Marine Biology

Companion Album

Lisa Kelly

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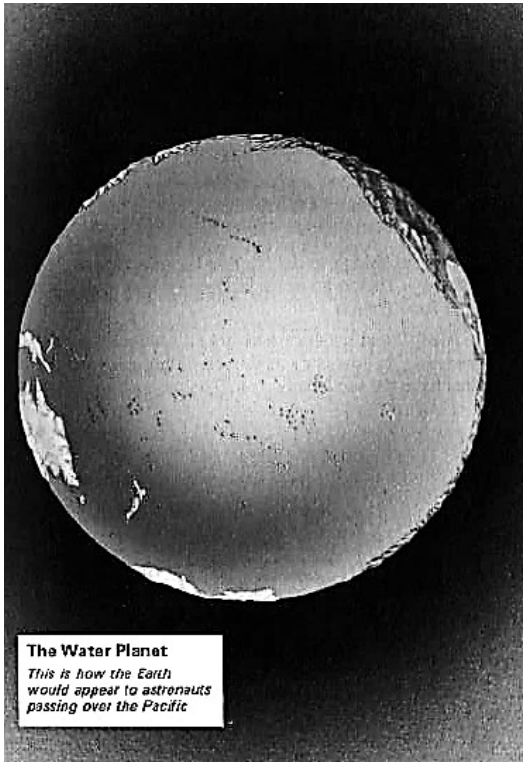
Understanding the Sea



Written by Denis Sanderson

Ladybird Book Series

Reformatted and slightly edited by Lisa Kelly

EXPLORING THE SEA

A great era of exploration is now well under way. Men have reached the moon, and may soon be travelling to other planets. But did you know that almost three-quarters of our own planet is still unexplored?

Nearly three-quarters of our world is covered by seas and oceans, and we are only just beginning to explore this world of the seas. In I960, the bathyscaphe Trieste descended to 11,000 meters (35 T KOO ft.) — the bottom of the deepest part of the Pacific Ocean (the Mariana Trench, near the Philippine Islands) and the invention of the aqualung* has enabled divers to begin exploring the more shallow parts of the sea.

However, it is not only in the deep oceans that new discoveries are being made. The shallow waters of the sea shore also offer opportunities for discovery. Much is still to be learnt about the lives and habits of many of the commonest sea creatures.

Every low tide on a rocky shore will reveal animals stranger than any to be found on land. Some have developed methods of hunting, killing and eating which no land animal has ever used.

It would be quite wrong to think that scientists have learnt all that there is to learn about these creatures, since there are too few scientists available for the study of the seashore.

This book will help you to make some discoveries of your own.

*Another name for SCUBA gear.

ANIMAL LIFE OF THE SEA

All animal life can be classified into groups called phyla. One group is called a phylum, and all the animals in a single phylum have a basic similarity of pattern. All phyla are to be found in the sea, and ten of the most

important ones are shown in the picture below.

The **Protozoa** are simple one-celled animals which can be seen only under a microscope. They are an important source of food for many larger creatures.

Sponges belong to the **Porifera** (meaning 'pore- bearing'). They draw water in through their pores and filter food from it.

Jellyfish and sea anemones are all **Coelenterates** (meaning 'hollow gut'). Although differing in their habits, they have the same body plan. The sea-urchins and starfish are the **Echinoderms** or 'hedgehog-skinned' animals. Although they seem different from each other, they too have a similar plan.

Of the twenty-two animal phyla, ten are wormlike. The most important marine worms are the **Annelids** (Latin— "rings"), whose bodies are divided into a series of

compartments. *__Nematodes__ are roundworms.

The **Arthropods** (meaning "jointed legs") include creatures as different in appearance as lobsters and barnacles. The **Mollusks**, too, differ widely. Most of them, such as whelks or mussels, have shells, but octopuses and squids are also Mollusks.

All these animals are completely without real bones. We call them **Invertebrates**. In the sea, only the fish, a few mammals, and some marine reptiles have true skeletons. They are the **Vertebrates**.

PLANKTON AND FOOD CHAINS

Plankton is the name given to the microscopic animals and plants which drift in millions through the upper layers of the sea. (The name comes from a Greek word meaning "wanderers".) They are aptly named,

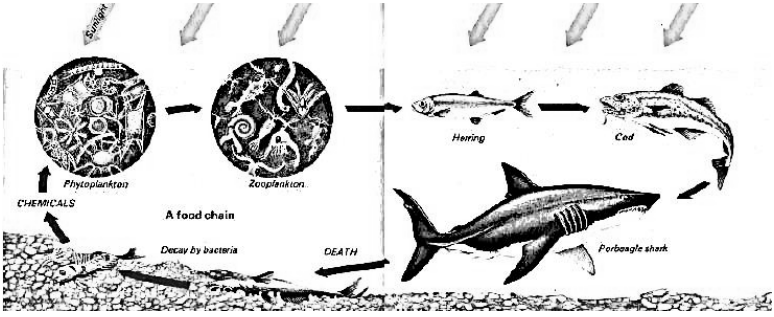
for although they are unable to swim of their own accord, they may drift for hundreds of kilometers on the currents and tides.

The tiny plants arc called **phytoplankton**. They live by absorbing chemicals from the sea. Like all plants they are able to use energy from sunlight in order to convert chemicals into food. This process is called **photosynthesis**. It is something that only plants can do.

The phytoplankton are eaten by tiny creatures called **zooplankton**. These in turn are the main food supply for many small fish like the herring. In their turn the herring are eaten by larger fish. This is called a **food chain**. Eventually it ends at a very large fish such as the shark. No other creature eats the shark.

When the shark dies its body decays and the chemicals from it are returned to the water. These are again absorbed by the phytoplankton and the chain starts again.

Without the phytoplankton's ability to absorb chemicals the chain would be incomplete, and no animal life would be able to exist in the sea. That is why these tiny plants are sometimes called “the grass of the sea”.



SEASONS AND THE SEA

The countless millions of creatures which die every year provide a vast store of chemicals near the bottom of the sea. During the summer the water near the surface becomes warmed but the depths remain cold. The boundary between the warm and cold layers is quite distinct, and is called a **thermocline**.

The great store of chemicals is trapped below it.

The winter gales, however, churn up the sea, breaking the thermocline and bringing the stored chemicals to the surface. Although this food is now available to the phytoplankton, the weak sunlight does not have sufficient energy to enable them to make use of it.

The coming of spring brings sunnier days and the phytoplankton suddenly increase, using the chemicals and sunlight. Fish and other creatures begin to spawn, and their young join the zooplankton in millions.

To take only one example, one turbot alone may lay anything from five to ten million eggs. The newly-hatched fish feed on the plankton nearby which, in consequence, is quickly used up, and by the end of spring has reached its lowest limit. Lacking food and falling prey to young jellyfish, crabs, etc., the millions of young turbot will have been reduced to about twenty.

Summer comes, and the surface of the sea warms up again, trapping the nutritious chemicals below the thermocline, where they will remain stored until the winter gales (or currents such as the Humboldt Current off South America) bring them to the surface and the cycle begins again.

TIDES AND THE SEA SHORE

Strictly speaking, the sea shore is the area between the highest and lowest spring tides. Spring tides have nothing to do with the season of spring. In fact they are just exceptionally high and low tides.

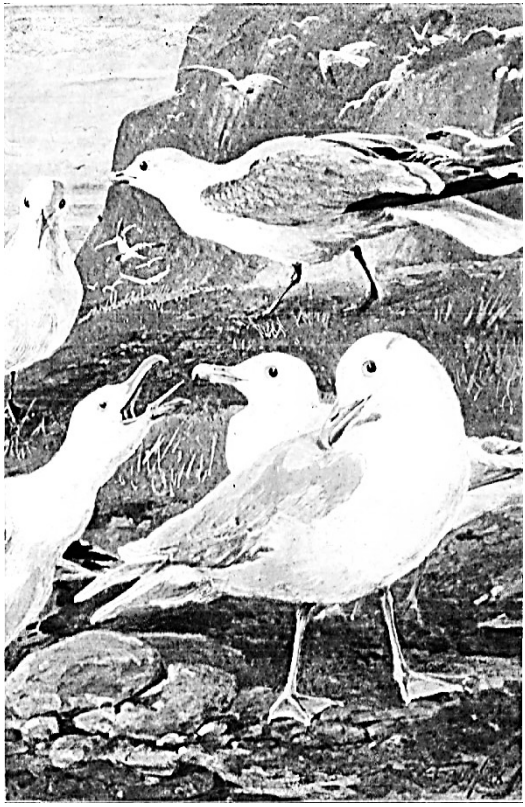
Tides are caused by the gravitational pull of the sun and moon. When they both pull in the same direction they cause a **spring** tide which occurs about once a fortnight. When they are pulling against each other a very small tide occurs. This is called a **neap** tide.

Before planning a trip to the shore it is advisable to consult a tide-table. You can buy one at a stationer's or the tides may be given in your local newspaper. Choose a day when there is a spring tide. This will uncover parts of the shore which would be under water at any other tide. Near the low tide mark you will find a host of creatures which are not found higher up the shore.

Start by turning over some large stones. Underneath you are certain to find starfish and crabs of various kinds. You may find small fish like the blenny, butter fish or sea-scorpion.

When you have finished examining a rock, be sure to turn it right way up again, otherwise many small creatures which live on the underside will die when exposed to the air and sun.

On the Seashore



Written by R. Cadwallader Smith

Cassell's "Eyes and No Eyes" series

Book VII

Reformatted and slightly edited by Lisa Kelly

LESSON I

FIVE-FINGERED JACK

What fun it is down by the sea at low tide! Scrambling among the slippery rocks, we quickly fill a bucket with curious things. Some are dead, others very much alive; but all have a story to tell us--the story of the life they lead on the bed of the sea, or among the sands and rocks of the shore.

Look, here is a Starfish! It is lying on the sand, left high and dry by the waves, for now the tide is low. The Starfish looks limp and lifeless; its five reddish-colored "arms" are quite still.

We know it is an animal that lives in the sea, and dies when washed ashore. But what does it do in the sea? How does it move without legs or fins? How can it live without a head? Has it a mouth? What does it eat, and how does it find its food?

Like so many other sea-animals, the Starfish is a puzzle. Some of its little tricks puzzled clever people until quite lately. But we know most of its secrets now.

Pass your finger down one of its arms, or **rays**. It feels rough, being covered with knobs and prickles. Now turn the Starfish over, and look carefully at its underside. In the center, where the five arms meet, is the animal's mouth, a harmless sort of mouth, you would think, too small to be of much use. Really, it is a terrible mouth, the mouth of an ogre!

We notice a groove down the center of each ray. But what are those little moving things which bend this way and that, as if feeling for something? Now that is exactly what they are doing. They are the feet of the Starfish. Each tiny foot is really a hollow tube, which can be pushed out or drawn in. At the tip of each is a powerful sucker, which acts rather like those leather suckers boys sometimes play with. Suppose the Starfish wishes to take a walk along the bed of the sea. First, it pushes out

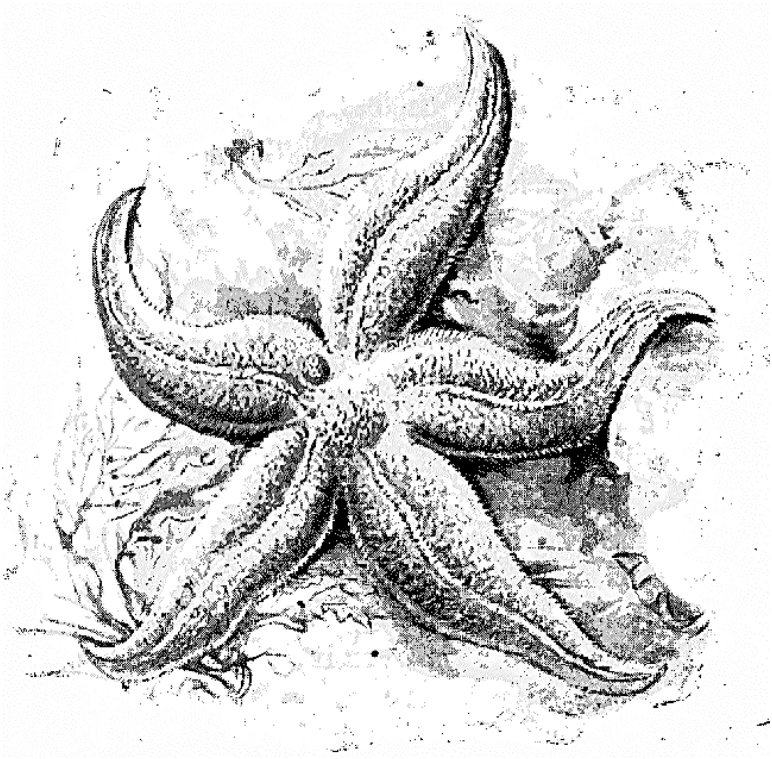
its tube-feet. Each sucker fixes itself to a stone or other object, and then the animal can draw its body along. You will see presently that the suckers can do other work too.

Our Starfish will die, however, unless we carry it to a pool. Before doing so, we must look at the tip of each ray for a small reddish spot. That is the Starfish's eye. Are those little eyes of much use in helping the creature to find its dinner? I think not. Most likely the Starfish *smells* its way.

If we put the animal on its back in a rock-pool we shall see the tube-feet at work. Once in the water our Starfish revives, and makes efforts to right itself. Can it turn over and crawl away?

The little tube-feet come out of their holes and begin to bend about. Now those near the edge of one "arm" feel the ground. Each tiny sucker at once takes hold, more and more of them touch the ground as the ray is turned right side up, and at last the Starfish turns over, and, slowly but surely, glides away.

Stones, shells, or rocks do not stop it. The rays slide up and over them. If we had feet like those of the Starfish, a journey up the wall of a house, over the roof, and down again, would be nothing to us. Nature gives all creatures the kind of foot which suits the life they lead. And it is hard to imagine feet more useful to the Starfish than those wonderful sucker-feet!



Common Five-Fingered Starfish

Ask any fisherman what he thinks of the "harmless" Starfish, and he will call it a pest and a nuisance. "It gets into the crab traps," he says, "and eats all the bait. And when we are line-fishing it sucks the bait off our hooks, and sometimes swallows hook and all." Small wonder that Five-fingers, or Five-fingered Jack, as it is called, has no friend among fisher-folk.

On pulling up a useless Starfish instead of a real fish, the fisherman tears the offender in half and throws the halves back into the waves. By doing this he harms himself more than the Starfish! Each half grows into a perfect Starfish with five rays complete. We can say that each part of this animal has a separate life, for each part can grow when torn away.

If you were asked to open an oyster you would need tools, would you not? Even with an oyster-knife it is not always an easy job. The oyster, tight in his shelly fortress, seems safe from the attack of a weak Starfish. Yet

the Starfish opens and eats oysters as part of its everyday life.

Finding a nice fat oyster, it sets to work. The Starfish folds its rays over its victim, with its mouth against the edge where the shells meet. The tug-of-war begins. The Starfish's tube-feet try to pull the shells apart; the oyster, with all its strength, tries to keep them shut. It is stronger than its enemy, and yet the steady pull of hundreds of suckers is more than it can stand, and the shells, after a time, begin to gape a little.

Now a strange thing happens. The mouth of the Starfish opens into a kind of bag which slips between the oyster shells. The Starfish, as it were, turns itself inside-out! It then eats the oyster and leaves the clean shell.

Mussels are smaller, so they are eaten in a different way. The Starfish merely presses the mussel into its mouth, cleans out the shells, and throws them away. Were we not right to call this wonderful mouth the mouth of an ogre?

Oysters, as you know, are so valuable that we rear them in special "beds." Along comes the hungry Starfish, with thousands of its relations, finding the fat oysters very good eating. They do great damage in our oyster-fisheries, and it is one long battle between them and the keepers of the "beds."

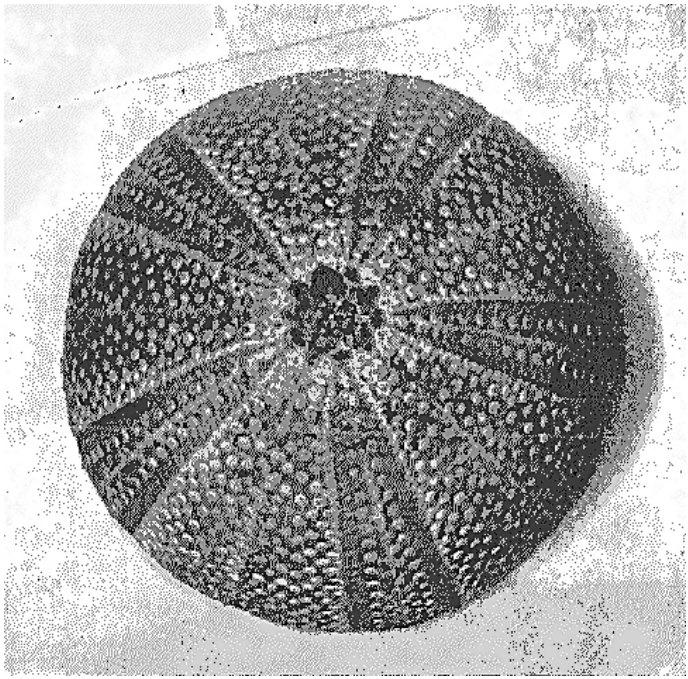
Supporting the tough skin of Five-fingered Jack is a wonderful skeleton. It is like a network of fine plates and rods made of lime. Perhaps you have seen one in a museum.

Five-fingers has a great number of cousins, some of them common enough along our shores. One of the strangest is the Brittle Star. On first seeing one of these animals I tried to capture it by holding its long, wriggling arms. At once the arms broke off. Then I tried to scoop the creature out of its watery home. But it began to break its "rays" off as if they were of no value whatever. To my surprise, the broken "rays" broke again while wriggling on the ground. This is a strange habit, is it not? Perhaps the Brittle Star has found this dodge

useful in escaping from enemies. Anyhow, the loss of an arm or two matters little, for others grow in their place.

Another cousin of the Starfish is the Sea-urchin, a round prickly creature rather like the burr of the sweet-chestnut tree. This mass of prickles is not a vegetable; he is very much alive. Nature has given many plants and animals these prickles, like fixed bayonets, for a defense against their enemies. You will at once think of the gorse and the hedgehog, or urchin, as some people call it. Our little Sea-urchin has prickles, like the hedgehog, but he is really unlike any other living creature, except, perhaps, the Starfish.

If you were to roll up a Starfish into a ball, and then stick about three thousand spines on the ball thus made, you would have a creature looking rather like a Sea-urchin.



Test or Shell of a Sea-Urchin

Beneath the mass of spines there is a hard **test** or shell, made of plates joined closely together; this is the skeleton of the Sea-urchin. Sometimes you find this strange shell on the seashore, rather dirty, and not always sweet-smelling. You might also find Sea-urchins half-dead, washed into the rock-pools. The shells are wonderful objects, so you should clean them in fresh water; they are well worth the trouble of taking home.

All over the shell you will see little rounded knobs. These show where the spines were fixed on; each spine fits into a hole in the shell, but so loosely that it is able to move about. The Sea-urchin can walk by moving its spines, tilting its body along from one place to another on the bed of the sea. It can do much more than that. Like its cousin the Starfish, it has numerous tube-feet, so you would not be surprised to see this prickly ball walk up the face of a rock.

The tube-feet, or sucker-feet, are fixed to the shell in much the same way as the spines. They can be bent this way or that. If the Urchin is on a rock he clings tightly with these sucker-feet; then, if he wishes to move away, you will see the long thin tubes stretch out and bend about. They fix themselves to the rock, and the animal is drawn along.

Besides these spines and suckers, the Sea-urchin owns another set of tools. Scattered over it, among the spines, are many tiny rods tipped with little teeth or pincers. You will not

be able to see them, except under a magnifying glass. Of what use are these strange little pincers or rods? It is thought that the Urchin uses them in several ways. They may help in capturing small prey, or they may be used when the creature has to fight a larger enemy. They are also certainly of use as cleansing tools. That is to say, they can pick off tiny scraps of weed or dirt which settle on the animal's body. Some Starfishes also own pincers of this sort, but they are not so perfect as those of the funny little Urchin. We must not forget that all these spines, tube-feet, and pincers are worked by a set of muscles.

In the center of the Urchin's shell is its mouth. The Starfish, we found, had a terrible mouth, but that of the Urchin is worse still. Not only is it of great size, but it is fitted with strong jaws and five long, sharp teeth, you may see them poking out from the mouth of the animal, and feel for yourself how hard they are.

There is a great deal more to know about Five-fingers; and the Sea-urchin still has his secrets which no one can explain. We have but glanced at their story in this lesson; but you can see that the Starfish, lying limp on the sands, is not as dull as it looks.

EXERCISES

1. Where is the mouth of the Starfish placed?

2. Describe how the Starfish moves.

3. How does the Starfish feed on the oyster?

4. Why is the *Brittle* Star given that name?

5. How do the Starfish and Sea-urchin keep themselves clean?