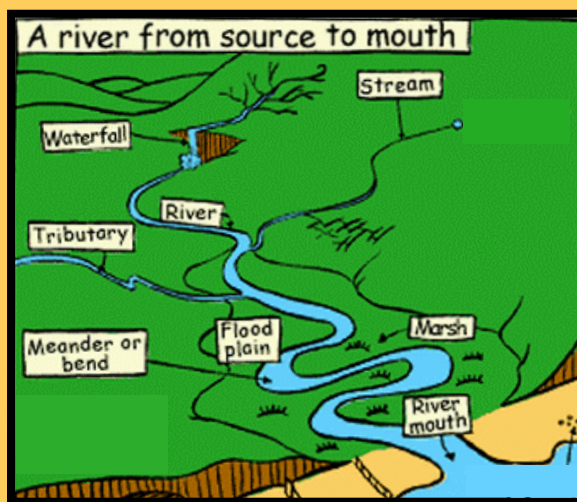
stream (n) – ချောင်း၊ စမ်းချောင်း
tributary [of a river] (n) – မြစ်၊ ချောင်း လက်တက်
vertebrate (n) – ကျောရိုးရှိသတ္တဝါ
waterfall (n) – ရေတံခွန်

3.1 The River System (00:00 – 05:40)

A Before you watch

1. **Discuss** and answer the questions.
 - a. Review 1.4. What information might be useful for this section?
 - b. Over 70% of the Earth is covered with water. How much of that do you think is fresh water rather than salt water?
2. Read the text and fill the gaps using the words in the diagram (and the box).

River Systems



Rivers have a _____^a, which is where they begin, and a _____^b, which is where they end. In between there are three stages to the river: the *upper*, *middle* and *lower* reaches. The upper reaches begin in the mountains. High in the mountains, water flows into small, fast-moving _____^c. In other places there are great _____^d, where water pours over high cliffs into the rivers below. In the middle reaches, these and other smaller rivers – called _____^e – join with a bigger river. Nearer to the sea, the land usually becomes flatter and rivers begin to bend slowly. In the lower reaches are _____^f and marshes. These are areas of low, wet land. They contain **sediment** from the higher land, which is washed down during floods. Finally, at the end of its journey, the fresh water from the river meets the salt water of the sea, often in a delta.

source floodplains streams
mouth tributaries waterfalls

B As you watch

1. How much of the water on earth is fresh water?
2. What natural forces made the “towers” shown in the video?
3. What is the name of the highest waterfall in the world?
4. How high is it?
5. What happens to the water before it reaches the bottom?

C After you watch

1. Order the statements from the video to explain how rain forms.



- a. ___ On reaching mountains, the moist air is forced upwards.
 - b. ___ As it cools, it condenses into cloud and finally rain.
 - c. ___ Moisture rising as water vapour from the surface of the sea is blown inland by wind.
2. Draw a diagram showing the water cycle. Use the statements above, the information in the video and the information you already have.
 3. What does this tell you about the water you drink every day?

3.2 The Upper Reaches (05:40 – 14:53)

■ St. Louis River rapids in Jay Cooke State Park, Minnesota, USA

A Before you watch

1. **Discuss:** Predict the characteristics of rivers in their upper reaches. Do they have:
 - a. fast-moving water or slow-moving water?
 - b. warm or cold water?
 - c. lots of oxygen or not much oxygen?
 - d. lots of life or not much life?

B As you watch

1. Answer the questions about rivers from A.
2. What animal is the only large predator in the upper reaches of the Japanese river system?
3. How long can this creature live for?
4. What animal hunts the salmon in the upper reaches in Canada?

C After you watch

1. Complete the text by filling the gaps.
2. Find the Colorado River on the map on pages 126 and 127. What does the map tell you about the elevation of the area?



From the Source

In their _____^a, mountain streams are full of power. Streams join to form rivers; they build in power and create _____^b. The water here is cold; it is low in _____^c but high in oxygen. Although mostly _____^d, the power of upland rivers to shape the land is great. They are powered by _____^e, and they're the most _____^f forces on the planet.

For the past five million years, Arizona's Colorado River has eaten away at the desert's sandstone to create a gigantic _____^g. It's over one mile deep and at its widest, it's 17 miles across. This river has cut the world's longest canyon system – a 1000 mile scar visible from space: The Grand Canyon (see picture, above).

rapids **canyon** erosive **gravity**
lifeless **nutrients** upper reaches

3.3 The Middle Reaches (14:53 – 24:06)

A Before you watch

1. **Discuss:** How does a river change after it leaves the mountains and hills?

B As you watch

1. Are the middle reaches the same as the upper reaches or different? Make notes. Describe:
 - a. appearance
 - b. animal life
2. How old are the otter cubs when they start their fishing practice?
3. How big do the mugger crocodiles grow to?
4. How many animals migrate across the Serengeti each year?
5. Why are the rivers both good and bad for the herds of wildebeest?
6. How big do Nile crocodiles grow to?

C After you watch

1. Complete the text by circling the correct word from each pair.

Into the Middle Reaches

As rivers leave the valleys / mountains^a behind, they gradually cool / warm^b and begin to support more / less^c life. As the land flattens out / rises^d, rivers slow down / speed up^e and lose / increase^f their power. Now they are carrying heavy / light^g loads of sediment that change the colour of the water to blue / brown^h.

2. Complete the table below using the text above.

	Upper Reaches	Middle Reaches
a. Water temperature	<i>cold</i>	<i>warmer</i>
b. Water Speed		
c. Animal life		
d. Predators		
e. Sediment		

ANIMAL CLASS: A GUIDE TO ANIMAL CLASSIFICATIONS

1. REPTILES

There are over 8,000 species of reptile in the world. Many reptiles live both on land and in the water. Reptiles live everywhere on Earth except for polar ice and tundra.

All reptiles:

- are **vertebrates** (have a backbone).
- are “**cold-blooded**” (cannot create their own body heat; they need the heat from the Sun to stay warm).
- are covered with **scales**.
- have lungs for breathing.

Most reptiles:

- have four legs.
- lay eggs.



IS IT A REPTILE?

Are the following animals reptiles? Why?

- a. a snake
- b. a penguin
- c. a frog
- d. a tortoise



3.4 Lakes (24:06 – 32:09)

A Before you watch

1. **Discuss** and answer the questions.
 - a. Why are lakes important for humans?
 - b. What are some of the most important lakes in your country? Why are they important?

B As you watch

1. Fill the gaps with numbers from the video.
 - a. Lakes hold _____ times more fresh water than rivers.
 - b. _____ of the largest lakes in the world are in the Great Rift Valley in East Africa.
 - c. There are _____ of different species of cichlids in Lake Malawi.
 - d. The floor of Lake Malawi drops _____ metres into an **abyss**.
2. What is the cause of the “smoking” lakes?
3. What do the lake fly midges do after they have mated?
4. Fill the gaps with facts about Lake Baikal
 - a. It is the _____ lake in the world.
 - b. It contains over _____ of all the freshwater in the world.
 - c. It is the _____ lake in the world.
 - d. _____ of the species at Baikal live nowhere else on Earth.

5. What are the names of these animals?



C After you watch

1. Complete the table below with the examples of adaptation mentioned in the video. Write down the purpose/benefits of each adaptation.
2. Find the Great Rift Valley on the map on pages 130 and 131. Why do you think there are so many big lakes there?
3. Find Lake Baikal on the map on pages 136 and 137. What are its map coordinates?
4. Answer the questions from A.

Animal	Adaptation(s)	Behavioural or Physical?	Possible purpose/Benefit(s)
a. cichlids			
b. dolphin fish			
c. lake fly midges			
d. freshwater seal			

3.5 The Lower Reaches (32:09 – End)

A Before you watch

1. **Discuss:** What do you remember about the river system from 3.1?
2. Read the text and fill the gaps with words from 3.1A.

The Amazon: Super-river



"The Amazon begins in the Andes and flows eastwards across Brazil. On its way the system **drains** a third of South America. Eventually, over 4,000 miles from its _____^a, it empties into the Atlantic Ocean.

"The Amazon transports a billion tons of _____^b a year. This is clearly visible at the *mixing of the waters*, where a massive _____^c called the Rio Negro flows into the main river."

B As you watch

1. Listen and check your answers from A.
2. Mark the statements true or false. If false, explain why.
 - a. Rivers have a lot of sediment in the lower reaches.
 - b. There are more fish species in the Atlantic Ocean than the Amazon River.
 - c. The "great broad" waterfalls are found only in the lower reaches of rivers.
 - d. Rivers go faster again before they join the ocean.
 - e. The "river tiger" is a kind of tiger.
 - f. Piranha fish eat other fish.
 - g. Wetlands are important for birds.

C After you watch

1. Read the text and answer the questions.
 - a. Which is nearer to the sea, a delta or a floodplain?
 - b. Why do people choose to farm on or near floodplains?
 - c. Where do deltas form?
 - d. What causes deltas to form?

Deltas and Floodplains

Floodplains form in the lower reaches of the river system. Floodplains are a flat area around a river. This area is covered with water when the river floods. The soil around floodplains is fertile and very good for farming because there is lots of sediment in it. This is one reason why humans have always lived near in these areas.

River deltas are formed where a sediment-filled river meets the sea, ocean or a lake. Sediment is not pushed very far into the lake or river because the river is running slowly and has less power. It is easy to see which water has sediment and which does not. Often, just before the delta, the river splits into smaller rivers (like in the photo of the Amazon on the left).

2. Use the information in the map below to answer the following questions in groups.



- a. The map relates to **mangrove** forests. What do you think the map is showing?
- b. What is a suitable title for the map?
- c. From what you have learned in this unit, can you give reasons why mangrove forests may only grow in these places?

UNIT 3: FRESH WATER -



FOCUS ON MYANMAR

INLE LAKE, SHAN STATE

Myanmar's most famous lake



An Intha man fishing on Inle Lake.

Inle Lake is a lake located in the Nyaungshwe Township of Taunggyi District of Shan State. It is the second largest lake in Myanmar (after Indawgyi Lake in Kachin State) with an estimated surface area of 44.9 square miles (116 km²), and one of the highest at an elevation of 2,900 feet (880 m). During the dry season, the average water depth is 7 feet (2.1 m), with the deepest point being 12 feet (3.7 m), but during the rainy season this can increase by 5 feet (1.5 m).

Although the lake is not large, it contains a number of important species. Over twenty species of snails and nine species of fish are found only at Inle. In November, December and January of each year, 20,000 brown and black head seagulls migrate to the lake.

Inle Lake is facing problems because of increased population and increases in **agriculture** and tourism. Between 1935 and 2000, the open water area of Inle Lake decreased by 32.4%. The water hyacinth also creates a major problem. It grows rapidly, filling up the smaller streams and large areas of the lake, taking nutrients and sunlight from other organisms. Over the past twenty years, pumps have been used to help control the growth of this plant. Public awareness education and small-scale control have also been successful.

There were very high temperatures in 2010, which caused the water level of the lake to drop too low, and drinking water had to be brought to the area. Additionally, the floating market was in danger of disappearing. One other serious consequence was that the **hydroelectric plant** at Lawpita, where the former capital Yangon received its power supply from, could not operate it properly.

1. Is Inle Lake bigger or smaller than Indawgyi Lake?
2. What is its height above sea level?
3. How high can the water level rise to in rainy season?
4. What is important about some of the wildlife at Inle Lake?
5. What organism is causing a problem and why?
6. What three problems do humans cause at Inle Lake?
7. What problem is talked about as a result of high temperatures, and what are the consequences?
8. What specific problems might there be at Inle Lake in the future because of the three human-related causes?

ADDITIONAL ACTIVITIES



FOCUS ON MYANMAR | SKILLS WORK

THE AYEYARWADDY RIVER

Myanmar's main waterway

The Ayeyarwaddy (or Irrawaddy) River is the largest and most important river in Myanmar. It flows from north to south for 1,348 mi (2,170 km). Its source is in Kachin State, where the N'mai and Mali rivers meet. The source of those rivers is the Himalaya glaciers of Northern Myanmar (at about latitude 28°N). From here the Ayeyarwaddy flows south, through the dry zone. It meets the Chindwin River to the south of Mandalay.

The Ayeyarwaddy Delta begins about 58 miles (93 km) above Hinthada, where it flows into smaller streams. Finally, thousands of miles from its source, the Ayeyarwaddy River drains into the Andaman Sea. The brown sediment from the Ayeyarwaddy can be clearly seen from space.

The Ayeyarwaddy River is important for many reasons. Firstly because many people in Myanmar are farmers, and they need the water to grow rice and other crops, especially in the Dry Zone (see Unit 5) and the delta region. Second, it is important because there are many important species of animal which live there, such as the Ayeyarwaddy dolphin. Finally, it is important for trade and travel. Rice, teak, cotton and other goods are transported up and down the river. In some parts of Myanmar there are no railways, so river transport is the main way of traveling from place to place.



1. Answer the questions.
 - a. Is the source of the Ayeyarwaddy in the north, south, east or west of Myanmar?
 - b. Which rivers meet to form the Ayeyarwaddy?
 - c. What is the source of those rivers?
 - d. Who is the Ayeyarwaddy River important to, and why?
2. Choose one of Myanmar's major rivers – the Chindwin, Kaladan, Salween (Thanlwin), Yangon River or Patheingyi River, for example.
3. Find information about the following:
 - How long is the river?
 - Where does it flow?
 - How do people rely on this river?
4. What are some of the animals that live in this river's ecosystem?
- How is this river connected to other rivers?
- What environmental challenges is this river facing?
4. Make a poster presenting what you have learned about your river. Some useful websites are:
 - The Arakan Rivers Network: www.arakanrivers.net
 - The Burma Rivers Network: www.burmariversnetwork.org
 - Karen Environmental and Social Action Network (KESAN): www.kesan.asia
 - Salween Watch: www.salweenwatch.org



■ Grjotagja Cave, Iceland, was famous for bathing until tectonic activity made the water too hot for bathing.

Unit 4 Caves

Key Words

acid (n) – အက်ဆစ်

bacteria (n) – ဗက်တီးရီးယားများ၊ ပိုးမွှားများ

bioluminescence (n) – သက်ရှိသတ္တဝါများ ကိုယ်ပေါ်မှ အလင်းထုတ်ခြင်း (ဥပမာ - ပိုးစုန်းကြူး)

chemical reaction (n) – ဓာတု ဓာတ်ပြုခြင်း

common ancestor (n) – မျိုးဆက် တူညီမှု ရှိခြင်း

consumer (n) – စားသုံးသူ

cooperation (n) – မျိုးစိတ်များ အတူတကွ ပူးပေါင်း နေထိုင်ခြင်း

corrosive (adj) – ပွန်းပဲ့တိုက်စား ပျက်စီး ယိုယွင်းစေသော အရာ

crystal (n) – သလင်းကျောက်

droplets (n) – (အရည်) အစက်ကလေး

echolocation (n) – ရေအောက်တွင် ရှိသော အရာထူ၏ အကွာအဝေးကို ၎င်း၏ ပဲ့တင်သံကြာချိန်ဖြင့် တိုင်းတာခြင်း

evolution (n) – ဆင့်ကဲတိုးတက်ပြောင်းလဲခြင်းဖြစ်စဉ်

food chain (n) – အစာ ကွင်းဆက်

fossil (n) – ကျောက်ဖြစ်ရုပ်ကြွင်း

hydrogen sulfide (n) – ဟိုက်ဒရိုဂျင်ဓာတ်၊ ဟိုက်ဒရိုဂျင် ဆာလဖိုင်

isolation (n) – သီးသန့်ဖြစ်ခြင်း၊ ကိုယ်ထီးတည်း ဖြစ်ခြင်း

limestone (n) – ထုံးကျောက်

lure (n) – သားကောင်များကို သွေးဆောင်ဖြားယောင်းသောအရာ

mucus (n) – ချွဲ၊ သလိပ်၊ နှပ်၊ နှာရည်

producer (n) – အစာထုတ်လုပ်သူ

sedimentary [rock] (adj) – အနည်ကျသော၊ နုန်း (ကျောက်)

sense (v) – အာရုံခံသည်

speciation (n) – တိရစ္ဆာန်မျိုးစိတ်များ နေရာဒေသ ကွဲပြားမှုအရ ဆင့်ကဲ တိုးတက် ပြောင်းလဲခြင်း

stalactite (n) – ကျောက်စက်ပန်းဆွဲ

stalagmite (n) – ကျောက်စက်မိုးမျှော်

theory of evolution, the (n) – ဆင့်ကဲ တိုးတက် ပြောင်းလဲခြင်း သီအိုရီ

4.1 Caves, the Final Frontier (00:00 – 07:28)

A Before you watch

1. **Discuss** and answer the questions.
 - a. What kinds of animals live in caves?
 - b. What do you think makes life in caves difficult for animals?
 - c. What do animals need to survive in the caves? (E.g.: the special skills, adaptations, etc)
2. Read the text. Were your answers to A1 right?

The Cave Environment

Living in caves means living without sunlight, so animals have adapted to this lightless environment. A glowworm is an insect. It makes **bioluminescence**, a “chemical light” to attract its prey. Bats and cave swiftlets (a type of bird) find their way by using sound not sight.

Other animals have adapted in different ways. Snakes in Borneo catch bats in the dark by **sensing** the heat from their bodies. Blind Salamanders can feel small movements in the water which helps them hunt. **Bacteria** use **hydrogen sulfide** gas, which comes from inside the Earth, for their energy.

3. Match these verbs with their synonyms.

a. trap	1. catch
b. produce	2. eat
c. draw	3. attract
d. consume	4. make

B As you watch

1. How deep is the shaft of the Cave of Swallows, in Mexico?
2. What animal creates the “galaxy” of little lights in the cave in New Zealand?
3. What is the purpose of the glow worm’s thread?
4. What big challenge do cave animals face?

C After you watch

1. Complete the text about cave glow worms’ adaptations using verbs from A3.

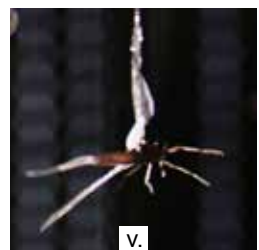
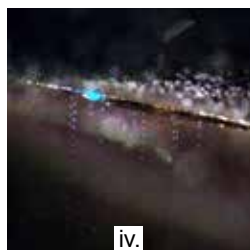
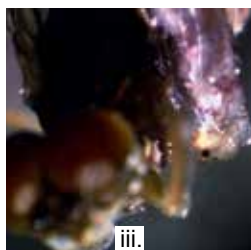
Glow Worms: Luring Their Prey

"This is a cave glow worm. To _____^a its prey, it goes fishing with a line of silk. The silk comes from glands in the glow worm’s mouth and is covered with **droplets** of **mucus**. Each glow worm _____^b lots of these lines. After it sets its lines, the glow worm waits, like a fisherman.

"But the glow worm doesn’t leave everything to chance. The blue light is a **chemical reaction** happening in its tail. It is a **lure**, to attract prey. The insects are _____^c to the lights and they get trapped in the sticky lines. Now, the glow worm pulls up the line and slowly _____^d the insect, alive."

2. Order the pictures according to the text and the video.

a. i b. c. d. e.



4.2 Looking into Limestone (07:28– 11:20)

A Before you watch

- 1. Discuss:** How do you think caves are made? What forces on Earth are powerful enough to make them?
- 2. Discuss** and choose the correct sentences.
 - i. Limestone is stone made from fruit.
 - ii. Limestone is made from the bodies of marine animals.
 - i. Limestone was formed underwater.
 - ii. Limestone was formed in volcanoes.
 - i. Limestone caves are created by wind.
 - ii. Limestone caves are created by water.

B As you watch

1. How much of the world's surface is covered in limestone?
2. What is limestone made from?
3. What does this tell you about the link between areas of limestone and the sea?
4. What shaped the limestone pillars in Borneo?
5. What substance in the water "eats away" at limestone to form caves?

C After you watch

1. Read the text about limestone and check your answers to **A2**.
2. Match the headings to the paragraphs.
 - a. What Limestone Is Made From
 - b. What Limestone Tells Us about Our Planet
 - c. What We Can Find inside Limestone
 - d. What Kind of Rock Limestone Is
3. Match the pictures to the paragraphs.

A Lesson in Limestone

- 1. Limestone** is a **sedimentary** rock. Sedimentary rocks are formed over a long time from the sediment at the bottom of seas or rivers.
2. Most limestone contains the bodies of marine animals with shells. When they die, their shells and bones break down into the sediment. Pressure from the water and layers of sediment above pushes down. This makes the layers underneath hard. Finally, after millions of years, it becomes stone.
3. Limestone is important for science because it often has fossils inside it. **Fossils** are the bodies of animals from millions of years ago. When they die, they fall into the sediment. Over a long time, their bodies become hard and turn to stone. When scientists find fossils, they can learn more about Earth's ancient animals.
4. Limestone is also interesting because it shows us how much the Earth changes over time. Limestone is created underwater, over millions of years. Today's highest mountains were under the sea millions of years ago. People have even found fossils of ancient sea animals at the top of high mountains in the Himalayas.



4.3 Food Chains (11:20 – 21:25)

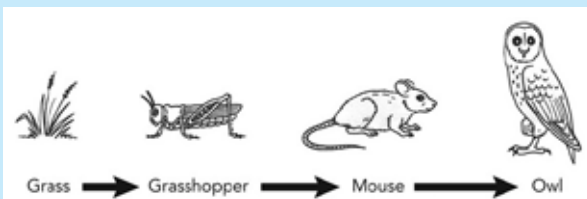
A Before you watch

1. **Discuss:** What do you think a food chain is?
2. Read the text. Were you right?

Food Chains

A **food chain** is a group of organisms in an ecosystem which depend on each other for food. At the bottom of the food chain are **producers**. These are usually plants. They take energy from sunlight. Above them, the animals are called **consumers**. They all take their energy from the producers (plants) or from each other (meat).

Below is an example of a food chain: Grass grows on the ground. It takes energy from sunlight. Small grasshoppers then eat the grass. Mice will eat the grasshoppers, and owls will eat the mice.



3. In cave ecosystems, there are also food chains, but they are different. **Discuss:**
 - a. Why are they different?
 - b. What animals might be in a cave food chain?

B As you watch

1. What is “guano”?
2. What is the cave’s food chain based on?
3. Complete the table.

Animal	Dependant on other animals? Which? How?
a. cockroaches	
b. centipedes	
c. crabs	
d. bats	
e. falcons/bat hawks	

C After you watch

1. Draw a simple cave food chain using the information above and from the video.

4.4 Growth and Evolution (21:25 – 39:03)

A Before you watch

- Read the text and answer the questions.
 - How is adaptation different to speciation?
 - Is the example of insect-eating bats and fruit-eating bats an example of adaptation, cooperation or speciation?
 - Is the example of echolocation an example of adaptation, cooperation or speciation?
 - Is the example of vampire bats feeding each other an example of adaptation, cooperation or speciation?

Evolutionary Theory

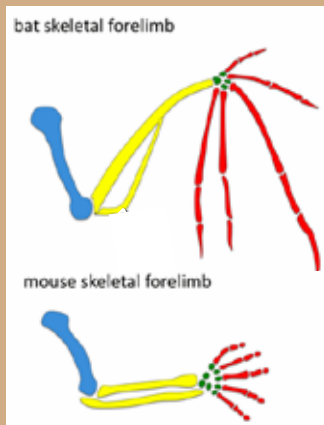
The **theory of evolution** comes from an idea by scientist Charles Darwin (1809-1882). **Evolution** is change over long periods of time. Three important types of changes are:

- **adaptation** – animals’ behaviour or bodies changing over time to suit their habitat.
- **speciation** – new species of plants or animals from old ones. They keep adapting until they are no longer the same kind of animal. This often happens when groups of animals in a species breed in **isolation** from other groups.
- **cooperation** – organisms evolving together and benefiting from each other.

Examples of Evolution in Bats

Scientists have recently been studying bat and mouse evolution. The bones of bats (below) are very similar to mouse bones. This shows that bats and mice evolved from a **common ancestor** millions of years ago. Some bats species have evolved **echolocation** – they can “see” using sound. Other bat species eat fruit and do not need echolocation to hunt insects.

Finally, vampire bats need to feed often, and will die within two days without food. They have evolved to feed each other if one bat has not found food. These and many more examples show us how organisms evolve to survive.



B As you watch

- Which picture represents a **stalactite**, which represents a **stalagmite**?



- What are stalactites and stalagmites made of?
- What is this and why is it important for cave diving?



- What unusual water feature of caves does this picture represent?



- What causes the feature above?
- What predator’s adaptation does this picture represent in the video?



C After you watch

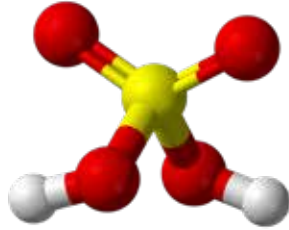
- What has affected the evolution of the species of the troglobites at the end of the video?
- The predators in the video have evolved to hunt for their prey in the darkness of caves. Match the adaptation to the animal.

a. the bats	1. heat
b. the snakes	2. sound
c. the salamanders	3. movement

4.5 Danger in Caves (39:03 – End)

A Before you watch

1. **Discuss:** Look at these pictures. Can you guess what the “danger” in these caves might be?



2. **Discuss:** Read the text about this dangerous substance. Can you guess what it might be?

It is a strong, **corrosive acid**.

It is colourless or a white-yellow colour.

It is used in strong cleaning liquids.

It can form naturally but humans also make it by mixing chemicals.

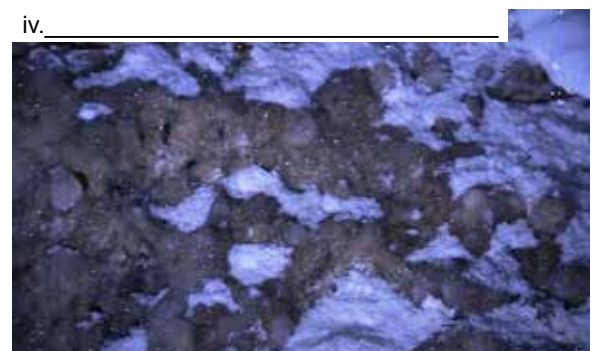
It is very dangerous to humans and can burn skin and make people blind.

B As you watch

1. What is the dangerous substance found in the water of the Villa Luz cave?
2. Where does the acid in these caves come from?
3. What kind of animals can live in the water in this cave?
4. What are the “snotites”?
5. What is the snotites’ “important role” in the cave?
6. How many miles of Lechuguilla have scientists mapped?
7. How was Lechuguilla cave formed?
8. How were the beautiful **crystals** in Lechuguilla formed?

C After you watch

1. Label the images according to the video.
 - a. Extremophile bacteria, feeding on the rock
 - b. The only water in the cave is in still, clear pools
 - c. Walls covered with delicate, fragile crystals
 - d. Cones, frosted with crystals



UNIT 4: CAVES -



FOCUS ON MYANMAR

CAVES OF MYANMAR

Myanmar's caves are open to the world once more | Adapted from <http://myanmarcaves.wikidot.com>. Images © Liz Price

Myanmar is one of the few countries unexplored by modern cavers. In colonial times – at the end of the 19th and early 20th centuries – there were many visitors to Myanmar's caves. Some were just going on picnics and others were doing scientific studies. Some of the scientists published their findings. Since then, very little research has been done on the caves, and when General Ne Win took power in 1962, it became more difficult for foreigners to travel to the areas with caves. However it is now getting easier to travel around the country, and cavers are once again interested in exploring Myanmar's caves.

Another problem for explorers has been understanding the information from colonial times. The British used different names and different spellings for caves. Also, most places in Myanmar no longer have their old British names. For example, the town which was called Amherst (in Mon State) by the British is now called Kyaik Khami.

There are several caves in the Hpa-an area, which has limestone mountains all around it. Most of the caves around Hpa-an are temple caves, with Buddhas and other Buddhist art inside them.

Mon State also has caves in its limestone mountains and hills. The most famous are the Farm Caves, which colonial explorers wrote about in the 1920s. The nearby Saddam Cave was also interesting for colonial explorers, mostly because of its stalagmites, its fresh water pools and its bats and other animals.

Shan State has some of the longest and most famous caves in Myanmar. The longest known cave in Myanmar is in the Taunggyi area. Mondowa Guh is 5,807 feet (1,770 m) in length. It is a river cave. At the front is a temple, with Buddhist statues and images, but beyond that it is a wild cave.



Inside Saddam Cave, clockwise from top left:

i. _____; ii. _____; iii. _____

1. When was most research into Myanmar's caves done?
2. Why have there been problems exploring Myanmar caves?
3. What is the connection between Buddhism and caves in Myanmar?
4. Where is the longest cave?
5. What kind of cave is the longest cave? How do you think it was created?
6. What do you think a "wild cave" is?
7. Identify and label the photographs from Saddam Cave (left), based on what you have learned in this unit.

ADDITIONAL ACTIVITIES


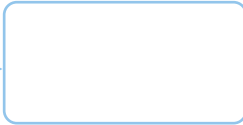
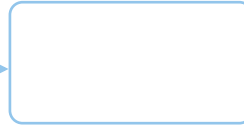



SKILLS WORK

1. Using the picture below as your example, explain in your own words what a food chain is.

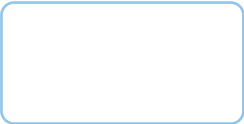
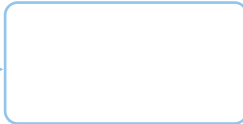

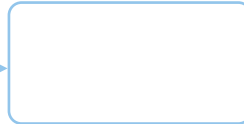


2. Complete the food chains below by writing and/or drawing the consumers and producers you think are missing. Then explain the environment in which you might find this food chain.

i.    





a. What type of ecosystem could this be in? _____

b. How do you know? _____

ii.    

a. What type of ecosystem could this be in? _____

b. How do you know? _____

iii.    

a. What type of ecosystem could this be in? _____

b. How do you know? _____

3. Choose one of the food chains above and write a short story explaining how each animal/plant lives, gets its energy, and then provides energy for others. Find a way to use the following words in your story:

nutrients produce environment attract consume adapt



■ A single thorn tree, growing in the Namib Desert, Namibia.

Unit 5 Deserts

Key words

antennae (n) – အင်းဆက်ပိုးမွှားများတွင်ရှိသော အာရုံခံ အစိတ်အပိုင်း

desert (n) – သဲကန္တာရ

dew (n) – နှင်းစက် နှင်းပေါက်

drought (n) – မိုးခေါင်သည်

exoskeleton (n) – အခွံ၊ ကြေးခွံ (ကျောရိုးမဲ့ သတ္တဝါများ၏ခန္ဓာကိုယ်ကို အကာအကွယ်ပေးသော အရာ)

flash flood (n) – ရုတ်တရက် ရေလွှမ်းမိုးခြင်း

food insecurity (n) – အာဟာရဖြစ်စေသော အစားအစာများကို လုံလောက်စွာ ရရှိနိုင်သော အခွင့်အလမ်း မရှိခြင်း

irrigation (n) – ဆည်မြောင်း

invertebrate (n) – ကြောရိုးမဲ့ သတ္တဝါ

plague (n) – ပုလိပ်ရောဂါ

rain shadow / rainshadow (n) – မိုးကွယ်ရာ ဒေသ (တောင်တန်းများ ကာရံထားမှုကြောင့် မိုးများ မရောက်နိုင်သော နေရာဒေသ)

rainfall (n) – မိုးရေချိန်

rainstorm (n) – မိုးသက်မုန်တိုင်း

river bed (n) – မြစ်၊ ချောင်းများအတွင်း ရေစီးဆင်းသည့် နေရာ

root (n) – အမြစ်

sand dune (n) – သဲတောင်ပူစာ၊ သဲခုံ

swarm (n) – ပျံသန်းနိုင်သော ပိုးကောင်များ

territory (n) – ပိုင်နက်၊ ကျက်စားရာ နေရာ

warm-blooded (adj) – သွေးနွေးသော (သွေးနွေးသတ္တဝါ)

5.1 Rainshadow Deserts (00:00 – 6:00)

A Before you watch

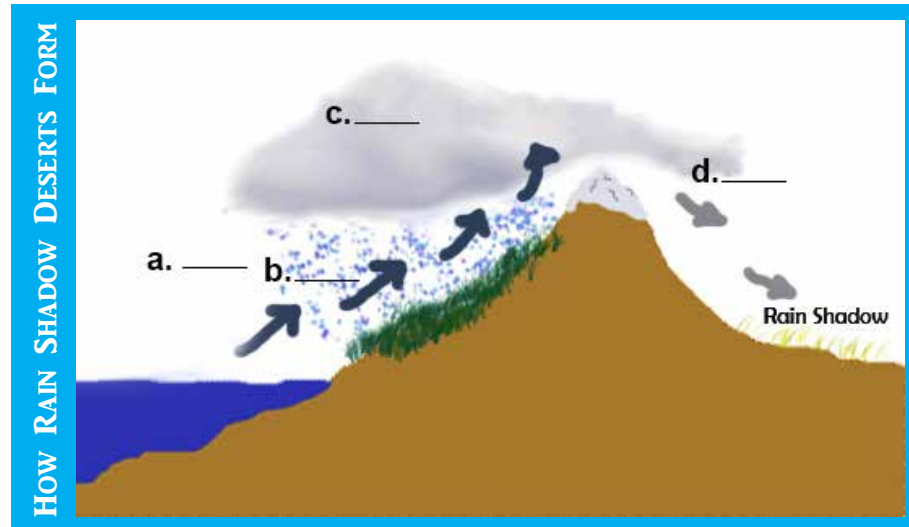
1. **Discuss:** What do you know about deserts?
2. Find the Gobi Desert on the map on pages 136 and 137. In which countries is it?

B As you watch

1. How much of the Earth's land is desert?
2. Which deserts do not have any life in them?
3. What surprising weather is there in the Gobi Desert?
4. What are the highest and lowest temperatures in the Gobi Desert?
5. What is the Bactrian camels biggest problem?
6. How do they solve that problem?
7. When do Bactrian camels breed?

C After you watch

1. The Gobi Desert is a **rainshadow** desert. Label the diagram which shows how rainshadow deserts form.
 - i. clouds forced upwards and rain falls on the mountains
 - ii. hardly any moisture remains when the wind gets over the mountains.
 - iii. clouds form over the sea
 - iv. wind blows clouds into the mountains



ANIMAL CLASS: A GUIDE TO ANIMAL CLASSIFICATIONS

2. MAMMALS

There are more than 4,000 different species of mammals. The smallest is the hog-nosed bat. It weighs 0.07 ounces (2 grams) and the largest is the blue whale, which weighs 132 tons (120 tonnes). Some live on land and some live in water, but all mammals share some common characteristics.

All mammals:

- are vertebrates (have a backbone).
- are “**warm-blooded**” (create their own body heat).
- give birth to live babies.
- feed milk to their young.

Most mammals:

- have hair or fur on their bodies.

■ Camels are mammals which have adapted to living in the desert.

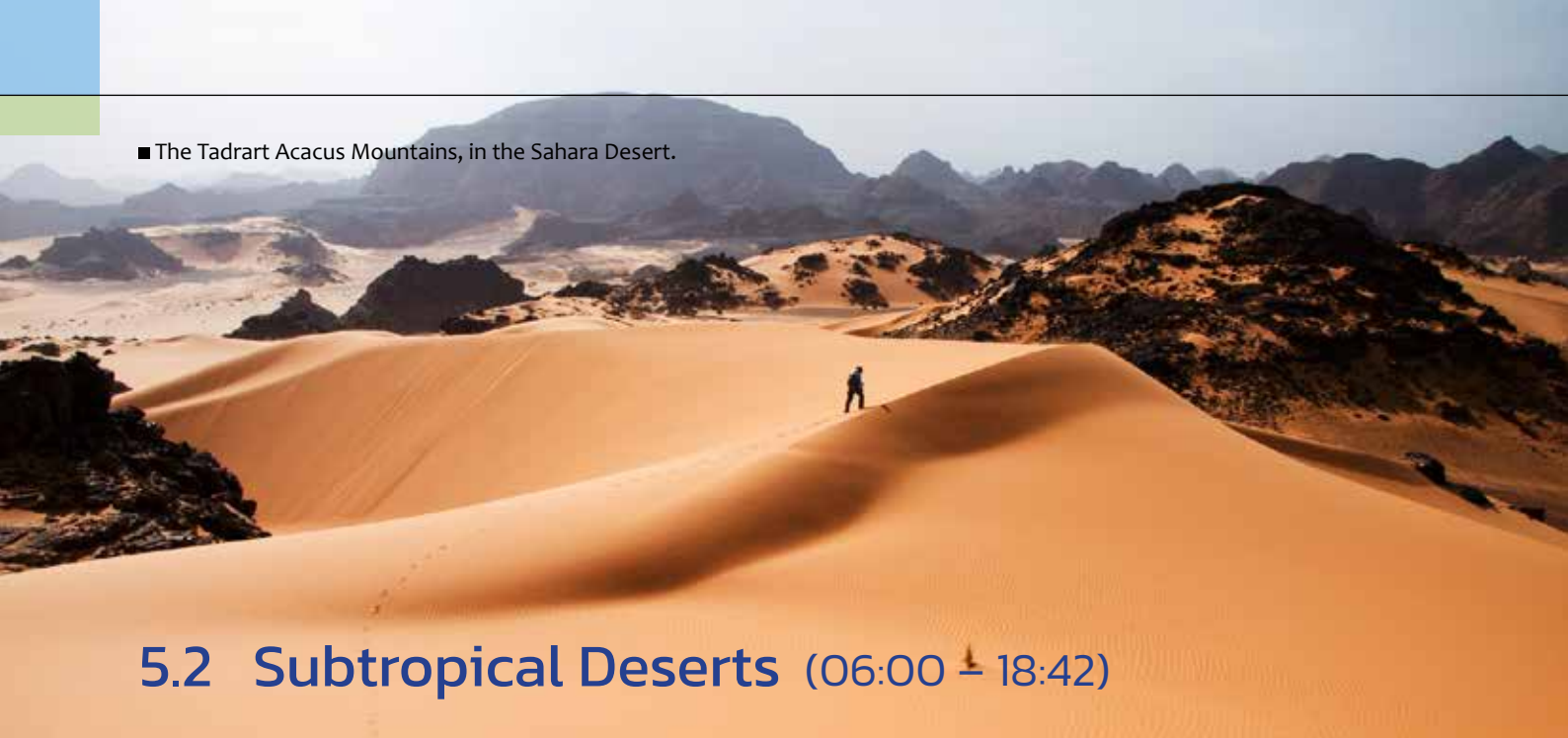


IS IT A MAMMAL?

Are the following animals mammals? Why?

- a. a bumble bee
- a. a monkey
- a. a whale
- a. a human





5.2 Subtropical Deserts (06:00 – 18:42)

A Before you watch

1. **Discuss** and answer the questions.
 - a. What does the map below show?
 - b. What does the map below show us about where deserts are?
 - c. What is a subtropical desert?

B As you watch

1. How are the camels in the Sahara different from the Gobi camels?
2. What two things together “shape all deserts”?
3. What is special about the **sand dunes** in Namibia?
4. How much does the temperature rise every hour during the day in Australia?
5. How do kangaroos keep cool?
6. How do Fennec foxes keep cool?

C After you watch

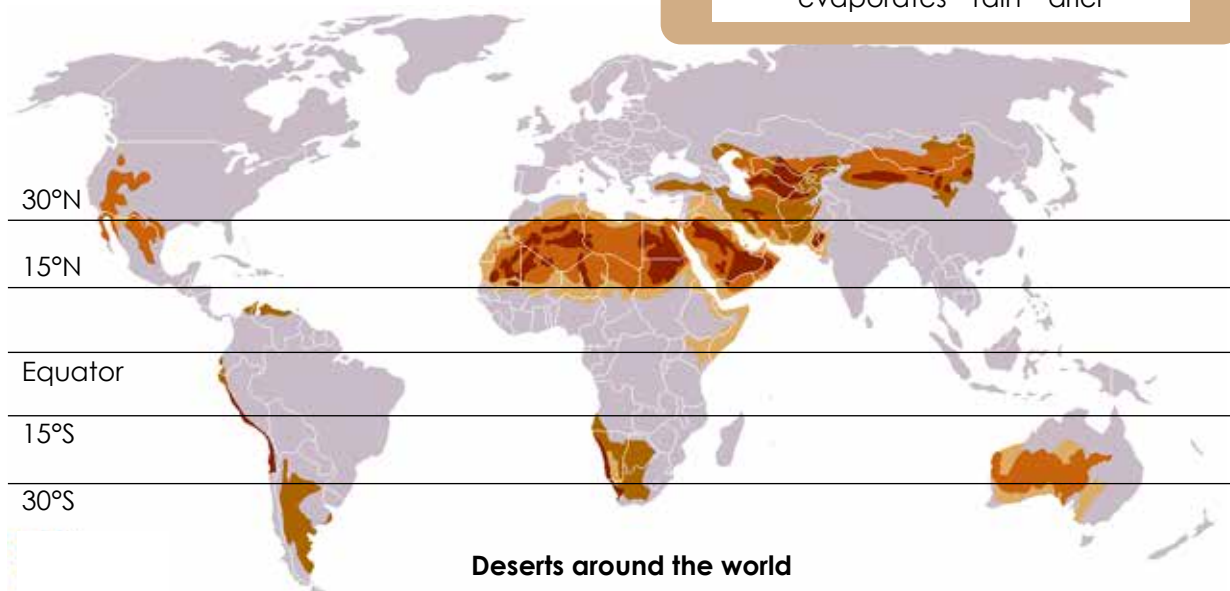
1. Complete the text using the words in the box.

How Subtropical Deserts Form

The formation of subtropical deserts is linked to the _____^a. Because the Sun's rays hit the equator _____^b, it is much hotter than other places. The hot, _____^c air at the equator rises and clouds form. Winds blow the clouds north and south, and rain falls between the equator and 15°N and 15°S.

Because of this, the areas between 15 – 30°N and 15 – 30°S get very little _____^d, but they get lots of _____^e and warm air. The warm air _____^f water from the ground. This makes the dry desert even _____^g.

moist directly sunlight weather
evaporates rain drier



5.3 The Atacama and Sonora Deserts

(18:42 – 32:35)

A Before you watch

1. The Atacama desert is located at 30°S in South America. Find it on the map on pages 128 and 129.
2. The Sonora is at 30°N in North America. It is east of the Gulf of California. Find the area on the map on pages 126 and 127 (It is not labeled).

B As you watch

1. What animal does the video compare the guanacos with?
2. How do the guanacos get their water?
3. In the Sonora desert, what season is the monsoon?
4. What animal lives in the saguaro cacti?
5. Where are the bats migrating from and to?
6. Why is the saguaro cactus important to other animals in the Sonora Desert?
7. What has shaped the land in Utah? How?

C After you watch

1. Below are explanations of how the two types of cactus in the video get their water. Label them correctly: *Atacama cactus* or *Saguaro*.

a. _____

When the summer monsoon rains come, the cacti drink as much as they can. After a **rainstorm**, their long, shallow **roots** suck up the water. When full, the cactus can store up to five tons of water, enough for it to survive many months of **drought**.

b. _____

There is a cold sea current that runs parallel to the land. The cold water cools the moist, warm air above it and that produces fog. The wind blowing onto the shore brings the fog inland. The fog condenses on the cacti and becomes **dew**. This dew provides the only source of water.

2. Read the text then answer the questions.

- a. What mammals were competing in the video?
- b. What were they competing for?
- c. How did they compete?
- d. What might happen to a loser in one of these fights?
- e. What benefits did the winner get?
- f. How might this competition be useful for the survival of the species?
- g. Can you think of other species which compete in this way or a similar way?

Competition in Evolution (Survival of the Fittest)

In 4.4 you looked at evolutionary theory. You saw *adaptation*, *speciation* and *cooperation* in and between animal species. However, evolutionary theory also talks about competition in and between species.

Competition is when animals compete (fight) for some kind of resource. This competition is sometimes called “natural selection” or “survival of the fittest”. This means that only the strongest and fittest animals or plants will live and breed; the others will die or be killed.

Most competition is for food and water, sunlight, **territory** or mates. During competition for mates, males of the same species will fight each other until one is the winner. The female will choose or be chosen by the male and they will then mate.

■ Ants will compete for the same resources and territory, even ants of the same species.



5.4 Surviving in the Desert (32:51 – 46:10)

A Before you watch

1. Read the text and answer the questions.
 - a. What animal does the flat lizard prey on?
 - b. Which animal preys on the flat lizard?
 - c. Why is it safer to be a female flat lizard?
 - d. What is the reason for the males' colours?

Augrabies Flat Lizards

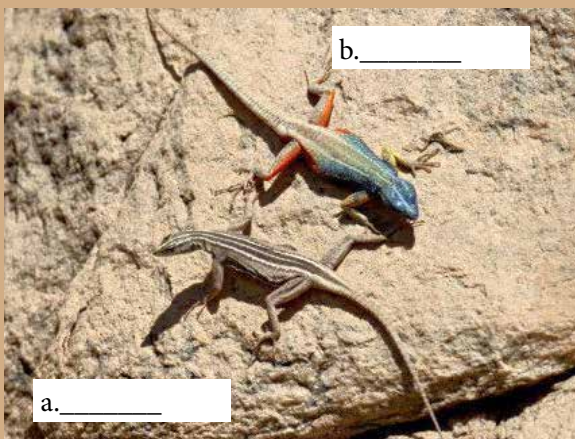
Augrabies flat lizards live in South Africa. They are called flat lizards because of their strange, flat bodies. The male and the female look a little different to each other. The males are very colourful. They have a blue head and a green back. Their front legs are yellow and their back legs are orange. Females are less colourful; they are a grey brown colour all over their bodies.

Predators and Prey

The flat lizard is both a predator and a prey animal. Its diet is mostly blackfly, tiny flies which live around rivers. However, because of its bright colours, the male is easy to see and they are often eaten by kestrels, which are large birds of prey. Female flat lizards, because of their darker colours, are harder to see, so are not eaten as often.

Why the Bright Colours?

The males probably have very bright colours to attract females. Like other species, male flat lizards compete for females. Scientists think that the males with the best and brightest colours are the most attractive to the females.



Augrabies Flat Lizards

2. Label the picture of the flat lizards correctly.

B As you watch

1. What is the "secret" of the river?
2. How do the lizards catch their prey?
3. How far do elephants walk in a day to find food? Why?
4. How do the oryx stop the lions attacking them?
5. What do elephants prefer to eat?
6. Where did the water in the river come from?
7. How often do the elephants usually drink?
8. How did the flood help the lion family?

C After you watch

1. Read the text and mark the statements true or false. If false, explain why.
 - a. Flash floods get their name from the flashes of lightning which happen during floods.
 - b. They happen in less than six hours.
 - c. Melting snow can cause a flash flood.
 - d. They are dangerous because they are often more powerful than people think.

Flash Floods

A **flash flood** is called that because it can happen "in a flash" (quickly). Usually, they happen in less than six hours. They can happen for many reasons, such as heavy rain, a large storm or snow melting. All flash floods can be dangerous, but in the desert they can be even more deadly.

Flash floods deliver a very large amount of water in a very short time. Roads often cross dry **river beds** and people who are traveling – on foot or in cars – try to cross them, but do not realise the strength of the water. Another danger is that the water comes very quickly, so people can be caught in a flood before they realise.

In the USA, government figures show that more people die in floods each year (127, on average) than by lightning (73), tornadoes (65) or cyclones (16).

5.5 Locusts (46:10 – End)

A Before you watch

1. **Discuss** and answer the questions.
 - a. What kind of animal is a locust?
 - b. What do they eat?
 - c. What else do you know about them?

B As you watch

1. How long can desert locust eggs be unhatched for?
2. What is a hopper?
3. How much food does a full-grown locust eat each day?
4. Why do the locusts need to keep moving?

C After you watch

1. Put these in order of size, according to the video:
plague, group, swarm.
2. Complete the text with the words in C1.
3. According to the text, what problems can locusts cause for people?
4. Find Madagascar on the map on pages 130 and 131.

Flight of the Locusts

Locusts are migratory insects. They travel in _____^a -, sometimes called bands. Because the locusts eat so much, they have to keep flying to find food. When these flying bands meet up, they form larger groups, called _____^b. When these join together, they form _____^c. These can be more than 40 miles wide and contain over 1 billion locusts. They eat everything in front of them and can destroy whole farms.

Madagascar, an island off Southeast Africa has had big locust problems since 2012. Each year, large numbers of locusts come back and eat farmer's crops. In 2013, the country couldn't grow enough rice because of locusts.



ANIMAL CLASS: A GUIDE TO ANIMAL CLASSIFICATIONS

3. INSECTS

Insects are divided into two main groups: those with wings and those without. There are nearly one million species of insects, and more are discovered each year.

All insects:

- are **invertebrates** (do not have a backbone).
- have a hard **exoskeleton** on the outside of the body.
- are divided into three parts: the head, the thorax (the middle section), and the abdomen (the back end).
- have two **antennae** and six legs.
- hatch from eggs.

Some insects:

- have wings.

■ Locusts are flying insects. They are similar to grasshoppers.



IS IT AN INSECT?

Are the following animals insects? Why?

- a. a spider
- b. a butterfly
- c. a fish
- d. a snow leopard



UNIT 5: DESERTS -



FOCUS ON MYANMAR | SKILLS WORK

MYANMAR'S DRY ZONE

So dry that it is nearly a desert | Information from: <http://www.irinnews.org/report/99919/hunger-in-myanmar-s-dry-zone>



A woman trying to collect water in the Dry Zone.

A quarter of Myanmar's population live in Myanmar's *Dry Zone*. 60% of those are farmers, who depend on the land to eat and to make money. Many face problems with access to food and water.

The area is dry because it is in the rain shadow of the Chin Hills. It has the lowest average annual **rainfall** in Myanmar. In some parts of the Dry Zone, the average rainfall is fewer than 4 inches (100 mm) of rain. The average rainfall in most other parts of Myanmar is 8 - 24 in. (200 - 600 mm).

One of the major issues facing the Dry Zone is food insecurity – people are without reliable access to a enough affordable, nutritious food. A 2014 survey showed that 18.5 percent of dry zone households face **food insecurity**. One local woman, 30-year-old Kyi Htay, from Bagan, Mandalay Region said “Getting food is a headache for us every day”.

Unfortunately, the problem will probably become worse in the future. Farmers' harvests have been poorer in recent years and water shortages are a problem. There are an increasing number of droughts because of the lack of rain and poor **irrigation**.

Improving food security in the Dry Zone area requires several solutions. These include planting new trees, more money for modern farming methods and help for farmers to improve the soil so they can grow more. Until these things happen, many people will face difficulties in Myanmar's driest place.

1. Answer the questions.
 - a. What causes Myanmar's Dry Zone area to be dry?
 - b. Why might the problem of food insecurity get worse in the future?
2. Make two lists of short and long-term solutions to improve the life of farmers there.
3. From the map, choose a region of Myanmar, e.g.: Northeastern Myanmar (Kachin and Shan States) or Myanmar's Eastern Coast (Tanintharyi Region and Mon State): Calculate its average rainfall for the following months: *May, August, November*, as in the example below:

Finding Averages

To find the average of several things, add them together, and divide by the number of things.

July's Rainfall in Northeastern Myanmar:

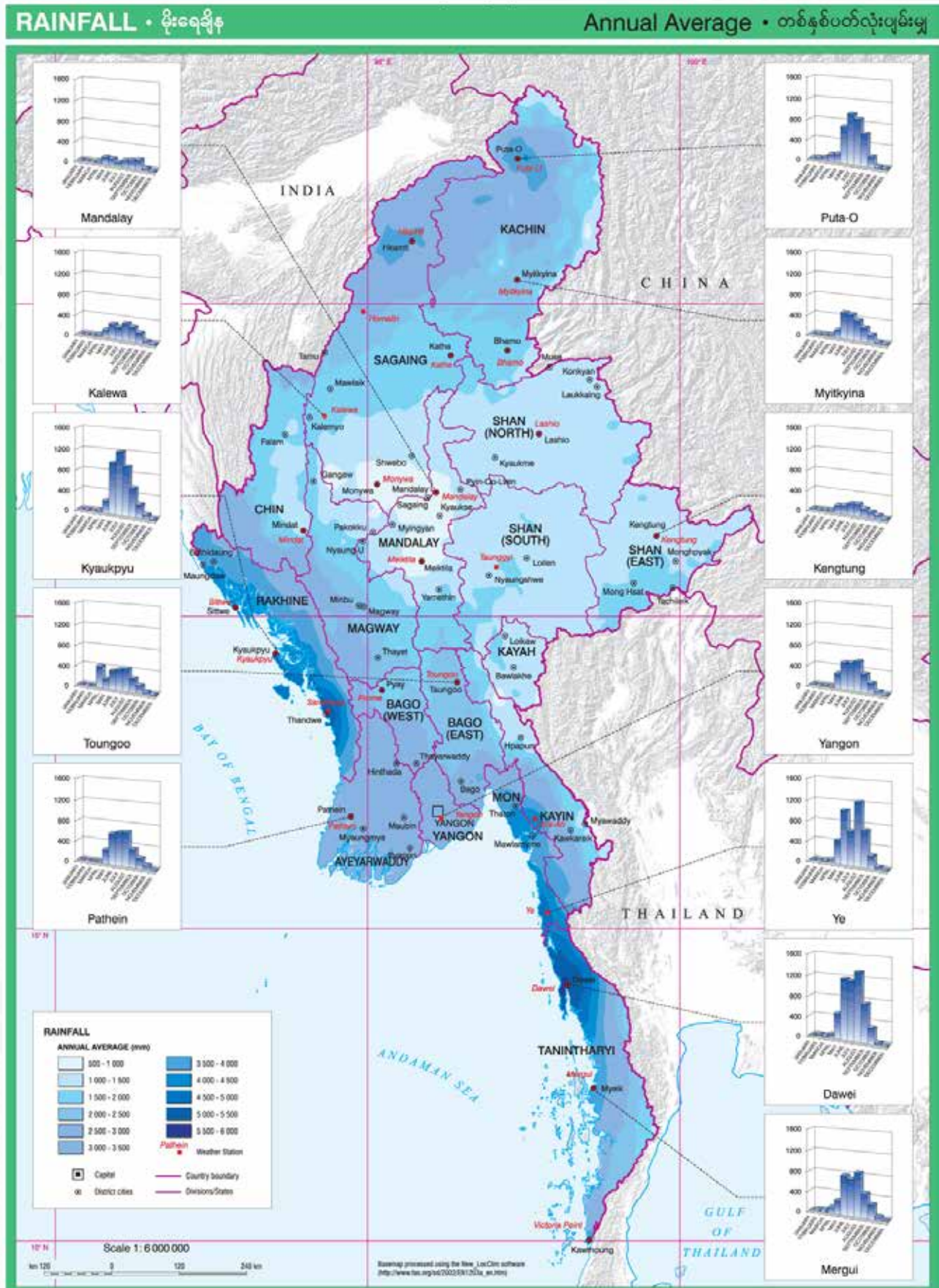
900 mm (Putao)
+ 450 mm (Myitkyina)
+ 200 mm (Kengtung)

1550 mm (Total)

1550 mm / 3 cities = about 517 mm.
The average rainfall for Northeastern Myanmar in July is 517 mm.

4. Put your data about average regional rainfall into a bar graph below. Be sure to:
 - label your axes.
 - title your graph.
 - draw clear bars.
 - space the units of measurement evenly.
5. Present your results to the class.

ADDITIONAL ACTIVITIES



■ A view of Webb Island, Antarctica.



Unit 6 Ice Worlds

Key Words

barren (adj) – မြဲသော

breeding cycle (n) – မျိုးပွားမှု သံသရာ

chick (n) - ကြက် ငှက်ပေါက်စ

climate change (n) – ရာသီဥတုပြောင်းလဲမှု

endangered (adj) – အန္တရာယ် ဖြစ်စေသည်၊
ဘေးသင့်သည်

exposed (adj) – ထင်ရှားမြင်သာစေသော

huddle (v) – ရောထွေးထားသည်

native (adj) – မူလဖြစ်သော၊ ဇာတိဖြစ်သော

snow-capped (adj) – နင်းခဲများဖြင့် ဖုံးလွှမ်းနေသော
(တောင်ထိပ်)

yield [of a crop] (n) – သီးနှံထွက်နှုန်း

6.1 Antarctic Summer (00:00 – 10:54)

A Before you watch

1. **Discuss:** What do you remember about the Arctic and Antarctica from Unit 1?
2. Complete the text using the words in the box.

Antarctica

Antarctica is the Earth's southernmost _____^a. It is on the South Pole. At 5.4 million sq mi (14.0 million km²), it is the fifth-largest continent in area after Asia, Africa, North America, and _____^b America.

About 98% of Antarctica is covered by ice. This ice averages at least 1.0 mile (1.6 kilometres) in thickness. Additionally, Antarctica is surrounded by sea ice. The size of Antarctica changes throughout the year as the sea ice retreats and advances with the seasons.

Antarctica, on average, is the coldest, driest, and _____^c continent. It is also the highest of all the continents (the South Pole is 9,300 ft (2,835 m) above sea level). It has yearly precipitation of only 8 inches (200 mm) near the sea and even less inland. Because of this it is classed as a _____^d. No humans live in Antarctica permanently. Only plants and animals that can survive the extreme cold can live there. Antarctic animals include _____^e and penguins. Plant life includes some grass and shrubs but no trees.

south continent desert windiest seals

B As you watch

1. Why are the adelic penguins migrating to Antarctica?
2. Why are the petrels migrating to Antarctica?
3. Why are the skuas migrating to Antarctica?
4. Why does spring start earlier at the Antarctic Peninsula?
5. What mammal is also migrating to Antarctica?

C After you watch

1. Read the pairs of facts about Antarctica and tick the correct fact in each pair.
 - a. i. 9% of all the world's ice is found at Antarctica.
ii. 90% of all the world's ice is found at Antarctica.
 - b. i. Antarctica is as large as the USA.
ii. Antarctica is the largest continent on Earth.
 - c. i. A "nunatak" is the **exposed** peak of a mountain.
ii. A "nunatak" is a storm in the middle of the day.
 - d. i. The ice at Antarctica less than a mile wide.
ii. The ice at Antarctica is over a mile deep.
 - e. i. In summer, more than 30% of Antarctica is ice-free.
ii. In summer, less than 3% of Antarctica is ice-free.
2. Find Antarctica on the map on page 142. Find the Antarctic Peninsula. What continent is it nearest to?

■ Blue ice covering Lake Fryxell, in the Transantarctic Mountains.

6.2 Antarctica – Winter (10:54 – 17:20)

A Before you watch

1. **Discuss** and answer the questions.
 - a. What is winter like in your country?
 - b. What do you think winter is like in Antarctica?
 - c. What problems do you think animals will face in winter in Antarctica?

B As you watch

1. How much bigger does Antarctica become in winter?
2. What animals arrive at Antarctica in winter and where do they come from?
3. Which animal, the male or the female, looks after the egg through the winter?
4. What does the temperature fall to in winter?

C After you watch

1. What example of competition between the penguins did you see?

2. What example of cooperation between the penguins did you see?
3. Read the text about seasons and complete the table showing the seasons at the North and South Poles.

Seasons in the South

In the southern hemisphere, the seasons are the opposite of the northern hemisphere. When it is summer in the north, it is winter in the south. This is the same at the North and South poles: when there is 24 hours of sunlight at the North Pole, there is 24 hours of darkness at the South Pole.

Season	North Pole	South Pole
a. Spring	Mar–May	
b. Summer		
c. Autumn		
d. Winter		

ANIMAL CLASS: A GUIDE TO ANIMAL CLASSIFICATIONS

4. BIRDS

Birds are the only animals that have feathers. A bird's wings have the same bones as a human arm, but they are arranged differently. There are more than 9,800 known species of birds, from the 2 ¼ inch (63 mm) bee hummingbird to the 9-foot-tall (2.7 m) ostrich.

All birds:

- are vertebrates.
- are warm-blooded.
- have wings and feathers.
- lay eggs with hard, waterproof shells.

Some birds:

- cannot fly.

■ **Flightless:** over millions of years, penguins have lost the ability to fly. They now use their wings only for swimming.



IS IT A BIRD?

Are the following animals birds? Why?

- a. a chicken
- b. a dragonfly
- c. a draco lizard
- d. a bat



6.3 The Arctic – Spring and Summer

(17:20 – 41:20)

A Before you watch

1. Read the text and answer the questions.
 - a. What two differences are there between the Arctic and Antarctica?
 - b. What two things can be used to define what the Arctic is?

The Arctic

The Arctic is a polar region at the northernmost part of the Earth. The Arctic is not a continent (like Antarctica is). It is a large frozen area of the Arctic Ocean as well as parts of Russia, Alaska, Canada, Greenland and four other countries.

There are different definitions of what the Arctic is. One definition says that it is everything north of 66°N. Another says that it is "the region where the average temperature for the warmest month (July) is below 10 °C (50 °F)".

Unlike Antarctica, humans live at the Arctic. The average temperature is higher than at Antarctica, so many different groups of people have adapted to life in the Arctic.

B As you watch

1. Complete the table about the diets of Arctic animals in the video.

Animal	Eats	How it gets food
a. eider duck		
b. musk oxen		
c. Arctic fox		
d. Arctic wolf		
e. Polar bear		

C After you watch

1. Identify the animals in the pictures.
2. Find the Arctic Circle on the world map at the back of the book. What countries or territories are within the Arctic Circle (above 66°N)?



a.



b.



c.



d.



e.

6.4 Antarctica – Spring (41:20 – 48:36)

■ Low cloud over Antarctica.

A Before you watch

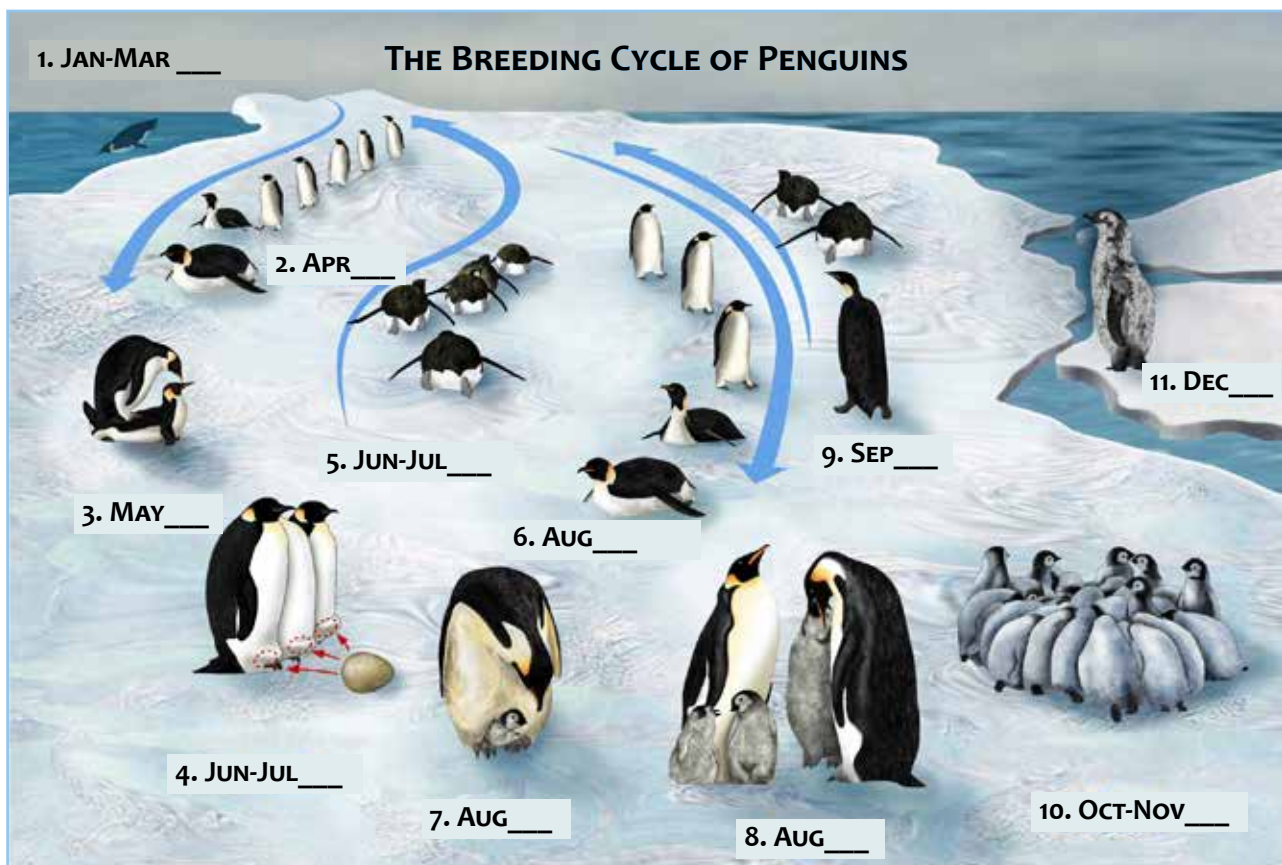
1. **Discuss:** What do you remember about Antarctica's winter and the penguins from 6.2?

B As you watch

1. In Antarctica, how long does the Sun stop shining for in winter?
2. What has the male penguin saved inside him?
3. What is the "hope" for the male penguins?
4. What do the penguin **chicks** eat?
5. What can happen to chicks without mothers? Why?
6. What do the chicks do to keep warm?

C After you watch

1. Label the diagram of the penguins' **breeding cycle**.
 - a. walk to the breeding grounds
 - b. penguins leave the ocean
 - c. females return
 - d. females leave to feed
 - e. males take the eggs to keep through winter
 - f. males and females mate
 - g. chicks hatch
 - h. chicks leave for the ocean
 - i. father feeds them
 - j. males leave to feed
 - k. chicks grow but **huddle** together for warmth



6.5 A New World (48:36 – End)

A Before you watch

1. **Discuss:** What do you remember about the polar bear family from 6.3?

B As you watch

1. Do the polar bear family still live together?
2. What are the “bigger changes” that the video talks about?

C After you watch

1. What do you know about it? What do you want to know about it? Complete the table.

Things I know about climate change	Things I want to know about climate change

2. Read the text and answer the questions.
 - a. Has the Earth’s climate changed in the past? How?
 - b. Do scientists think it will change in the future? How?
3. Discuss the questions in groups.
 - a. What are three natural causes of climate change and how do you think each affects the climate?
 - b. What are two human-made causes of climate change and how do you think each affects the climate?
 - c. Look at the effects of climate change. For each, can you explain how climate change might cause these things to happen?
 - d. Do you see any evidence of climate change around you or in the news? Can you give examples?

Climate Change

The climate of the Earth sometimes changes, and it becomes warmer or colder. For example, between 100,000 and 10,000 years ago, there was an ice age. Ice covered most of North America and northern Europe. About 8,000 years ago, the temperature rose again and the ice age ended.

Natural Climate Change

There are many natural causes of **climate change**. Three major causes are volcanoes, the Earth’s orbit around the Sun, and the Sun itself.

Human-made Climate Change

Over the last 100 years, the Earth has got warmer. Some scientists call this *global warming*. Last century, the average temperature of the Earth rose by 0.6°C, and 19 of the hottest 20 years have happened since 1980. Some scientists believe that by 2100, the Earth will become 2 - 5°C hotter than it is now. This could have many big effects on people and the environment.

Almost all climate scientists agree that some global warming is caused by human activity. There are two major causes of human-made global warming: burning fossil fuels and deforestation.

The Effects of Climate Change

There are many possible effects of climate change on humans and the environment, including:

- more natural disasters such as cyclones, floods and droughts
- the melting of sea ice at the poles
- the rise of sea levels
- food shortages because of natural disasters
- increased risk of disease
- loss of species



UNIT 6: ICE WORLDS -



FOCUS ON MYANMAR

MYANMAR'S COLDEST PLACES

Putao and Hkakabo Razi



The road to Putao.

Putao is the northernmost town in Myanmar. It is on the bank of Namlaung River. The weather here is cold here all year round, and the town is only accessible by road during the summer. The area around Putao is also well-known for its rare birds and orchids. The "black orchid" (*Paphiopedilum*) grows only in the mountains east and west of Putao. Some of the rarest and most **endangered** animal species in the world such as the takin, the red panda, black bear, and black deer, are **native** to this region.

Hkakabo Razi is **snow-capped** all year round. At 19,294 feet (5,881 metres), it is the highest mountain in South East Asia. It is part of the Eastern Himalayas. Like the main Himalayas, these mountains are heavily affected by the monsoon.

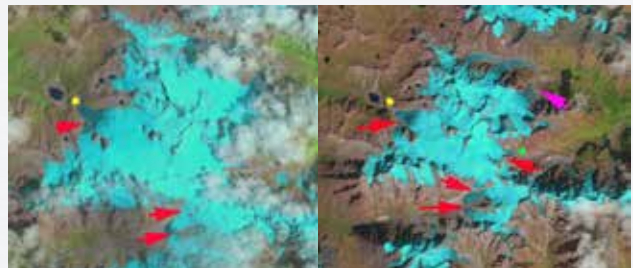
Hkakabo Razi National Park covers 2,369 square miles. Within it are broad-leaved rain forest, a sub-tropical temperate zone from 8,000 to 9,000 feet (2,400–2,700 m), broad-leaved forest; and coniferous snow forest.

Above 11,000 feet (3,400 m), the highest forest zone is alpine, different in history and origin from the other forests. Still higher up, around 15,000 feet (4,600 m), cold, **barren**, windswept terrain and permanent snow and glaciers dominate. At around 17,500 feet (5,300 m), there is a large ice cap with several outlet glaciers.



Hkakabo Razi, the highest mountain in Myanmar.

Some scientists believe that Myanmar's glaciers are shrinking because of climate change. Glaciers close to Hkakabo Razi have shrunk by up to 37% in sixty years, and images (below) of the glaciers show a much smaller area than 30 years ago.



Hkakabo Razi glaciers in 1986 (left) and 2009 (right).

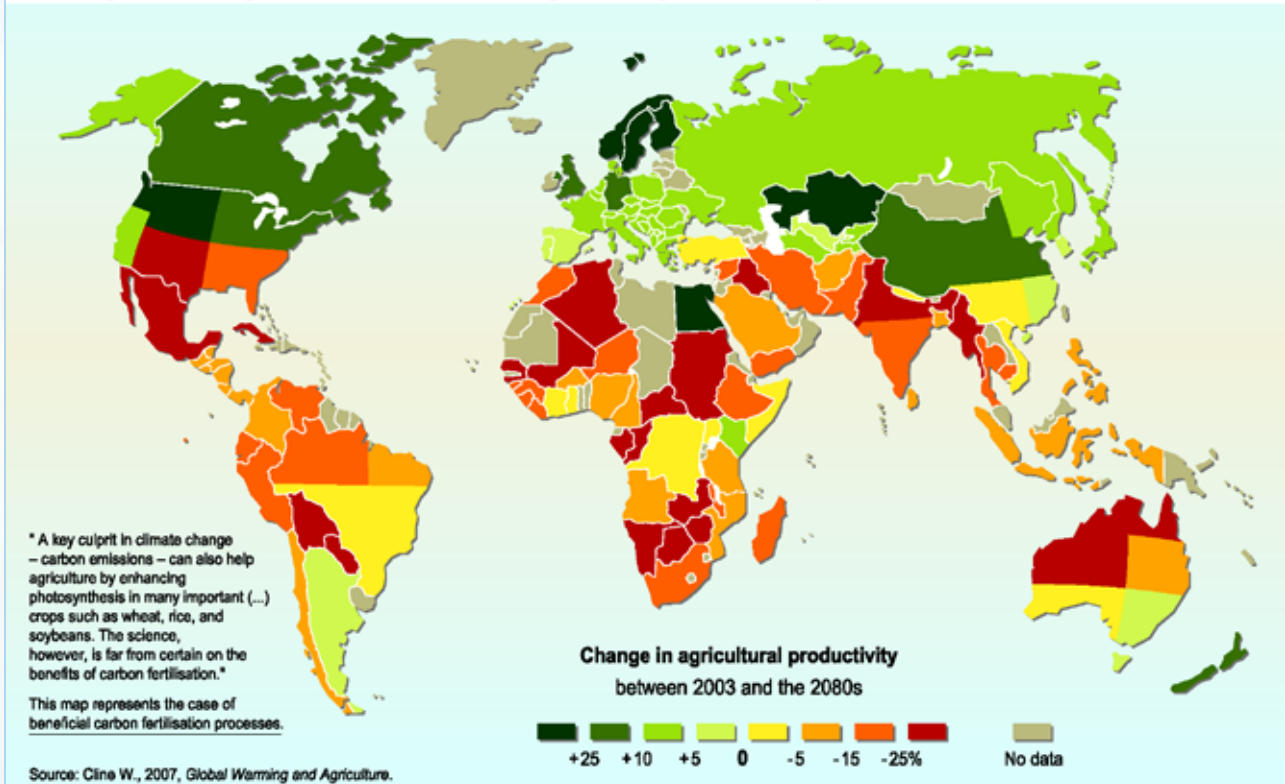
1. Why do you think Putao is only accessible by road during the summer?
2. What rare plants and animals live around this area?
3. Which mountain range is Hkakabo Razi connected to?
4. What kind of trees grow because of the different climate zones within the national park?
5. What has happened to the glaciers at Hkakabo Razi and why?
6. Why do you think Hkakabo Razi is snow-capped year round? Give information from the text to support your answer.

ADDITIONAL ACTIVITIES

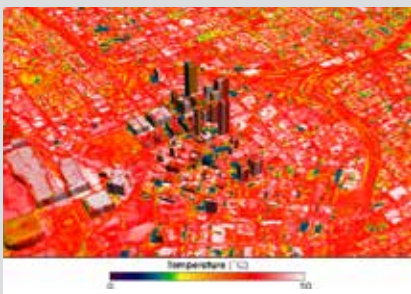


SKILLS WORK

Projected impact of climate change on agricultural yields



1. According to this map, what are three countries or areas whose agricultural **yields** could possibly increase by 25% or more in the future?
2. What kind of climate do these countries have now? How could that change?
3. Why might this increase be possible if climate change continues?
4. According to the map, what are three countries whose yields will decrease by 25% or more as a result of climate change?
5. What kind of climate do these countries have now? How could that change?
6. The photos below show an impact of climate change in a different location. How has climate change affected that place? For each, explain what you think has happened.



Atlanta, Georgia, USA



Northern Canada



Dadaab, Kenya, East Africa



■ Savanna near the South African city of Pietermaritzburg.

Unit 7 Great Plains

Key Words

cereal (n) – ကောက်ပဲသီးနှံများဖြင့် စီမံပြုလုပ်ထားသော မနက်စာ စားသောက်ဖွယ်

edible (adj) – စားသုံးရသော

export (v) – ပို့ကုန်

food pyramid (n) – အစာပိရမစ်

food web (n) – အစာကွင်းဆက်

grassland (n) – မြက်ခင်းပြင်

hectare (n) – ဟက်တာ (နေရာသေ အကျယ်အဝန်း)

matriarch (n) – အမျိုးသမီးခေါင်းဆောင်။

primary consumer (n) – မူလစားသုံးသူ

plateau (n) – ကုန်းပြင်မြင့်

pride (n) – ခြင်္သေ့အုပ်

pollination (n) – ဝတ်မှုန်ကူးခြင်း

reproduce (v) – မျိုးပွားခြင်း

scrub (n) – ချုံထူနောင်းတော

secondary consumer (n) – ဒုတိယအဆင့် စားသုံးသူ

sow (v) – မျိုးကြံသည်၊ စိုက်သည်

staple [food] (n) – ပုံမှန်စားသုံးသော အစားအစာ

starve (v) – ဆာလောင်သော

steppe (n) – အေး၍ ခြောက်သွေ့သော ဒေသတွင်ရှိသော မြက်ခင်းလွင်ပြင်

subcontinent (n) – တိုက်ကြီးများ၏ တစိတ်တဒေသ (ဥပမာ - တောင်အာဖရိကတိုက်)

tertiary consumer (n) – တတိယအဆင့် စားသုံးသူ

trophic level (n) – အစာကွင်းဆက်တွင် ရှိသော

အစာထုပ်လုပ်သူနှင့် စားသုံးသူ အဆင့်ဆင့်

waterhole (n) – ရေများစုစည်းရာ ချိုင့်ခွက်

7.1 Grasslands (00:00 – 08:48)

A Before you watch

1. **Discuss:** What is grass? Where does it grow, and what do humans use it for?
2. Read the text and mark the statements true or false. If false, explain why.
 - a. Grass does not grow easily or quickly.
 - b. A graminoid is a type of grass.
 - c. Some grasses can be eaten.
 - d. Edible grasses are called rice.
 - e. The edible grasses that humans eat every day are called staples.
 - f. Bamboo can be used for cooking.



Grasses

Grasses are one of the most important groups of plants on Earth. They are equally as important for humans and for animals. One of the most important features of grass is its ability to grow fast in difficult climates and conditions. This means that it can grow anywhere where there is some rain. The scientific name for grasses is “graminoid”, and included in that group are **cereals** and bamboo.

Cereals

Cereals are **edible** grasses. Humans have grown rice, wheat and corn for thousands of years. These cereals are called **staples**. Staples are the food that gives humans most of their energy in their diets. They are also important for the animals that live on the **grasslands** around the world.

Bamboo

The other important grass for humans is bamboo. This is truer in Asia than in any other part of the world. Bamboo has many uses, including food, building, furniture and traditional medicines.

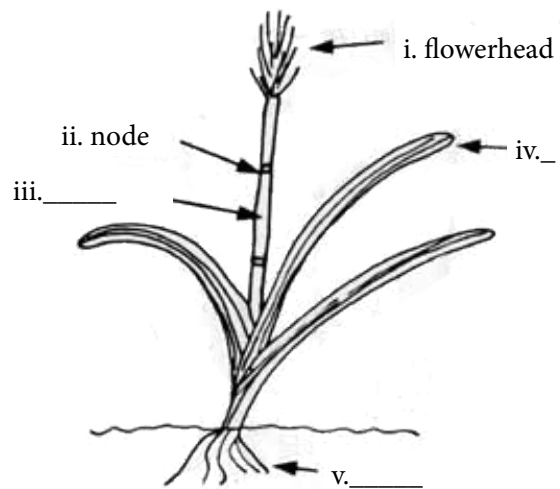
B As you watch

1. What great migration is happening in the video?
2. How many Mongolian gazelle live in the Central Asian **Steppe**?
3. Why do they all come together to calve?
4. What class of animal is the red-billed quelea?
5. How big is the flock?

C After you watch

1. Label the diagram of the grass plant with the words below.
 - a. roots
 - b. stem
 - c. leaf

A basic diagram of the parts of a grass plant



2. Answer the questions.
 - a. If you are a grazer, what are the advantages of living in these grasslands?
 - b. In what ways is the grass attacked or damaged in the video?
 - c. Why can grass continuously support species?
 - d. According to the video, how is grass able to grow again so quickly?
3. Discuss these questions in groups.
 - a. What grasses (cereals and bamboos) do you use?
 - b. What would you use if you didn't have them?
 - c. How important are grasses for your community?

7.2 The Arctic Tundra (08:48 – 22:12)

A Before you watch

1. **Discuss:** What do you remember about *the Arctic, the Arctic tundra and food chains?*
2. Read the text about food webs and answer the questions about the diagram.
 - a. What is the producer?
 - b. What are the primary consumers?
 - c. What are the secondary consumers?
 - d. What are the tertiary consumers?

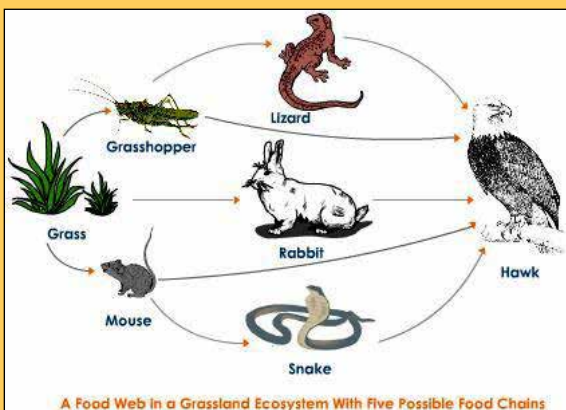
Food Webs

You saw in 4.3 that there are producers and consumers in a food chain. A **food web** is made of all the food chains in an ecosystem. It shows us where organisms' energy and nutrients can come from.

All energy on Earth comes from the Sun, so in a food web (or chain), there must be a producer which takes the Sun's energy and transfers it into another form.

There are three basic levels (called **trophic levels**) to a food web: *producers*, *primary consumers* and *secondary consumers*. Producers are plants, (grasses and trees). They take energy from sunlight and nutrients from the ground. Primary consumers are grazers; they eat plants for their energy and nutrients. The secondary consumers are predators; they eat the grazers.

Additionally, there are also **tertiary consumers** in many ecosystems. Tertiary consumers are predators which eat primary or secondary consumers.



B As you watch

1. What example of competition can you see between the geese?
2. Why is the tundra a good place for grazers?
3. Which predator has been waiting for the geese to arrive?
4. Which predator is following the migration of a grazer?
5. Write the name of the animal next to the name of its young.
 - a. calf - _____
 - b. gosling - _____
 - c. cub - _____

C After you watch

1. Complete the table using the information in the video and the information in the text box.

Organism	Trophic level	Gets energy from
a. Grass		
b. Geese		
c. Arctic fox		
d. Wolf		
e. Caribou		

2. What trophic level (seen in the text and diagram) is missing from the table?
3. Do you think any of the animals are tertiary consumers? Why?
4. Draw a food web of the Arctic tundra. Include the animals from 6.3 and any other animals that they eat. Watch 6.3 again and do additional research if necessary.

7.3 Prairies and Veldt (22:12 – 26:36)



■ A canola field in the Canadian Prairies

A Before you watch

1. Find the North American Prairies (on the map on pages 126 and 127) and the southern African Veldt (130 and 131) based on these descriptions.

The prairies begin in Canada. They form an area to the east of the Rockies and across to Saskatoon. They follow the Rockies south and go through the USA, ending south of Austin, Texas and east of Kansas City, Missouri.

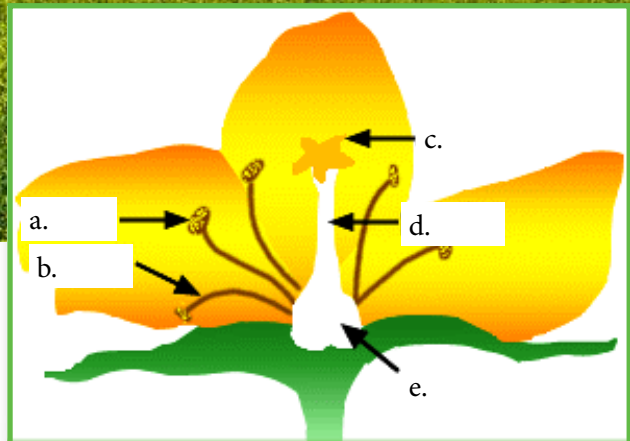
Veldt is a type of wide open rural landscape in Southern Africa. Particularly, it is a flat area covered in grass or low **scrub**, especially in the countries of South Africa, Lesotho, Swaziland, Zimbabwe, Botswana and Namibia.

B As you watch

1. Read the text and mark the statements true or false. If false, explain why.
 - a. There are 60 million bison on the prairies.
 - b. There is enough grass for the bison herds all year.
 - c. Not all of the bison will mate.
 - d. The female bison fight each other.

C After you watch

1. Read the text and label the parts of the diagram with the underlined words.
2. Why do you think that grasses do not have bright colourful flowers but insect-pollinated plants do?



Pollination

Pollination is the process through which plants **reproduce**. When a plant is pollinated, it can produce seeds. These seeds can then create new plants.

Pollination happens in the flowers of plants. Inside the flower are male parts called stamens¹. They produce pollen², which sits on the stamen. Also in the middle of the flower is a female part, called a pistil³. At the top of the pistil is the stigma⁴, which is also sticky. Pollen needs to move from a stamen to a stigma, then down the pistil into the ovule⁵. In the ovule, new seeds are produced.


Most plants do not pollinate themselves (self-pollination) so they need help to pollinate other plants (cross-pollination). There are two main ways that plants pollinate – by insects or by wind.

Insect Pollination

Insects such as bees are very important in pollination. Many flowering plants produce a sweet food called nectar. Bees fly from plant to plant collecting the nectar. When they land on the flower, pollen sticks to their body. When they move to another flower, some pollen will land on the stigma of that plant.

Wind Pollination

Grasses are wind pollinated. They do not use insects to pollinate. Instead the wind moves pollen from one plant to another.



■ Karakoram-West Tibetan Plateau alpine steppe near Ladakh, India.

7.4 Tibet and India's Grasslands (26:30 – 36:39)

A Before you watch

1. Find India and Tibet on the map on pages 136 and 137. What separates them?
2. **Discuss:** From what you have learned about weather (1.4, 3.1, 5.1), what can you predict about the climates of northern India and southern Tibet?

B As you watch

1. What is the effect of the Himalayas on Tibet?
2. What is the purpose of the competition between the male wild asses?
3. Is the pika a predator or a grazer?
4. What animal preys on the pika?
5. What is the effect of the Himalayas on northern India?
6. Why does elephant grass have that name?
7. What are the examples of very large and very small grazers in India?

C After you watch

1. Read the text, look at the picture, then write a paragraph comparing northern India and southern Tibet. The words in the box may help.

dry grey long grass dusty lush green

THE HIMALAYAS AND THEIR EFFECT ON CLIMATE

The Himalayas have a big effect on the climate of India and the Tibetan **Plateau**. They stop very cold, dry Arctic winds from blowing south into the **subcontinent**. This keeps South Asia warm. They also form a barrier for the monsoon winds, stopping them from travelling northwards. These winds cause heavy rainfall in northern India, Nepal and Bhutan. The Himalayas also play an important part in the formation of Central Asian deserts such as the Taklamakan and Gobi deserts.



The Himalayas, with India and Nepal to the south and Tibet to the north.

2. What is the name for the brown coloured land in the picture above?
3. Is there a similar area in your country? Where?

7.5 African Savannah (36:39 – End)

A Before you watch

1. **Discuss:** What do you know about Africa? What animals live in its grasslands?
2. Look at the summary and predict which words (below) fill the gaps.

nighttime dangerous drink hunt
waterhole cooler attack thirsty

Danger on the Savannah

~ African elephants must _____^a daily.

~ The **matriarch** leads her elephants to a _____^b.

~ The elephants must share the water with other _____^c animals.

~ More elephants arrive in the night.

They travel in the dark because it is _____^d.

~ Lions do not usually _____^e elephants, but at _____^f they are able to _____^g and kill a small elephant.

~ The elephants know that the lions are _____^h but they need water, so they have to stay at the waterhole with them.

B As you watch

1. Which picture shows a **pride** and which shows a **herd**?



2. What brings herds back to the savannah?
3. What brings grass back to the savannah?
4. Which animal lives on the savannah all the time?

C After you watch

1. Check your predictions from **A2**.
2. Read the text about food pyramids. Why is the food pyramid wider at the bottom than at the top?
3. What would happen if the pyramid was wider at the top and thinner at the bottom?
4. How is a food pyramid different from a food chain or a food web?
5. How is it the same?

Simple Food Pyramids

We have used food chains and food webs to show how plants and animals use each other for energy: a **food chain** is a group of plants and animals which use each other for food energy and a **food web** is all of the possible food chains in the ecosystem.

Scientists also use **food pyramids** (or trophic pyramids) to show how much energy (or how many organisms) there are at each trophic level. For example, in the food pyramid below, the lions are at the top. There are fewer of them and they take their energy from the primary consumers, such as giraffes. There are many more giraffes than lions. There must be; if there were more lions than giraffes, they would eat them all and there would be no food to eat. Below the giraffes are the producers. Again, there are more producers than primary consumers. If there were more consumers than producers, they would eat all the plants and also **starve**.



UNIT 7: GREAT PLAINS -



FOCUS ON MYANMAR | SKILLS WORK

MYANMAR RICE

The most important cereal in the country | Information from <http://ricepedia.org/myanmar>



Rice farmers working in the fields in Myanmar.

Myanmar is the world's sixth biggest rice producer. Rice is the staple food of everyone in Myanmar. The average person in Myanmar eats 310 pounds (141 kg, 86.5 viss) of rice per year. Because rice is the staple food of Myanmar, it is necessary for the food security of the whole country.

It is also an important crop for Myanmar's economy; In colonial times Myanmar was the biggest exporter of rice in the world. In 2010, Myanmar produced 33

million tons of rice and **exported** 122,000 tons to other countries.

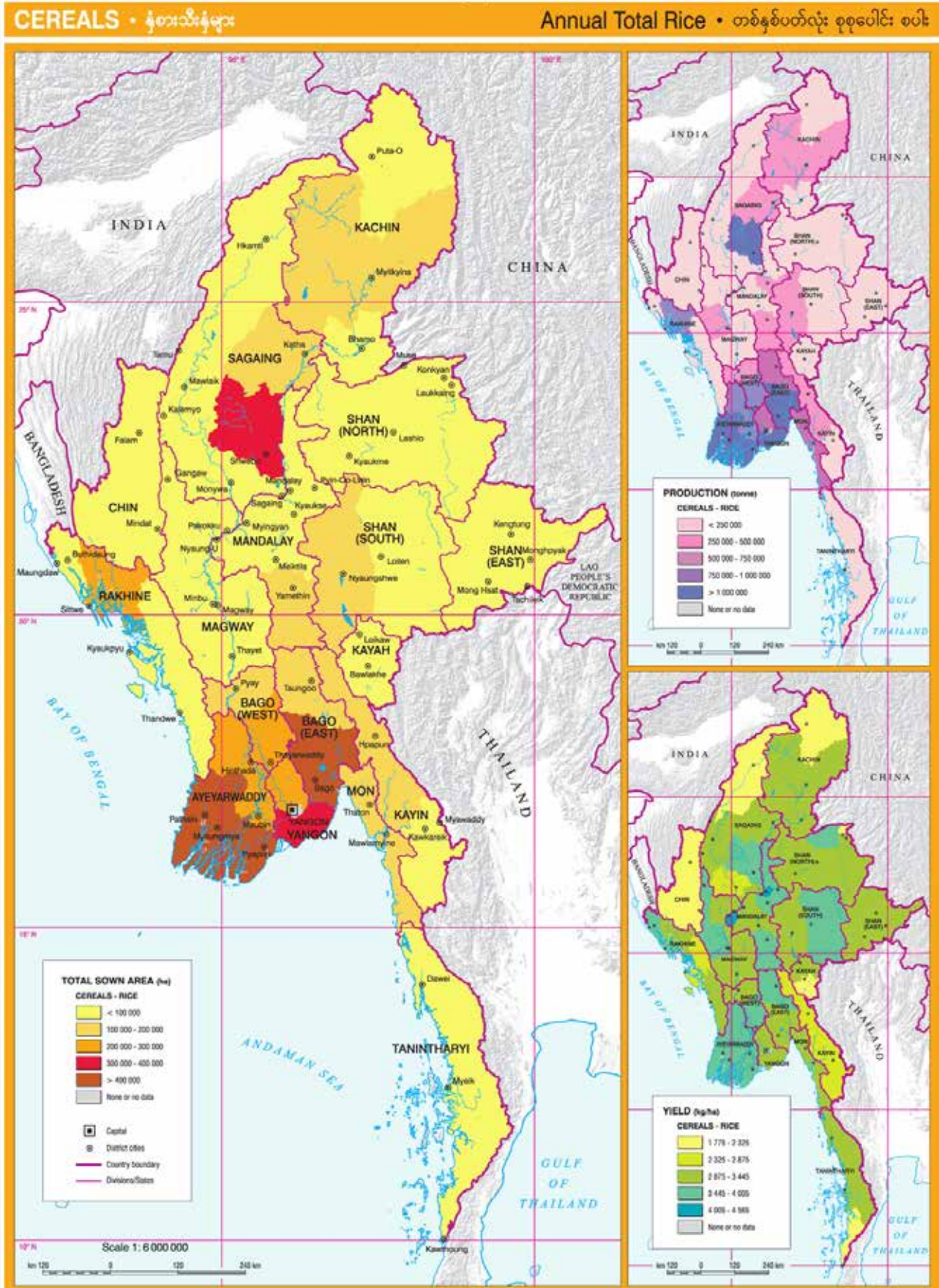
There are many different types of rice in the world and they have evolved to grow in their local climate. Therefore, different kinds of rice can grow in different parts of Myanmar and at different times. Some types are **sown** during the monsoon. Some types, such as *deepwater rice* only grow in the lowland of the Ayeyarwaddy Delta. *Rainfed rice* is sown in lower Myanmar, in Yangon and Bago Regions. In upper Myanmar, irrigation is needed to grow enough rice.

Since 2010, the Myanmar government has been trying to increase rice production and rice exports, but the country still faces problems. Many farmers are poor, and can't buy modern equipment. Transporting rice is difficult because of poor roads and railways.

To increase rice production, more money for farmers (such as microloans, where farmers borrow small amounts of money), improved roads and new storage buildings are necessary. Additionally, if the price of paddy increased, farmers would make more money from rice farming, and be able to grow more.

1. Answer the questions.
 - a. Why does food security in Myanmar depend on rice?
 - b. How much rice did Myanmar sell abroad in 2010?
 - c. What kind of rice can only grow in the Ayeyarwaddy Delta region of Myanmar?
 - d. What needs to change to make Myanmar a bigger exporter of rice?
2. Discuss and answer the questions.
 - a. What do you think has happened to Myanmar's production since colonial times?
 - b. List the ways Myanmar could help farmers to improve rice production.
3. Choose three areas of Myanmar on the map – one where you come from, one you have visited before, and one where you hope to go one day.
 - a. What is the highest number of **hectares** (ha) sown (farmed) with rice in these places?
 - b. How many tonnes of rice/cereal grains are produced in these places? Use the average amount (if the chart shows 300,000 - 400,000, use 350,000).
4. Put your data about the number of hectares sown and amount of grain produced into a bar chart.
5. Which of the three areas has the highest yield of rice and cereals? Why do you think that is? Use evidence from the data and graphs to form your conclusion.

ADDITIONAL ACTIVITIES





■ Smoke among the trees in the tropical rainforest of Pulau Perhentian Kecil, Malaysia.

Unit 8 Jungles

Key words

biodiversity (n) – ဇီဝမျိုးကွဲ
cannibalise (v) – စက်ပစ္စည်းအစိတ်အပိုင်းတစ်ခုအား အခြား စက်ပစ္စည်းတွင် တပ်ဆင်သုံးစွဲသည်
carbon dioxide (n) – ကာဗွန်ဒိုင်အောက်ဆိုဒ်
chlorophyll (n) – ကလိုရိုဖီ
 (သစ်ပင်၊ အရွက်များတွင်တွေ့ရှိရသည့် အစိမ်းရောင်ဓာတ်)
complex (n) – အဆောက်အအုံတစ်ခု၏ တွဲလျက်ပါရှိသော အစုအစည်းများ
copulation (n) – ကာမဆက်ဆံသည်၊ မိတ်လိုက်သည် (တိရစ္ဆာန်)
decay (n) – အပျက်အစီး၊ အပုပ်အဆွေး
decomposer (n) – အပုပ်အဆွေး၊ အပျက်အစီး မှီဝဲ တိရစ္ဆာန်များ
disperse (v) – ပြန့်နှံ့သွားစေသည်
fertilise (v) – ရှင်သန်စေသည်
filament (n) – အမြစ်မျှင်
fossil record (n) – ကျောက်ဖြစ်ရုပ်ကြွင်းမှတ်တမ်း
fungi (n) – မှို (သစ်ဆွေး၊ သစ်ပုပ်တို့တွင် ပေါက်သည့် ရေညှိ)
generalist (n) – မည်သည့် ကွဲပြားသည့် အစားအမျိုးကိုမဆို၊ သို့မဟုတ် မည်သည့်နေရာဝန်းကျင်တွင်မဆို စားသုံးကာ နေထိုင် သက်ရှင်နိုင်သည့် သတ္တဝါ

glucose (n) – ကလူးကို့စ်
humidity (n) – လေထုအတွင်း စိုထိုင်းမှု ပမာဏ
metamorphosis (n) – ပိုးတုံးလုံးဘဝမှ အင်းဆက်ပိုးကောင်သို့ ကူးပြောင်းသွားခြင်း
old-growth (adj) – သက်တန်းရှင့် ရှေးဟောင်းသစ်တော
photosynthesis (n) – နေရောင်ဖြင့် အစာချက်ခြင်း
primate (n) – နို့တိုက်သတ္တဝါ
rainforest (n) – မိုးသစ်တော/ အမြစ်မီးတော (အပူပိုင်းမိုးရွာသွန်းသည့် ဒေသမှ)
specialist (n) – ကျွမ်းကျင်သူ (အစားအသောက်တစ်ခုအား စားနိုင်ရန် သို့မဟုတ် နေရာဒေသတစ်ခုတွင် နေထိုင် သက်ရှင်နိုင်ရန် ကျွမ်းကျင် လေ့ကျင့်ထားသူ)
sperm (n) – သုတ်ရည်

8.1 Into the Jungle (00:00 – 09:30)

A Before you watch

1. **Discuss** and answer the questions.
 - a. Where are the tropical rainforests (jungles)?
 - b. What is the climate like in these parts of the world?
2. Read the text and label the diagram with information from the text about each layer.

RAINFOREST LAYERS

Rainforests have four main layers: the emergent, the canopy, the understory and the forest floor.

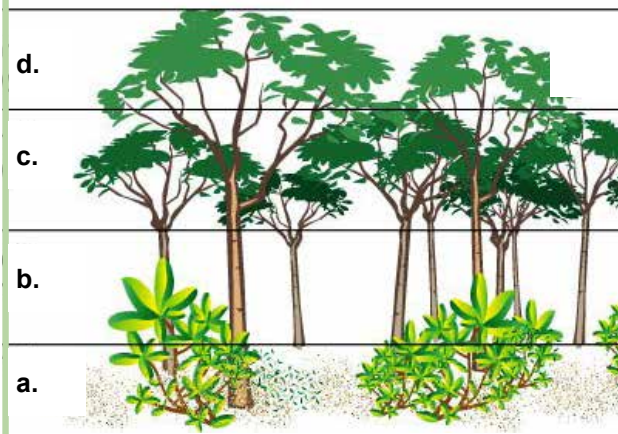
The emergent layer is at the top. Only a few of the tallest trees reach this high, up to 60 m from the ground.

The canopy is the second layer. Most of the largest trees – 30–45 m tall – are here. The most **biodiversity** is in the forest canopy. Some scientists think that up to 50 percent of all plant species on Earth are found there.

The next layer is the understory. It is about 15–30m from the ground. It is home to birds, snakes, and lizards, as well as bigger predators such as jaguars and leopards. There is also a lot of insect life. Only about 5 percent of the sunlight shining on the rainforest reaches the understory.

The forest floor gets only two percent of the sunlight. The plants here have adapted to low light. There is not much vegetation because so little sunlight reaches it. It contains dead plants and animals, which decay quickly in the warm, humid environment. Many forms of **fungi** grow here. They help decay the animal and plant waste.

Rainforest Structure



B As you watch

1. How much of the Earth’s land is made up of jungle/tropical rainforest?
2. How many of the world’s species live in the jungle?
3. According to the video, what has to happen if the forest is to remain healthy?
4. What do young seeds compete for on the forest floor?

C After you watch

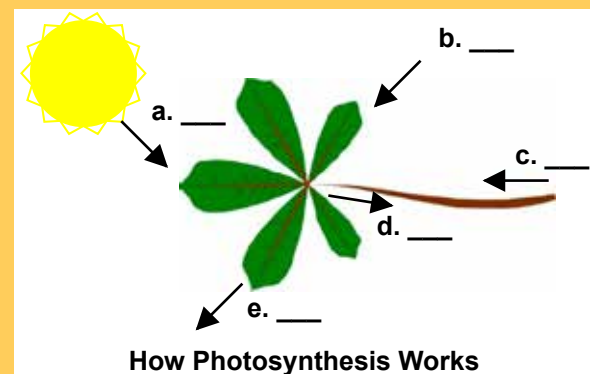
1. Read the text and label the diagram correctly.
 - i. carbon dioxide from air into leaves
 - ii. oxygen out into the air
 - iii. energy from sunlight
 - iv. water in through roots
 - v. glucose back into plant

What Is Photosynthesis?

Photosynthesis is how plants get their energy. They can’t move around to find food, so they make their food where they are. However, they need three things: *sunlight*, *water* and **carbon dioxide**.

Plants take in carbon dioxide through their leaves and water through their roots. The leaves change the water and carbon dioxide into **glucose** and oxygen. The plants use the glucose as food and they release the oxygen.

They use the Sun’s energy to power the whole process. A chemical called **chlorophyll** traps sunlight. Its colour is green. This is why almost all plants are green.



2. Find Papua New Guinea on the map on pages 140 and 141. What seas surround the island in the east and west?

8.2 Monkeys and Mating (10:20 – 22:23)

A Before you watch

1. **Discuss** and answer the questions.
 - a. Which layer of the rainforest do you think monkeys live in?
 - b. What do you think they eat?

B As you watch

1. What layer of the rainforest do most animals live in?
2. Why do trees flower or fruit at different times of the year?
3. What food do all the monkeys in the video love to eat?

C After you watch

1. Read the text and answer the questions.
 - a. How do fig trees reproduce?
 - b. What form of cooperation, between plants and animals, is described in the text?

Reproduction in plants and animals

All species must reproduce to survive. Animals do this by mating. This is different in different species, but usually this is through **copulation**. During copulation, the **sperm** of a male **fertilises** a female. After fertilisation, one or more babies will grow inside the female, and then she will either lay eggs or give birth days, weeks or months later.

Plants reproduce differently. You have seen how plants use insects for pollination: insects help them fertilise and produce seeds. Many plants also use animals to **disperse** their seeds to other places. They do this with fruit. Animals need to eat, and fruits are often sweet and full of energy. They also have seeds inside. Animals eat the fruit and then move to other places. The animals' bodies cannot digest the hard seeds and they pass through the animals bodies back into the ground. Those seeds can then begin to grow into new plants.

ANIMAL CLASS: A GUIDE TO ANIMAL CLASSIFICATIONS

5. AMPHIBIANS

Amphibians are animals that live part of their lives in water and part on land. They live in moist places or near water to keep their bodies from drying out.

All amphibians:

- are vertebrates.
- are cold-blooded.
- have skin, not scales.
- breathe through their skin.
- lay eggs.
- go through **metamorphosis** (young amphibians hatch from eggs, but do not look like their parents; as they develop, their body shape changes).

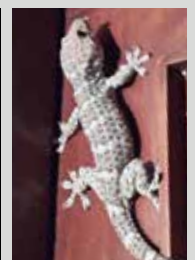
■ **Mating frogs:** Frogs are probably the most well-known amphibians, but how are they different to reptiles?



IS IT AN AMPHIBIAN?

Are the following animals amphibians? Why?

- a. a turaco
- b. a toad
- c. a preying mantis
- d. a gecko



8.3 Fungi and Decomposers (22:23 – 28:08)

A Before you watch

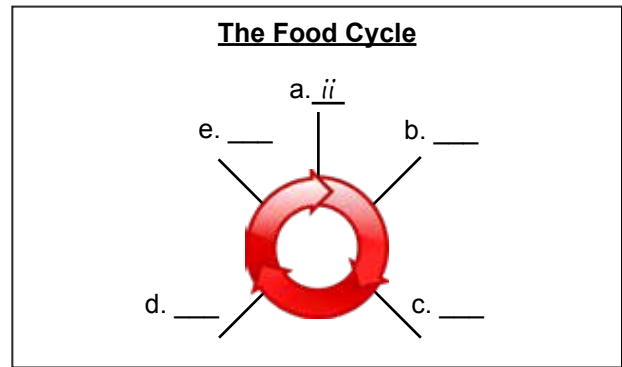
1. **Discuss:** What are fungi and what do they do?
2. Read the text and complete the diagram of the food cycle using the phrases below.
 - i. **Decomposers** take energy from the Sun and nutrients from dead producers and consumers.
 - ii. Producers take energy from the Sun and nutrients from the soil.
 - iii. Nutrients go from decomposers into the soil.
 - iv. Secondary consumers take energy and nutrients from primary consumers.
 - v. Primary consumers take energy and nutrients from producers.



You have looked at food chains, food webs and food pyramids, and have seen that plants and animals need to get energy and nutrients from somewhere. There is one other important part of the food chain in an ecosystem – decomposers.

Decomposers, such as **fungi**, feed on the dead – dead plants, trees and animals. This process is called **decay**. Decomposers take nutrients from the dead, feed on them and then put them back into the ground. Plants can then take those nutrients and grow. This makes the food chain into a cycle. This cycle helps life in the ecosystem to continue.

Fungi are probably the most important decomposers. They are found in almost every ecosystem. Other important decomposers are worms and different kinds of bacteria.



3. Predict the correct word in each sentence below.

Fungi

Low / high ^{a.} **humidity** creates the right conditions for decay. In temperate / tropical ^{b.} forests dead leaves create nutrients on the forest floor. However, that doesn't happen in temperate / tropical ^{c.} forests because nutrients are quickly consumed by fungi.

The fruiting body of fungi is visible / invisible ^{d.} but most of the fungi is underground. They have long **filaments** similar to roots / branches ^{e.}. The filaments of fungi are connected to the roots / leaves ^{f.} of trees, so trees can quickly get the nutrients they need from the fungi.

Scientists think that there are almost one thousand / million ^{g.} kinds of fungi in the tropics.

B As you watch

1. Check your predictions from A3. Were you correct?

C After you watch

1. Why don't nutrients stay in the soil in tropical rainforests?
2. From the text and your understanding of the food cycle, write a sentence in your own words explaining whether rainforests could exist without fungi, and why.
3. Look at the map on pages 128 and 139. What large rivers flow through the Amazon basin?

8.4 Specialisation (28:08 – 42:45)

A Before you watch

1. Read the text and answer the questions.
 - a. What is the difference between generalist and specialist species?
 - b. How do rainforests encourage specialisation?
 - c. Why is there so much competition in the rainforest?



Specialisation and Specialists

There are many ways to define organisms – producers and consumers, mammals and birds, etc. Another way we can define them is as **generalist** or **specialist** species. A generalist species can live in different habitats and can eat different plants or animals. Generalists can usually survive and adapt very easily. Specialist species are the opposite. They have adapted so much that they can only eat certain foods and live in certain habitats. This is true of many organisms in the rainforest.

There is strong competition in the rainforests. Plants compete for sunlight and space, and animals compete for food. There is often a lot of food, but it can be over a large area. Animals have to travel a long way to find food. The competition causes animals and plants to develop very specialised habits and skills. To avoid competition, animals, birds, insects and plants find ways to find food that are not already used by other species.

◀ The pitcher plant specialises in catching insects in its water-filled pitcher and digesting them.

B As you watch

1. Take notes on this part of the video and use them to complete the table.

Organism	Habitat	Specialisation
a. cordyceps		
b. colugo		
c. pitcher plant		
d. red crab spider		
e. forest elephants		

C After you watch

1. What are the benefits of specialisation? What are its drawbacks?
2. Do you think humans are generalists or specialists? Why? Give reasons and examples.
3. Have there been any other examples of specialists in Planet Earth? If yes, what are they?

8.5 Chimpanzees (42:45 – End)

A Before you watch

1. Read the text and mark the statements true or false. If false, explain why.
 - a. Chimpanzees have leaders.
 - b. They can make their own weapons and tools.
 - c. Chimpanzees hunt other chimpanzees.
 - d. Sometimes chimps kills other chimps.

Chimpanzees

Chimpanzees (or “chimps”) are a species of **primate** which live only in Africa.

Society and Lifestyle

Chimpanzees live in large groups, called troops, and have complex societies with alpha (leader) males and females. Mothers and their young are very close and the young stay with their mothers for up to seven years.

Intelligence

They are intelligent and can make and use tools. They can use sticks to find food and can use stones to open nuts. Also, some chimps may use sticks or stones to kill prey.

Hunting and Killing

Chimps hunt for prey in groups and will hunt and kill other primates (such as small monkeys). They will also attack and kill other chimp communities if they are too close, or if they want to take their food. Sometimes chimps will even **cannibalise** chimps from other communities.

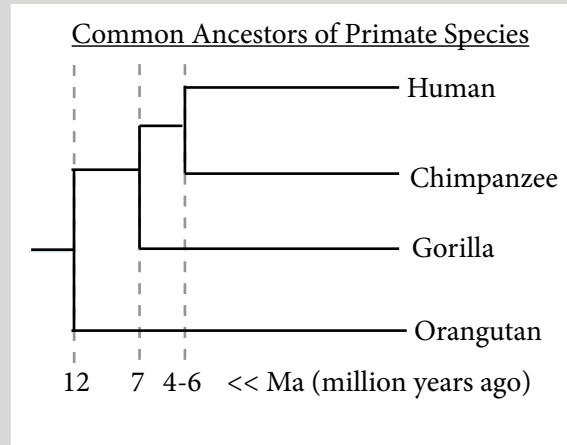
B As you watch

1. Which layers of the rainforest do chimpanzees live in?
2. Why are there lots of chimpanzees in the forest in Uganda?
3. What are the chimps trying to do in the video?
4. What two reasons for cannibalising dead chimps does the video suggest?
5. Why is there no dominant species in the rainforest?
6. What animal is the closest relative of the chimpanzee?

C After you watch

1. What does the diagram below show?
2. Read the text and fill the gaps using the information in the diagram.

The Evolution of Chimpanzees and Humans



Humans are mammals; we have hair, feed milk to our young and have warm blood. We are also primates, like the chimpanzee. In fact, chimpanzees are the closest living species to humans. We are related to other primate species too, such as _____^a and _____^b, but not as closely as to the chimpanzee.

Scientists know a lot about the evolution of primates. This is because of fossil evidence they have found. The different fossils (from different times) help scientists to create a **fossil record**. This fossil record is like a map of a species' history. It shows how they have evolved and changed over time.

We think that all primate species had a common ancestor about _____^c years ago. They evolved into two groups. One became the orangutans and the other became the common ancestor of humans, chimpanzees and _____^d. This group divided into two about seven million years ago and one group became the gorillas. About _____^e years ago, this group divided into two again. They became humans and chimpanzees.

UNIT 8: JUNGLES -



FOCUS ON MYANMAR

THE TANINTHARYI FOREST COMPLEX

And the Western Forest **Complex** in Thailand



■ The Thung Yai Ramit River, which runs through the Western Forest Complex in Thailand.

The Tanintharyi Forest Complex is a huge rainforest covering around 30,000 square kilometres. It supports many important species. The Kayah-Karen Montane Rain Forests region ranks among the highest for bird and mammal species richness in Indochina.

Altogether 153 mammal species, 490 bird species, 41 reptiles and 108 species of fish are known to live in the area. Mammals include tigers, leopards, dhole,

clouded leopards, ten species of primates, water buffalo, elephants and tapir. Birds include the globally threatened plain-pouched hornbill and the largest population of critically endangered Gurney's Pitta.

The area is now dominated by human use. Logging and farming have degraded the forest as it is cleared for intensive, cash crop agriculture. Additionally, increasing population pressure has forced travelling farmers to go deeper into the forest where **old-growth** forests are being cleared. Hunting is also a major threat to this region.

More than 100 adult tigers were photographed here from 2005-2010. However, there is space for larger numbers of tigers to live and breed, if hunting is stopped. If it is well managed, this important tropical rainforest area could one day hold the largest single tiger population in the world. However, Myanmar needs to act quickly. If it does not, its important and unique forests could disappear, and the animals which live there too.

1. Answer the questions about the text.
 - a. Why is this forest complex important?
 - b. What are some of the problems in this forest?
 - c. What could the forest sustain if managed properly?
2. There are many forest types in Myanmar, including monsoon rainforests, seasonal forests and alpine forests. Why is Tanintharyi Region Myanmar's only tropical rainforest?
3. How can humans and nature successfully share this area?
4. Research the species and complete the table.

Species	Class (mammal, bird, etc)	What threatens it	Found where else?
Gurney's Pitta			
Clouded Leopard			
Malayan Tapir			
Tectona Grandis			
Dhole			
Plain-pouched Hornbill			

ADDITIONAL ACTIVITIES



SKILLS WORK

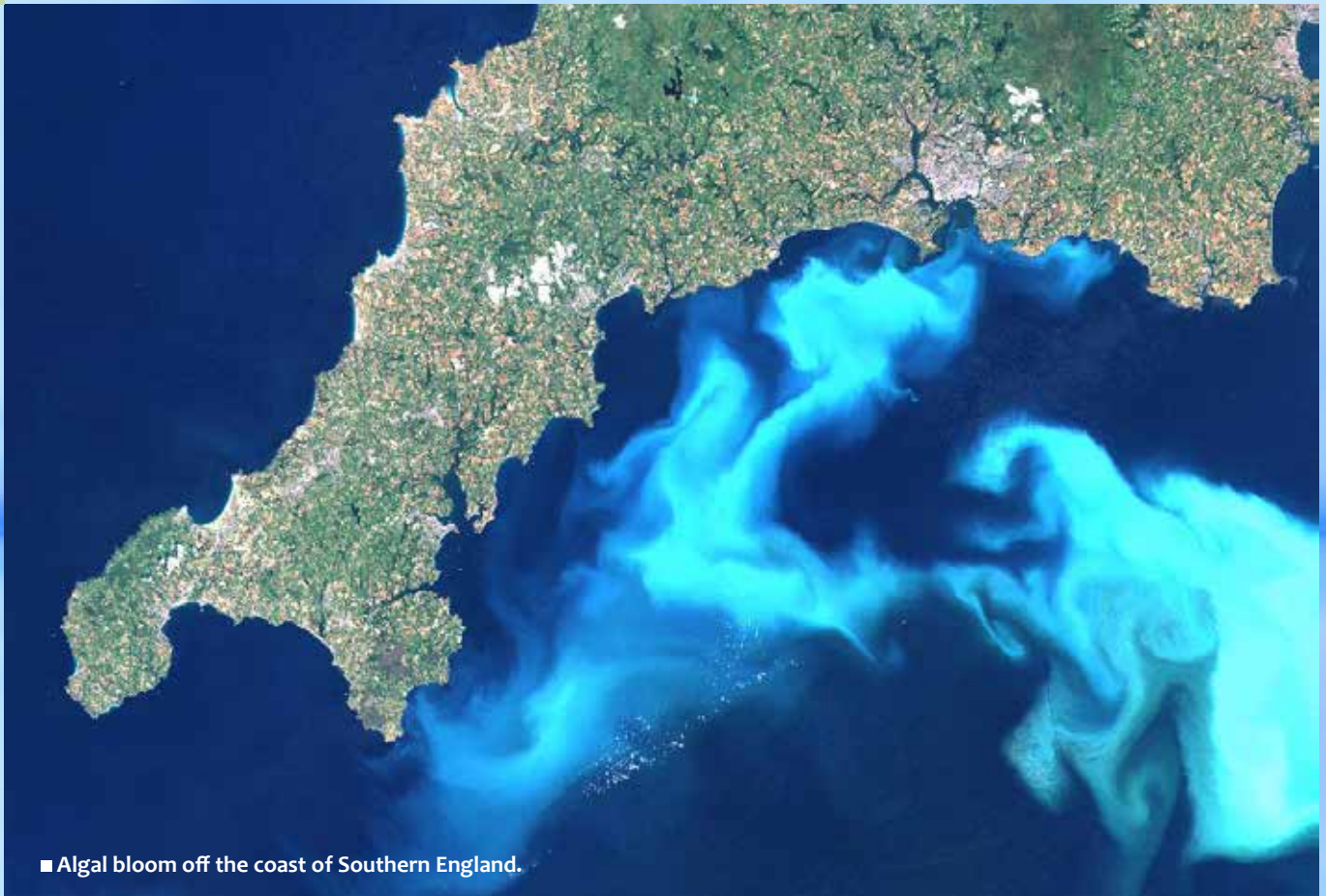
1. The process of photosynthesis happens in five steps. Put the steps in the correct order.

- i. The roots get water from the soil by pulling it up through the stem.
- ii. Sunlight enters the leaf and chlorophyll traps it.
- iii. When the plant has sunlight, CO_2 and water, it is ready to make energy. The plant uses its energy to make sugar.
- iv. Small holes in the leaves bring in CO_2 .
- v. The plant releases oxygen.

- a. _____
- b. _____
- c. _____
- d. _____
- e. _____

2. Make a simple diagram, in the style of a comic strip, showing each of the five steps. Be sure to:

- draw clear pictures showing each step.
- write what is happening in clear, simple words.
- create a simple introduction and conclusion.



■ Algal bloom off the coast of Southern England.

Unit 9 Shallow Seas

Key Words

- algae (n)** – မှော်ပင်၊ ရေညှိ
- archipelago (n)** – ကျွန်းစု
- coastline (n)** – ပင်လယ်ကမ်းရိုးတန်း
- coral (n)** – သန္တာကျောက်
- fin (n)** – (ငါး) ဆူးတောင်
- gill (n)** – (ငါး) ပါးဟက်
- krill (n)** – သမုဒ္ဒရာနေ ပုစွန်ဆိတ်ငယ်
- limb (n)** – ခြေလက်အင်္ဂါ၊ ခြေဆံလက်ဆံ
- plankton (n)** – ရေထဲတွင်ရှိသော (အပင်၊ အကောင်)၊
မျောလှေ့
- reef (n)** – သောင်ခုံ ကျောက်တန်း။
- spine (n)** – ကျောရိုး

9.1 Tropical Shallows (00:00– 14:00)

A Before you watch

1. Read the text and answer the questions
 - a. What does “interspecies” mean?
 - b. What is the difference between interspecies cooperation and symbiosis?
 - c. What does the coral depend on the plankton for?
 - d. What does the plankton depend on the coral for?

Interspecies Cooperation

There is always competition for food and territory in the animal world. Sometimes, animals (or plants) have evolved to form a relationship with another species which is not a ‘predator-prey’ relationship. This allows two species to share the same space and/or a food supply. This is called *interspecies cooperation*.

Sometimes, species can totally depend on each other for survival. This is called *symbiosis*.

The diagram below shows **coral**, which are sea animals. It also shows zooxanthellae, a **plankton** (a kind of plant). The plankton lives safely inside the coral and feeds on CO². In return, the coral feeds on the plankton and gets the nutrients it needs.



B As you watch

1. What do these numbers, percentages, sizes and amounts refer to?
 - a. 200 metres
 - b. 8%
 - c. 3 metres
 - d. 500 litres
 - e. 5 months
 - f. 2,000
 - g. 2 centimetres

C After you watch

1. Would the relationship between the trivali, the yellow goatfish, and the banded sea kraits be considered competition, cooperation or symbiosis? Why?
2. What is the reason that this relationship is changing?
3. Look at the following examples and say whether they are competitive, cooperative or symbiotic relationships.
 - a. a honeyguide bird leading a honey badger to a bee hive, both eat the honey
 - b. large insects defending their territory by pushing away smaller insects
 - c. bees and flowers
 - d. two different species of trees absorbing the same nutrients in the soil



9.2 Shark Bay and the Persian Gulf (14:00 – 22:43)

A Before you watch

- Discuss:** Read the statements. Are they true or false?
 - Grass grows underwater.
 - There are herds of grazers in the sea.
 - There are football fields underwater.
 - Dolphins in Australia sometimes lie on the beach.
 - Seabirds can live in the desert.
 - Fish use the wind to fly across the desert.

B As you watch

- Look at the statements in **9.2A** again. Are they true or false? If false, explain why.
- Socotra cormorants have adapted to raise their young in the middle of the desert. What advantage does this provide them?
- How have the cormorants adapted for surviving in this desert?

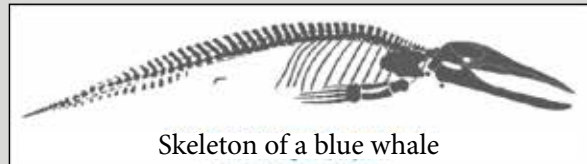
C After you watch

- What classes of animals are these?
 - dugongs
 - dolphins
 - socota cormorants
- Describe the relationship between the Persian Gulf and the surrounding deserts. How is this isolated shallow sea so rich in life?
- Read the text and answer the questions.
 - What parts of the bodies of sea mammals help us to understand their evolution?
 - What land mammal is related to the whale, the hippopotamus or the wolf?
 - What animal do scientists think is the common ancestor of the hippo and the cetaceans, and how long did it live?
- Using the diagram showing the evolution of the cetaceans, describe the physical changes over time.

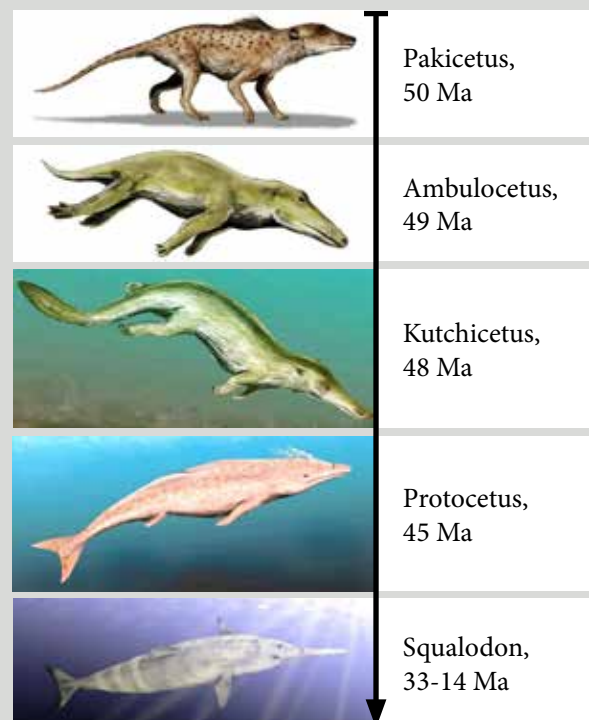
The Evolution of Sea Mammals

Whales, dolphins and porpoises are mammals. Together they are a group of mammals called *cetaceans*. Their ancestors lived on land long ago. We know this because:

- cetaceans need to breathe air;
- the bones of their **fins** are similar to the **limbs** of land mammals (see diagram below);
- their **spines** are more similar to a land mammal's than to a fish's.



Scientists did not understand the evolution of sea mammals until recently. At first, scientists thought that cetaceans and wolves evolved from a common ancestor because they had similar teeth. However, recent fossil evidence suggests that whales and dolphins are related to the hippopotamus. Their common ancestor lived 50 million years ago and was called the *pakicetus*. The diagram below shows the evolution of the ancestors of the modern cetaceans, from 50 -14 million years ago.



9.3 Temperate Seas (22:43 – 31:00)

A Before you watch

1. Read the text and answer the questions.
 - a. What kinds of organism are classed as algae?
 - b. Why are they similar to plants?
 - c. Why is algae important to life on Earth?



Algae is the general name for a large group of organisms which live in water. They take in carbon dioxide and release oxygen. There is so much algae that together it creates 75% of all the oxygen in the atmosphere. There are many different kinds of algae, from tiny, simple organisms to giant plant-like kelp, which grow in “kelp forests” in temperate seas.

B As you watch

1. Where are the humpback whales traveling from and to?
2. How do the humpback whales communicate with each other?
3. At what time of year are the temperate seas most productive?
4. Why is the reason for this increased productivity?
5. What do salps look like?
6. What do they eat?
7. What sea creatures are krill similar to?

C After you watch

1. What animals were migrating in the video and why were they migrating?
2. Find California on the map on pages 126 and 127. Which coast of the USA is it on?

ANIMAL CLASS: A GUIDE TO ANIMAL CLASSIFICATIONS

6. FISH

Fish live in water. They are found almost everywhere on earth: in rivers, streams, seas and oceans. There are around 32,000 species of fish in the world

All fish:

- live in water, but some can come on to land.
- are vertebrates (have a backbone).
- breath oxygen through **gills**.
- have fins on their bodies.
- hatch from eggs.

Most fish:

- have scales.
- are cold-blooded, but some are warm-blooded.

■ A shoal of fish off the coast of Papua New Guinea.



IS IT A FISH?

Are the following animals fish? Why?

- a. a seahorse
- b. a jellyfish
- c. a catfish
- d. a shrimp



9.4 Sea Predators, Sea Prey (31:00 – 40:50)

A Before you watch

1. Match the animals to the pictures.

a. starfish

c. shark

b. squid

d. stingray

i.



ii.



iii.



iv.



B As you watch

1. What is special about the teeth of sea urchins?
2. How does the sunflower starfish taste for food?
3. How do brittle stars try to defend themselves?
4. How does the sunflower starfish eat its prey?
5. How do the adult chokker squid communicate?
6. What do seals eat and what eats the seals?

C After you watch

1. Were the sea urchins primary or secondary consumers?
2. Were the sunflower starfish primary or secondary consumers?
3. Which of the animals in the video were invertebrates, which were mammals and which were fish? Use the information in *Animal Class*, below, to help you. Watch the video again if necessary.

ANIMAL CLASS: A GUIDE TO ANIMAL CLASSIFICATIONS

7. INVERTEBRATES

You have seen that insects are invertebrates (animals with no backbone) but there are many other species of invertebrate. Scientists think that 97% of all animal species are invertebrate. This is over 1.3 million species. Arachnids (e.g. spiders) are invertebrates, and so are worms and centipedes. Marine (sea and freshwater) invertebrate groups include starfish, sea snails and prawns (shrimp). There are so many different species that it is impossible to identify common characteristics, except for two:

All invertebrates:

- have no backbone.
- are cold-blooded.

■ Krill are crustaceans, a group of invertebrate species similar to shrimp or prawn, which live in all the world's oceans and are food for most sea animals.



IS IT AN INVERTEBRATE?

Are the following animals invertebrates? Why?

- a. a crab
- a. scorpion
- a. sea urchin
- a. millipede



9.5 Polar Seas (40:50 – End)

A Before you watch

1. **Discuss** and answer the questions.
 - a. What do you think polar seas are like?
 - b. What animals do you expect to live there?
2. Read the text and find these locations on a map.
 - a. The Roaring Forties
 - b. The Furious Fifties
 - c. The Screaming Sixties

Southern Winds

In the southern hemisphere there are several areas of very strong wind, which are named after their latitudes. These are the Roaring Forties, the Furious Fifties and the Screaming Sixties.

The Roaring Forties are an area in the southern hemisphere between the latitudes of 40° and 50°. The Furious Fifties lie between 50 and 60° south, and the Screaming Sixties are above 60° south.

These strong winds are caused by three main factors:

1. air moving towards the poles;
2. the rotation of the Earth;
3. few land-masses to slow down or stop the winds.

B As you watch

1. Who do the king penguins share their beach with?
2. How long do king penguin chicks stay with their mothers?
3. What mammal tries to prey on the penguins, and what is its usual diet?
4. Why is it not easy for the seals to kill the penguins?

C After you watch

1. After watching the penguins and seals move on land, what can you say about their evolution?
2. What might happen to both species in the far future?

3. Read the text and answer the questions.
 - a. Why is there a decrease in the number of krill?
 - b. What problems could this cause to other sea animals?
 - c. How might this also be a problem for humans?
4. Discuss the questions
 - a. Who should be responsible for taking care of the world's seas? Why?
 - b. What can people do to help save the world's seas?



Krill are very tiny sea animals, which look like small shrimp. They are important in the food chain because there are so many of them; they are the staple food of almost all other sea animals (or their young). Unfortunately, in recent years, the number of krill in the world's oceans has decreased by up to 80%.

The reasons for the decrease are probably related to humans. Some countries harvest large amounts of krill for humans to eat. Others use krill to feed fish for humans to eat, and others sell krill oil as a health food. Additionally, some scientists think that the amount of carbon dioxide in the ocean is dangerous for krill and may be killing them. Also, increasing temperatures have warmed the oceans. This may also be reducing the number of krill, or stopping them breeding.

Scientists are aware that krill are very important to the world's oceans, and some countries are fishing responsibly, but the world's population continues to grow and the climate is still changing, so we do not yet know what the future is for krill or for other sea creatures.

UNIT 9: SHALLOW SEAS -



FOCUS ON MYANMAR

MYANMAR'S THREATENED CORAL REEFS

In the Myeik Archipelago | <http://www.mmtimes.com/index.php/national-news/10434-myeik-marine-survey-prompts-calls-for-protection.html>



■ Coral reef on the coast of Myanmar's Andaman Islands.

Along the southern **coastline** of Myanmar, in Tanintharyi Region, is an **archipelago** of islands called the Myeik Archipelago. Around this area, most of Myanmar's coral **reefs** are found. Currently, 65 coral species have been catalogued in Myanmar's reefs, but there are probably many more. Because there have been very few surveys, we do not yet know much about Myanmar's reefs. The Reefs at Risk in South East Asia (RRSEA) project estimates that Myanmar has 656 square miles (mi²) (1,700 km²) of coral reefs.

According to the project, 56 percent of Myanmar's reefs are threatened. The research suggests that overfishing is the main threat to nearly one half of Myanmar's reefs. Destructive fishing, coastal development, and sedimentation each threaten around 10 percent of Myanmar's reefs.

In May 2014, a team of scientists from Flora and Fauna International (FFI) recorded hundreds of species around the 800-island archipelago, including at least four new species of coral, as well as several invertebrates and fish. Discoveries included barramundi cod, ghost pipe fish and species of coral present that have never been recorded in Myanmar waters before.

FFI is now talking with the government and local community representatives about how to protect the area, which is also on a list of proposed World Heritage Sites. "There are no protected areas of coral in Myanmar. That's our big mission," said Frank Momberg, FFI program director for Myanmar.

The team discovered some reefs had up to 80 percent "hard coral coverage", which means they can be classified as "excellent" according to global standards. The scientists also said they were surprised to discover coral growing even in areas where water visibility was very low.

The archipelago's position between the Pacific and Indian oceans means it is a unique habitat, with marine life from both waters, Mr Momberg said.

1. Answer the questions.

- a. Why does science currently know very little about Myanmar's coral reefs?
- b. What is the biggest threat to the reefs at the moment?
- c. Why are the reefs important and interesting for scientists?
- d. What way of protecting the reefs does the text suggest?
- e. What surprised scientists about the coral reefs in the archipelago?
- f. What makes the reefs a unique habitat?

2. Discuss:

- a. What else can be done to protect Myanmar's reefs?
- b. Whose responsibility should it be to protect the reefs? Why?

ADDITIONAL ACTIVITIES



SKILLS WORK

Algae Overload

There is no way to know exactly how many species of algae there are in the world. We can only estimate the numbers of different types of algae. Chlorophyte is a green algae, which is mostly found in fresh water, but can also live in the ocean and even in deserts. There may be up to 13,000 different species of chlorophyte. Chlorophyte's cousin is charophyte, which is also green. They live in fresh water and do not like salt. There could be 9,000 species of charophyte. Ochrophytes are brown or yellow-brown in colour, and scientists are still learning about them. There could be 21,000 species of brown algae in the world. Meanwhile, most of the 14,000 possible species of red algae are found almost always in the sea. Blue-green algae are tiny, like bacteria, so they are difficult to count, and they live in almost every environment, from wet rocks to Antarctica. There are an estimated 8,000 kinds.

Data estimates from: http://www.seaweed.ie/guiry/pdfs/How_Many_Published.pdf

- To graph these statistics as parts of a whole, find the estimated percentage of each type of algae.

Finding Percentages

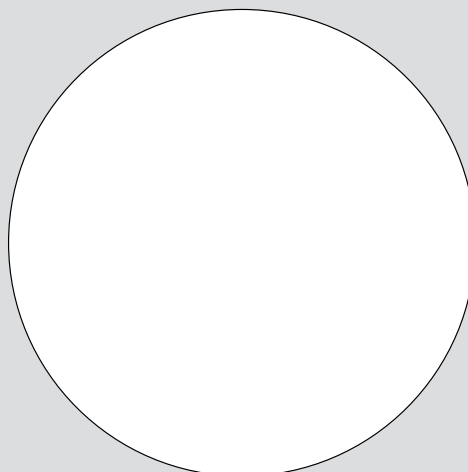
$$\text{Percentage} = (\text{Estimated Number of Species} / \text{Total Number of Species}) \times 100$$

Total Estimated Number of Species:	
Name	Percentage of All Algae
a.	
b.	
c.	
d.	
e.	

- Transfer these percentages into a pie chart showing the distribution of the different kinds of algae. Remember:

- the circle represents 100%, or the total number of estimated species
- the percentage should match with the amount of the circle it covers. If a type of algae is estimated to have 50% of all species, then it should cover half the pie chart.
- to give the chart a title.
- to fill in the key.

Example:



Key

■ Deciduous forests overlooking Gwacheon, South Korea.



Unit 10 Seasonal Forest

Key Words

- coniferous (adj)** – ထင်းရှူးတော
- endemism (n)** – နေရာဒေသအလိုက် သီးခြား ဖြစ်ပေါ်လာသော
- evergreen (adj)** – အမြဲစိမ်းသော
- extract (v)** – ထုတ်ယူရနိုင်သော အဆီ၊ အနှစ်
- larvae (n)** – ခူကောင်ဘဝတွင်ရှိသော ပိုး
- molt (n)** – (တိရိစ္ဆာန်) အရေခွံ၊ အမွှေးများ ပြောင်းလဲခြင်း
- nymph (n)** – ပိုးတုံးလုံး
- optimal (adj)** – အသင့်တော်ဆုံးဖြစ်သော။
- resin (n)** – သစ်စေး (သစ်ပင်မှ ရသော အစေး)

10.1 The Taiga (00:00 – 08:50)



■ Taiga forest near Arkhangel'sk, Russia

A Before you watch

- 1. Discuss:** What do you remember about the *taiga* from Unit 1?
- Read the text and label the pictures with underlined words from the text.

The Taiga

The taiga is the largest area of forest in the world. It is also the furthest north. It lies between 50 and 70° of latitude north, between the arctic tundra and more temperate forest. It grows around the whole planet, across North America and Eurasia, covering parts of Canada, the USA, Sweden, Finland, Norway and Russia.

The taiga consists of coniferous trees, which are adapted to the cold, difficult climate. Coniferous trees have sharp leaves, called needles. Inside them is a bad-tasting resin, so they are hard for animals to eat. Their seeds grow inside cones, so that they are protected and difficult to eat.



a. _____



b. _____



c. _____

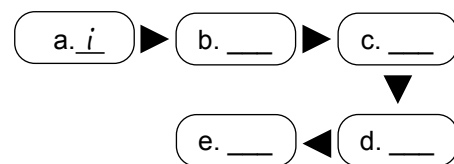
- Find the city of Arkhangel'sk on the map on pages 136 and 137. What latitude is it on?

B As you watch

- How far from the North Pole is the closest tree?
- What percentage of the world's trees are in the taiga?
- How long can it take for a taiga tree to grow larger than a seedling?
- What kind of animal is a lynx?
- Which animal can eat the conifer's seeds?
- Which animal doesn't migrate? Why?
- What do male capercaillie do every year in the taiga in spring?

C After you watch

- Complete the cause and effect chain showing why there is very little biodiversity in the taiga.



- Because the climate is cold, very few trees can grow in the taiga.
- The taiga can support very few predators.
- The trees that can grow protect themselves from grazers.
- There are very few grazers in the taiga.
- There is not enough food for grazers.

10.2 North and South American Forests

(08:50 – 21:05)

A Before you watch

1. **Discuss** and answer the questions.
 - a. What differences do you think there will be between the taiga and the forests of North and South America?
 - b. What might be the reasons for these differences?

B As you watch

1. How do the needles of trees get water if there is no rain?
2. How much faster do North American trees grow than trees in the taiga?
3. What does the pine marten find to eat?
4. What is the world's largest living thing, and what is its name?
5. What species of tree are the the oldest trees on the planet?
6. What existed on Earth first, humans or the coniferous forests?
7. Listen and fill the gaps about the trees of South America.

South America: Trees of the Southern Continent

"Here in _____^a, araucaria trees, or monkey puzzles, are like the _____^b of the taiga. They have waterproof scales instead of needles and their cones look a little different, but the principles are the same. Slender-billed parakeets rather than crossbills **extract** their _____^c. Where the growing season is _____^d, there are alerce trees, the redwoods of the south. Like the frozen north, the Valdivian forests of Chile support very _____^e animals."

C After you watch

1. Find Chile on the map on pages 128 and 129. Do you think the Valdivian forests are in the north or south of the country? Why?
2. What is different about the animals in the Valdivian forests of Chile?
3. Label the four trees from the video correctly.
 - a. giant redwood
 - b. bristlecone pine
 - c. araucaria (monkey puzzle tree)
 - d. alerce



1. _____



2. _____



3. _____



4. _____

■ Valdivian temperate rainforest in Chile, South America.

10.3 Broadleaf Forests (21:05 – 31:00)

A Before you watch

1. **Discuss:** What do you remember about the broadleaf forests of the world from Unit 1?

B As you watch

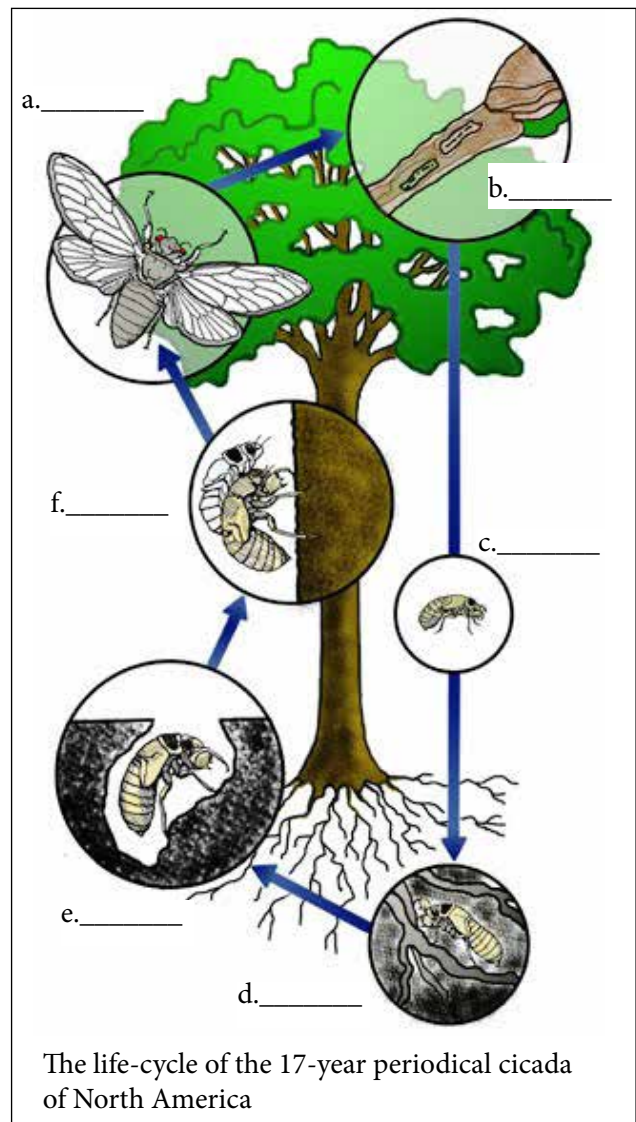
1. What is the advantage to trees of having broad leaves?
2. Why are broad leaves good for the animals in the forest?
3. What effect does this have on the food chain in the broadleaf forests?
4. What happens in the forests of North America every 17 years?

C After you watch

1. Periodical cicadas are clumsy and have no defences against predators. How are they able survive and reproduce as a species?
2. Read the description of the life cycle of the cicada and label the stages correctly using words and phrases from the text.

The Life-cycle of the Cicada

Rice-shaped eggs are laid in twigs and plant stems. Then, the eggs hatch into **larvae**. The larvae drop to the ground, dig into the soil and into a tree root. The larvae will suck the tree's sap through straw-like mouthparts (called the rostrum). There is now a **nymph** stage, which lasts up to 17 years. When the nymph is fully grown and the temperature is **optimal**, the nymph tunnels to the surface and goes through its final **molt** and emerges as a winged adult. When the wings dry and harden, the cicada flies in search of a mate. After they mate, the female lays more eggs in trees and the cycle begins again.



3. Order the sentences, which explain the role of cicadas in the forest food cycle.
 - a. The adult cicadas hatch and provide additional food for all the animals in the forest.
 - b. Cicadas mate. After they have mated, they die, decay and return nutrients to the soil.
 - c. The newly-laid cicada larvae return to the soil and begin to take nutrients from tree roots again.
 - d. Cicadas live underground and take nutrients from the roots of trees. 1
 - e. The nymphs' old outer skins fall to the forest floor, decay and return nutrients to the soil.

10.4 Winter and Spring (31:00 – 40:10)

A Before you watch

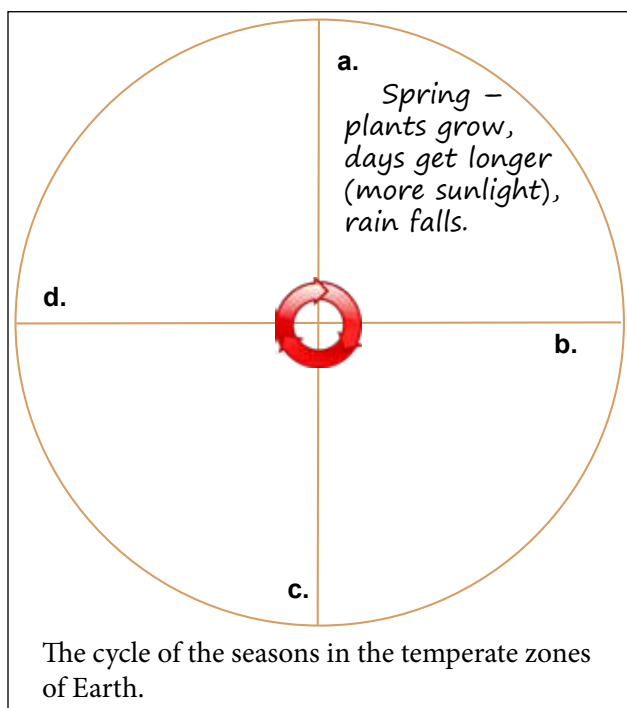
1. **Discuss** and answer the questions.
 - a. What do you know about the seasons in the temperate zones of the world?
 - b. Why are the seasons in the temperate zones different to the tropical zones?

B As you watch

1. What is the “rut” and what is its purpose?
2. What happens to the leaves of the trees in the northern hemisphere in autumn?
3. Where have the black vultures migrated from, and why?
4. How many amur leopards are there living in the wild?
5. Why are the plants on the ground “in a hurry” to open and grow in the spring?

C After you watch

1. Read the text about the seasons and label them correctly. (Note: they are not in order.)
2. Put the seasons in the correct order in the season cycle diagram below. Write the most important information from the text (in note form) on the diagram.



a. _____ In this season, plants begin growing again. The snow melts, and temperatures rise. Days become longer. Plants on the forest floor grow leaves and flowers before the trees grow leaves in order to catch direct sunlight and get their share of growth. The warmer temperature tells the trees to grow new leaves again, and restart the cycle. As tree leaves grow to their full size, they block most of the direct sunlight to the forest floor. In this season, deciduous forest receives most of its rain. However, it rains throughout the entire year.

b. _____ This season is extremely cold. The soil freezes, killing some plants. There is a lot of snow during this season. It is too cold for the trees to protect their leaves from freezing, so they simply lose them. This helps trees to conserve water, as a lot of water evaporates through the surface of a leaf.

c. _____ In this season, the deciduous forest cools down. As temperatures drop, the tree cuts off the supply of water to the leaves and closes off the area between the leaf stem and the tree trunk. With limited sunlight and water, the leaves are unable to continue producing chlorophyll (green pigment in leaves). This makes them change into the beautiful red, yellow and orange leaf colours. As it gets even colder, the leaves fall off.

d. _____ In this season, the deciduous forest gets its hottest. Trees and other plants enjoy full growth. The deciduous forest receives some rain. The broad green leaves help capture sunlight needed to make food through photosynthesis.



■ Avenue of the Baobabs, Madagascar.

10.5 Tropical Broadleaf Trees (40:10 – End)

A Before you watch

1. **Discuss** and answer the questions.
 - a. What kind of broad leaved trees might grow in tropical zones?
 - b. Does your country have broad leaved trees? Where?

B As you watch

1. How is a tropical broadleaf forest similar to a European one? How is it different?
2. Why do tropical broadleaf trees lose their leaves?
3. What tree flowers in the Indian teak forests, and why is that important for the animals there?
4. Why are the deer “welcomed” by other animals in the teak forest?
5. What adaptations do baobab trees have for surviving the dry seasons of Madagascar?
6. Explain the cooperative relationship between hawk moths, baobab trees and mouse lemurs.

C After you watch

Read the text and complete the sentences.

1. Humans are usually omnivores, which means _____.
2. Dogs and cats are _____, which means that they eat only meat.
3. Deer, buffalo and caribou are _____, which means that they eat _____.

Herbivores, Carnivores and Omnivores

Some animals eat only plants. These are the primary consumers, and are also called *herbivores*. Some animals eat only other animals. In the food chain these are the secondary or tertiary consumers. They are also called *carnivores*. Some animals, however, eat both plants and other animals. These are called *omnivores*.

Many primates are omnivores. Lemurs are an example of an omnivorous primate. Most of their diet consists of fruit, but they also eat insects, such as moths, when they are available.

Other examples of omnivorous mammals include bear species, pigs, mice and rats.

UNIT 10: SEASONAL FOREST -



FOCUS ON MYANMAR | SKILLS WORK

FORESTS IN MYANMAR

Important and biodiverse | Data from <http://www.banca-env.org/ebook.pdf>

Here is a guide to the major forest types in Myanmar.

Tropical Evergreen

The tropical **evergreen** forest (16% of Myanmar forest) is mainly found in the lowlands. It is wet evergreen forest. In it are species such as dipterocarpus. This type of forest is well conserved along the coast of the Tanintharyi Region.

Mixed Deciduous

The mixed deciduous forest (38% of Myanmar forest) is the major forest type of Myanmar. It is mostly full of teak trees. Teak makes this forest the most economically important forest of the country. The mixed deciduous forest is also associated with bamboo species, which are an important source of food for many wildlife species.



Myanmar teak

Dry Forest

The dry forest (10% of Myanmar forest) is found in the Central Dry Zone, where the rainfall is usually under 1,000 mm. It is described as "thorn scrub forest".



Thorn scrub forest similar to that in Myanmar.

Deciduous Dipterocarp

The deciduous dipterocarp forest (5% of Myanmar forest) is found only in five countries in the world: Myanmar, Laos, Cambodia, Vietnam and Thailand. Also known as *Indaing* forest in Myanmar, it is mostly found at higher altitudes in the northern part of the country. This forest type has been isolated from other similar forests of South East Asia, so it is one of the centres of **endemism** in Myanmar. It has endemic species like the critically endangered Burmese star tortoise, and many threatened species like the vulnerable Eld's deer.



Deciduous dipterocarp forest similar to that in Myanmar.

Hill and Temperate Evergreen

The hill and temperate evergreen forest (25% of Myanmar forest) is found in high rainfall areas, on slopes between 900 m and 1,800 m (hill forests) and over 1,800 m (montane forest). This forest type is characterised by many climber species and rich and lush undergrowth.

Others

The final 3 forest types account for 6% of Myanmar forest. They are: Mangrove forests (or tidal forests), beach and dune forest (found in narrow strips on beaches and dunes along the coasts), and the swamp forest, found in the Ayeyarwaddy Delta and in the floodplains of other rivers and lakes.

ADDITIONAL ACTIVITIES

1. Complete the table about Myanmar's seasonal forest using the information in the text.

forest type	% of total forest	additional information

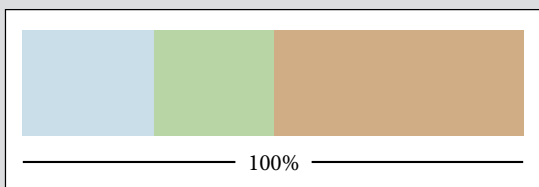
2. Answer the questions about the text.

- Which forest type is there most of in Myanmar?
- What forest type has mostly one type of tree and several types of grass? What are the names of the tree and the grasses?
- What is the scientific name for Indaing forest?
- What forest types are found close to coastal areas?
- What forest types are found in Myanmar's lowland?

3. Transfer these percentages into a column chart showing the distribution of the different kinds of forest in Myanmar. Remember:

- that the column chart represents 100% of the forest in Myanmar.
- that the percentage should match with the amount of the column it covers. If a type of forest is estimated to be 50% of all the forest in Myanmar, it should cover half the column.
- to give the chart a title.
- to fill in the key.

Example:



Key

■ Sunset, looking out towards the Pacific Ocean.



Unit 11 Ocean Deep

Key Words

- detritivore (n)** – ပုတ်ဆွေးသော အပင်များကို စားသုံးသော
- calve (v)** – ဈေးနေသည်
- dorsal fin (n)** – (ကျောရိုး) ဆူးတောင်
- earthquake (n)** – ငလျင်
- excrete (v)** – အညစ်အကြေး စွန့်သည်
- feces (n)** – မစင်
- fissure (n)** – အက်ကြောင်း
- hydrothermal (adj)** – ရေပူ
- organic (adj)** – သဘာဝအတိုင်းဖြစ်သော၊ ပိုးကောင်များ
- sexual maturity (n)** – လိင်ပိုင်းဆိုင်ရာ အရွယ်ရောက်မှု
- suspend (v)** – သားပေါက်သည်
- tsunami (n)** – ဆူနာမီရေလှိုင်း
- vent (n)** – လေဝင်၊ လေထွက်ပေါက်

11.1 The Search for Food (00:00 – 11:40)

A Before you watch

1. **Discuss:** What is plankton? Why is it important for life in the sea?
2. Read the text and answer the questions.
 - a. Are plankton plants or animals?
 - b. What trophic level(s) are plankton in the food chain?
 - c. Are plankton large or small?
 - d. Which animals depend on plankton?
 - e. Why are the plankton important for life on our planet?



Plankton is the general name for a large number of small organisms which live in the seas and oceans of our planet. Plankton are divided by trophic level into three main groups: *phytoplankton*, which are plants (such as the many different species of algae); *zooplankton*, which are small invertebrates (such as krill and jellyfish); and *bacterioplankton*; which are bacteria. Phytoplankton are producers; they take energy from the Sun by photosynthesis. zooplankton are consumers, usually feeding on other, smaller plankton. Finally, some bacterioplankton are producers and others are decomposers; they feed on the dead and decaying organisms in the ocean called “marine snow”.

Plankton are extremely important for life on our planet; the phytoplankton (including algae) produce oxygen when they photosynthesise and zooplankton are at the bottom of the food chain for nearly all the carnivores (consumers) in the ocean, including the larvae of most fish, and the biggest animal on earth, the blue whale.

3. Complete the table with information from the text.

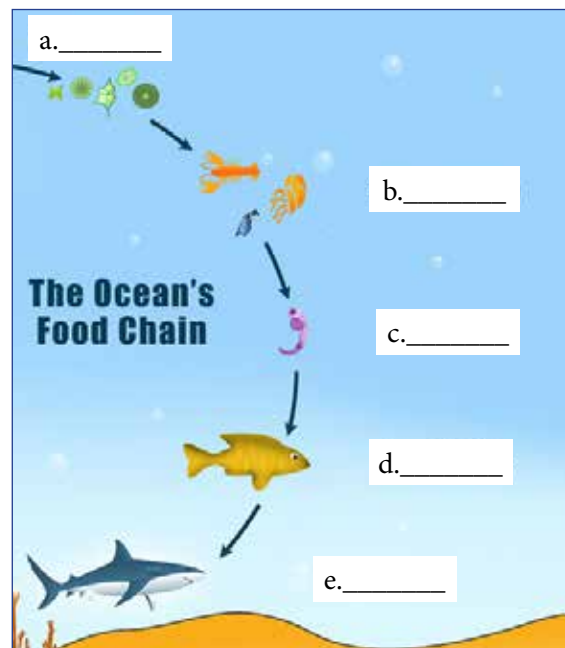
plankton	type of organism	trophic level	important for:
<i>phytoplankton</i>			
	<i>animal</i>		
			<i>recycling nutrients</i>

B As you watch

1. What kind of animal is a *whale shark*, a fish or a mammal?
2. What does the whale shark usually eat?
3. Are the tuna fish carnivores or herbivores?
4. What is the whitetip shark’s specialisation?
5. According to the video, how do predators (such as whitetip sharks) find food in the ocean?
6. How do the dolphins catch their prey?

C After you watch

1. Label the ocean food chain diagram correctly.
 - i. zooplankton
 - ii. predator
 - iii. fish larvae
 - iv. small fish
 - v. phytoplankton



11.2 Descent into Darkness (11:40 – 19:35)

A Before you watch

- 1. Discuss:** Read the statements. Are they true or false?
 - a. Marine snow is frozen water, which sinks to the bottom of the ocean.
 - b. Marine snow only happens in winter.
 - c. Marine snow is an important food source for animals who live deeper in the ocean.
 - d. Where there is no sunlight, marine snow forms the base of the food chain.
 - e. Marine snow gets eaten before it gets to the bottom of the ocean.
 - f. Marine snow fall only started recently, because of climate change.
- 2.** Read the text and check your answers. Explain why. If false, explain why.



Marine snow is another important food source for the deep ocean. Marine snow is not snow, of course, but it looks similar. It is particles which continuously fall from the upper levels of the ocean to the lower levels.

Most of the particles are **organic** waste (**feces**) or dead and dying plants and animals. Other particles include sand, soot and dust. These marine snow particles are important for animals which live deeper in the ocean. Because sunlight cannot reach these places, photosynthesis cannot happen. Grazers need to find another source of food, and many eat particles of marine snow.

Sometimes, in deep ocean, marine snow can fall for months before it reaches the bottom. Additionally, particles of snow are often eaten by an animal and later **excreted**. The feces continues to fall as snow until it is eaten by a **detritivore** or reaches the bottom. The particles can be eaten, excreted and eaten again many times before they hit the bottom.

The fall of marine snow has continued for more than a billion years.

B As you watch

- 1.** What does plankton do after sunset?
- 2.** How big are manta rays?
- 3.** What does plankton do after dawn (sunrise)?
- 4.** What happens in the ocean as we go deeper?
- 5.** Below 500 metres, what helps animals remain **suspended**?
- 6.** How does the sea spider stop itself from sinking?
- 7.** Why can't any creature at these depths "waste energy"?

C After you watch

- 1.** Label the animals from the video.



a.



b.



c.



d.

- 2.** What differences did you see in the environment and the animals as the video went deeper into the ocean?

11.3 The Ocean Floor (19:35 – 30:11)

A Before you watch

1. Read the text about the deep ocean and answer the questions.
 - a. What happens to the depth of the ocean as you move away from land?
 - b. What is the mid-ocean ridge?
 - c. What causes the mid-ocean ridge?
 - d. What organisms live here?
 - e. What do they eat?
 - f. Why are they unusual?

The Deep Ocean

Because it is so deep, the ocean is the most unexplored place in the world. As you travel away from the continents, the sea floor drops slowly. This is called the continental shelf. From about 650 feet (200 m), the ocean floor drops more quickly. This area is called the continental slope. About a mile down (1,600 m) is an area called the continental rise. At between 2.5 and four miles (4000-6000 m) the ocean floor becomes flatter again and drops more slowly. This huge area of ocean is known as the abyssal plain.

In the middle of the world's deep oceans is the mid-ocean ridge. It is a giant mountain range which circles the entire Earth. It is actually a huge rift valley around the entire planet. At these places, the Earth's tectonic plates are pulling apart.

Life here should be impossible. There is no sunlight and the only heat comes from the volcanic gas in giant **hydrothermal vents**. Even here, we find life. Hundreds of species of invertebrates live around these vents. They feed on the nutrients in the gases in the vents. This makes them some of the few organisms in the world which do not take their energy (either directly or indirectly) from the sun.

B As you watch

1. What does the monkfish do to catch its food?
2. What examples of scavengers are shown?
3. What are the "dragon chimneys"?
4. What animals live around the vents at Nine North?
5. What can happen when vents become inactive?

C After you watch

1. Read the text and fill the gaps with the words in the box.

predator scavenger

Scavengers vs. Predators

_____ ^a, as you saw in the video, are animals which feed on the dead. They are important for the same reason as decomposers – they take nutrients from the dead bodies and put them back into the ecosystem.

Some _____ ^b are very well known. Probably the most well known of all _____ ^c are vultures. Vultures are birds which are found in many on every continent except Antarctica and Oceania.

Other _____ ^d are less well known. The giant isopod is one of the deep ocean's most important _____ ^e. They grow to over 12 inches (30 cm) and will eat and eat until their bodies cannot move any more.

Most _____ ^f will also eat dead bodies if there is not enough food to catch and eat.



2. What is the difference between predators and scavengers?

11.4 Mountains of the Deep (30:11 – 43:30)

A Before you watch

1. **Discuss:** Predict the meaning of:
 - a. submarine volcano
 - b. seamount
2. Read the text and check.
3. Mark these statements as true or false. If false, explain why.
 - a. Submarine volcanoes are usually found near ocean ridges.
 - b. A submarine volcano is only called a submarine volcano if it is located in the deep ocean.
 - c. A seamount is only called a seamount if it is over 1 kilometre above the sea floor.
 - d. Some seamounts are so tall that their peaks almost touch the surface of the water.



■ A submarine volcano erupting.

Seamounts and Submarine Volcanoes

Submarine volcanoes are underwater vents or **fissures** in the Earth's crust. Through these, magma can erupt. Most are located near areas of tectonic plate movement, known as ocean ridges. Although most are located in the depths of seas and oceans, some also exist in shallow water, which can spew material into the air during an eruption. Hydrothermal vents are often found near submarine volcanoes.

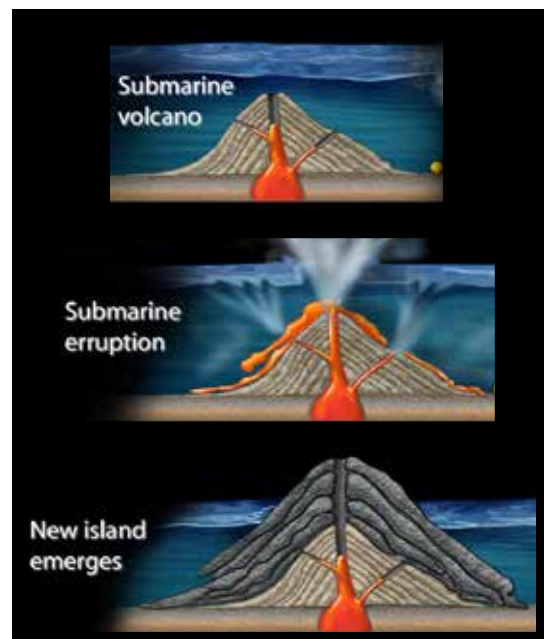
Many submarine volcanoes are seamounts; they are extinct volcanoes that rise from the sea floor. Seamounts are mountains that rise at least 1,000 metres above the sea floor. The peaks are often found hundreds or thousands of metres below the surface. However, some seamounts are unusual. For example, the Bowie Seamount in Canada's Pacific waters rises from a depth of about 9850 feet (3,000 m) to within 80 feet (24 m) of the sea surface.

B As you watch

1. How many submarine volcanoes might there be?
2. How far below the surface does the nautilus stay during the day?
3. What does it do at night?
4. Why can nautilus not see where it is going?
5. What other invertebrates are related to nautilus?
6. What is the predator/prey relationship between the squid and the Pacific spotted dolphin?
7. What cooperation is there between the mola mola fish and the smaller fish around it?
8. Why is Ascension Island important for frigatebirds?
9. Why is Ascension Island important for green turtles?

C After you watch

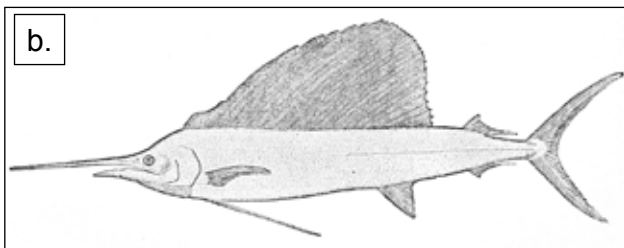
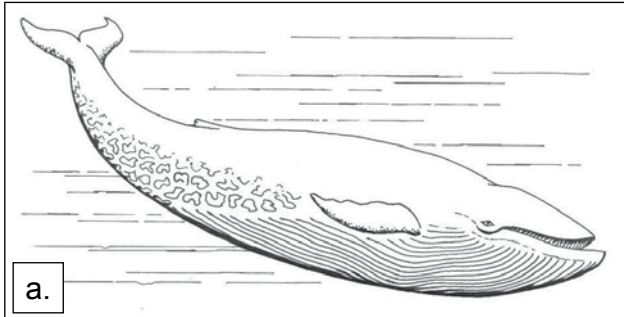
1. Find Ascension Island on the map on pages 130 and 131. What geographical feature is close to Ascension Island?
2. What do you think is the relationship between the feature and Ascension?
3. Look at the diagram and write a paragraph describing the formation of volcanic islands like Ascension Island.



11.5 The Blue Whale (43:30 – End)

A Before you watch

1. **Discuss:** Which picture shows a sailfish? Which shows a blue whale?



2. Read the sentences and predict whether they are describing blue whales or sailfish.
 - a. "They are three metres long."
 - b. "They have huge **dorsal fins**."
 - c. "They change colour, from blue, to striped, to black."
 - d. "They are the biggest animals that have ever existed."
 - e. "Some weigh nearly 200 tons."
 - f. "We don't know where they go to breed."
 - g. "They feed almost exclusively on krill."

B As you watch

1. Check your predictions from A1.
2. Check your predictions from A2.
3. How many krill does a blue whale eat each day?
4. How many blue whales used to live in the oceans?

C After you watch

Answer the questions.

1. What is the main difference between male and female blue whales?
2. What is the purpose of the blue whale's migration?
3. Why is the blue whale an endangered species?
4. Before the 1800s, how many more blue whales were there than there are today?
5. What is the main danger to blue whales today?

Blue Whales

The average blue whale is 70 feet (21 m) long and weighs 100 tons (90 metric tonnes). The upper parts of the blue whale's body are blue-gray. The undersides are whitish or light yellow. The female is larger than the male.

Blue whales migrate several thousand miles to wintering grounds. The mating season lasts for 5 months over the winter. One calf is born after a pregnancy of one year. It feeds for 7 months and will reach **sexual maturity** at 5-15 years of age. Females give birth every 2-3 years.

Blue whales live in open oceans, from the far Southern Hemisphere to the far north of the Pacific Ocean. In summer they live in polar waters because there is more food there. They eat only krill. In the winter, they migrate to warmer tropical and subtropical areas to breed and **calve**.

The blue whale is one of the world's most endangered whales. It was hunted between the mid-1800s and mid-1900s. By the mid-1900s only about 1,000 remained. Hunting stopped in 1967 and they are returning to the southern hemisphere and North Pacific. The latest estimate is 15,000 blue whales worldwide. Before hunting, there were probably 300,000 individuals.

Today, threats to blue whales include destruction of habitat. They are fully protected by the International Whaling Commission.

UNIT 11: OCEAN DEEP -



FOCUS ON MYANMAR

UNDER THE ANDAMAN SEA

Volcanoes and mountains beneath the water |



Under the Andaman Sea and the Indian Ocean lie many seamounts. Some of these reach above the surface of the water and form the Andaman Islands. Only one of these, Barren Island, is an active volcano.

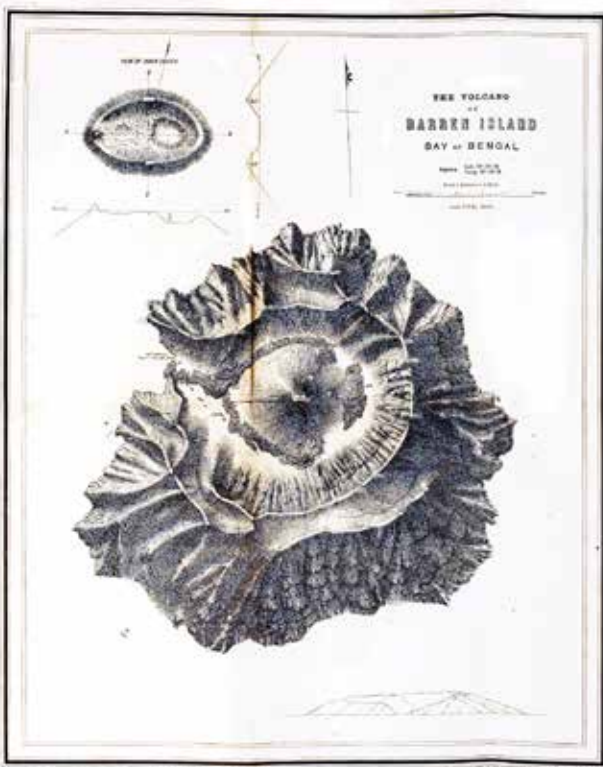
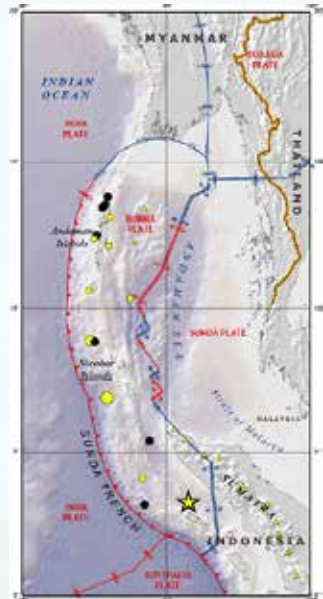
The Andaman Islands sit on the edge of two tectonic plates – the Indian Plate and the Burma Plate. The two plates meet under the Andaman Sea. They formed through millions of years of volcanic activity at the

point where the plates meet. North Andaman Island is 285 km southwest of Myanmar. The islands cover an area of 6,408 km².

There is still lots of tectonic activity in the area. Scientists believe that the tectonic activity of the Indian Plate and the Burma Plate caused the 2004 Indian Ocean **earthquake** and **tsunami**, which killed more than 220,000 people along the coast of the Indian Ocean.

Over 1600 km of the Indian plate boundary moved, and some was pushed under the Burma Plate. This pushed up the ocean floor by five metres. This caused the earthquake and the tsunami which happened after.

Barren Island rises 2,250 m from the sea floor, and its highest point is 354 m above sea level. It is part of the Indian territory of Andaman and Nicobar Islands, and lies about 135 km northeast of the territory's capital, Port Blair. It is an active volcano, and last erupted between 2005 and 2007. Scientists think that the eruptions are related to the 2004 earthquake.



1. Answer the questions about the text.
 - a. How many active volcanoes are part of the Andaman Islands?
 - b. How do scientists think the 2004 earthquake and tsunami happened?
 - c. Is Barren Island in Myanmar or India?
2. What do you remember about the 2004 earthquake and tsunami?
3. What can be done to reduce the numbers of people killed if a tsunami happens again?

ADDITIONAL ACTIVITIES



SKILLS WORK

1. Read the information in the box and complete the table showing the measures from the text.

Metric to Imperial Conversions

Most countries in the world (apart from Myanmar and the USA) use metric numbers – metres, kilometres, etc., so many books have metric measures. If you are used to imperial numbers (feet, miles, etc), it is useful to know how to convert from metres to feet and kilometres to miles.

Metres to Feet

One metre equals 3.28 feet. Therefore, if you multiply the number of metres by 3.28 (or 3.3 for a rough calculation), you get the number of feet:

$$\text{Feet} = \text{number of metres} \times 3.28 \text{ (or 3.3)}$$

If an object is 1000 m long, we multiply that by 3.28, and the answer is 3,280 ft.

Kilometres to Miles

One kilometre equals 0.6214 miles. Therefore, if you multiply the number of kilometres by 0.6214 (or 0.6 for a rough calculation), you get the number of miles.

$$\text{Miles} = \text{number of kilometres} \times 0.6214$$

If an object is 100 km long, we multiply that by 0.6214, and the answer is 62.14 mi.

Distance, Length or Height to Measure	km or m	ft or mi
Distance, North Andaman Island to Myanmar	285 km	
Amount of plate boundary moved in 2004		
Amount ocean floor moved upwards in 2004		
Height, Barren Island, sea floor to sea level		
Highest elevation, Barren Island		
Distance, Barren Island to Port Blair		

2. Read the information in the box and complete the table.

Converting square kilometres (km²) into square miles (mi²)

Often, books will give areas in square kilometres (km²). If you are used to miles and not kilometres, it is useful to know how to convert km² into mi².

One square mile equals 2.59 km². Therefore, if you divide the number of square kilometres by 2.59, you get the number of mi²:

$$\text{mi}^2 = \text{number of km}^2 / 2.59$$

If an object has an area of 1000 km², we divide that by 2.59, and the answer is 386.1 mi².

Area	km ²	mi ²
Andaman Islands	6408	
Myanmar		
Southeast Asia		

Answer Key

Unit 0 Introduction

0.1 Maps, Oceans and Continents

- Answers:**
 - a world map
 - north = the top; south = the bottom, east = to the right and west = to the left
- Answers:**

a. vii	e. iii
b. viii	f. iv
c. vi	g. ii
d. i	h. v
- Answers:**

i. Pacific	l. Southern
j. Atlantic	m. Arctic
k. Indian	
- Answers:**

i. ix	l. xiii
j. x	m. xi
k. xii	
- Answers:**

a. North America	d. Asia
b. South America	e. Africa
c. Europe	

0.2 Earth's Biomes

- Answer:** The different biomes on Earth
- Answers:**
 - F - there are 11
 - T
 - T
 - F - There are many, some on land and some in water.
 - T

0.3 Time-lapse and Slow-motion Photography

- Possible Answers:**

a. a few hours	c. two or three weeks
b. one or two seconds	d. one or two seconds
- Answers:**

time-lapse - i, ii	slow-motion - iii, iv
--------------------	-----------------------
- Answers:**

a. time-lapse	c. time-lapse
b. slow-motion	d. slow-motion

Unit 1 From Pole to Pole

1.1 The Arctic and Antarctica

A Before you watch

- Answers:**

a. 3	d. 4
b. 5	e. 2
c. 1	

B As you watch

- Answers:**
- up to -70 degrees centigrade
 - 4 months
 - to the sea ice
 - seals
 - almost 50%
 - 24 hours

C After you watch

- Answer:** polar bears = the Arctic; penguins = the Antarctic
- Answers:**

a. south	d. approx. 16-17°N, 96-97°E
b. north	e. approx. 42-44°N, 74-75°W
c. New Zealand	

1.2 Tundra, Taiga and Broadleaf (Deciduous) Forests

A Before you watch

- Answers:**

i. polar	iv. temperate
ii. temperate	v. polar
iii. tropical	
- Answer:** Between ii and iii, and between iii and iv.

B As you watch

- Answers:**

	Arctic Tundra	The Taiga	Broadleaf Forest
1. Are there trees? (Y/N)	no	yes	yes
2. Describe the trees.	---	short shrubs, needle-shaped leaves, animals cannot eat them	broad leaves, animals can eat, leaves fall in winter
3. Are there many animals? (Y/N)	yes	no	yes
4. Give examples of animals.	caribou, wolves	---	birds, butterflies, deer, leopards

C After you watch

- Answer:**
tundra – Polar
taiga – Polar/Temperate
deciduous (broadleaf) – Temperate
- Answer:** Broadleaf forest, because the Sun's energy is stronger, producing more plant life, which more animals can eat.

1.3 Seasons

A Before you watch

- Answers:**
 - Because the Earth has a tilt. This means that one pole is always facing the Sun more. Therefore, when the Sun hits the South Pole most directly (in summer), it is hitting the North Pole the least (so it is winter in the north).
 - Closer to the equator, the Sun's rays hit the Earth more directly, but at higher latitudes, they hit at an angle, so are not as strong.
 - Lowland is usually warmer than upland because the air pressure is higher in the lowland.
 - land near the equator

B As you watch

Possible Answers:

- Cherry blossoms bloom.
- Their leaves change colour and fall off.
- Answers:**

a. 4	c. 3
b. 1	d. 2

C After you watch

- Answers:**

a. ii (summer)	c. iv (winter)
b. i (spring)	d. iii (autumn)
- Answer:** The Sun's rays hit the earth directly, so it is always hot.

1.4 Oceans and Weather

A Before you watch

- Answers:**

a. 4	c. 3
b. 2	d. 1

B As you watch

- Answers:**

a. summer	c. the shark
b. a second	d. the seal
- Answers:**

a. moisture	d. condenses
b. evaporates	e. rains
c. moisture	

C After you watch

- Answers:**
 - condensation / moisture condenses
 - precipitation / rain or snow falls
 - evaporation / water evaporates
- Answer:** east = Indian Ocean, west = Atlantic Ocean

1.5 Habitats and Ecosystems

A Before you watch

- Answers:**
 - ecosystem
 - habitat
 - [plant] community
- Possible Answers:**
 - An ecosystem describes everything - air, water, plants, etc, in an area, and how they interact with each other. A habitat is just a type of place where an organism can live.
 - its habitat
 - field, desert

B As you watch

- Answers:**

a. one third	f. highlands of Angola
b. water	g. in large packs
c. swamp	h. once a day
d. dry season	i. hundreds
e. dust storms	j. sun

C After you watch

- Possible Answers:**
 - enough food (plants), water and a lot of space
 - water, food (insects)
 - enough food (plants), water and places to run to get away from predators
 - enough food (animals, especially impalas)
- Possible Answer:** changes in food or water supply, climate change
- Angola is north west of the Kalahari Desert.

Unit 1 Additional Activities

Skills Work

1. Answers:

- a. Mexico
- b. Australia
- c. South Africa
- d. Africa
- e. Asia

2. Answers:

- a. northern
- b. southern
- c. northern
- d. northern
- e. southern

3. Answers:

- a. polar, temperate
- b. tropical, subtropical, temperate
- c. polar, temperate
- d. temperate, subtropical
- e. temperate

Focus on Myanmar

1. Answers:

- a. less than 50 m
- b. Taunggyi, between 500 and 1000 m

2. Answers:

- a. elevation and latitude
- b. tropical, sub-tropical, temperate, polar
- c. colder
- d. Kachin State
- e. the lowlands

Unit 2 Mountains

2.1 Rift Valleys and Mountains

A Before you watch

1. Answers:

- a. 5
- b. 4
- c. 1
- d. 2
- e. 3

2. Answers:

- a. crust
- b. mantle
- c. outer core
- d. inner core

3. Answers:

- a. T
- b. T
- c. T
- d. F - it can, but it is called lava

B As you watch

1. Answers:

- a. land masses
- b. lava
- c. volcanoes
- d. erupting
- e. molten

C After you watch

Possible answer:

- 1. The map shows that Ethiopia is the lowest point (has the lowest elevation) in Africa; it is 155 m below sea level.

2.2 Predators and Prey

B As you watch

Answers:

- 1. grass
- 2. They share lookout duty (looking for predators).
- 3. during the day
- 4. no
- 5. one summer
- 6. predators and prey

C After you watch

1. Answers:

- a. - very fast runners
- camouflage
- eyes at the front of their head so they can see what is in front of them
- b. - very fast runners
- live in large groups
- defences on their bodies
- camouflage
- eyes on the side of their head so they can see all around

2.3 Creation and Destruction

A Before you watch

2. Answers:

- a. The land mass in the centre at the top, in the brown area.
- b. The brown area at the top of the map is the North American plate.
- c. The yellow area centre left is the Pacific plate.

3. Answers:

- a. snow and rocks
- b. Avalanches can move very fast, and crush or bury animals.

B As you watch

Answers:

- 1. 100,000
- 2. a male grizzly bear
- 3. Moths' bodies have a lot of fat.
- 4. frost, snow and ice
- 5. 15 million years ago
- 6. Africa and Europe

C After you watch

- Answers:
 - rock
 - ice
 - valleys
 - Earth
 - 43
 - 3
- France, Switzerland, Germany, Austria, Italy (also Monaco and Liechtenstein (LEICH on map)

2.4 Surviving in the Mountains

A Before you watch

- Answers:
 - i = physical ii = behavioural
- Possible Answers:
Strong legs, thick fur, ability to climb well

B As you watch

- Answers:
 - grazer
 - predator
 - predator
 - predator
 - grazer
 - grazer
 - grazer

C After you watch

- Answers:

Animal	Adaptation	Behavioural / Physical?	Purpose
a. Markhor	large horns on their heads	P	to protect them
b. Snow leopard	large paws and big tail	P	to help them climb mountains
c. Golden snub-nosed monkey	thick fur	P	to keep them warm
	stay very close together	B	to keep them warm
	move to warmer areas	B	to get more food
d. Giant panda	stays for three weeks in a cave	B	to protect their newborn babies

2.5 Migration over the Mountains

A Before you watch

- Answers:
 - T
 - F
 - T
 - F - They usually migrate to breed or find food.

B As you watch

- Answers:
- 50,000
 - India
 - winds, golden eagles, hunger, tiredness

C After you watch

- Answers:
 - migrations
 - 300-400
 - heights
 - tiredness
 - 20,000
- Eagles are the predators and cranes are their prey.
- elephants, catfish, cranes, storks, buffalo
- Afghanistan, India, China, Pakistan, Myanmar, Nepal, Bhutan

Unit 2 Additional Activities

Skills Work

- Possible Answers: Carpathian Mountains (Europe), Appalachian Mountains (North America), Ural Mountains (Europe/Asia), Sierra Nevada (North America) Hindu Kush (Asia)
- Answers:
 - Tanintharyi, Myinmoletkat Taung, 6,798 ft (2,072 m)
 - Shan State, Loi Pangnao, 8,409 ft (2,563 m)
 - Eastern Myanmar, Mela Taung, 6,820 ft (2,080 m)
 - Central and eastern Myanmar, Nattaung, 8,606 ft (2,623 m)
 - Central Myanmar, Mount Popa, 4,980 ft (1,518 m)
 - Central and eastern Myanmar, Loi Leng, 8,770 ft (2,673 m)

Focus on Myanmar

- Answers:
 - west
 - from the Himalayas to southern Myanmar
 - higher
 - Because some parts are highland and some are lowland. This affects the climate.
- Answers (in any order):
Indian, Eurasian, Australian

Unit 3 Fresh Water

3.1 The River System

A Before you watch

2. Answers:

- a. source
- b. mouth
- c. streams
- d. waterfalls
- e. tributaries
- f. flood plains

B As you watch

Answers:

- 1. 3 %
- 2. wind and rain
- 3. Angel Falls
- 4. almost 1000 metres
- 5. It is blown away as mist.

C After you watch

1. Answers:

- a. 2
- b. 3
- c. 1

3. Possible Answers:

The water we drink has been drunk many times before; the water we drink has traveled very far to become drinking water; the water we drink has been fresh water, salt water, rain water, river water, clouds, etc.

3.2 The Upper Reaches

B As you watch

1. Answers:

- a. fast-moving
- b. cold
- c. lots of oxygen
- d. not much life
- 2. the giant salamander
- 3. up to 80 years
- 4. Grizzly bear

C After you watch

1. Answers:

- a. upper reaches
- b. rapids
- c. nutrients
- d. lifeless
- e. gravity
- f. erosive
- g. canyon
- 2. The area just north of the Colorado River is the lowest lying land in North America.

3.3 The Middle Reaches

B As you watch

1. Possible Answers:

- a. brown, has a lot of bends
- b. more animal life, family groups, more predators

Answers:

- 2. 4 months
- 3. 4 metres
- 4. 2 million
- 5. There is more drinking
- 6. 5 metres
- water, but there are more predators.

C After you watch

1. Answers:

- a. mountains
- b. warm
- c. more
- d. flattens out
- e. slow down
- f. lose
- g. heavy
- h. brown

2. Answers:

	Upper Reaches	Middle Reaches
a. Water temperature	cold	warmer
b. Water Speed	fast	slow
c. Animal life	fewer animals	more animals
d. Predators	fewer	more
e. Sediment	none	a lot

Animal Class 1: Reptiles

- a. Yes, it has scales and lays eggs.
- b. No, doesn't have scales.
- c. No, it doesn't have scales.
- d. Yes, it has scales, lays eggs and has four legs.

3.4 Lakes

B As you watch

1. Answers:

- a. 20
- b. 3
- c. 850
- d. 700

- 2. lots of recently hatched midges rising from the lake
- 3. They drop to the water, lay their eggs and die.

4. Answers:

- a. largest
- b. a fifth / 20%
- c. oldest
- d. 80%

5. Answers:

- a. a [freshwater] seal
- b. giant amphipods

C After you watch

1. Answers:

Animal	Adaptation(s)	Behavioural or Physical?	Possible purpose/Benefit(s)
a. cichlids	keep their young in their mouth	B	to keep them safe from predators
b. dolphin fish	have electric field around them	P	helps them find food
c. lake fly midges	they all mate at the same time	B	so that they can mate successfully without predators eating them all (and their eggs)
d. fresh-water seal	lives in freshwater	P	allows the seal to survive a long way from any ocean

- Because it is the lowest point on the continent, so many rivers flow and drain into that area.
- 53°N, 108°E
- Possible Answers:**
 - We can drink the water; we can eat fish that we catch in lakes, we can use the water for farming, people can make money from tourism.
 - Inle lake is very important because people rely on the water for drinking and farming, plus they catch and eat the fish. It is also one of the most famous tourist places in the country. People from all over the world go there, and many people rely on tourism to make money. Twin Taung Lake in Sagaing is important because a plant called spirulina grow in the lake and farmers harvest it and sell it.

3.5 The Lower Reaches

B As you watch

- Answers:**
 - source
 - sediment
 - tributary
- Answers:**
 - T
 - F
 - T
 - F
 - F
 - T
 - T

C After you watch

1. Answers:

- a delta
- The soil is very fertile/productive.
- places where a sediment-filled river meets a sea or a lake
- The slow movement of the water, which cannot push the sediment out to sea (or further out into the lake).

2. Possible Answers:

- The areas of the world where there are mangrove forests.
- “Map Showing Mangrove Distribution around the World” / “Map of Mangrove Forests around the world”
- The areas where there are mangroves are mostly tropical; the areas where mangroves grow are areas where there is nutrient-filled water, which helps them to grow.

Unit 3 Additional Activities

Focus on Myanmar

Answers:

- smaller
- 2900 feet or 880 metres
- 17 feet or 5.2 metres
- It can only be found there.
- increased population, agriculture and tourism
- the water hyacinth
- The water level drops too low. People have to bring drinking water from outside, and the floating market and the Lawpita hydroelectric plant are threatened.
- Possible Answers:** The lake might dry up; if the lake dries up, people will have no water; there would also be no fish in the lake, so people would have no food; species might go extinct and animals which depend on the lake would also die.

Focus on Myanmar | Skills Work

1. Answers:

- north
- N'mai and Mali
- Himalayan glaciers in northern Myanmar
- Farmers, especially in the Delta and Dry Zone, need it to grow crops. Traders and travellers need it for transport. There are several species of animal who live only here.

Unit 4 Caves

4.1 Caves, the Final Frontier

A Before you watch

2. Answers:
- bats, birds, snakes, insects
 - no sunlight
 - Adaptations such as using sound or heat to find prey, taking energy from other sources than the Sun.
3. Answers:
- 1
 - 4
 - 3
 - 2

B As you watch

- Answers:
- 400 Metres
 - glow worms
 - to trap food
 - finding a regular, reliable source of food

C After you watch

1. Answers:
- trap / catch
 - produces / makes
 - drawn / attracted
 - consumes / eats
2. Answers:
- i
 - iv
 - ii
 - v
 - iii

4.2 Looking into Limestone

B As you watch

- Answers:
- nearly 10%
 - shells of marine animals and coral
 - Any area which is now limestone (mountains, cliffs, etc) was once the floor of an ancient sea or ocean.
 - rain
 - acid

C After you watch

1. Answers:
- ii
 - i
 - ii
2. Answers:
- 2
 - 4
 - 3
 - 1
3. Answers:
- 4
 - 3
 - 2
 - 1

4.3 Food Chains

A Before you watch

3. Answers:
- In a normal ecosystem, the producers (plants) take their energy from the Sun. The consumers then take energy from the plants. In a cave, there is no sunlight, so energy must come from somewhere else.
 - (possible answers) bats, snakes, insects, birds.

B As you watch

- Answers:
- bat droppings (poo, feces)
 - droppings
3. Answers:

Animal	Dependant on other animals? Which? How?
a. cockroaches	dependent on bats / eat the bat guano
b. centipedes	dependent on other insects / eat the cockroaches
c. crabs	dependent on bats / eat nutrients from the bat guano
d. bats	dependent on insects / eat insects
e. falcons/bat hawks	dependent on bats / eat bats

C After you watch

- Possible Answers:
- Answers will vary, but the diagram should show guano at the left (or bottom) of the food chain, then insects to the right of (or above) the guano, then bats or birds to the right of (or above) the insects. It may even show bigger birds (like bat hawks) to the right of (or above) the bats.

4.4 Growth and Evolution

A Before you watch

1. Answers:
- Adaptation is change over time, speciation is new specie is developing from older ones (through adaptation).
 - speciation
 - adaptation
 - cooperation

B As you watch

- Answers:**
 - stalagmites
 - stalactites
- calcite
- a reel of string, so divers can find their way back through the caves
- a halocline - water which looks like air
- a meeting of fresh and salt water
- the snake's ability to "see" heat

C After you watch

- Answer:** 1) Long periods of isolations from other organisms, so they have evolved into unique species; 2) the lack of sunlight affected their evolution and some have lost their eyes.
- Answers:**
 - 2
 - 1
 - 3

4.5 Danger in Caves

B As you watch

Answers:

- sulphuric acid
- oil from the Earth's crust
- fish
- drops dripping from the end of columns of sulphuric acid
- They are the base (producers) of a food chain, and take energy from hydrogen sulphide gas
- 120
- Sulphuric acid has eaten away the limestone.
- The crystals were formed by sulphuric acid eating away the limestone. (The chemical reaction creates gypsum.)

C After you watch

- Answers:**
 - iv
 - iii
 - i
 - ii

Unit 4 Additional Activities

Focus on Myanmar

- Answers:**
 - in the colonial era
 - Getting access to caves, place names changing, maps having old names on.
 - Many caves in Myanmar are used for religious reasons by Buddhists.
 - Shan State
 - It is a "river cave". These caves are formed by rivers running through them and eating the limestone away over time.
 - A wild cave is a cave which is not used for human purposes (religious reasons, etc).
- Answers:**
 - a cockroach
 - a stalactite
 - guano (bat droppings)

Skills Work

- Possible Answers:**
 - It could be a park or a garden...
 - ...because there is grass and a cat.
- Possible Answers:**
 - It could be a pond, a lake, a river...
 - ...because there is a frog and frogs live in and near water.
- Possible Answers:**
 - It could be a forest somewhere with a temperate or polar climate.
 - ...because there is a tree which only grows in those climates.

Unit 5 Deserts

5.1 Rainshadow Deserts

A Before you watch

- Answer:** Mongolia and China

B As you watch

Answers:

- one third
- none of them
- snow
- 50 degrees to -40 degrees
- lack of water
- they eat snow
- winter

C After you watch

1. Answers:

- a. iii
- b. iv
- c. i
- d. ii

Animal Class 2: Mammals

- a. No, they have six legs, don't give birth to live babies, don't feed milk to their young.
- b. Yes, they are warm-blooded vertebrates, give birth to live babies and feed milk to their young. They also have fur.
- c. Yes, they are warm-blooded vertebrates who give birth to live babies and feed milk to their young.
- d. Yes, they are warm-blooded vertebrates who give birth to live babies and feed milk to their young. They also have hair.

5.2 Subtropical Deserts

B As you watch

Answers:

- 1. Dromedaries (from the Sahara have one hump), whilst Bactrian camels have two humps.
- 2. wind and sand
- 3. Their size - they can be up to 300 metres high. Only the tops move. The main body can remain the same for thousands of years.
- 4. 5 degrees
- 5. They lick saliva onto their forearms which takes heat from their bodies as it evaporates.
- 6. They stay under the sand and only come out at night.

C After you watch

1. Answers:

- a. weather
- b. directly
- c. moist
- d. rain
- e. sunlight
- f. evaporates
- g. drier

5.3 The Atacama and Sonora Deserts

B As you watch

Answers:

- 1. camels
- 2. partly from cactus flowers, partly from dew.
- 3. summer
- 4. gila woodpeckers
- 5. from Mexico to the Southern USA
- 6. Animals who are migrating rely on it for food and water.
- 7. Rivers passing over the land make wide canyons, which forms the rocks into spires and pinnacles.

C After you watch

1. Answers:

- a. Saguaro
- b. Atacama

2. Answers:

- a. nubian ibex
- b. resources and mates
- c. fighting with their heads and horns
- d. He might never be able to mate.
- e. access to mates, food and water, territory
- f. only the stronger animals reproduce, and their young will also be strong
- g. **Possible Answer:** Dogs compete with each other for territory. They will fight dogs who come into their area. They also have a leadership structure, with the strongest dog at the top.

5.4 Surviving in the Desert

A Before you watch

1. Answers:

- a. blackflies
- b. kestrels
- c. they are darker coloured so harder to see
- d. to attract females (mates)

2. Answers:

- a. female
- b. males

B As you watch

Answers:

- 1. blackfly, rising up from the river
- 2. they jump for it
- 3. up to 50 miles
- 4. They walk into the dunes.
- 5. grass roots
- 6. mountains more than 100 miles away
- 7. every four or five days
- 8. Their prey comes out of the sand dunes to eat.

C After you watch

Answers:

- 1. F - They are called flash floods because they happen quickly.
- 2. T
- 3. T
- 4. T

5.5 Locusts

B As you watch

Answers:

1. 20 years
2. a young locust
3. its own body weight every day
4. To find enough to eat.

C After you watch

Answers:

1. group, swarm, plague
2. Answers:
 - a. group
 - b. swarm
 - c. plague
3. They eat everything, destroying crops and farms.

Animal Class 3: Insects

- a. No, it has eight legs.
- b. Yes, it has six legs, antennae, three sections, lays eggs and has no backbone.
- c. No, it has no legs, and it has a backbone.
- d. No, it has four legs, gives birth to live babies and has a backbone.

Unit 5 Additional Activities

Focus on Myanmar | Skills Work

1. Answers:
 - a. It is in the rain shadow of the Chin Hills, with very low rainfall.
 - b. Because of poor rice harvests and more water shortages.
2. Possible Answers:

short-term solutions - Give people food if they don't have enough, the government, bring water by truck.

long-term solutions - Planting new trees, investing in modern farming methods, improving the soil.

Unit 6 Ice Worlds

6.1 Antarctic Summer

A As you watch

2. Answers:
 - a. continent
 - b. South
 - c. windiest
 - d. desert
 - e. seals

B As you watch

Answers:

1. to breed
2. to breed
3. to predate/hunt the petrels
4. because it is further north than other parts
5. the humpback whale

C After you watch

1. Answers:
 - a. ii
 - b. i
 - c. i
 - d. ii
 - e. ii
2. Answer: South America

6.2 Antarctica – Winter

B As you watch

Answers:

1. It doubles in size (becomes twice as big).
2. emperor penguins, from the ocean
3. males
4. minus 60 degrees

C After you watch

Possible Answers:

1. finding a mate
2. keeping warm in order to hatch their eggs
3. Answers:
 - a. **South Pole** - September-November
 - b. **North Pole** - June - August
South Pole - December-February
 - c. **North Pole** - September-November
South Pole - March-May
 - d. **North Pole** - December-February
South Pole - June-August

Animal Class 4: Birds

- a. Yes, it is a warm-blooded vertebrate with wings and feathers. It lays eggs with hard, waterproof shells.
- b. No, it's an insect.
- c. No, it's a reptile.
- d. No, it's a mammal.

6.3 The Arctic – Spring and Summer

A Before you watch

1. Answers:
 - a. 1. Antarctica is a continent, but the Arctic is not;
2. Humans don't live at Antarctica, but they do live at the Arctic
 - b. 1. latitude; 2. temperature

B As you watch

1. Answers:

Animal	Eats	How it gets food
a. eider duck	mussels	dive through holes in the ice
b. musk oxen	vegetation	smash through the ice
c. Arctic fox	meat	they hunt young musk oxen
d. Arctic wolf	meat	they hunt young musk oxen
e. Polar bear	seals/walruses	they hunt them on the ice

C After you watch

1. Answers:

- polar bear
- Arctic fox
- walrus
- arctic wolf
- musk ox

2. **Answer:** the USA, Canada, Denmark (Greenland), Iceland, Norway including Svalbard), Sweden, Finland and Russia

6.4 Antarctica – Spring

B As you watch

Answer:

- 30 days
- one last meal
- the females are bringing food
- fish and squid
- childless mothers compete to parent the chick, and sometimes trample it to death
- they stay together tightly (huddle)

C After you watch

Answers:

- b
- a
- f
- e
- d
- c
- g
- i
- j
- k
- h

6.5 A New World

B As you watch

- Answer:** no
- Possible Answers:** climate change, and issues related to it

C After you watch

2. Answers:

- Yes, because of natural causes - the Sun, volcanoes and the Earth's orbit.
- Yes, mostly because of human-made causes - burning fossil fuels and deforestation.

3. Possible Answers:

- The **earth's orbit** affects the climate by bringing the Earth closer to the Sun sometimes, which can increase temperatures.

The **Sun** affects the climate by burning hotter (actually its radiation increases, which we feel as heat).

Volcanoes affect the climate by giving out dust and ash and smoke, which can block out sunlight. However, they also release gases, such as carbon dioxide, which helps to warm the atmosphere.

- Burning fossil fuels** affect the climate by releasing gases into the atmosphere which help to warm the Earth.

Deforestation affects the climate by releasing gases into the atmosphere which help to warm the Earth. However, cutting down trees also reduces the number of trees, so they cannot photosynthesise (see Unit 8). This increases the amount of carbon dioxide in the atmosphere, which helps to warm the Earth.

- Natural disasters** such as cyclones, floods and droughts are caused by changing weather as the Earth gets warmer.

The **melting of sea ice** at the poles is caused by increased temperatures even at the polar regions.

The **rise of sea levels** is caused by the melting of the sea ice.

Food shortages are caused by droughts and floods because of changing weather.

Increased risk of disease is caused by insects from warmer climates being able to travel to places which previously too cold and then infecting people.

Loss of species is caused by deforestation, drought, the raising of sea levels and the melting of sea ice which animals depend on.

Unit 6 Additional Activities

Focus on Myanmar

Possible Answers:

1. Because of the bad weather the rest of the year.
2. **plants:** black orchids;
animals: takin, red panda, black bear, black deer
3. the Himalayas
4. broadleaf and coniferous trees
5. They have shrunk, probably because of climate change.
6. Because it is very high (19,294 at its peak), so it is cold. Also it is part of the Himalayas, which are a rainshadow, therefore lots of precipitation (snow) falls in that area.

Skills Work

1. Norway, Sweden, Finland, the northwest of the USA, Kazakhstan, Egypt
2. They are all in the temperate climate zone or between the temperate and the subtropical zones.
3. These countries or areas might currently be too dry or too cold to allow much food production. The changing climate could make those areas warmer and wetter so that more food can be grown.
4. Cuba, Parts of midwestern USA, Mexico, Bolivia, Paraguay, Iraq, Algeria, Mali, Sudan, Central African Republic, Congo, Gabon, Zambia, Namibia, Botswana, Zimbabwe, Northern India, Myanmar, northern and northwestern Australia
5. Mostly these countries sit in the tropical and subtropical climate zones, so they are very hot. Most of them have hot seasons and rainy seasons.

Unit 7 Great Plains

7.1 Grasslands

A Before you watch

2. **Answers:**
 - a. F - Grass grows quickly even in difficult environments.
 - b. F - Graminoids is the scientific name for all grasses.
 - c. T
 - d. F - Rice is one type of edible grass.
 - e. T
 - f. T

B As you watch

Answers:

1. Mongolian gazelle
2. two million
3. It is safer in large groups.
4. bird
5. one and a half billion

C After you watch

Answers:

1. **Answers:**
 - a. v
 - b. iii
 - c. iv
2. **Possible Answers:**
 - a. There is lots to eat, and also you can see any predators who are trying to kill you.
 - b. It is eaten, it is burned.
 - c. Because it grows so quickly and can recover very quickly from being eaten or burned.
 - d. The part of the grass which grows new leaves is under the ground so it is safe.

7.2 The Arctic Tundra

Before you watch

2. Answers:

- a. grass
- b. grasshopper, mouse, rabbit
- c. lizard, snake
- d. hawk

B As you watch

Answers:

1. competition over nesting sites
2. The grass grows quickly and there are few predators.
3. Arctic fox
4. wolves
5. a. caribou b. geese c. wolves

C After you watch

1. Answers:

Organism	Trophic level	Gets energy from
a. Grass	producer	sun
b. Geese	primary consumer	eating grass
c. Arctic fox	secondary consumer	eating primary consumers
d. Wolf	secondary consumer	eating primary consumers
e. Caribou	primary consumer	eating grass

2. Answer: tertiary consumers

3. Possible Answer: The wolves may be, because they are big predators and could catch and kill other, smaller predators.

7.3 Prairies and Veldt

B As you watch

1. Answers:

- F - There were 60 million bison, but now there are a lot fewer.
- T
- T
- F - It is the males who fight each other.

C After you watch

1. Answers:

- 2
 - 1
 - 4
 - 3
 - 5
2. Possible Answer: Because insect-pollinated plants need to be bright, so that insects can see them and are attracted to them.

7.4 Tibet and India's Grasslands

A Before you watch

Answer:

- the Himalayas

B As you watch

Answers:

- They create a rain shadow that makes Tibet dry.
- territory
- a grazer
- Tibetan foxes
- They make India green.
- It is very tall.
- large:** elephants, rhinoceroses;
small: pygmy hogs

C After you watch

1. Example:

Because of the effect of the Himalayas on the two places, Northern India and Tibet are very different. Northern India is lush and green. Long grass grows because there is plenty of rain. By contrast, Tibet is a dry place. It does not get much rain, so there is far less vegetation. The land is coloured grey and brown.

- a desert
- Yes, the Dry Zone is dry because the mountains of the Rakhine Yoma form a rain shadow.

7.5 African Savannah

B As you watch

1. Answers:

- herd
 - pride
- grass and water
 - rain/water
 - baboons

C After you watch

1. Answers:

- drink
 - waterhole
 - thirsty
 - cooler
 - hunt
 - night time
 - attack
 - dangerous
- Because there are more primary consumers than secondary consumers, and more producers than primary consumers.
 - The primary and secondary consumers would starve.
 - Food pyramids show quantities at each trophic level. Food chains and webs show how producers and consumers use each other for energy.
 - They are both about the relationships between different producers and consumers.

Unit 7 Additional Activities

Focus on Myanmar | Skills Work

1. **Answers:**

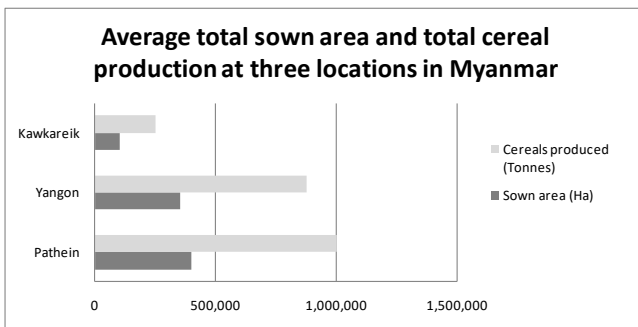
- Because it is Myanmar's staple food.
- 122,000 tons
- deepwater rice
- There needs to be better, more modern equipment, and better roads and railways. There should also be more help for poor farmers.

3. **Example:**

	Total sown area for rice and cereals (ha)
Pathein	400,000
Yangon	350,000
a. Kawkareik	100,000

	Production of cereals/rice (tonnes)
Pathein	1,000,000
Yangon	875,000
b. Kawkareik	250,000

4. **Example:**



5. **Example:** Pathein has the highest sown area of the three locations. I think this is because Pathein is in a warm area, so lots of rice can grow well in large fields. Also, it is a lowland area, so it is possible to sow large fields of rice and cereals. Additionally, it is very close to the flood plain of the Ayeyarwaddy River, which means that there is lots of water to grow large amounts of crops.

Unit 8 Jungle

8.1 Into the Jungle

A Before you watch

2. **Answers:**

- forest floor / 0-15 m high
- understory / 15-30 m high
- canopy / 30-45 m high
- emergent layer / 60 m +

B As you watch

Answers:

- 3%
- half / 50%
- giant forest trees have to die
- sunlight

C After you watch

1. **Answers**

- iii
 - i
 - iv
 - v
 - ii
2. the Arafura Sea, the Banda Sea

8.2 Monkeys and Mating

B As you watch

Answers:

- the canopy
- Because there are no seasons in the parts of the world where the rainforests are.
- figs

C After you watch

1. **Possible Answers:**

- Animals eat the fruit, they digest the sweet outside part and the seed passes through their body. When they defecate (go to the toilet) the seed comes out far from the parent tree. Then the seed can begin to grow.
- Animals helping plants to reproduce in exchange for food from the plants.

Animal Class 5: Amphibians

- No, it is a bird.
- Yes, it has skin and lays eggs.
- No, it is an insect.
- No, it is a reptile.

8.3 Fungi and Decomposers

A Before you watch

2. **Answers**

- ii
- v
- iv
- i
- iii

B As you watch

1. **Answers:**
 - a. high
 - b. temperate
 - c. tropical
 - d. visible
 - e. roots
 - f. roots
 - g. million

C After you watch

1. **Answer:** They are washed away
2. **Example:** It might be very difficult for rainforests to exist without decomposers because they help to put many important nutrients back into the soil very quickly.
3. **Answer:** The Amazon, the Rio Negro, The Rio Madeira

8.4 Specialisation

A Before you watch

1. Possible Answers:
 - a. Generalists are able to eat lots of things and live in varied habitats, but specialists can only eat one type of food or live in one type of habitat.
 - b. Rainforests have a lot of competition. To get food and territory, species develop skills that no other species have.
 - c. The food is spread over a large area.

B As you watch

1. **Answers:**

Organism	Habitat	Specialisation
a. cordyceps	the bodies of rainforest insects	infects the brains of insects, controls their bodies and moves them towards other insects, infects them, then eats their bodies from the inside
b. colugo	the rainforests of Borneo	eats only young leaves, and gets them by gliding from tree to tree
c. pitcher plant	the rainforests of Borneo	contains a sweet liquid to attract insects, traps them and digests them
d. red crab spider	the pitcher plant	is able to hang on pitcher plants and steal the trapped insects from the pitcher plant
e. forest elephants	the Congo	search for mud which is good for their health

C After you watch

Possible Answers:

1. **Benefits:** Specialists are able to find lots of food if they are the only species eating it. Usually specialists do not have much competition because generalists will choose to eat many different things.
Drawbacks: Specialists are not very well able to adapt if their habitat changes. Some specialists eat only one food. If the food cannot be found, the species will probably become extinct.
2. Humans are generalists. We can live in many different environments - tropical or temperate climates, lowland, highland etc, and we can eat almost any food - meat, vegetables, cereals, etc.
3. crab-eating macaques (episode 3), the troglodytes (unit 4), flat lizards (episode 5), the lion-hunting elephants (episode 7).

8.5 Chimpanzees

A Before you watch

Answers:

1. T
2. T
3. T
4. T

B As you watch

Answers:

1. forest floor and canopy
2. There's a lot of fruit there.
3. to increase their territory
4. to get extra protein
5. competition for resources
6. humans

C After you watch

Answers:

1. the relationship between humans and other primates through evolution
2. **Answers:**
 - a. gorillas
 - b. orangutans
 - c. 12
 - d. gorillas
 - e. 4-6

Unit 8 Additional Activities

Focus on Myanmar

- Answers:**
 - Because it contains many different kinds of plant and animal species.
 - human use, farming, hunting of the animals
 - the biggest population of tigers in the world
- Possible Answer:** Because of its latitude - it is near the equator so it has a tropical climate.
- Possible Answer:** By finding a way for humans to make profit from the complex without destroying it, such as responsible tourism, where tourists pay lots of money to see the wild animals and the money goes to local people and organisations.

Skills Work

- Answers**
 - ii
 - i or iv
 - i or iv
 - iii
 - v

Unit 9 Shallow Seas

9.1 Tropical Shallows

A Before you watch

- Answers:**
 - between species
 - Cooperation is where they share space or resources. Symbiosis is where they completely rely on each other.
 - The coral gets its nutrients from the plankton.
 - The plankton gets protected by the coral.

B As you watch

- Answers:**
 - shallow seas - seas which are not more than 200 metres deep
 - the amount of ocean which is "shallow seas" - 8%
 - the length of the whale calf - 3 metres
 - the amount of milk the whale calf drinks each day - 500 litres
 - the amount of time the whales must stay in the shallow waters for - 5 months
 - the number of reefs which together make the Great Barrier Reef - 2000
 - the height of pygmy sea horses - (less than) 2 cm

C After you watch

Possible Answers:

- Cooperative - they work together and benefit each other, but do not depend on each other.
- The reefs are not in their original (pristine) state.
- Answers:**
 - cooperation
 - competition
 - symbiosis
 - competition

9.2 Shark Bay and the Persian Gulf

B As you watch

- Possible Answers:**
 - T
 - T
 - F - A herd of dugongs can eat a football field-sized amount of grass in a day.
 - F - If they go onto the beach they can become stranded.
 - T
 - F - The wind blow nutrients from the desert into the sea.
- There are no land-based predators there.
- They pant (breathe in and out quickly) to keep cool. Also, they build nests far enough away from other cormorants that they cannot peck (bite) each other.

C After you watch

1. Answers:

- mammals
- mammals
- birds

Possible Answers:

- The desert winds blow nutrient-rich sand grains into the sea, which animals and plants need to live there in large numbers.

3. Answers:

- the way they breath, their fins and spines
- the hippopotamus
- pakicetus, 50 million years ago

4. Example:

The diagram shows us that cetaceans evolved from a land mammal with four legs and a tail. Around 50 million years ago (ma), the ambulocetus had evolved. Its legs had become shorter because it probably spent more time in the water than on land. Around 49 ma, the ambulocetus had evolved into a different species. Its tail had evolved to help it swim better and its legs were much smaller and probably not very good on land. Between 45 and 33 ma, the modern cetacean body slowly evolved. The legs were replaced by fins and the tail became very similar to a fish's tail. Since then, many species of cetacea, such as many whale and dolphin species have evolved, probably from one common ancestor.

9.3 Temperate Seas

A Before you watch

1. Answers:

- plant-like (similar to plants)
- Because they photosynthesise (breathe in carbon dioxide and breathe out oxygen).
- Because algae creates 75% of the oxygen in the atmosphere.

B As you watch

Possible Answers:

- from the equator to the temperate seas of the northern and southern hemispheres
- by slapping their fins on the water
- winter
- The storms (turbulence) bring nutrients up from below.
- linked chains of individuals up to 15 metres long
- algae
- shrimp

C After you watch

Possible Answers:

- All are migrating, but specifically, the humpback whales and the krill migrate to find food.
- the west coast

Animal Class 6: Fish

- Yes, it has fins, gills and a backbone.
- No, it has no backbone.
- Yes, it has a fins, gills and a backbone.
- No, it has no backbone.

9.4 Sea Predators, Sea Prey

A Before you watch

Possible Answers:

1. Answers:

- ii
- iii
- iv
- i

B As you watch

Answers:

- They sharpen themselves and are replaced every few months.
- with its feet
- by grouping together
- It wraps its stomach round them and digests them.
- through the pigment (colour) on their bodies
- The seals eat fish and squid, and great white sharks eat the seals.

C After you watch

Possible Answers:

- primary (the kelp is a producer, which photosynthesises)
- secondary (they eat sea urchins)
- Invertebrate:** sea urchins, starfish, squids
Mammal: seal
Fish: sharks, stingray

Animal Class 7: Invertebrates

- Yes, it has no backbone.
- Yes, it has no backbone.
- Yes, it has no backbone.
- Yes, it has no backbone.

9.5 Polar Seas

B As you watch

Answers:

1. elephant seals
2. over a year
3. fur seals, who usually eat krill
4. They can only attack the penguins from behind.

C After you watch

Possible Answers:

1. They have evolved to spend more time in the sea and less on the land, so their bodies are less suited to living on the land.
2. They might disappear, as there is less and less food for them; They may keep on evolving and evolving and eventually no longer live on land at all.
3. Answers:
 - a. Probably humans, who eat them, or use them as fish food. Also there is more carbon dioxide in the water, and increasing temperatures.
 - b. They are the staple food of most sea animals.
 - c. The human population is increasing, so they need more food.
4. Possible Answers:
 - a. Rich countries like the USA, because they can afford to take care of the oceans and have the technology; the countries with the most coastline because they are the ones who need the sea most.
 - b. Stop eating fish; choose to only buy fish that has been carefully and well farmed; stop buying from companies and countries who destroy marine ecosystems; don't use krill oil.

Unit 9 Additional Activities

Focus on Myanmar

1. Answers:

- a. There has not been a lot of study of them.
- b. fishing
- c. Because new species have been found, and also some species which have never been seen around Myanmar before.
- d. Making them a protected (World Heritage) site.
- e. Coral growing in areas of low visibility.
- f. their position between the Indian and Pacific oceans

2. Possible Answers:

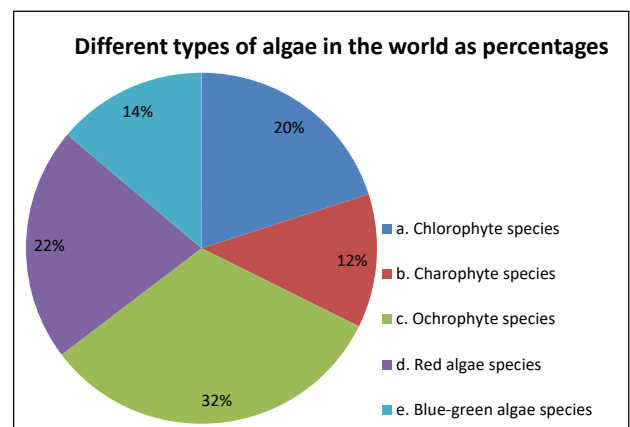
- a. Ban all fishing; do not allow any divers in the area; make it very expensive to visit the area and use the money to protect it further.
- b. The Myanmar government's because they are in Myanmar's waters; the United Nation's because they are important for the whole world; Private companies because they could make a profit and also help to protect the reefs while allowing people to enjoy visiting the area.

Skills Work

1. Answers:

Total Estimated Number of Species: 65,000	
Name	Percentage of All Algae
a. Chlorophyte	20%
b. Charophyte	13.8%
c. Ochrophytes	32.3%
d. Red algae	21.5%
e. Blue-green algae	12.3%

2. Example:



Unit 10 Seasonal Forest

10.1 The Taiga

A Before you watch

Possible Answers:

- Answers:
 - needles
 - cones
 - coniferous tree
- 64°N

B As you watch

Answers:

- 1,000 miles
- 33.333% (1/3)
- 50 years
- cat
- moose
- the wolverine
- mate

C After you watch

- Answers:
 - i
 - iii
 - v
 - iv
 - ii
- There are not many prey animals.

10.2 North and South American Forests

B As you watch

Answers:

- fog from the sea
- 10 times faster
- birds' eggs
- giant sequoia
- bristlecone pines
- trees
- Answers:
 - South America
 - conifers
 - seeds
 - longer
 - few

C After you watch

Answers:

- the south (because in the north is the Atacama Desert)
- They are miniature (very small).
- Answers:
 - 1
 - 3
 - 4
 - 2

10.3 Broadleaf Forests

B As you watch

Possible Answers:

- They trap more light.
- They are easier to eat.
- Because the forest can support many kinds of grazer (primary consumer), there are also many kinds of secondary consumers.
- Cicadas hatch.

C After you watch

Answers:

- There are so many of them that predators become full, and stop hunting them.
- Answers:
 - Females lay eggs in trees.
 - The eggs hatch into larvae.
 - The larvae drop to the ground.
 - The larvae live in the ground and feed from the tree's sap for 17 years.
 - The nymph tunnels to the surface.
 - The nymph molts and emerges as a winged adult.
- d, a, e, b, c

10.4 Winter and Spring

B As you watch

Possible Answers:

- It is when male deer get together and fight. They fight over mates.
- They fall.
- Siberia, in the north, where it is too cold.
- 40
- They need to grow before the trees about them begin to leaf and steal all the sunlight.

C After you watch

- Answers:
 - spring
 - winter
 - autumn
 - summer
- Answers
 - Summer** - hottest season, plants grow a lot and photosynthesise lots.
 - Autumn** - forest cools, leaves turn brown and fall from trees.
 - Winter** - very cold, some plants die, trees have no leaves, snow falls.

10.5 Tropical Broadleaf Trees

B As you watch

Answers:

- Similar:** Trees lose leaves like other broadleaved trees.
Different: It never gets cold in the tropical broadleaf forests. The length of the day is always the same in tropical broadleaf forests.
- They can't afford to lose water from the leaves during the hot season.
- The flowers contain liquid, that is rare during the hot season.
- They show other animals if predators are around.
- They flower in less than a minute.
- Possible Answer:** The lemurs need to eat the moths to survive through the dry season. The baobab trees need the lemurs and the moths to help fertilise the trees. Both the lemurs and the moths rely on the trees for nectar.

C After you watch

Answers:

- They eat meat and plants.
- carnivores
- herbivores
- plants

Unit 10 Additional Activities

Focus on Myanmar | Skills Work

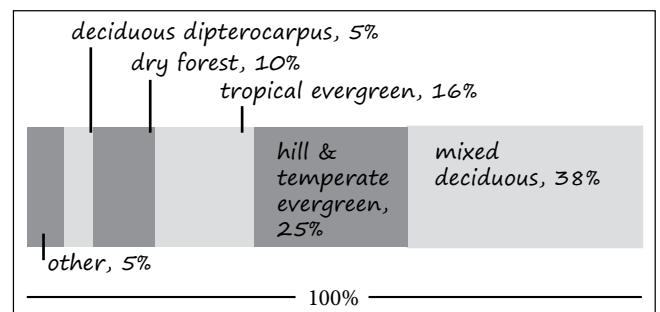
1. Answers (in any order):

forest type	% of total forest	additional information
mixed deciduous	38	mostly teak, some bamboo, important for economy
hill & temperate evergreen	25	found at higher altitudes, many climber "species"
tropical evergreen	16	found in lowlands, and well-preserved in Tanintharyi Region on coast
dry forest	10	found in central Dry Zone, mostly thorn scrub
deciduous dipterocarpus	5	found in northern Myanmar and only four other countries
other	6	mangroves, beach and dune forests and swamp forest, found mostly in lowlands around Ayeyarwaddy Region

2. Answers:

- mixed deciduous
- mixed deciduous, teak and bamboo
- deciduous dipterocarpus
- tropical evergreen, mangroves, beach and dune forests and swamp forests
- tropical evergreen, mangroves, beach and dune forest, swamp forest

3. Example:



Unit 11 Ocean Deep

11.1 The Search for Food

A Before you watch

2. **Answers:**
- both
 - producers, consumers and decomposers
 - small
 - all consumers in the ocean
 - Some produce oxygen, others are at the bottom of the food chain for sea-based carnivores.
3. **Answers:**

plankton	type of organism	trophic level	important for:
Phytoplankton	plants	producers	producing oxygen
zooplankton	animal	primary consumer	forming base of food chain
bacterioplankton	bacteria	decomposer	recycling nutrients

B As you watch

Answers:

- fish
- plankton
- carnivore
- locating prey in the emptier parts of the ocean
- taste
- They scan the water using sonar.

C After you watch

1. **Answers:**
- v
 - i
 - iii
 - d
 - ii

11.2 Descent into Darkness

A Before you watch

2. **Answers:**
- F - It is mostly organic waste, sand, soot and dust.
 - F - It falls continuously.
 - T
 - T
 - T
 - F - It has been happening for more than a billion years.

B As you watch

Possible Answers:

- It rises from the deep sea.
- eight metres across
- They return to the deep sea.
- Pressure builds and the temperature falls.
- their unusual shapes
- feathers on its legs
- There is very little food around.

C After you watch

1. **Answers:**
- dumbo octopus
 - manta ray
 - sea spider
 - vampire squid
2. **Possible Answer:** The environment becomes darker and darker, and there are fewer and fewer animals. The animals which there are become more and more unusual, and have to rely on specialisation to survive and find food, or on unusual adaptations to defend themselves from predators.

11.3 The Ocean Floor

A Before you watch

Possible Answers:

- It gets deeper.
- a range of underwater mountains going around the earth
- the tectonic plates pulling apart
- different kinds of invertebrates
- nutrients from the volcanic gases
- They do not get their energy from the Sun.

B As you watch

Possible Answers:

- attracts it with a lure
- crabs, eels, isopods
- hot vents that erupt underwater
- tube worms
- All life there dies.

C After you watch

1. **Answers:**
- scavengers
 - scavengers
 - scavengers
 - scavengers
 - scavengers
 - predators
2. Predators hunt and kill their food. Scavengers find food which is already dead.

11.4 Mountains of the Deep

A Before you watch

- Answers:
 - underwater volcanoes
 - mountains on the ocean floor
- Answers:
 - T
 - F - Some are in shallow water.
 - T
 - T

B As you watch

Answers:

- 30,000
- 400 metres
- goes up to the reefs to feed
- Because it swims backwards.
- squid and octopus
- The dolphin is predator, the squid is prey.
- The smaller fish eat particles from the mola mola. This cleans the mola mola.
- It's the only land for a long way.
- For their breeding.

C After you watch

Answers:

- the mid-Atlantic ridge (see mid-ocean ridge in 11.3)
- Answer:** Ascension Island was probably formed by a volcano at the mid-ocean ridge.
- Example:** New islands such as Ascension form slowly through years of underwater eruptions at points such as mid-ocean ridges. During each eruption, lava comes up from beneath the ocean floor and then hardens. Later, new lava comes out when the volcano erupts again. Each time, the mountain gets higher, over thousands or millions of years. Eventually, sometimes, the volcano has erupted so many times that the mountain reaches the surface and becomes an island.

11.5 The Blue Whale

B As you watch

- Answers:
 - blue whale
 - sailfish
- Answers:
 - sailfish
 - sailfish
 - sailfish
 - blue whale
 - blue whale
 - blue whale
 - blue whale
- four million
- 300,000

C After you watch

Possible Answers:

- The female is larger.
- mating
- hunting
- 285,000
- destruction of habitat

Unit 11 Additional Activities

Focus on Myanmar

- Possible Answers:**
 - one - Barren Island
 - The Indian tectonic plate moved under the Burma plate, pushing the sea floor up by five metres.
 - India
- an early warning system so people know when a tsunami is likely to come

Skills Work

1. Answers:

Distance, Length or Height to Measure	km or m	ft or mi
a.	285 km	177 mi
b.	1600 km	994 mi
c.	5 m	16.5ft
d.	2,250 m	7,604 ft
e.	354 m	1,161 ft
f.	135 km	84 mi

2. Answers

Area	km ²	mi ²
a.	6,408	2,724
b.	676,578	261,227
c.	9,596,961	3,705,386

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36	Gjotagja cave Iceland	Chris 73	http://commons.wikimedia.org/wiki/File:Gjotagja_cave_Iceland_1.JPG	CC BY-SA 3.0
38	Unidentified bird species from the Fossil Butte Member in southwestern Wyoming, USA	Matt Mechtley	http://en.wikipedia.org/wiki/Green_River_Formation#/media/File:Fossil_bird_Field_Museum.jpg	CC BY-SA 2.0
39	Simple food chain	Siyavula Education	https://www.flickr.com/photos/121935927@N06/13578545323/	CC BY 2.0
42	Limestone formations in the Imperial Cave at Jenolan Caves, NSW, Australia.	Toby Hudson	http://en.wikipedia.org/wiki/Jenolan_Caves#/media/File:Jenolan_Caves_Imperial_Cave_3.jpg	CC BY-SA 3.0
42	Images of Myanmar caves	Liz Price	http://myanmarcaves.wikidot.com	© Liz Price
44	Camel Thorn Tree (Acacia erioloba) in Sossusvlei region, Namib-Naukluft National Park, Namib Desert, Namibia.	Luca Galuzzi (Lucag)	http://commons.wikimedia.org/wiki/File:Thorn_Tree_Sossusvlei_Namib_Desert_Namibia_Luca_Galuzzi_2004a.JPG	CC-BY-SA-2.5
45	Human Langur monkey (Semnopithecus dussumieri), Orchha, Madhya Pradesh, India.	Yann	http://commons.wikimedia.org/wiki/File:Langur_monkey_Orchha,_Madhya_Pradesh,_India.jpg	CC BY-SA 4.0
47	Tadrart Acacus desert in western Libya, part of the Sahara.	Luca Galuzzi	http://en.wikipedia.org/wiki/Sahara#/media/File:Libya_4985_Tadrart_Acacus_Luca_Galuzzi_2007.jpg	CC BY-SA 2.5
48	Two Plectroctena sp. ants, either P. mandibularis or P. strigosa.	Muhammad Mahdi Karim	http://en.wikipedia.org/wiki/File:Plectroctena_sp_ants.jpg	GNU Free Documentation License, V 1.2
49	Viceroy Butterfly (Limenitis archippus) (Monarch Mimic)	PiccoloNamek	commons.wikimedia.org/wiki/File:Viceroy_Butterfly.jpg	CC BY-SA 3.0
49	Serious and standing snow leopard	Tambako The Jaguar	https://www.flickr.com/photos/tambako/10915492333/	CC BY-ND 2.0
50	Rub' al Khali or Empty Quarter is the largest sand desert on earth.	Nepenthes	http://commons.wikimedia.org/wiki/File:Rub_al_Khali_002.JPG	CC BY-SA 3.0
52	View toward the NNE from Rothera Research Station (on Adelaide Island) over Laubeuf Fjord	Vincent van Zeijst	http://commons.wikimedia.org/wiki/File:Antarctica_%287%29_Laubeuf_Fjord_Webb_Island.JPG	CC BY-SA 3.0
54	Dragonfly	dnlsnck	https://www.flickr.com/photos/danspink/9592148244/	(c) Daniel Spink
54	Draco taeniopterus Gunther, 1861 from Bulon Island, Thailand	Psmuseum	http://en.wikipedia.org/wiki/Draco_%28genus%29#/media/File:Draco_teniopterus_Gunther_1861_from_Bulon.jpg	CC BY-SA 3.0
55	An arctic wolf, keeping a watchful eye around.	BerZophus	http://commons.wikimedia.org/wiki/File:Watchful_Arctic_Wolf.jpg	CC BY-SA 2.5
55	Muskoxen on Victoria Island, Nunavut Territory, Canada	Ansgar Walk	http://en.wikipedia.org/wiki/List_of_mammals_of_Nunavut#/media/File:Muskox_08-28.06.98.jpg	CC BY-SA 3.0
58	Sea Spirit leaves Port Lockroy, Antarctica	Liam Quinn from Canada	http://commons.wikimedia.org/wiki/File:Sea_Spirit_leaves_Port_Lockroy_Antarctica_%286063071159%29.jpg	CC BY-SA 2.0
58	at Putao	Erik Oo	http://commons.wikimedia.org/wiki/File:Putao_Sign.jpg	CC BY-SA 3.0
60	Midland hilly savanna near the South African city of Pietermaritzburg	Gossipguy	http://commons.wikimedia.org/wiki/File:Upland_South_Africa_Savanna.jpg	GNU Free Documentation License, Version 1.2
63	The Qu'Appelle Valey with a field of Canola, late summer, Southern Saskatchewan	Kjfmartin	http://en.wikipedia.org/wiki/Canadian_Prairies#/media/File:Theawesomequappellevalleykjfmartin.jpg	CC BY-SA 3.0

64	Mountains in Ladakh	Jochen Westermann	http://commons.wikimedia.org/wiki/File:Karakoram-West_Tibetan_Plateau_alpine_steppe.jpg	CC BY-SA 2.0
65	Herd of bush elephants, in Amboseli national park, south Kenya.	Benh LIEU SONG	https://www.flickr.com/photos/bleusong/7234330010	CC BY-SA 2.0
68	Perhentian-8500	dnlsnkr	https://www.flickr.com/photos/danspink/15990500534/	CC BY-NC 2.0
70	Red-eyed tree frog mating pair.	Brian Gratwicke	http://kk.wikipedia.org/wiki/%D0%A1%D1%83%D1%80%D0%B5%D1%82:Red-eyed_Tree_Frog_%28Agalychnis_callidryas%29_mating_pair.jpg	CC BY 2.0
70	a Guinea Turaco, aka Green Turaco (Tauraco persa). At Birds of Eden, South Africa.	Ian Wilson	http://commons.wikimedia.org/wiki/File:Tauraco_persa_%28captive_-_Birds_of_Eden%29.jpg	CC BY 2.0
70	Couch's Spadefoot Toad (Scaphiopus couchii), Amistad National Recreational Area, Del Rio, Texas, USA	Clinton & Charles Robertson	http://en.wikipedia.org/wiki/Couch%27s_spadefoot_toad#/media/File:Scaphiopus_couchii_ANRA.jpg	CC BY-SA 2.0
71	After rain a huge collection of fungi burst into life on an old tree stump in the Exotic Rainforest section of the Brisbane Botanic Gardens Mt Coot-tha.	russavia	http://commons.wikimedia.org/wiki/File:Funky_Funghi_%285156255130%29.jpg	CC BY 2.0
72	Nepenthes alata	Richard Parker	http://commons.wikimedia.org/wiki/File:Nepenthes_alata_%3F_P3170211_pitcher_plants_red_mts.jpg	CC BY 2.0
74	Jungle view 1 Sigiriya	Danspink	https://www.flickr.com/photos/danspink/13378067593/in/photostream/	CC BY-NC 2.0
77	The Great Barrier Reef - 164	Kyle Taylor	https://www.flickr.com/photos/kyletaylor/4875021166	CC BY 2.0
78	Pakicetus inachus, a whale ancestor from the Early Eocene of Pakistan, after Nummelai et al., (2006), pencil drawing, digital coloring	Nobu Tamura	http://en.wikipedia.org/wiki/File:Pakicetus_BW.jpg	CC BY 3.0
78	Ambulocetus natans, a primitive whale from the Eocene of Pakistan, pencil drawing, digital coloring	Nobu Tamura	http://en.wikipedia.org/wiki/File:Pakicetus_BW.jpg	CC BY 3.0
78	Kutchicetus minimus, an early whale from the middle Eocene of India. Pencil drawing, digital coloring	Nobu Tamura	http://en.wikipedia.org/wiki/File:Pakicetus_BW.jpg	CC BY 3.0
78	Protocetus atavus, an early whale from the middle Eocene of Egypt, pencil drawing, digital coloring	Nobu Tamura	http://en.wikipedia.org/wiki/File:Pakicetus_BW.jpg	CC BY 3.0
78	Squalodon calvertensis, a toothed whale from the Miocene of North America, pencil drawing, digital coloring	Nobu Tamura	http://en.wikipedia.org/wiki/File:Pakicetus_BW.jpg	CC BY 3.0
79	School of Goldband Fusilier, Pterocaesio chrysozona(?). The picture was taken in Papua New Guinea.	Brocken Inaglory	http://commons.wikimedia.org/wiki/File:School_of_Pterocaesio_chrysozona_in_Papua_New_Guinea_1.jpg	CC BY-SA 3.0
79	Spiny seahorse (Hippocampus histrix) from the northern coast of East Timor.	Nick Hobgood	http://commons.wikimedia.org/wiki/File:Hippocampus_hystrix_%28Spiny_seahorse%29.jpg	CC BY-SA 3.0
79	Jelly cc11.jpg	Dan90266	http://commons.wikimedia.org/wiki/File:Jelly_cc11.jpg	CC BY-SA 2.0
79	Ictalurus furcatus	forgotton0001	http://commons.wikimedia.org/wiki/File:Blue_catfish.jpg	CC BY 2.0
80	Stingray City, Grand Cayman	Barry Peters	https://www.flickr.com/photos/barrypeters/3412412804/	CC BY 2.0
80	Asterias rubens, Common Starfish: Caswell Bay A macro shot of a starfish in a rockpool at Caswell Beach.	Pam Brophy	http://commons.wikimedia.org/wiki/File:Starfish,_Caswell_Bay_-_geograph.org.uk_-_409413.jpg	CC BY-SA 2.0
80	Great white shark (Carcharodon carcharias) off South Africa	Hermanus Backpackers	http://commons.wikimedia.org/wiki/File:Great_white_shark_south_africa.jpg	CC BY 2.0
80	Krill Abundance Has Dropped 80% in 30 Years. (A) This gravid female is nearly ready to release her eggs. (B) Krill feed on phytoplankton, indicated by the green color in this specimen's digestive organ.	(Images: Langdon Quetin and Robin Ross, researchers at the Marine Science Institute, University of California, Santa Barbara, and funded by the Office of Polar Programs, National Science Foundation)	http://commons.wikimedia.org/wiki/File:Gravid_krill.png	CC BY-SA 2.5
80	A spiny king crab (Paralithodes californiensis) perches on a rock.	Moondigger	http://commons.wikimedia.org/wiki/File:Spiny_king_crab_md.jpg	CC BY-SA 2.5
80	Armed to Kill	Jayendra Chiplunkar	http://commons.wikimedia.org/wiki/File:Indian_Black_Scorpion_%28Heterometrus_bengalensis%29_02.JPG	CC BY-SA 3.0
80	The Echinus melo or water melon sea urchin at Capo Caccia Alghero Sardinia	Marco Busdraghi	http://commons.wikimedia.org/wiki/File:Riccio_Melone_a_Capo_Caccia_adventurediving.it.jpg	CC BY-SA 3.0
82	Kapas Island sunset	dnlsnkr	https://www.flickr.com/photos/danspink/16768431880/	CC BY-NC 2.0
84	View over Gwacheon 1	dnlsnkr	https://www.flickr.com/photos/danspink/10381992643/	CC BY-NC 2.0
86	location: Oncol park, Provincia de Valdivia, Chile	Albh	http://commons.wikimedia.org/wiki/File:Valdivian_temperate_rainforest.JPG	CC BY-SA 3.0
86	Alerce gigante en los faldeos del volcán calbuco, Chile	Camillo Vargas A.	http://commons.wikimedia.org/wiki/File:Reserva_Nacional_Llanquihue_-_Chile_-_Alerce_Gigante.jpg	CC BY-SA 3.0
86	Monkey Puzzle tree in Crescent Garden	Barry Shimmon	http://commons.wikimedia.org/wiki/File:Monkey_Puzzle_tree_in_Crescent_Garden_-_geograph.org.uk_-_1385604.jpg	CC BY-SA 2.0
87	17-year periodic cicada, Magicicada sp. brood XIII, 2007. Photographed at Lisle, Illinois. Shown with Kentucky Coffee Tree - Gymnocladus dioicus	Bruce Marlin	http://commons.wikimedia.org/wiki/File:Magicicada_species.jpg	CC BY 3.0
88	An aerial view of the colorful autumn forest	Wing-Chi Poon	http://en.wikipedia.org/wiki/Deciduous#/media/File:Aerial_View_of_Autumn_Forest_Colors.jpg	CC BY-SA 2.5
90	Fog in a forest, Telemark, Norway	Ernst Vikne	http://commons.wikimedia.org/wiki/File:Fog_in_a_forest,_Telemark_2.jpg	CC BY-SA 2.0
90	Deccan Scrub Forests at Mastyagiri, Nalgonda district, Andhra Pradesh	Adityamadhav83	http://commons.wikimedia.org/wiki/File:Deccan_Scrub_Forests_at_Mastyagiri_02.JPG	CC BY-SA 3.0
93	Ocean food chain	ck12.org	http://www.ck12.org/book/CK-12-Earth-Science-Concepts-For-Middle-School/section/11.20/	CC BY-NC 3.0
94	Mobula Ray in "Oceanário de Lisboa", 2008	Moesmand	http://commons.wikimedia.org/wiki/File:Manta_Ray_Lisboa_aquarium_2008.jpg	CC BY-SA 3.0
96	Choo choo train clouds over the Atlantic Ocean. Salvador, Bahia, Brazil.	Tiago Fioreze	http://commons.wikimedia.org/wiki/File:Clouds_over_the_Atlantic_Ocean.jpg	CC BY-SA 3.0
101	A trophic pyramid (a) and ecological food-web (b).	Thompsma	http://en.wikipedia.org/wiki/Food_web#/media/File:TrophicWeb.jpg	CC BY 3.0

Credit where it's due:

The creation of this book, in this way, would not have been possible 20 years ago. It is only since the creation of open source file and information sharing in the last 10-15 years that anything like this has been achievable. We (Mote Oo Education) do not have the resources to produce the many diagrams and maps necessary for such a book, and we do not have the finances to pay for the many photographs included in this book. We also do not have the time or ability to research in large, well-stocked public libraries or in universities. Therefore, we must firstly credit the following websites, without whom we could not have accomplished this:

- commons.wikimedia.org
- wikipedia.org
- flickr.com
- cia.gov
- pixabay.com

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Finally, thanks to the users of this work. We hope that people enjoy using this resource to teach each other and themselves, and that it is an example of the possibilities of open source educational resources in our modern world.

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ARCTIC REGION



803400AI (G01486) 6-09

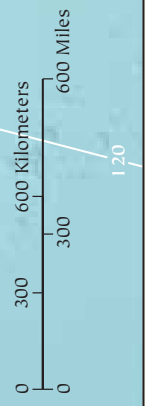
NORTH AMERICA





Scale: 1:36,000,000

Lambert Conformal Conic Projection,
standard parallels 25° N and 77° N



803464AI (G00694) 6-10

SOUTH AMERICA





803521AI (G00186) 11-11

AFRICA





803510AI (G00392) 6-12

EUROPE





803546AI (G00772) 8-12

MIDDLE EAST





803615AI (G00412) 8-13



ASIA



803623AI (G00543) 8-13

SOUTHEAST ASIA





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OCEANIA



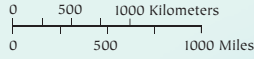


ANTARCTIC REGION

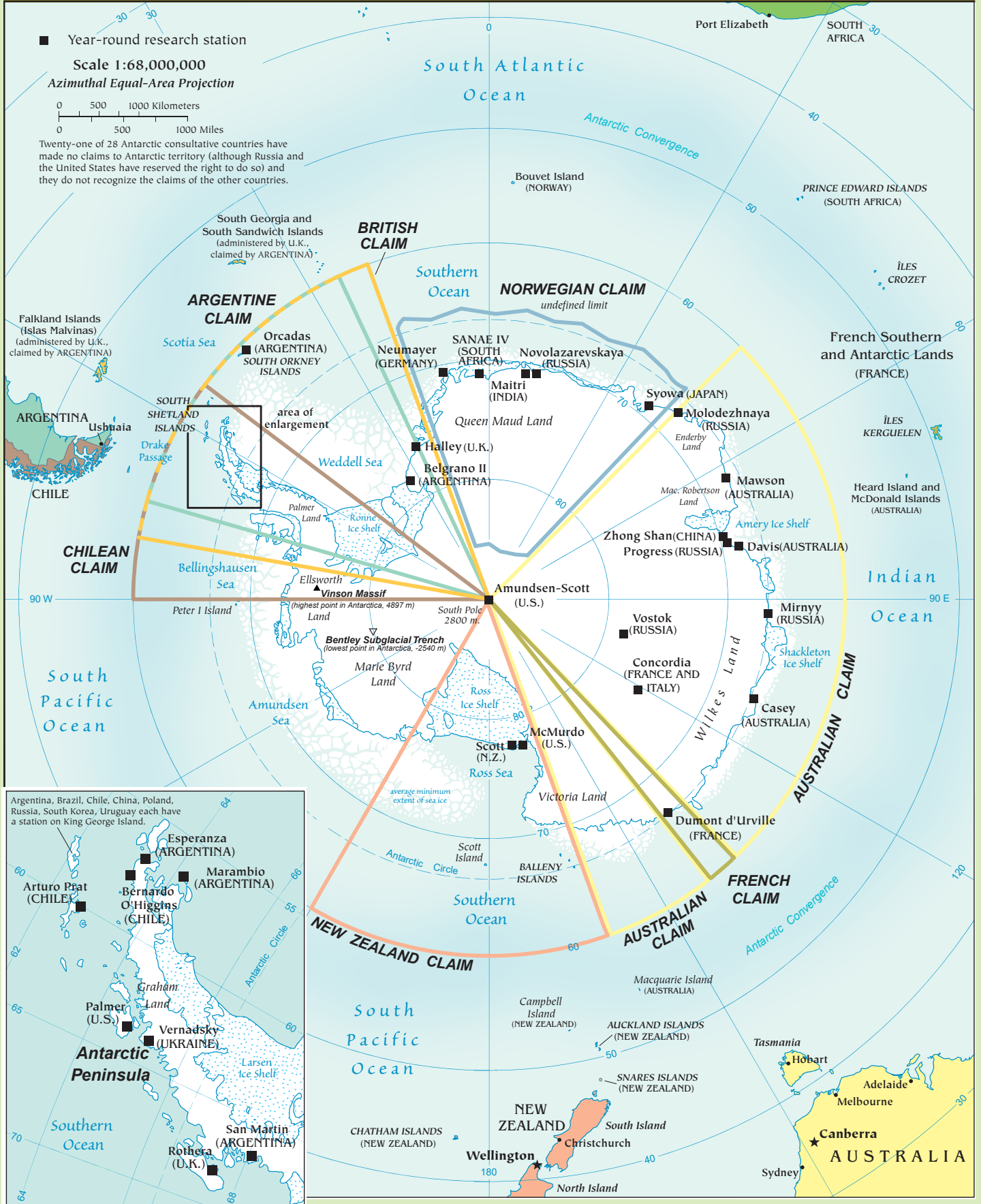
■ Year-round research station

Scale 1:68,000,000

Azimuthal Equal-Area Projection



Twenty-one of 28 Antarctic consultative countries have made no claims to Antarctic territory (although Russia and the United States have reserved the right to do so) and they do not recognize the claims of the other countries.



AUSTRALIA Independent state
Bermuda Dependency or area of special sovereignty
Sicily / AZORES Island / island group
 ★ Capital

Scale 1:35,000,000
 Robinson Projection
 standard parallels 38°N and 38°S



Physical Map of the World, August 2013



Antarctica
Twenty-one of 28 Antarctic consultative countries have made no claims to Antarctic territory (although Russia and the United States have reserved the right to do so) and they do not recognize the claims of the other countries.



August 2013

Boundary representation is not necessarily authoritative.

- AUSTRALIA Independent state
- Bermuda Dependency or area of special sovereignty
- Sicily / AZORES Island / island group
- ★ Capital

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 Robinson Projection
 standard parallels 38°N and 38°S



Political Map of the World, August 2013



Antarctica

Twenty-one of 28 Antarctic consultative countries have made no claims to Antarctic territory (although Russia and the United States have reserved the right to do so) and they do not recognize the claims of the other countries.



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