Chapter 5 Living in the sea

Web references
www.reefed.edu.au; www.mesa.edu.au

Few marine animals die of old age because most are victims of predation (that is, they are eaten by predators) and so never reach adult size. Vast numbers of animals and plants are eaten in their immature stages by plankton eaters.

This chapter looks at places animals live in the sea as well as some of the interesting relationships and adaptations developed by them to survive.

Comparing the land and sea

If you stand on the beach and look out to sea it is impossible to look under the water. However if you stand on a hill and look out over a valley (Figure 58.1) you can feel the wind on your face and see streams and fields, fences and livestock and wilderness areas on the horizon.

Figure 58.1 Physical comparison

If a disease breaks out on land, you can quarantine an area by stopping movement of people and animals. However the ocean knows no boundaries and marine pests spread from country to country as discussed in Chapter 28. You are able to fence land or brand livestock but it is difficult to fence the ocean.

The seabed also contains land features that have been submerged due to sea level rises. Old valleys are called submarine canyons and seamounts were once mountains.

The largest animals in the world are found in the sea. This is because sea water can support a greater weight therefore sea creatures have a completely different skeleton (Figure 58.2).

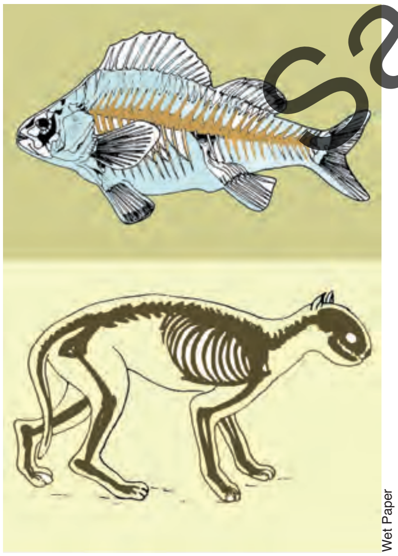


Figure 58.2 Biological comparison

Terrestrial animals have hollow bones to keep their weight to a minimum whereas aquatic animals mostly have solid bones because the upthrust of the water reduces their weight. Food chains (page 65) and energy pyramids (page 67) are also larger in the sea.

The most obvious difference is the taste of sea water. A litre of sea water contains 35% salt compared to fresh water which contains almost no salt. Chapter 6 discusses many more chemical differences. Other simple comparisons are shown on the next page in Figure 59.1.

Questions

Use your textbook to find the answers

1. What is an adaptation?
2. What is the difference between a population and a community?
3. Name four differences between living on the land and living in the sea.
4. Give three examples of structural adaptations.
5. Write a definition for the term *territory.*
6. What is the difference between a functional and a structural adaptation?
7. Why are predators important?
8. What is the difference between a food web and a food chain?
9. Why do some fish have to be streamlined?
10. Would a filter feeder be well adapted to a muddy habitat? Give a reason for your answer.
11. Imagine you are a short rounded fish which could only move quickly in short bursts. Name two habitats that would give you the best chance of survival.

Relationships

To survive in the marine environment, marine organisms often engage in a variety of relationships with other organisms. These are either predator - prey, scavenger or symbiotic relationships.

Other relationships such as competition between species for space or dominance hierarchies also affect individuals who live in populations.

Predator - prey

In this relationship one animal, the **predator** hunts and consumes another animal, the **prey**. An example of this harsh relationship is demonstrated when a shark eats a fish. The shark is the ultimate predator of the ocean. The predator is mostly larger and more powerful than the prey.

Predators are very important in a community as they control the numbers of prey within that community. Without these natural enemies there would be a population explosion among the prey. The prey may then eat out its own food supply and eventually starve. It is therefore important for a community to have a natural balance of numbers within each species.

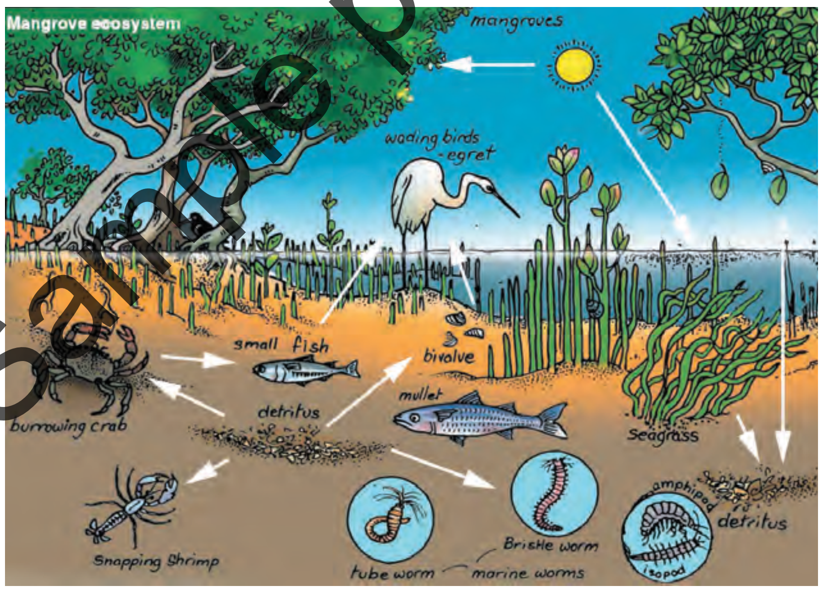


Figure 68.1 Mangrove food web
(Illustration Sharyn Madder, Kerry Kitzelman)

Figure 68.2 Predator - prey relationships
(Illustration Sharyn Madder)

Chapter 8 Snorkelling

Note: Snorkeling (American English)

Mick O'Connor

Web reference
http://www.snorkeling.info

As land animals, humans have no adaptation for life in water because we -

- cannot breathe underwater,
- cannot see well underwater,
- have difficulty propelling ourselves through it,
- loose heat and
- we have problems staying afloat.

Because of this many of us never go to sea and those that do tend to stay on the surface.

Snorkelling and snorkel diving require equipment that helps us overcome some of our body's limitations when we go into the sea. We put on a glass safety mask to trap air in front of our eyes so we can see; we extend our windpipe with a snorkel so we can breathe; we use fins to lengthen and flatten our legs for propulsion and we wear an artificial skin to keep us warm.

Using this equipment we can experience marine life in its natural environment. We can feel the water pressure and observe how light changes as we dive deeper into the sea. We can quickly see how the seascape differs from the landscape.

On land, we can build fences, cut down trees and build roads. We can control the land and influence the lives of the land animals and plants that we share it with. When you snorkel under the sea, you quickly learn that the seascape is largely unaltered by humans; its topography so far has been left unchanged and we have little control over sea life.

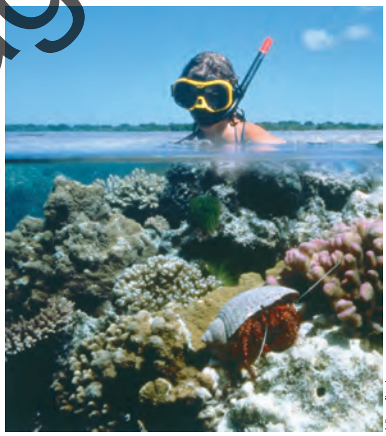
Snorkelling shows us the underwater world in its untouched state, something that is difficult to find on the land because we have altered it so much. If the world under the sea is to remain untouched so that our children will be able to appreciate the natural wonders of the ocean world, we will have to change our attitudes about changing the land.

Our underwater history

Carved stone tablets from ancient civilisations contain the first records of humans swimming underwater (Figure 99.3).

Bob Moffatt

Figure 99.1 Snorkelling inshore



Viewfinder

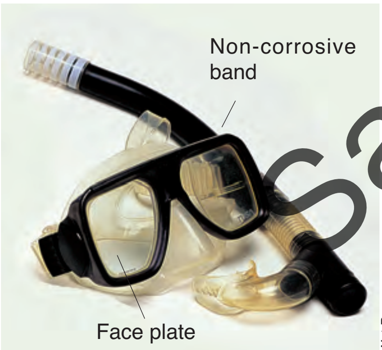
Figure 99.2 Snorkelling enables us to observe underwater life.

Wet Paper

Figure 99.3 Ancient tablets show people swimming with fish. (Photo taken at the Louvre, Paris)

Figure 102.1 A mask helps you see better underwater.

Figure 102.2 Testing your mask for fit



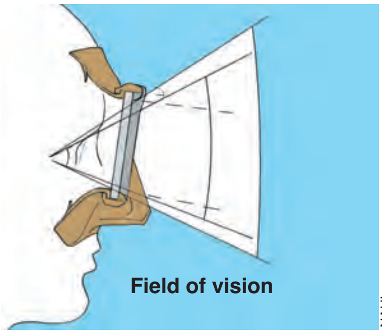


Figure 102.3 Features of a mask

Snorkelling equipment

The basic equipment for snorkelling is a mask, snorkel, fins, wetsuit (for colder climates), stinger suit (for tropical summer climates), sandshoes or booties and a weight belt. In general, the choice of equipment is based on three principles.

- Firstly, comfort. Any piece of equipment selected must be a good, firm but comfortable fit which can be worn for long periods without causing any discomfort.
- Secondly, how much money do you have to spend? Look for quality when purchasing equipment even though it may cost more.

  Cheap, inferior equipment does not last long and may even be a threat to your safety, for example, a mask that is made with safety glass is more expensive but is less likely to damage your eyes if broken.
- Finally, suitability. Different localities or activities may require specialised equipment: for example, a thicker wetsuit for colder water and a stinger suit to protect you from jellyfish in tropical summers.

Masks

A **mask** places a layer of air between your eyes and the water and allows you to see better underwater (Figure 102.1). Modern masks made from silicone compounds are practical and comfortable. They are more expensive than rubber ones, but they last longer and are generally less affected by ozone and chlorine.

When choosing a mask, think about the following points.

- The mask should be a comfortable, watertight fit, preferably with a soft double seal. Check the fit by placing the mask on your face (without using the straps) and inhale gently through the nose (Figure 102.2). A mask that fits should stay in place.
- The face plate(s) or window must be made of safety glass and should be secured with a non-**corrosive** band.
- The mask should be made of good quality **silicone** and have compensation depressions in the bottom. Purge valves are optional devices which make clearing the mask easier but may leak.
- A flexible but heavy, split strap with easily adjustable locking devices provides greater security and comfort underwater.
- A low-volume mask is easier to clear, and increases your field of vision (Figure 102.3).

After you have bought your new mask, remove the manufacturer's film on the glass by scrubbing the surface with

Chapter 22
Coastal engineering

Search engine words

Search for - artificial reef, boulder wall, breakwater, canal, desalination plant, groyne, harbour, lighthouse, marina, oil rig, port, sand bypassing systems, training wall, wind farm.

Coastal engineering includes the construction in, near or on the coast of houses, high-rise, marinas, groynes, underwater cabling, sand pumping jetties, aquariums, boulder walls, artificial reefs, desalination plants and canal estates. In Western Australia, pollution of inland lakes lead to the construction of a new river mouth at Dawsville (Figure 247.3) which resulted in an enormous growth in housing development. In 2008 a billion dollar **desalination plant** was built to supply water to growing cities of southeast Queensland (Figure 247.1).

Figure 247.1 Desalination plant under construction

Engineering structures

Desalination plants

Desalination is a technology that separates dissolved salts and other minerals from seawater or other salty water to provide clean drinking water.

Desalination technologies already exist and have been used for over 20 years. In Australia, the most common desalination process is **reverse osmosis** (Figure 247.2), which involves the removal of salts and other minerals out of the water as it moves through a membrane process (moving through a thin sheet of material) under high pressure. Other processes include thermal distillation, which involves evaporating the salt water and collecting the purified vapour; and electrodialysis, which involves removing salts by separating and collecting their chemical components through electrolysis (using an electric current).

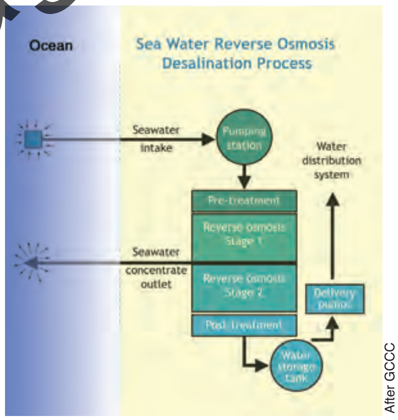


Figure 247.2 Desalination plant process

Australian Water Association
www.awa.asn.au

Physical barriers

The construction of a physical barrier to the sea is one method that is used to stop erosion of the foreshore. These physical barriers are mostly just made of rock and lie parallel to the coast. **Boulder walls** are one of the most common structures used in the prevention of beach erosion and in many coastal developments are mandatory with the cost borne by the developer or home owner.

Boulder wall construction

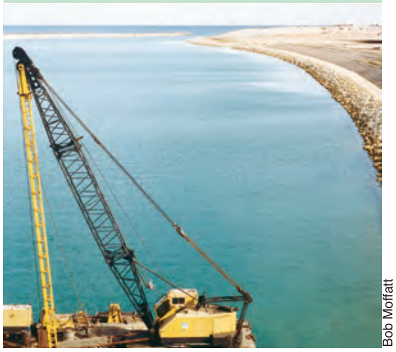


Figure 247.3 The Dawsville cut in the mid 1990's, Western Australia

Diving deeper

1. Research why training walls have been built at the mouth of so many of our rivers.
2. Find out how offshore artificial reefs help beach construction.
3. Build a model groyne to show that you understand what it is and why they are constructed. Research how effective they are in preventing beach erosion during severe storms.
4. Research the progress of the artificial reef in Queensland built to protect Narrowneck beach from erosion.
5. Create a sand tray model to show what a beach and sand dune system looks like on your nearest beach.
6. Design the perfect artificial offshore reef break.
7. Debate high density development on the coastal zone - just how much development should be allowed?
8. Make a model oil rig or poster to show how oil and gas are mined from the sea.
9. Make a model boat harbour complete with lights and facilities.
10. Design a wind generator.
11. Use your digital camera to make a collection of coastal engineering structures from your nearest coastal area.
12. Design a house to withstand a cyclone.
13. Visit a lighthouse and write a report on its history.

Key words

Artificial reef, beach erosion, boulder wall, breakwater, canal, coastal engineering, desalination plant, groyne, harbour, lighthouses, marinas, offshore tourist pontoons, oil rig, port, rock revetment, sand bypassing systems, training wall, wind farm.

Summary questions

Fill in the gaps in these sentences. The missing words can be found in this chapter.

a. [1] _____ _____ includes the construction in, near or on the coast of houses, high-rise, marinas, [2] _____ , [3] _____ _____ , sand pumping jetties, aquariums, boulder walls, artificial reefs and [4] _____ estates.

b. [5] _____ walls are one of the most common structures used in the prevention of beach erosion and in many coastal developments is [6] _____ with the cost borne by the developer or home owner.

c. Groynes do not prevent beach [7] _____ during severe storms as they cannot prevent offshore movement, so beaches that have been built up by groynes over years can be [8] _____ away in an overnight storm.

d. A [9] _____ is similar to a groyne as it goes out at right angles to the beach for a certain distance before it veers in the direction of longshore current. Breakwaters cause [10] _____ on the updrift side resulting in the buildup of sand on the beach.

e. The solution to sand being trapped by a training wall was to build a [11] _____ ___ - ___ system. Here sand is picked up by a pumping jetty using a series of [12] _____ _____ , and gravity fed to a pump station on shore.

f. Hard reefs however provide a great place for [13] _____ diving and fishing as they allow places for fish to grow and [14] _____ .

g. [15] _____ eight percent of all goods come to Australia by sea and ports, harbours and giant [16] _____ have been built so ships can load and unload cargo. These large structures have a marked effect on coastal [17] _____ and have to be built now to strict environmental and safety guidelines.

h. In many cases there is an [18] _____ solution either at the manufacturing end of the [19] _____ cycle or the pollution end of the drain.

New South Wales syllabus match
Marine and Aquaculture Technology CEC Years 7-10

For information about this syllabus and its use go to their web site www.boardofstudies.nsw.edu.au . The chapter matches for these modules are outlined below.

No	Module name	Chapter	Title
Core	Marine and aquaculture technology	00	Introduction
Core	Water safety	01	Water safety
Core	First aid	02	First aid
Core	Maintaining equipment used in water	04	Maintaining equipment
Core	The marine environment	05	Living in the sea
Core	Management and employment	00, 17, 30	Introduction, Marine employment, Saving the sea
1	Water birds of NSW	27	Marine vertebrates
2	Mangroves	21	Estuaries and marine life
3	Microscopic aquatic organisms	25	Small sea creatures
4	Aquatic plants	21	Estuaries and marine life
5	Marine mammals	27	Marine vertebrates
6	Dangerous marine creatures	03	Dangerous creatures
7	The oceans	18, 19	Weather, Oceans
8	Rock platforms	20, 23. 26	Coastlines and marine life, Waves, Animals without backbones
9	Introducing estuaries	21	Estuaries and marine life
10	Living together in the sea	5	Living in the sea
11	Marine pests and threats	28	Trashing the sea
12	Temperate marine ecosystems	6	Sea water
13	Antarctica's marine ecology	31	Antarctica
14	The abyss	5	Living in the sea
15	Watercraft design, construction and repair	7, 10	Boating, Making a surfboard
16	Basic snorkelling	8	Snorkelling
17	Open water snorkelling	8	Snorkelling
18	Fish harvesting	9	Fishing
19	Manufacturing fishing equipment	9	Fishing
20	Boat building	7	Boating
21	Sailing theory and practice	7	Boating
22	Aquarium design, construction and maint	11	Aquariums
23	Underwater farming	12	Underwater farming
24	Designing systems for aquaculture	14	Aquaculture farm designs
25	Economics of aquaculture	14	Aquaculture farm designs
26	Growing stock feed for aquaculture	12, 14	Underwater farming, Aquaculture farm design
27	Biology of native crayfish	13	Crayfish
28	Growing crustaceans	13	Crayfish
29	Fish biology	27	Marine vertebrates
30	Managing fish production	12, 14	Underwater farming, Aquaculture farm design
31	Managing water quality in aquaculture	6, 29	Sea water, Sea water quality
32	Pests and diseases in aquatic organisms	14	Aquaculture farm design
33	Small motorboats	07	Boating
34	Advanced motor-boating	07	Boating
35	Tourism	16	Marine industries
36	Food from the sea	15	Food from the sea
37	Local fishing industries	16	Marine industries
38	Industries and employment	16, 17	Marine industries, Marine employment
39	Coastal management	30	Saving the sea
40	Tides and currents	24	Tides and currents
41	Marine and civil engineering	22	Coastal engineering
42	Saving water environments	28, 29, 30	Trashing the sea, Sea water quality, Saving the sea
43	Recreational and community groups	00, 30	Introduction, Saving the sea
44	Shipwrecks and salvage	32	Shipwrecks
45	Basic navigation	07	Boating
46	Marine disasters	28, 32	Trashing the sea, Shipwrecks