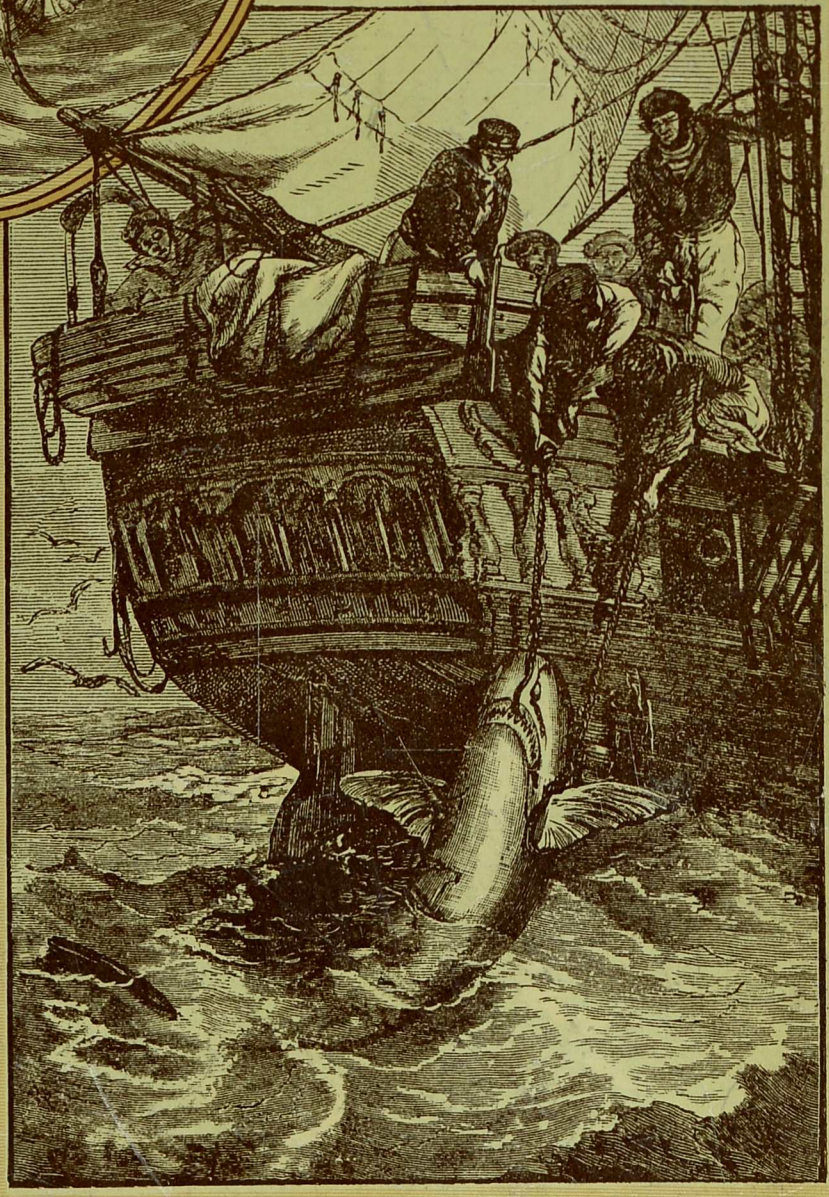




# THE SEA & Its Wonders



Book  
FOR THE  
Young

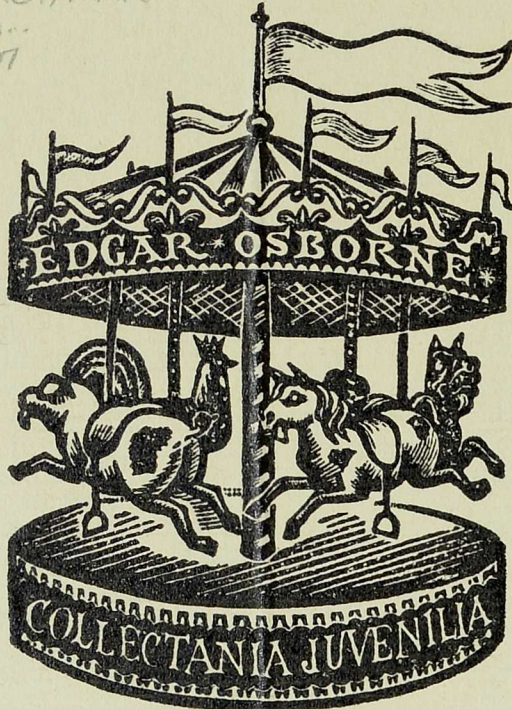
By  
MARY & ELIZABETH KIRBY\*



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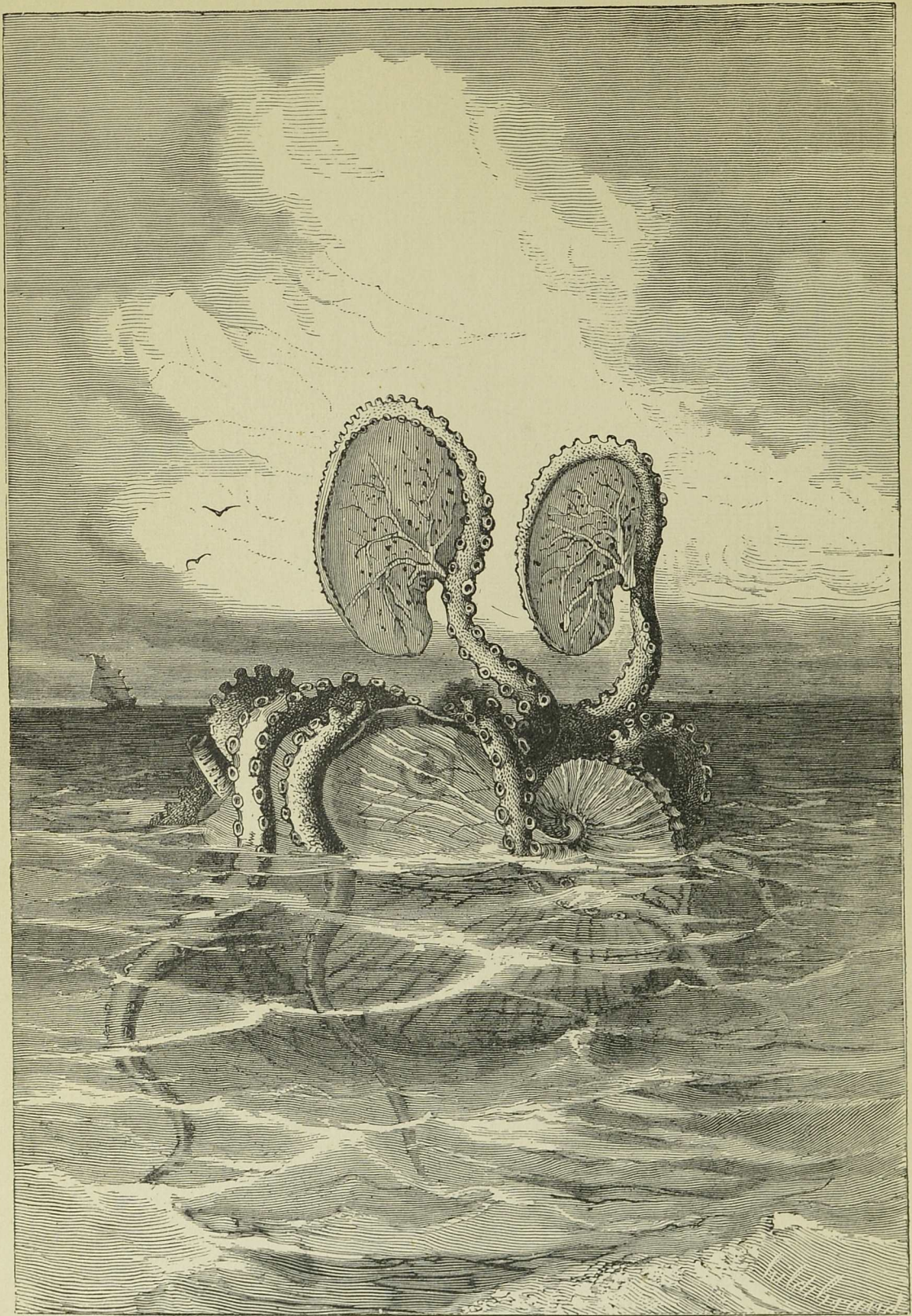


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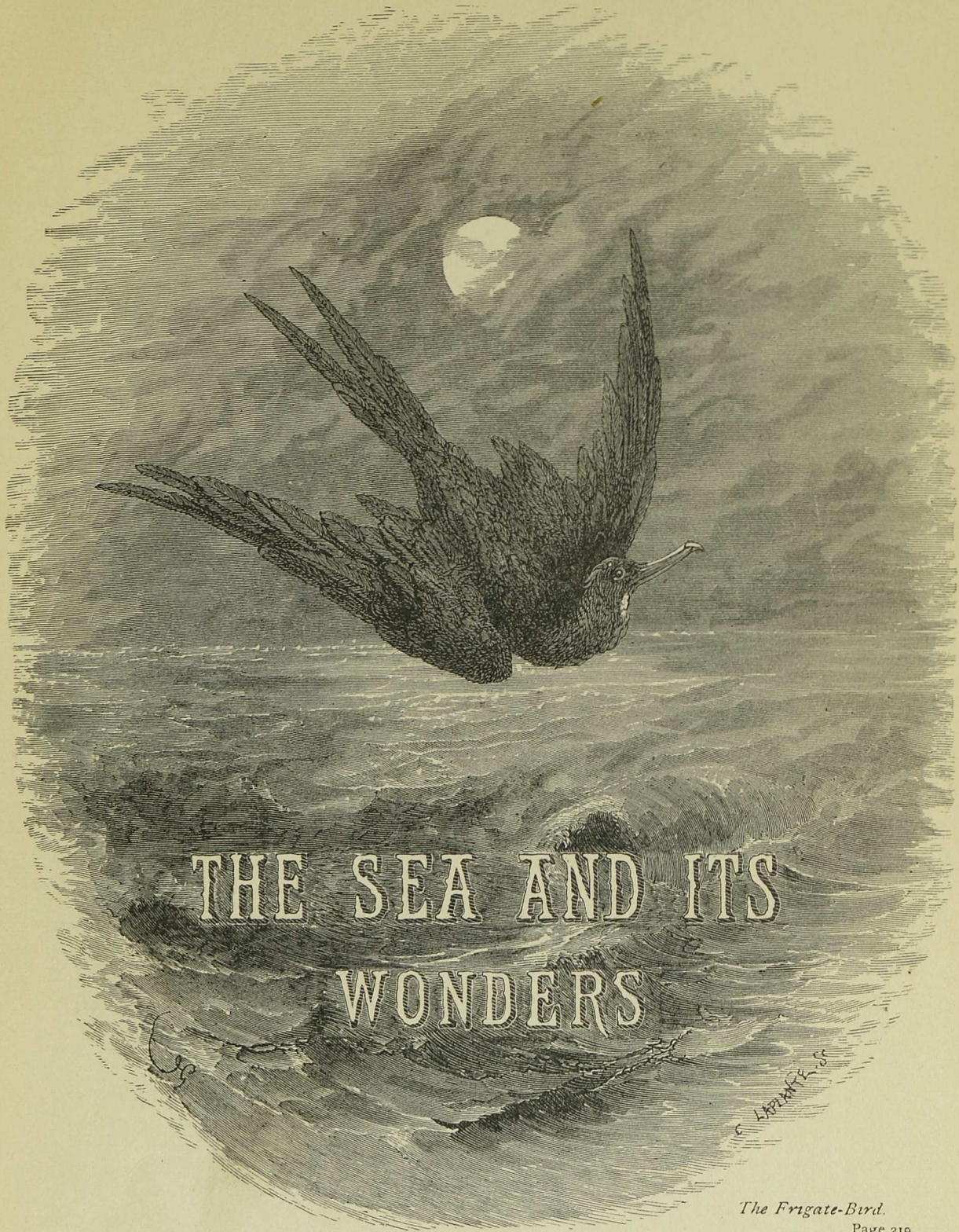








THE ARGONAUT IN THE OPEN SEA.



THE SEA AND ITS  
WONDERS

C. LEITCH '53

*The Frigate-Bird.*  
Page 219





# THE SEA

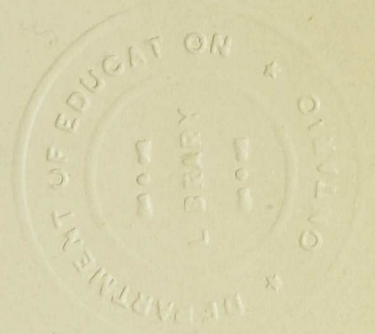
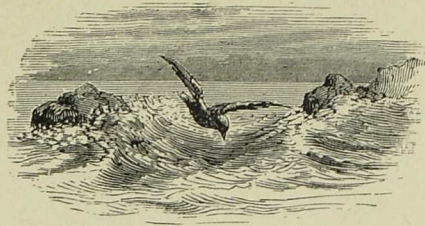
## AND ITS WONDERS.

A COMPANION VOLUME TO "THE WORLD AT HOME."

BY

Mary and Elizabeth Kirby,

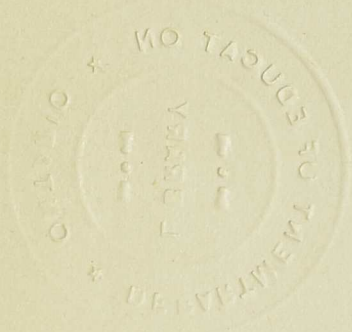
AUTHORS OF "THINGS IN THE FOREST," ETC.



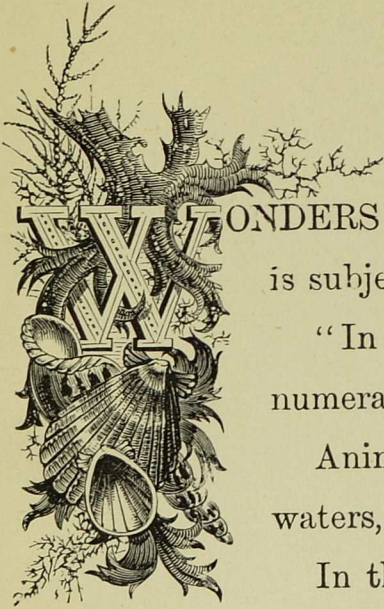
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## Preface.



WONDERS abound in the Ocean. It is a world in itself, and is subject to its own laws.

“In this great and wide sea are creeping things innumerable, both small and great.”

Animals, plants, and insects have a home within its waters, far beyond the domain or even the reach of Man.

In the present Volume—a Companion Volume to “The World at Home”—the Wonders of the Sea are brought under the reader’s notice.

The fantastic forms and shining creatures that people the recesses of the Deep are here placed before him.

The object aimed at has been to allure him to the study of the great book of Nature, rather than to perplex him with a strictly scientific arrangement.

The various chapters are amply illustrated with Drawings taken from life, and on which the utmost care has been bestowed.

M. AND E. K.



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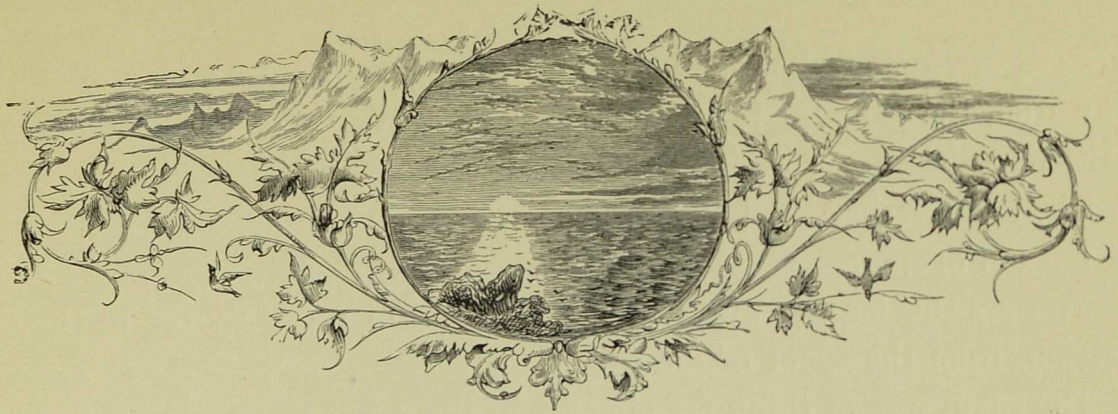
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# THE SEA AND ITS WONDERS.

---

## CURRENTS IN THE SEA.

A MODERN writer has said that the waters are the greatest travellers upon the face of the earth.

They go up by the mountains, and down by the valleys. They are always on the move, ever restless, and ever changing.

They move about by currents. A current is like a river in the ocean, that goes winding on, in its own proper route, starting from its own point and reaching its own haven.

The great wide sea is full of currents. Some of them are icy cold ; others are warm and genial.

In the seas of the Torrid Zone, the water is warm on the surface. But it is not warm below. At some depth the water is very cold.

It is cold, because an icy current is flowing beneath. This current comes from the Poles, and flows to the Equator.

It flows beneath, because its coldness makes it heavy. Heat expands bodies, and makes them light and buoyant. Cold condenses and makes them heavy.

The water on the surface of the sea is heated by the rays of the sun,

and goes streaming along and making warm currents. These currents flow away from the Equator to the Poles. The heavy current beneath goes just in the opposite direction, from the Poles to the Equator.

There is another kind of movement going on in the sea.

I mean evaporation.

You see this happen every day. Particles of water fly off, in the shape of steam, from the spout of the tea-kettle.

The same sort of thing is going on in the sea.

Particles keep flying off, drawn up, as it were, by the heat of the sun. They rise into the air, and, for a time at least, are gone.

By-and-by we shall hear a little more about them.

As the surface water keeps flying off in evaporation, the water from below rises to take its place.

This also evaporates in its turn. Thus the waters keep ascending and descending. And, in the great body of the ocean, a constant movement, or circulation, is going on.

---

## RAIN AND DEW.

I AM going to tell you about the travels of the waters through the vast region of the air.

The particles which have flown off from the bosom of the ocean, rise, as we have seen, and appear for the moment to be gone.

But their work is only just begun. Let us follow them in their wonderful career. For they will descend again in rain, in dew, in hail, and in snow.

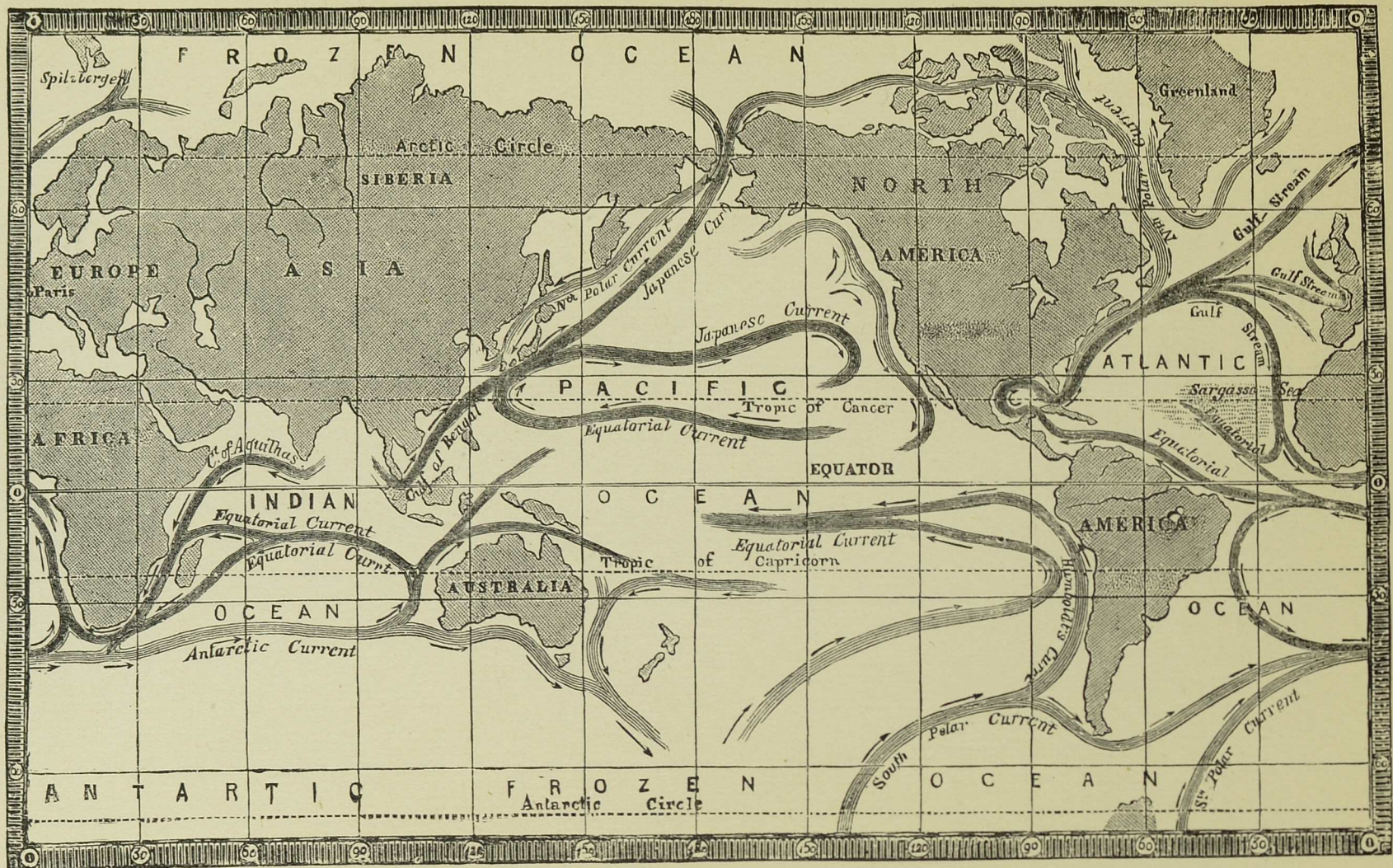
How beautiful is the dew!

Have you not seen it sparkling on the grass like diamonds?

It came from the vast storehouse in the air, and was supplied by the particles that flew off from the bosom of the ocean.

But how did it come upon the blades of grass?

In obedience to one of Nature's laws.



MAP OF CURRENTS IN THE SEA



Every kind of body, whether animal or plant, or stick or stone, has in it a certain amount of heat, or, as it is called, caloric.

During the night, each blade of grass has been giving out a portion of heat into the air, but receiving none from the air again. And the earth, on which the grass is growing, can give but very little warmth to replace that which is gone. So that the blades of grass become colder than the air. In this state of coldness they cannot take in the moisture that comes upon them from the atmosphere. So it is deposited upon them in pearly drops, called dew.

If there are clouds in the sky, the clouds throw back the heat to the earth, and prevent it from being lost in space. Thus on cloudy nights there is little or no dew.

In windy weather, there can be no dew. The air next to the ground is constantly being blown away, before it has time to get cold enough to deposit dew. Consequently there is none.

You have seen the clouds floating about in the sky. Sometimes they are light and fleecy; sometimes heavy and dark. Often the setting sun will paint them with gold and purple and crimson.

What makes the clouds?

Those same particles which have flown from the bosom of the ocean. When a warm current of air is carried into a cold region, by the winds, the particles condense and become visible to us.

They become, in fact, a *cloud*.

Thin wreaths of clouds are sometimes seen floating on the tops of the highest mountains.

Currents of air have carried them thus high above their ancient home in the waters.

Sometimes the cloud goes on getting more and more moisture. It becomes too heavy to float in the air, and it descends in rain; or else congeals, and falls in snow or hail.

The rain, which has been thus discharged, waters the earth.

“He watereth the hills from his chambers.”

## SPRINGS AND FOUNTAINS.

I HAVE not yet done with the vapours that rise up from the bosom of the ocean.

We have seen that they form dew, and clouds, and rain. But their career is not ended.

They supply the sources of springs or brooks.

When the rain falls on a light soil, it sinks in, and is absorbed by the earth. It keeps sinking deeper and deeper, till it reaches some spot where it can get no further. The water settles in this spot, as in a kind of basin.

Other rains come, and sink in the same basin. Thus the basin gets full.

Then the water will force its way, by degrees, to some outlet, and become a spring. If the water that feeds the spring comes down from a mountain, or has but a little way to sink through the ground, the spring, when it gushes out, will be cold. But if the water that feeds the spring has to sink to a great depth in the earth, it becomes heated, and the spring comes forth as a hot spring.

For I must tell you that the earth gets warmer the deeper you penetrate into it. This is a matter of daily experience.

The colliers who are at work in a coal-pit feel oppressed by the heat which comes from below. And at a very much lower depth than the coal-pit all the water would actually boil. Nay, if we went lower still, right through the crust of the earth, the very rocks would be melted.

So you can well understand what it is which makes the water gush forth as a hot spring.

And there is another kind of spring, which is of the greatest use to us. I mean a medicinal spring.

In this case the water, in its progress, has become mixed with a variety of mineral particles. Some of these particles have a medicinal property.

When the spring gushes forth, its waters may be called healing waters. People flock to them, to bathe their crippled limbs, or to drink the draught which is as good as medicine.

Thus you see how simple are the materials with which Nature works her greatest wonders—out of which she fashions clouds, and rain, and springs, and fountains, for the comfort and the health of man!

---

## CURRENTS IN THE AIR—THE TRADE-WIND.

NOTHING seems to us so changeable and uncertain as the wind.

It literally “bloweth where it listeth,” and is out of the reach and control of man.

But even the winds are subject to laws, in the great economy of Nature; and travel, not by chance, but each in its own track.

In the Torrid Zone, the heated air rises high in column-like shapes, and flows towards the Poles.

All the time, cold currents of air are flowing from the icy Poles towards the Equator, and fill up the space from which the heated air has gone.

Thus there is a constant movement, or circulation, as well in the regions of the air as in the sea.

By this means the atmosphere is kept pure.

If there were no causes to hinder them, the winds or currents of air would always flow in this way from north to south.

But as the ocean currents are turned from their course by various obstacles, so it is with the winds.

Several causes help to alter their course, and incline them to the west, instead of due north and south.

I can mention one of them.

The daily movement of the earth on its axis.

The earth, as you know, keeps turning round from west to east, and bringing us alternate day and night.

Now, the winds, of which I am speaking, come rushing from the Poles to the Equator. As they approach it, they become affected by this movement of the earth.

The earth travels faster than they do, so that they are left behind, and driven out of their straight course.

The earth is going east, and they incline to the west.

These two currents, from the North and South Poles, meet each other in the Tropics, and form one great current which goes from east to west.

This is the trade-wind.

It is called the trade-wind, because trading vessels used to be driven along by it. In those days, steam-ships were not invented, and sailors depended wholly on the wind.

When Columbus was sailing towards the New World, he got into the track of the trade-wind.

He began to be frightened. He thought, if the wind always blew in one direction, how could he get back?

Another traveller sailed round the world, blown gently along by the trade-wind.

He came from Portugal, and his name was Magelhaens.

He went sailing on, over a vast ocean, that was as smooth and placid as could be.

He called it the Pacific Ocean, because it was so calm.

But the trade-wind meets with many things to oppose it.

Great pieces of land, called continents, come in its path.

In the Indian Ocean it is broken up, and blows six months one way, and six months another.

Then it is called the monsoon.

I will tell you the reason why the trade-wind cannot always blow one way. It is interfered with and forced back by columns of air.

The monsoon, or trade-wind if you like to call it so, has been blowing six months from the north-east.

Now the plains of Asia glow with the burning rays of the sun. The air gets hot, and rises, as it always does when in a heated state.

It would leave a void, but this Nature does not permit.

Columns of air rush from the Equator to fill up the space.

These columns meet the trade-wind and drive it back. They make it



take a different course, and blow from the south-west instead of from the north-east.

This change in the monsoon does not take place all at once.

The land requires a little time to heat and to cool.

When it is going to change, the weather becomes unsettled. Black clouds get up in the sky. There are flashes of lightning and peals of thunder, more terrific than ever we have in England. The waves toss about, and are covered with foam. Rain falls in torrents. There are great floods; and on the land, houses are swept away by the fury of the tempest.

---

## THE OPEN SEA.

PEOPLE who go out to hunt for whales, in the Arctic Seas, have a very useful custom.

Each harpoon thrown at the whale, is marked with the name of the ship, and the date when it was thrown.

Thus, when a whale escapes from one ship, and is hunted down by another, people in the second ship can tell how long it is since the animal was wounded.

The harpoon with the name and date is found sticking in its body.

Now, a suggestion occurred to people's minds relating to the whales.

A whale was killed, near Behring's Strait, with an old harpoon in its body.

According to the date, the ship from which the harpoon had been flung was at that time cruising in Baffin's Bay.

If you look at the map, you will see that Baffin's Bay is on one side of the extreme north of America, and Behring's Strait on the other.

How did the whale make its way?

The only route then known was round Cape Horn, or round the Cape of Good Hope.

But there had not been time for the whale to take such a journey. And it was sore wounded and stricken, and had not the strength.

Besides, the whale of the north has not the same habits as the whale of the south. It shuns hot seas and warm regions. It will not get into the Gulf Stream if it can help.

So it could never have gone round by Cape Horn.

It was clear that the whale had found a shorter route, and one which mankind as yet knew not of. It had found a north-west passage from one ocean to another.

And another thing was also as clear as daylight. There must have been open water for the whale to swim in.

An open sea round the North Pole!

But no human eye had ever beheld that sea. Some people laughed at it, and said it was a fable.

How could there be an open sea in that dreary region of ice and snow?

Had not ships been set fast, and had not brave men died of cold and hunger?

Yes; but still there were winged messengers which kept on saying, again and again, that such a thing must be.

The messengers were the birds. The birds flew north, instead of south, to escape the winter.

Where did the birds all fly to? Surely not to eternal ice and snow!

There was a young American, whose heart was set on finding the open sea.

His name was Elisha Kane. He had the title of Dr. Kane given to him.

He had thought of the subject, and studied it, till it possessed his whole mind. He resolved to set out on a voyage of discovery.

The people of America were very much interested in the success of this voyage.

Two ships were presented to Dr. Kane, and sailors came forward, and placed themselves under his command. Even ladies worked, with their own hands, to raise money for the expedition.

Three things were promised by the crew of Dr. Kane.

Implicit obedience, abstinence from intoxicating liquors, and from profane language.

Thus supported and encouraged, Dr. Kane set out on his first expedition. It failed. But the American people did not despair. Neither did Dr. Kane.



DR. KANE.

Another expedition was set on foot.

This time, the English sent supplies from London. They wished for success on two accounts. They wished to spread the knowledge of the Bible through the most remote regions. And they wished to gain tidings of Sir John Franklin, who had been lost in his attempt to find out the North-West Passage.

This second expedition set out under the command of Dr. Kane.

Dr. Kane was scarcely thirty years of age; but he had been a great traveller.

He had influence over his men. He was full of hope, and kept assuring them of success. He was strong, and patient, and enduring.

But the powers of the North—ice, and cold, and frost—met and battled with him at every step. Winter overtook him speedily. He was shut up six months in the ice.

The second winter found him still searching in those frightful regions.

It killed nearly all his men. Only eight were left alive. If it had not been for the kindness of the Esquimaux, he must have perished.

The hearts of his men began to fail them. They wanted to turn back.

Their captain had promised them an open sea—a grand discovery; and to return crowned with glory.

But where was the open sea to be found?

The third winter came. He had scarcely a friend or follower left. He had to depend entirely on the Esquimaux.

In this desperate state, success was at hand.

His men went out, one day, on an expedition. They pushed forward, perhaps with the energy of despair. All at once, behold, there was the open sea!

The open sea, after which they had sought so long and painfully, rolled at their feet. There were great waves dashing on the shore.

The air was milder and more genial. And there were the sea-birds skimming the surface of the deep.

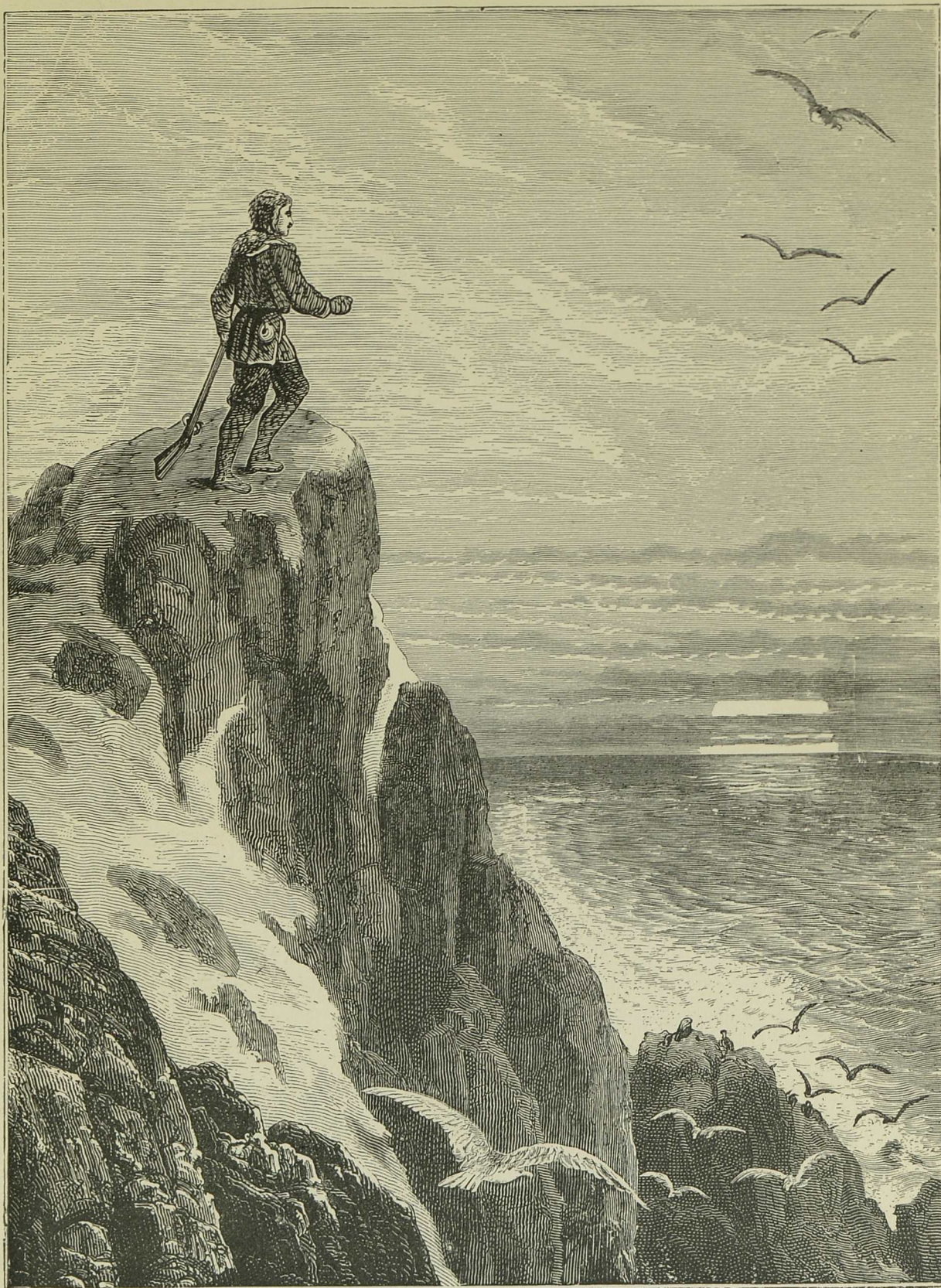
Yes; the very birds which had gone to the north to escape the cold!

The discovery was made; but it was bought with life.

Dr. Kane had scarce strength to quit this region where he had suffered so much.

He was successful, indeed. He had approached nearer to the Pole than any other man.

But nature could do no more—he reached a milder climate, but, alas! it was only to die!



THE OPEN SEA.



## THE GULF STREAM.

THERE is a broad stream flowing in the midst of the ocean. It does not mix with the rest of the sea. Its colour is different. In some parts of its course it is vividly marked by a deep blue tint.

You may see the line where, on either side, it touches the surrounding waves. A vessel will sometimes be half in the stream, and half out of it.

The stream is so warm, that to get into it is like getting into summer.

It happens now and then that a ship's crew, tired with battling with the winds, and half frozen with cold, will run their vessel into it. Here they find warmth and comfort, and can bathe their benumbed limbs in its kindly waters. Then they can start on their voyage with renewed energy and strength.

This mighty stream flows round the world. It has an influence on the climate of many nations. It has been an object of wonder and interest in all times. It brings warmth, and genial weather, wherever it approaches.

It is a benefactor of the world!

The name of the stream is the Gulf Stream.

It is called so, when it emerges from the Gulf of Mexico.

The Gulf of Mexico is full of hot currents and streams; indeed, it has been said to be like a caldron.

When the Gulf Stream issues from this caldron, it is a rapid current of warm water, which flows across the Atlantic Ocean. When it reaches the Azores, it divides. Part of the stream is driven towards Europe. The other part flows towards the western coast of Africa, and returns to the Equator, from whence it set out.

The stream will have performed a journey of twenty thousand miles.

The Gulf Stream carries many productions of the Tropics to the shores of colder countries.

Tropical fishes are found swimming in its waters. They go along with it to colder regions—keeping in the stream, or else they would die.

Before America was discovered, it brought seeds, and fruits, and trunks of trees from the new and unknown world beyond the sea.

But the warmth it brings is the most important. You would scarcely believe the amount of heat it spreads over the Atlantic, and carries with it to the shores near which it flows.

There are pleasant spots on the coast of France, where invalids can enjoy a summer climate all the year round. Figs and vines grow out of doors, and ripen their fruits.

This is owing to the happy effect of the Gulf Stream.

Further south there are places where the climate is cold and ungenial, and where neither vines nor figs can flourish.

This is owing to the absence of the Gulf Stream.

England itself would be a dreary country without the Gulf Stream. Our ships could never have sailed to every part of the world. For our ports and harbours would have been blocked up by ice.

The Gulf Stream makes itself felt even at Spitzbergen, which, you know, is a great deal further north than Iceland.

It is thought that some such warm current has reached the Pole, and caused the open sea, about which I have told you.

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## THE REGION OF CALMS.

THERE is a region called by the sailors "The Region of Calms."

It lies on either side of the Equator, and forms a belt or zone.

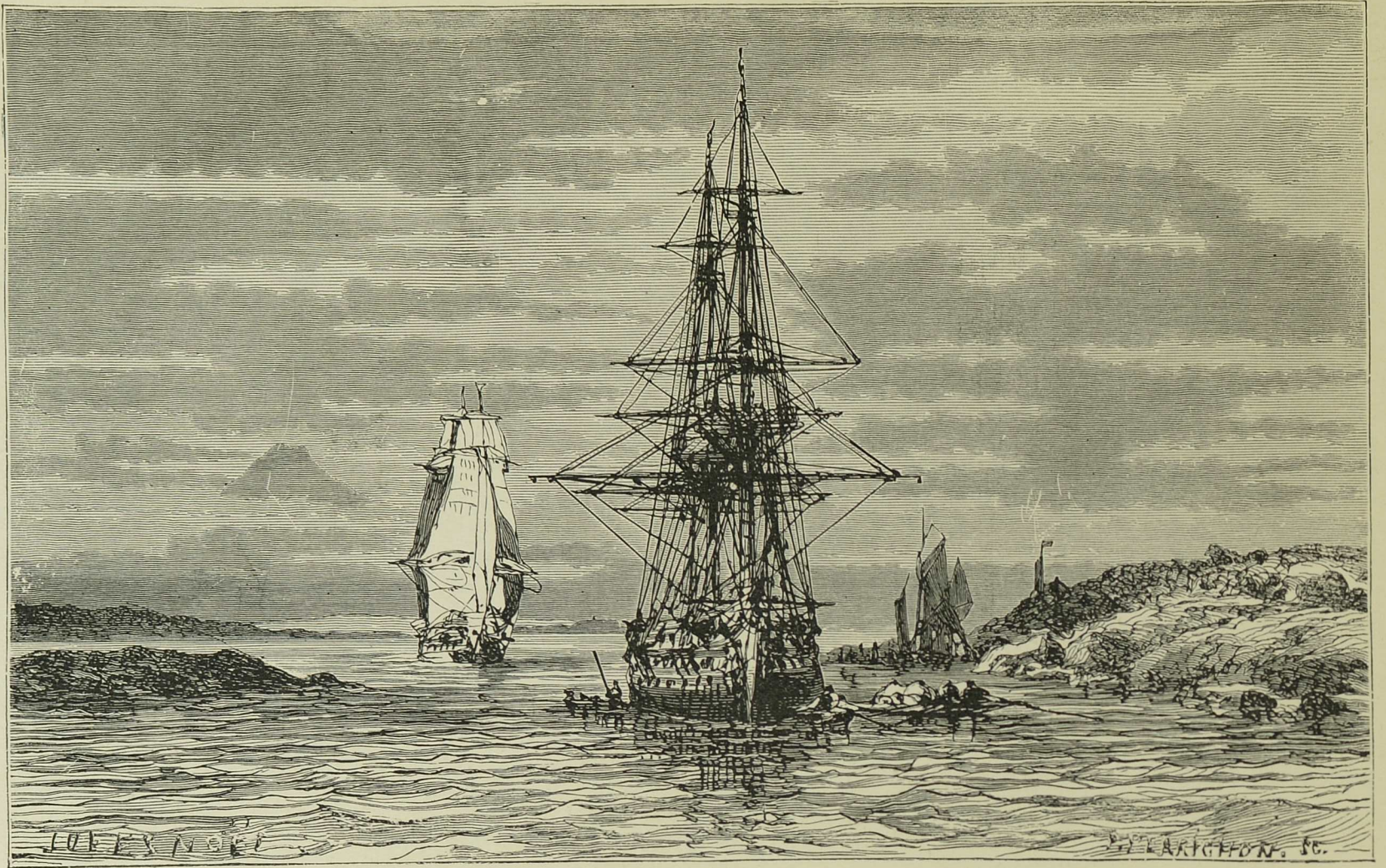
Here reigns a perfect serenity of the atmosphere, a dull, dead calm, that the sailor dreads more than anything.

He has been sailing over a flowing ocean, rippled by the welcome breath of the trade-wind. Overhead, the bright blue sky has been unstreaked by a single cloud.

He leaves this happy region behind. The sky is overcast. The waves cease to be tipped with silver foam.

He comes to a belt of heavy cloud. The winds are hushed, and





GULF OF MEXICO—STARTING-POINT OF THE STREAM



thick vapour hangs undisturbed in the air. The surface of the sea is like lead.

He feels oppressed, and half choked by the atmosphere.

The part of the ocean he is now traversing is called the cloud ring.

A mass of accumulated vapour collects in this ring. It pours down in torrents of rain. The rains are almost unceasing. Sailors can sometimes scoop up fresh water from the surface of the briny deep.

Though it is the region of calms, there will often be frightful storms.

Without any warning, furious tempests will arise, and hurricanes sweep round in a circle.

Happy is the sailor when he turns his back on this unpleasant region, and his good ship once more ploughs the waves, urged onward by the cheering breeze!

“ Down dropped the breeze, the sails dropped down,  
 ’Twas sad as sad could be;  
 And we did speak, only to break  
 The silence of the sea.

“ Day after day, day after day,  
 We stuck, nor breath nor motion;  
 As idle as a painted ship  
 Upon a painted ocean.”

---

## THE MOTIONLESS SEA.

Is there such a thing in the world?

Yes. At one time, winds and storms alone drove ships into its deserted waters. But now, people who go to the gold diggings sail across it.

It is like the Dead Sea. It lies quite out of the usual tracks and roads across the ocean.

Birds drop off from the vessel, when she comes hither.

There has been a flock of feathered companions flying over the deck, or settling on the mast.

The sailor in these lonely seas, far away from sight of land, loves to see the birds. They cheer his solitude.

The sea-gull, the petrel, the albatross keep faithful to the ship.

Often a cloud of birds will surround it. But when the ship gets near to the Motionless Sea, the gull does not like to go any further. The petrel skims away, and is seen no more. The great albatross forsakes the crew, and lags behind.

On the vessel passes, into a region of silence and of death!

The air is still as the grave. There is no note of bird, no hoarse music of the waves. The very waves are dumb!

Where is the Motionless Sea?

In the Southern Ocean. It lies between two great currents of water that are flowing in contrary directions.

One is a stream of icy water from the South Pole. It is so cold that it drives all warmer currents before it, instead of mixing with them.

This cold current makes the South Pole so terrible to visit. Neither man nor beast can live there.

But from the Tropics comes another current, to meet the cold one. This is warm and genial.

There is an angle or corner of ocean between these two currents. And here lies the Motionless Sea.

The cold current is called Humboldt's Current, because the great traveller Humboldt found out where it started from.

You can find it in the map of "currents in the sea."

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## THE CYCLONE.

THERE is nothing which sailors dread so much at sea as a tempest.

In these days, there are signals, called storm-signals, put round the coast of Great Britain, to warn captains of ships when a storm is coming on.

Then, they do not start on their voyage till the storm is over.

Out in the deep wide sea, away from every trace of land, there can be no storm-signals.

But the sailors know very well what is going to happen. They know

there are such things as hurricanes and water-spouts. And they have heard of the terrible cyclone.

What is the cyclone ?

A fierce tempest, or number of tempests, that travel in a circle, sweeping on and bringing desolation with them.

The circle they take is a very wide one. Woe be to the poor ship that comes in their way !

Shall I give you an account of a ship being caught in the cyclone ?

The ship was sailing along in the deep sea, when the waves began to roll about, and toss and foam. The wind blew very fiercely indeed, and rose higher and higher. The ship had to struggle, with all her might, against the waves. All the rigging was torn away, and she soon lay without helm or sail, and the waves dashing over the deck and washing everything away.

What a terrible position to be in !

The captain knew that he had come in the path of the cyclone, but there was no help for it. The ship had to struggle through as she could.

Was the ship wrecked ?

No ; she managed to outride the storm, and reached the port for which she was sailing.

But another and smaller vessel, that was her companion, and was making for the same port, was not so fortunate. In the midst of the storm she was lost sight of.

The captain kept hoping that she might come after him. Every day, the sailors were on the look-out, for the chance of seeing a speck on the horizon, that might turn out to be the missing ship.

Did they ever see the ship again ?

I will tell you what happened.

One day, a sailor called out that he saw something. He thought it was a raft, covered with shipwrecked sailors, and towed along by boats.

The sailors seemed to be waving signals of distress. He felt sure they were the crew of the very ship that was missing.

It was a clear bright morning, and the sun shone down on the smooth

waves. The captain declared that he could see the men quite distinctly. And he sent a steamer off to save them.

The men on board the steamer fancied they heard piteous cries. They thought they could distinguish the drowning men, stretching out their hands, and praying to be saved.

Another minute, and they hoped to rescue them.—But it was a mere delusion.

A number of trees had been torn up by the tempest from the neighbouring shores, and were being driven along by the current. Nothing else was to be seen. The raft and men had vanished away like the mirage of the desert.

Indeed, it was but another kind of mirage, and perhaps even more cruel.

The missing ship was never heard of.

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## THE WIND-SPOUT AND THE WATER-SPOUT.

THERE is the wind-spout, as well as the water-spout. Both are very terrible to meet with.

The wind-spout draws or sucks up the water in the shape of a funnel. A vessel, sometimes, is hurried into the very middle of it. There is no drawing back. She is held in the very grasp of the waters, and seems to be at the bottom of a huge crater of a volcano. There is nothing but darkness around, and a streak of light overhead. Sailors call this dreadful position "the eye of the storm."

All kinds of noises stun the ear. The rattling and groaning of the ship, the roar of the waves, and the howling of the wind are heard on every side.

Every man on board must expect instant death.

But when the ship has been sucked in by the wind-spout, and then held suspended as it were in the air, it is let go. The furious storm passes onward with a roar like thunder. The masts are split and rent, and the men are deafened and half stunned. But the moment of danger has passed.

Is the water-spout like the wind-spout ?

It is perhaps more terrible.

There is a dense thick cloud overhead, the shape of a cone with the point downwards.

The sky grows dark and lurid. The wind begins to whistle and to howl. And then the water-spout bursts. Lightning flashes and thunder



THE WATER-SPOUT.

peals. A cone of the water rises up to meet the cone in the air. The sea is white with foam, and is lashed into fury.

The ship, if it comes that way, is dragged into the midst of the water-spout, and often wrecked.

Sometimes, however, it is said that a vessel has escaped.

How has it escaped ?

By firing right through the water-spout, and so making a way.

But I fear this is a very rare occurrence indeed.

Happily, the water-spout itself is rarely met with, even in the Tropics  
And a water-spout may not always be large and dense enough to  
destroy a ship.

Or if it is large and dense, it may go on its way, and not meet with a  
single ship to destroy.

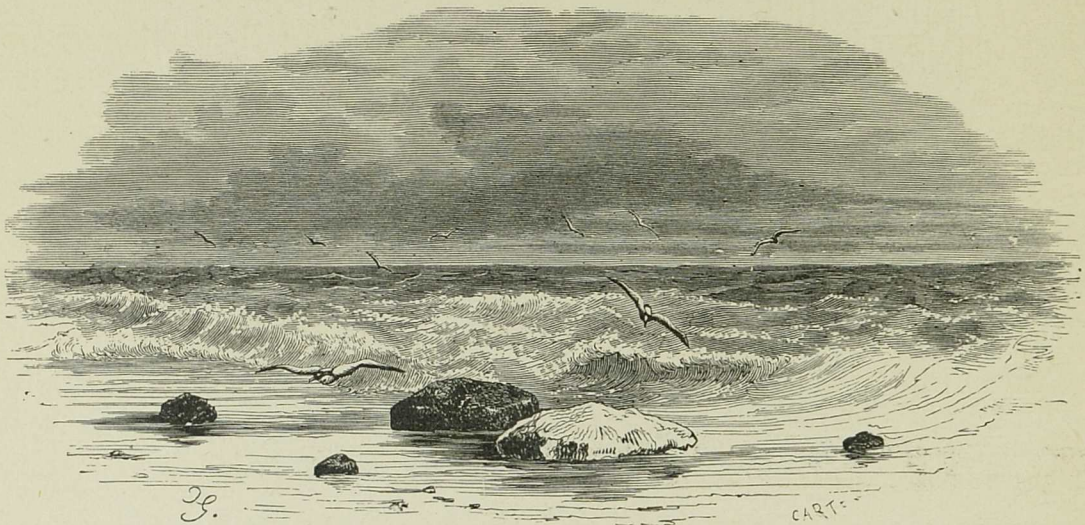
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### A LITTLE ABOUT THE TIDE.

YOU have, no doubt, seen the great Ocean many times. You have watched  
the waves roll in upon the beach, and reach the spot where the tide turns.

Then they would roll back again, as if in obedience to a law that  
never changed.

This movement is called the ebbing and flowing of the *tide*.



THE FLOWING TIDE.

The old writers, and the modern writers as well, have talked and  
thought a great deal about the tide. But all are agreed on one point.  
The great flowing wave, called the tide, is drawn forward, as it were  
out of its place, by the influence of the moon.

I will try to explain this to you.

There is a law in Nature which is called *attraction*.



You may have seen the loadstone or magnet draw a needle to it.

The needle was *attracted* by the loadstone.

If you throw an apple up into the air, it will fall down again to the ground.

Why does it fall?

Because the earth attracts it. It is drawn to the earth, as the needle is to the magnet.

Those active feet of yours are kept to the earth by the law of attraction.

If you gave a spring up into the air, you would very soon come down.

The earth's attraction would bring you down.

Birds, that fly in the air, cannot get beyond the earth's power of attraction. Nothing can. There is a force in the great mass of earth to keep things on its surface. It is one of the wonderful laws of Nature.

Now all bodies have this power of attraction, more or less.

The great body of the moon has it, and so has the sun.

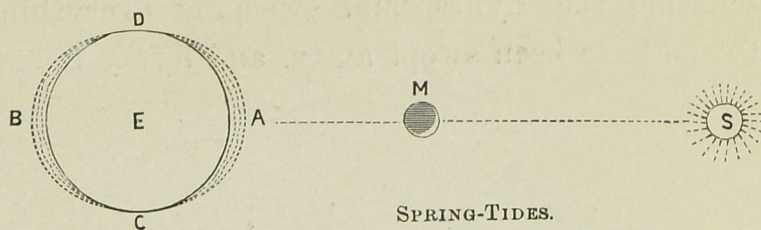
But the sun is further off than the moon, and it cannot attract so much.

The moon draws up the great wave of ocean, which is called the tide.

The solar tide, or tide caused by the sun, is so small as to be only perceived when the sun and moon both act on the water at once.

The tides happen twice in twenty-four hours. The earth goes round on her axis in that time, and brings the same point of the ocean twice under the direct influence of the moon.

The coming in of the water takes twelve hours, and is called the flux or rising tide. When the water reaches a certain point, and begins to retire, it is called the reflux or ebb of the tide.



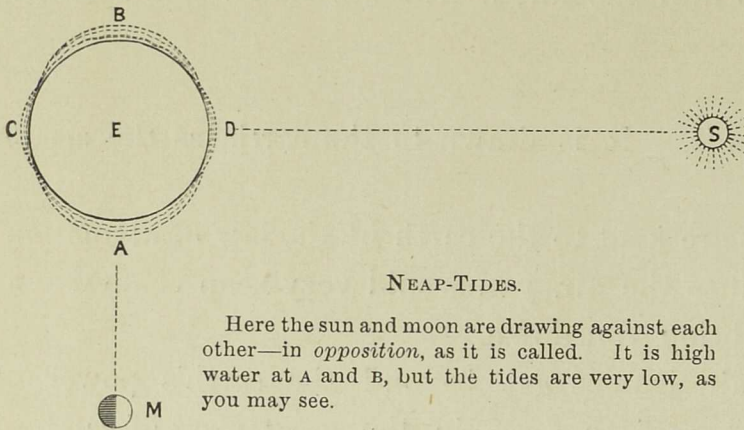
SPRING-TIDES.

A and B high water, c and D low; E is the earth, M the moon, S the sun.

The sun and moon are drawing together—in *conjunction*, as it is called. In the plate the moon is to us a new moon. When on the opposite side of the earth, it is full moon. Still, being on a line with the sun, spring-tides occur. The sun and moon are then said to be in *meridian*.

Twice in the course of every month, the sun and the moon come into a line with each other. This happens at new and full moon. Then both

attract at once, and may be said to draw together. At such times, the tides rise high, and are called spring-tides.



NEAP-TIDES.

Here the sun and moon are drawing against each other—in *opposition*, as it is called. It is high water at A and B, but the tides are very low, as you may see.

But when the sun and the moon act in contrary directions, a contrary effect is produced. Instead of drawing together, one counteracts the other.

Then the water is low, and is called a neap-tide.

The neap-tide happens at the end of the first quar-

ter of the moon, and the beginning of the third.

The word neap means scanty, and the neap-tide is small, or scanty.

The height of the tide is affected, also, by other causes.

When a strong wind comes in with the tide, it will drive on the waves in a very furious manner.

Sometimes the giant waves will rush in with such power, as to do a great deal of mischief. This is called a storm-tide.

People who live on a flat coast, like that of the Netherlands, dread these storm-tides.

Far inland, they hear the roar of the waters, and on comes the flood, bursting the dykes, and sweeping everything before it. Villages and towns have been swept away, and fertile lands buried under the sea.

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## THE TIDE-RACE.

THE tide rises much higher in some parts of the world than it does in others. In the Tropics, the tide is so slight that it is scarcely seen.

Sometimes the tide does a great deal of mischief, and is very dreadful. I will tell you why.

There are some rivers which run into the sea with great wide mouths,



GREAT EQUINOCTIAL TIDE AT HAVRE, ON THE WEST COAST OF FRANCE.



almost like the sea itself. Indeed, such a river is called an arm of the sea.

When the tide goes rushing up such a river as this, it meets a current or stream coming down to the sea.

Then it seems to get angry, and drives the current before it with fury.

Sometimes the river will be full of boats, and then woe betide them !

A great wave comes marching along as fast as a railway train. It is like a wall of white alabaster to look at. It will be four miles in length and thirty feet high.

It is a mass of foaming water !

It sweeps over the boats, and strikes them on all sides. Some are sunk, others upset ; and others again are left untouched and in safety.

Onward goes the great flood, but it gets less swift and less furious.

In fact, it gradually disappears.

Then the scattered boats are picked up. People recover their senses. And women and children go about in the wet and the mud on the banks, looking for things that have been lost in the confusion.

Such a scene happens sometimes on the great rivers of China. And it happens on the mighty rivers of America.

Sometimes this monster wave will suddenly appear in the most peaceful moments, and when the heavens are calm and the sun shining.

A knot of persons will be standing talking, on the banks of the Seine, and not thinking of any evil.

All in a moment a noise is heard, like the muttering of thunder. And a long line of foam is seen in the distance. This line of foam is the moving mass of water coming with the tide.

People look at each other in alarm. They know what is going to happen.

It is the mascaret. Mascaret is the name of the wall of water.

What is the tide-race ?

It is quite different to the mascaret, and much more to be dreaded. It only happens in the Tropics.

The wind dies quite away. There is a dead calm, and the sea looks like a lake of glass.

But on the beach, without any seeming cause, great waves begin to dash, and foam, and rush forward, as if driven by a hurricane. The ships are torn from their anchors, and houses are swept away by the fury of the waves.



TIDE-RACE OFF BOURBON ISLAND IN 1846.

Towns and cities are destroyed, or partly so, if the terrible waves do not retire.

The city of Lisbon was nearly swept away, about a hundred years ago, by the tide-race.

I must tell you that the tide-race has nothing to do with the tide. It is one of those strange events that nobody can account for.

## WHAT MAKES THE SEA SHINE?

THERE is a very beautiful sight often visible at sea.

Perhaps you have seen it, when on a visit to the shore in the autumn. You may have stood on the beach at night, and watched a boat moving backwards and forwards over the waves.

Each blow of the oar struck a jet of light out of the water. Some jets were feeble, others vivid, others quite resplendent. The drops of water fell off, from the oars, like a shower of pearls and diamonds. The boat itself left a streak of flashing light behind it as it moved along.

Far out at sea, the sight is grander still.

Ships appear to sail through an ocean of colour. There are streaks of red, and blue, and crimson. When the vessel moves, there seems to be fire issuing from her sides, and rolling along the water.

Sometimes a troop of dolphins are seen playing about among the waves. The effect of the shower of light which falls from their shining scales, is very beautiful indeed. Each drop of water sparkles like a gem.

What occasions all this glorious show of light?

The presence of a substance which is widely spread through the regions of Nature.

It is found in the sea and on the land.

It is called phosphorus.

Phosphorus is a deadly poison, and when it is seen by itself, separated from the bodies in which it lives, it looks like a little white stick of a waxy nature. It is so apt to take fire, that it is not safe to meddle with. People who sell it, keep it in water, to prevent accident.

When it is taken out of the water it begins to smoke, and after a time to burn. The slightest friction makes it burst out into a flame. If the hand gets burned with phosphorus, the wound is very painful, and not easy to cure.

Now, this burning, inflammable substance shines, in the dark, like fire. It is phosphorus which makes the sea shine.



THE SHINING SEA

But how came it in the sea ?

Because it exists in the bodies of millions of creatures that live in the water.

Some of these creatures are so tiny, that you could not see them except through a microscope. But when myriads of them are together, they have a splendid effect. They make streaks and bands of light. Indeed, they seem as if they had set the waves on fire.

Besides these tiny beings, almost every other inhabitant of the ocean has more or less phosphorus in its body.

The beautiful sea anemone, about which you will hear presently ; the star-fishes ; the soft-bodied animals of various kinds, which abound on



every hand ; the shell-fishes, such as crabs and lobsters ; and even the real fishes, help in this midnight illumination.

These creatures have the power of giving out light, as the electrical eel gives out electricity.

Where does the light come from ?

In the sea anemone, the light comes from the arms or feelers, from the zone or belt that girdles the body, and from the stomach.

Here is found a sticky kind of liquid, which bathes the organs of the body.

The liquid is the seat of the phosphorescence.

If you were to mix some of it with water, in a basin, the water would shine, more or less, as the sea does.

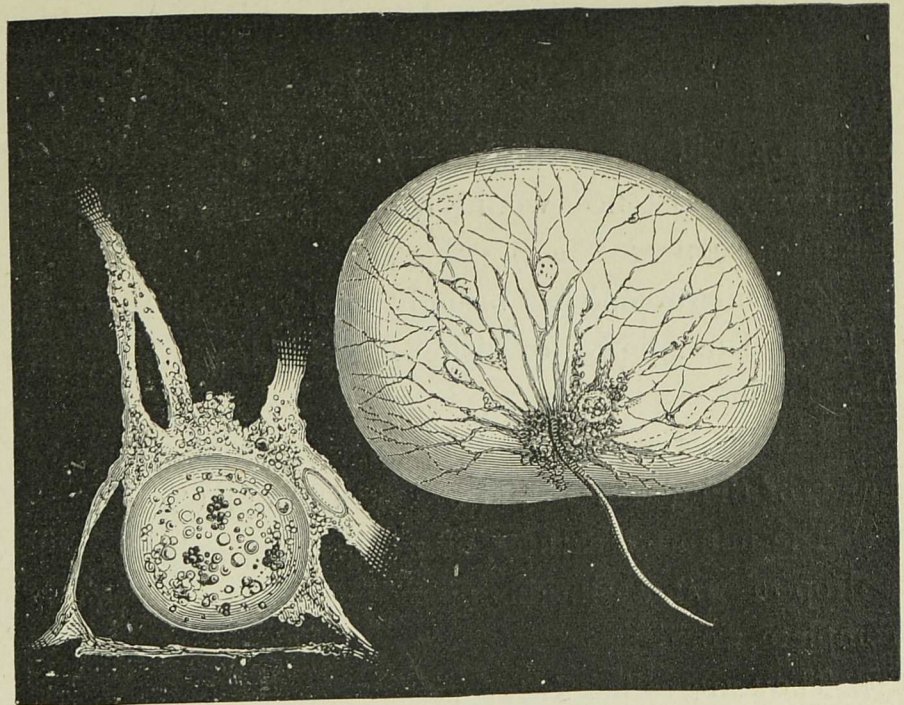
One of these light-giving creatures was once put into a small portion of milk. The milk became so brilliant, that people could see to read by it as by a lamp.

There is a little round ball of jelly that floats in the sea, and is too small to be visible.

If it is looked at through a microscope, it will be seen to have both a mouth and a stomach, and little feelers.

Inside its body it has tiny points, from which the light flashes. The flashes follow each other with such rapidity, that they are like minute flashes of lightning.

These creatures have perfect control over the light they give.



ONE OF THE LIGHT-GIVING CREATURES, SEEN THROUGH THE MICROSCOPE.

The least agitation makes them give it out with great brilliancy.

This was proved by a naturalist. He skimmed some water from the top of the sea, and filled a vessel with it. The vessel was full of those minute creatures. After the water had settled and was at rest, they ceased to shine, and remained quite still.

He then dropped a little acid into the water. The moment the acid reached the little creatures, it threw them into an agitation, and made them shine, and sparkle, like stars dropped from the heavens.

There are some small molluscs with two shells.

They have such a quantity of phosphorus in their bodies, that when they are eaten (which happens sometimes), the lips of the person who eats them seem to be on fire.

The name of the mollusc is *Pholas dactylus*. You will hear more of it by-and-by.

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## MINUTE CREATURES IN THE SEA.

COUNTLESS hosts of tiny creatures live in the sea. They are so tiny that their very existence would have remained a secret, if it had not been for the microscope.

The microscope has brought a new world to our sight. A world which is beyond our power of vision, and hidden from us as much as if it were in the clouds.

But it is a world full of wonders, and where we find traces, on every hand, of the goodness and the skill of our Creator.

The minute creatures, of which I am going to tell you, are so small, that a drop of water contains many millions. A drop of water is to them a complete world.

They are called *Infusoriæ*.

They exist everywhere; in salt water and in fresh, in hot regions and in cold. The great rivers carry enormous quantities of them to the sea.

In a single year, the river Ganges carries down to the ocean a mass of infusoriæ equal to the size of the largest pyramid!

You perceive that, though the smallest, they are the most numerous creatures in the world. Their bodies are transparent, and all kinds of shapes.

Some are like a bell, or a flower, or a thimble, or even a mere grain.

The most tiny of all are called monads. They are mere atoms, that spin about in the water. For a long time, people thought that the infusoria was a mere transparent cell, or bag, that was filled with nothing but water. But this has been found out to be a mistake. The creature, so far from being a mere bag, has four distinct stomachs.

Indeed, some of its neighbours have as many as four hundred.

Four hundred stomachs!

You may imagine how difficult it is to study the habits and the mechanism of beings so tiny. But it has been done, thanks to the microscope.

I might tell you the names of many clever men who devoted themselves to this study.

Professor Ehrenberg was one of them.

I will tell you how he contrived to make his observations.

He put a drop of coloured water on a piece of glass. And beside it, he put another drop that had no colour in it at all.

Then, with the point of a needle, he made a canal between the two drops. This answered his purpose. By means of the microscope, he saw the tiny creatures pass from the coloured drop to the clear. He could distinguish their stomachs full of colour, and could count them too, through their transparent sides. He amused himself with making the experiment first with red, and then with blue.

He saw, also, that the infusoria had fine hairs like antennæ. These hairs are called cilia.

The cilia move quickly about, and make currents in the water. Tiny atoms (you may think how tiny) are attracted to the mouth of the creature, and drawn in, and swallowed. For it has a mouth as well as a stomach.

These minute beings swim merrily about like the fishes, or they creep

like serpents, or they twist themselves in every direction. The little volvox spins round and round on its own axis.

They multiply in a variety of ways, some of which are very curious. One creature will divide into two equal parts, each of the parts being the exact image of the parent. So that you have two infusoriæ instead of one.

Others drop tiny germs, or, in fact, eggs. You may fancy how tiny such eggs must be!

These germs, in time, begin to grow. Each of them becomes a perfect creature, and whirls about in the sea, as its parent did before it.

But—would you believe it possible?—minute as the infusoriæ are, there are creatures smaller still, who fasten upon them, and suck the juices of their bodies!

These creatures are infusoriæ likewise, but they are called parasites, because they feed on others. Some of the parasites have bodies shaped like a tube, and are provided with short suckers, clothed with cilia.

Others have round bodies, and possess suckers, but without the cilia.

The first of these parasites swims about in the waters. When a suitable victim happens to come near, it gives chase, and fastens itself upon it. The other species, instead of swimming about, keeps still, until a victim chances to pass and give it a touch. Then it attaches itself to it by means of its suckers, and off they both swim together.

The parasite buries itself in the body of its victim, and multiplies so fast, that one infusoria will have as many as fifty parasites living on it!

I have not told you the most curious fact of all. The infusoria has the power of dissolving itself into several parts, or even into nothing!

Suppose we disturb, with a feather, the water in which the little creatures are swimming.

They will stop whirling about in a moment.

Then, you will see a hollow place come in the tiny body of the infusoria. That is, of course, if you look through the microscope.

The hollow place increases little by little, and the entire creature is gradually dissolved.

The feather was dipped in spirits of wine. This was what agitated our

little friend so violently. But add a drop of pure water before it has had time quite to dissolve.

Wonder of wonders !

The creature stops in its work of self-destruction ! What is left of its body begins to swim about as if nothing had happened !

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## MORE ABOUT THE WORLD OF ATOMS.

I HAVE not quite done with the world of atoms.

Presently, we shall climb up higher in the scale of beings. We shall see the fish, and the bird, and the giant whale.

But, at present, we must keep within range of the microscope.

Take up a handful of sand from the beach, and examine it under the glass.

The naked eye will do us little service here.

What do you see in the sand ?

Why, a number of beautiful little shells.

Nothing can be more elegant than their shape. Nature has bestowed the greatest pains upon them. She has not made them all alike ; but she has finished them off with the utmost skill and nicety.

Yet the whole of them were too minute ever to be seen by man !

Indeed, for a long time, man did not know of their existence. They were first discovered in the Adriatic Sea during the last century.

People fancied this was the only place where they existed. But now they are found almost everywhere.

Their numbers surpass all human imagination. Masses of them are brought up from the depths of the sea.

The very bed of Ocean, vast as it may be, is only part of the domain they occupy !

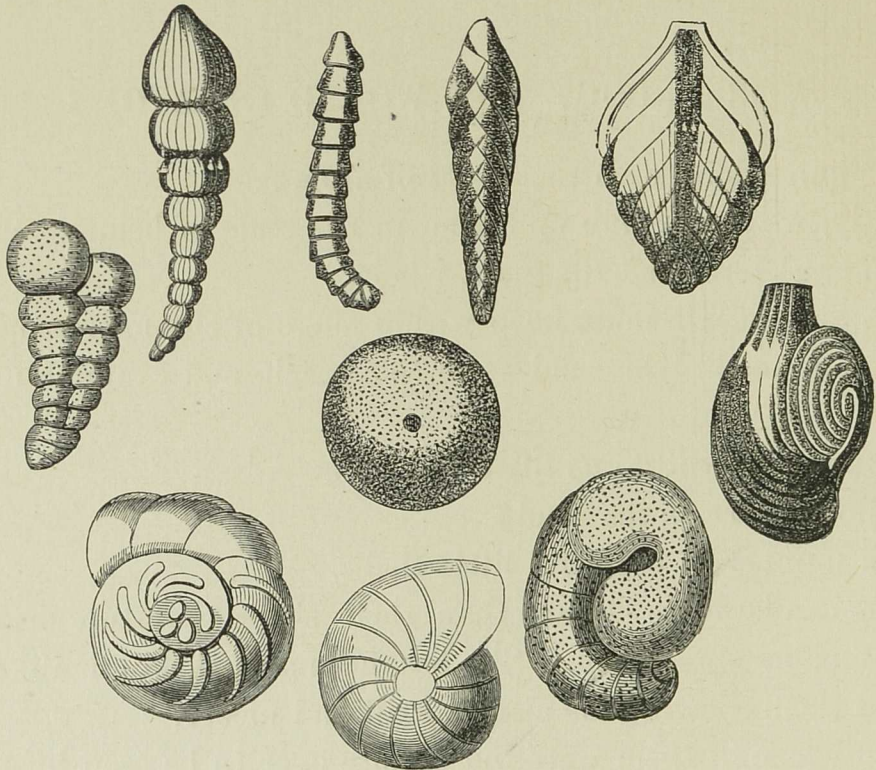
Their name is rather a long one, but you must try to remember it.

They are called *Foraminifera*.

With great patience, the naturalist has discovered the history of these minute bodies.

They are the shells of marine animalcules. These animalcules form an entire order to themselves, and one of the most curious in the whole extent of Ocean.

You may see by the picture what they are like.



SHELLS FROM THE BED OF THE OCEAN.  
(*Foraminifera.*)

They are as whimsical as possible in their shape. Some are like stars, some like shells, some like mere globules.

The shell is divided into a number of chambers, communicating with each other. It has also holes or pores, which open outside.

But what is the creature itself made of?

It is made of transparent jelly, and fills the chambers about which I have just told you.

The hole or pore lets out a number of long hairs or filaments.

These hairs move quickly about. They are at once hands and feet. The animal uses them to creep along, and also to seize its prey.

A kind of venom is supposed to exist in these hairs.

If the animal touches its prey with them, it will appear as if stupified, and unable to escape.

This is how it fishes for its food.

Though so minute, it is fierce and cruel. It stuns its prey with poison, and then devours it.

In its own tiny world, how a creature so armed must be dreaded!

But I have another curious fact to tell you.

These little atoms seem to have no end of resources.

An individual can make itself a foot when it chances to want one!

When it is trying to climb up a glass, put there, no doubt, by a naturalist who is studying its history, it will push out a part of its body into a kind of foot.

The foot will help it to climb, as well as if it were really part of its body.

But when the climbing business is over, the foot will be put back again.

That is, it will be received back into the body, and the animal will appear as it did before.

Thus the will of so minute and feeble a creature is enough to create a member!

But I have yet to tell you of the great work which these minute shells have done, and are doing now.

We shall hear presently of a little creature that builds an island.

These friends of ours have built up the mountains!

Under the sea there are vast banks and hills formed of their ruins. The banks get so high by gradual accumulation, that they stop vessels in their course, and make islands in the hot seas of the Tropics.

Often the shells are found in a fossil state. Then, they form chains of hills and mountains.

The great Pyramids of Egypt are built of nothing else.

The city of Paris itself is half made up of these tiny shells.

There is a quarry close by, out of which stone is taken for building the houses, not only in Paris, but in the neighbourhood. The stone is full of the remains of Foraminifera.

They make part of the soil on which we walk, the houses that shelter us, the buildings which remain from one generation to another.

Each tiny animal furnished one particle of the mass. Race after race left their minute shells behind them. By degrees the work went on, and the rock, or stone, or mountain, was formed.

Other races are living now in the depths of the ocean, and silently doing their work, for the benefit of mankind at some future period.

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## THE SPONGE.

FOR a long time, people could not make up their minds whether the sponge was a plant or an animal.

It has neither sense nor motion, so that there is not much about it to remind us of an animal. Still, it has a kind of animal-life, and naturalists have placed it in the lowest rank of the animal kingdom.

I will tell you what a sponge is like when it lives in the sea. It has a horny or stony network of a body, a skeleton, if you like to call it so.

This network is full of passages or holes, and is covered with a slimy matter, which is really the living sponge.

The way of life which the sponge practises, is as simple as can be. It does not move. It remains, all its days, in the place to which it is attached **under** the water. All it does, is to draw water through its pores or holes, and let it flow out again. This is the means of nourishing it, for the water is full of particles on which the sponge may be said to feed.

You see what a feeble kind of existence it has.

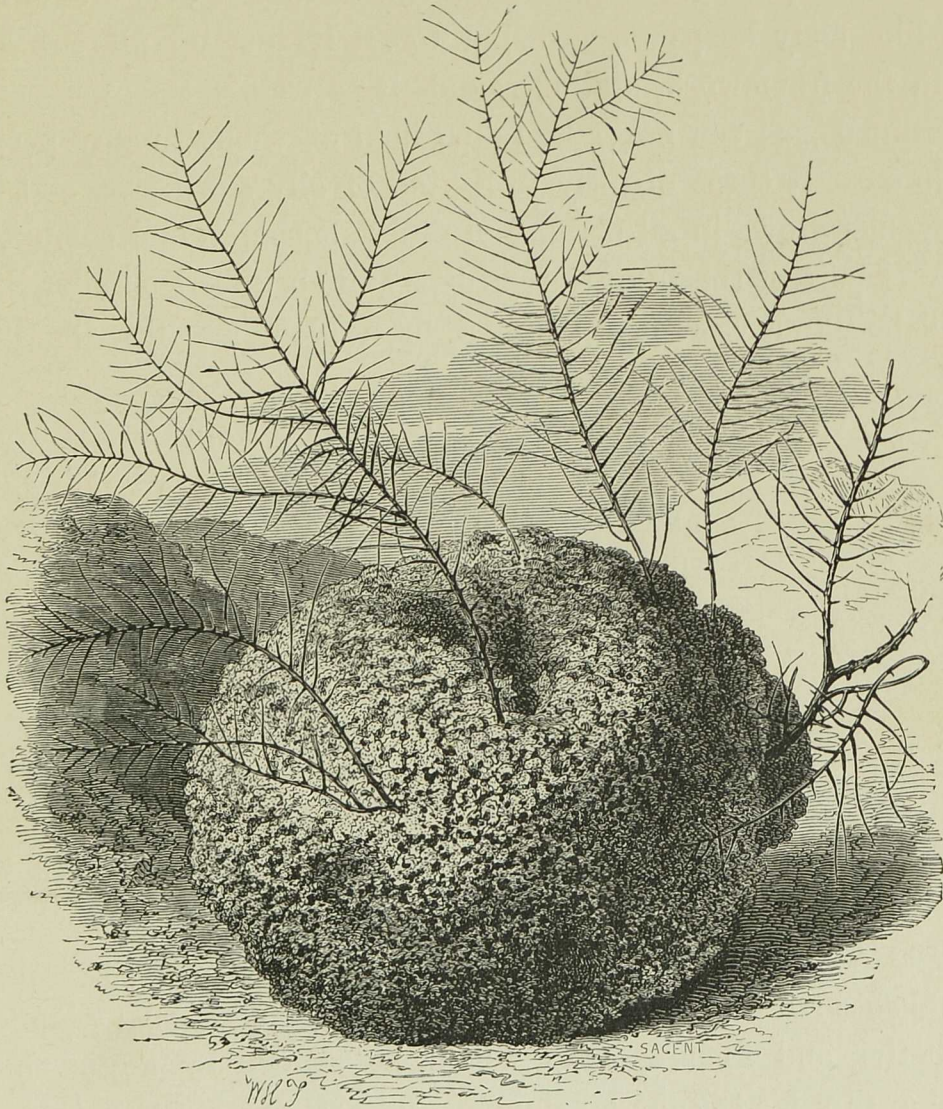
The passages, which branch about in the horny skeleton of the sponge, have often little points or buds sticking to the sides.



These are the little sponges beginning to grow.

As they get larger, they are clothed with hairs or cilia, and at last break away from the parent sponge. They move about in the water for a few days, their cilia helping them along.

At length, the little sponge reaches a place where it can fix itself. Then it fastens one end of its body to the rock, or stone, where it means to



A SPONGE, WITH CORALLINE UPON IT.

live. Its cilia keep on moving very fast, but when the sponge has fairly settled itself, they become quiet. Indeed they never move again.

The little sponge is a mere drop of jelly at present. But soon a change begins to take place.

Little spots are seen on its body, which grow into fibres. They are made of three materials—silex or flint, lime, and horn.

All these three materials exist in the sea. The cilia have been sucking them up, into the body of the sponge, to make the fibres of.

The fibres keep on growing, and become a kind of network or skeleton. The jelly-like body keeps on growing too. It fills up all the holes and passages in the framework, and surrounds it as well.

This animal part can never be taken hold of, though many people have tried to do so. It turns directly to a kind of oily substance, and dries up.

The sponge grows in all manner of different shapes and colours.

It makes part of the beautiful gardens and shrubberies under the water.

It will be like a vase, or a trumpet, or a globe, or like the branch of a tree.

There is a very curious sponge. It is called "Neptune's Glove."



NEPTUNE'S GLOVE.

The sponge we use is not very handsome to look at when alive. It is a dull black above, and a dirty white beneath.

It grows to rocks deep in the sea, and has to be cut off with a knife. Men dive down to get it as they dive for coral.

There is a large coarse sponge, which is much easier to obtain. It grows along the coast, and can be drawn out of the water by a kind of fork or prong.

The man who is fishing, sticks the fork into the sponge, and so carries it away. But this kind of sponge is not of much value.

The better and finer sponges would be spoiled by any such process. And these are by far the most valuable, and cost the most money.

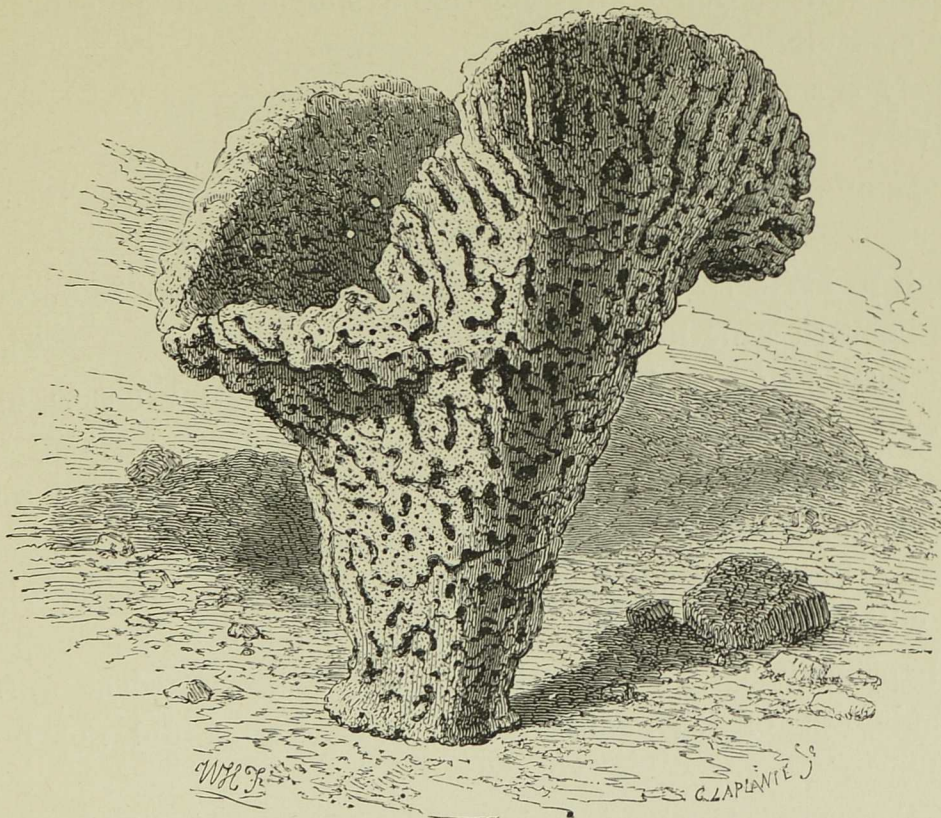
When the sponge is brought out of the water, its living jelly-like body drips away and is gone.

The skeleton is dried, and becomes an article of commerce.



DIVING FOR SPONGE





ANOTHER SPONGE.

Do you wish to know where sponges are to be found ?

In many places. The Red Sea, the Indian Ocean, the Mediterranean Sea, the Gulf of Mexico, and nearly all parts of the world.

Fifty kind of sponges grow on our own British shores, but they are not used in commerce.

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### THE FAMILY OF POLYPS.

**THERE** is a little animal found in the sea, in rivers, and in lakes of fresh water, and indeed almost everywhere.

Its family name is Polyp.

But it has another name besides.

It is called the Hydra.

You can scarcely fancy anything more simple than the construction of this little creature.

Its body is a mere sac or bag, with an opening at one end, crowned with six very slender threads.

The opening is the creature's mouth. The threads are its arms, the sac is its stomach.

Though it looks so small and defenceless, it leads a very merry life. It fastens itself to some leaf or plant that grows in the water. Then, when it is quite settled and at its ease, it stretches out its arms to find something to eat.

It has an excellent appetite. You would not believe what a quantity it can draw into its stomach at once.

It draws in more than its little sac can hold. And what is very funny, it will use one of its arms to keep the food in its place.

This happens when it has swallowed a tiny worm. The worm would soon wriggle out of its mouth, if one of the arms did not hold it in the sac.

Then the worm is digested, but the arm is untouched, and can be drawn out as lively as ever.

You see what curious things take place in the different parts of the great world of Nature.

The poor worm is often a victim of the greedy little polyps.

Those restless arms of theirs catch hold of it. If it happens to be a great deal larger than they are, it is no matter. They will crowd round it, and embrace it with a network of arms, till it cannot possibly get away.

But the polyps, of which I am speaking, are not fond of society. Each one lives by itself. And, when the battle is over, it unwinds its arms, and slips away without the least confusion.

I must tell you that the polyp is so extremely fond of eating, that if half its body is cut away, the part with the mouth will go on swallowing just the same; even though the food keeps dropping, through the opening made by the cut, back into the water.

Indeed, the polyp is altogether a very odd creature.

If it were cut in pieces it would not die. No indeed! Each piece would grow into a complete polyp.

And if only an arm were to be cut off, from that single arm would spring a whole race of polyps.

Nay, I have another marvel to tell you. A polyp has been turned inside out, as you would turn a glove.

Even this did not hurt it. What was the outer surface of the body became the sac, and digested food. The sac became the outside.

The polyp did not seem any the worse for this arrangement. At the same time, it made sundry efforts to turn itself back again.

I must tell you how the little polyps come into existence.

They grow, like tiny buds, on the body of the mother. They are so quick in growing, that a bud will hardly have become a polyp, before it, in its turn, puts out another bud. The bud springs up rapidly, and begins to sprout. So that a whole generation is seen growing from one parent.

When the polyp is old enough, it separates itself, and begins life on its own account.

These little animals have been called "imperfect," because they have neither heart, nor lungs, nor head, nor feet.

They have nothing but the mouth, the sac, and the feelers.

Yet we have seen that they are quite able to take care of themselves, to seize and devour their prey, and to repair injuries done to their bodies.

The same gift of instinct is found in them, as in the higher animals. The same kind Providence has them in His care, and even the little polyp is not passed over, or neglected, in the vast region over which He reigns.

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## THE POLYP AND ITS HOUSE.

I HAVE not yet done with the polyps. Small and insignificant as they seem, you will see what important persons they really are.

I mean that race of polyps which chooses to live, not solitary, but in a community.

These are the social, or coral-making polyps.

They live in perfect harmony, each in its cell. The cells form one entire house, or place of abode, which is quite full of polyps.

Now, the coral-making polyp was once a tiny spot of clear jelly, that dropped from its parent, and swam about in the water as the little sponge did.

This was the only period of its life when it was quite free to roam hither and thither.

But this state of things did not last long.

The little jelly-like creature soon begins to fasten itself to a rock, or to a piece of ready-made coral.

Now mark what a change happens to it.

It has been provided by Nature with cilia, which have all this time been moving as quickly as possible. While it is fastening itself to the rock, the cilia keep on moving. But when the creature is firmly settled, they do not move any more. The little jelly-like body begins to swell, and to raise itself up in the shape of a tube. Round the edge or the top of the tube there comes a kind of rim. This is the beginning of the cell, which is going to be made; in fact, the house of the polyp.

Very soon, another change takes place. A tiny knot or swelling appears in the middle of the jelly. It is made up of several parts, and soon resolves itself into the mouth and feelers of a polyp. The feelers very soon set themselves to work. The whole race of polyps have famous appetites. And the feelers begin to stretch themselves out, to catch food and carry it to the mouth.

What is the wall of the polyp's house made of?

Of chalk, and also of a small quantity of phosphorus.

If you remember, I told you that the creatures in the sea had a great deal of phosphorus in their bodies.

The polyp takes in chalk and phosphorus from the food it eats. The chalk passes out, and helps to make the walls of its house. Thus the polyp is always hungry and wanting to eat, to get more chalk to make up for what it loses.



Its house keeps growing, bit by bit. And it is a kind of living house, not a dead, inanimate one. The body of the polyp is joined to it by a number of tiny vessels, that pass from one to the other, so that the polyp and its house are in reality one living creature.

But as the polyp goes on building new parts of its tube, it keeps climbing up higher and higher. Then the old part is left below, and becomes dead and hard like stone.

The polyps and their houses thus make one structure. Living at the top, and dead and hard at the bottom. And this is the whole history of the coral reef, or island.

People who visit the coral islands go to look at the reef, and watch the little polyps at work.

Sometimes, the million of tiny arms are seen lying quiet on the water. They are minute as threads, and are all kinds of shapes and colours—as rose, pink, or blue. But their principal employment seems to be, to catch hold of anything that comes in their way. It does not matter

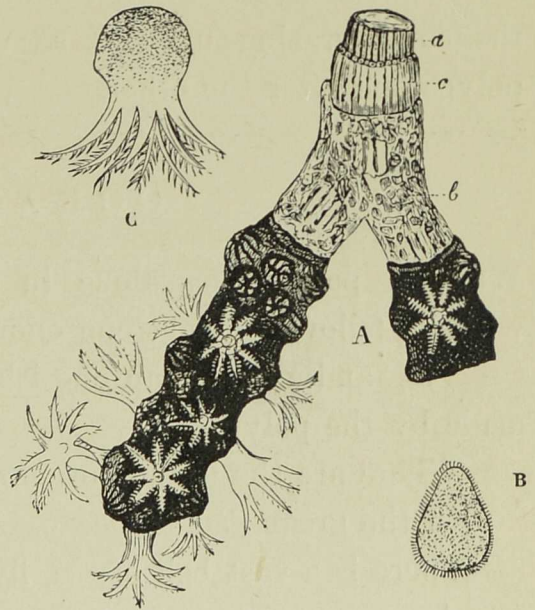
what the thing is, whether living or dead, it is all the same to the polyp. It wants matter to feed its own body and the walls of its house. So its little arms seize the morsel greedily, and bring it to the ever open mouth.

The whole wide ocean is crowded with polyps of all kinds and shapes and sizes.

Do you perceive how useful their appetites are?

In the vast sea there must be quantities of dead and decaying matter. Scarce a drop of water is without some atom that wants clearing away. Well, there is the polyp ever ready to snap it up!

Thus the ocean is purified. These ever-open mouths act like so many minute scavengers.



BRANCH OF RED CORAL WITH THE POLYPS IN.

A, branch of coral; a, the stony stem; b, vessels spreading; c, vessels going in straight lines; B, a germ set free; C, a full-grown polyp.

But the little creatures, in the coral reef, have many enemies. Even in their stone houses they are not safe.

Some bright-coloured fishes, with scales of blue mixed with green, and as handsome as can be, are very fond of feeding on the top of the coral reef. In fact, they live close by it, in the lake and among the breakers.

A shoal of these gay-coloured fishes have been seen, upon the top of the coral, grazing upon it as upon a field, and eating up the poor little polyps one after the other.

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## C O R A L I S L A N D S .

WHEN a polyp lives alone in the sea, it is a feeble creature. United with its fellows, it is strong enough to build an island.

Yes, and more than one island. Whole groups of islands have been made by the polyps.

Where are the islands of coral found?

In the great Pacific Ocean.

There is a vast belt of sea, five thousand miles long, and fifteen hundred broad.

This wide-spreading tract of ocean is studded with groups of the most lovely islands.

They are called the South Sea Islands. But another name is given them—Polynesia, a word meaning “many islands.”

By far the greater number have been built by the polyps.

The picture is of a coral island. It is encircled by a reef or ring of coral, and you may see the vessels sailing round it. The waves dash, without ceasing, against the reef, and a long line of foam sparkles in the sun.

No rampart of the firmest rock could resist, in this manner, the action of the waves. It would in time be swept away and destroyed. Yet age after age the coral reef stands unhurt. It is, in fact, a living barrier. Millions of little architects are always at work, and at hand to repair an injury.

Thus, the coral - making polyp, small and feeble as it is, may be said to conquer the very waves of ocean.

The water, between the island and the reef, is smooth as a lake, and is very convenient for ships to harbour in.

Here they may anchor in safety, even though the storm is raging without.

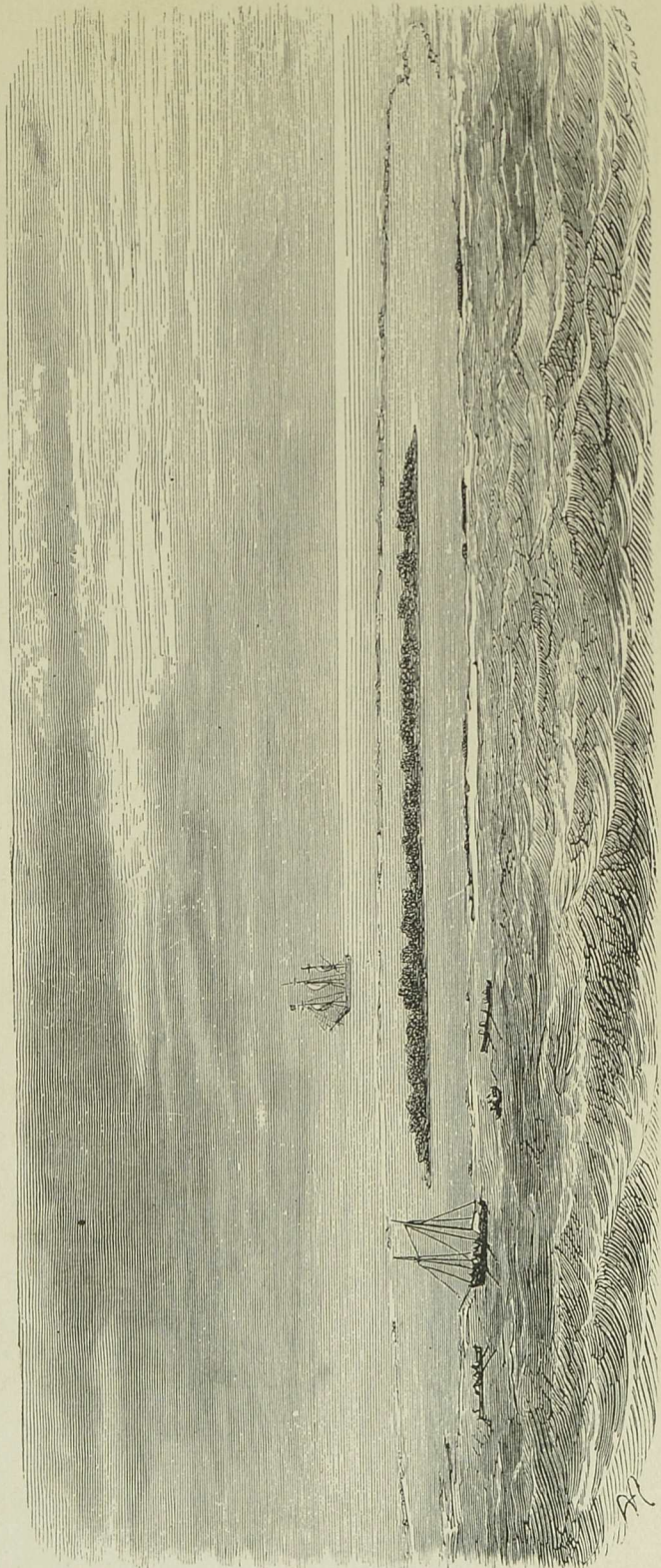
They enter this safe and pleasant harbour, through openings left in the reef by the little polyps themselves. But for these openings, no vessel could reach the island within. It would be dashed to pieces on the reef of coral.

Why have the polyps left the openings?

They have no doubt been guided by instinct.

If the lake were quite shut in, the water would be unfit for them to live in.

Streams of fresh water, that keep flowing into it from the island itself, would cause it to lose its saltness; and the little polyps could not carry on their work, without the materials they extract from the sea.



CORAL ISLAND, WITH ITS REEF.

It is a curious fact that the openings are always left exactly opposite the mouths of the fresh-water streams.

On either side of the opening in the reef is found a lovely islet, covered with the feathery plumes of the cocoa-nut palm. These waving plumes can be seen a long way off, and serve as a beacon to guide the mariner to the spot.

The coral islands are not all alike.

Here is a picture of one that is like a ring in the ocean, and has the lake in the middle. Such islands are called "fairy rings of ocean." You can see that this also is surrounded by a coral reef.

When the tide is out, the reef looks like a dry rock.

Nothing is to be seen. The polyps are shut up in their houses.

But when the tide comes in, and the waves dash over the barrier, a wonderful change takes place. Millions of coral-making creatures put out their arms, and the whole surface of the rock seems to be alive.

For a long time, people used to speak of the coral reef as though it rose from the very bottom of the sea. They used to say, that the polyps worked so hard, there was no knowing how many islands they might build.

Nay, they might fill the whole Pacific, not with islands, but with a continent!

This has been found out to be a mistake.

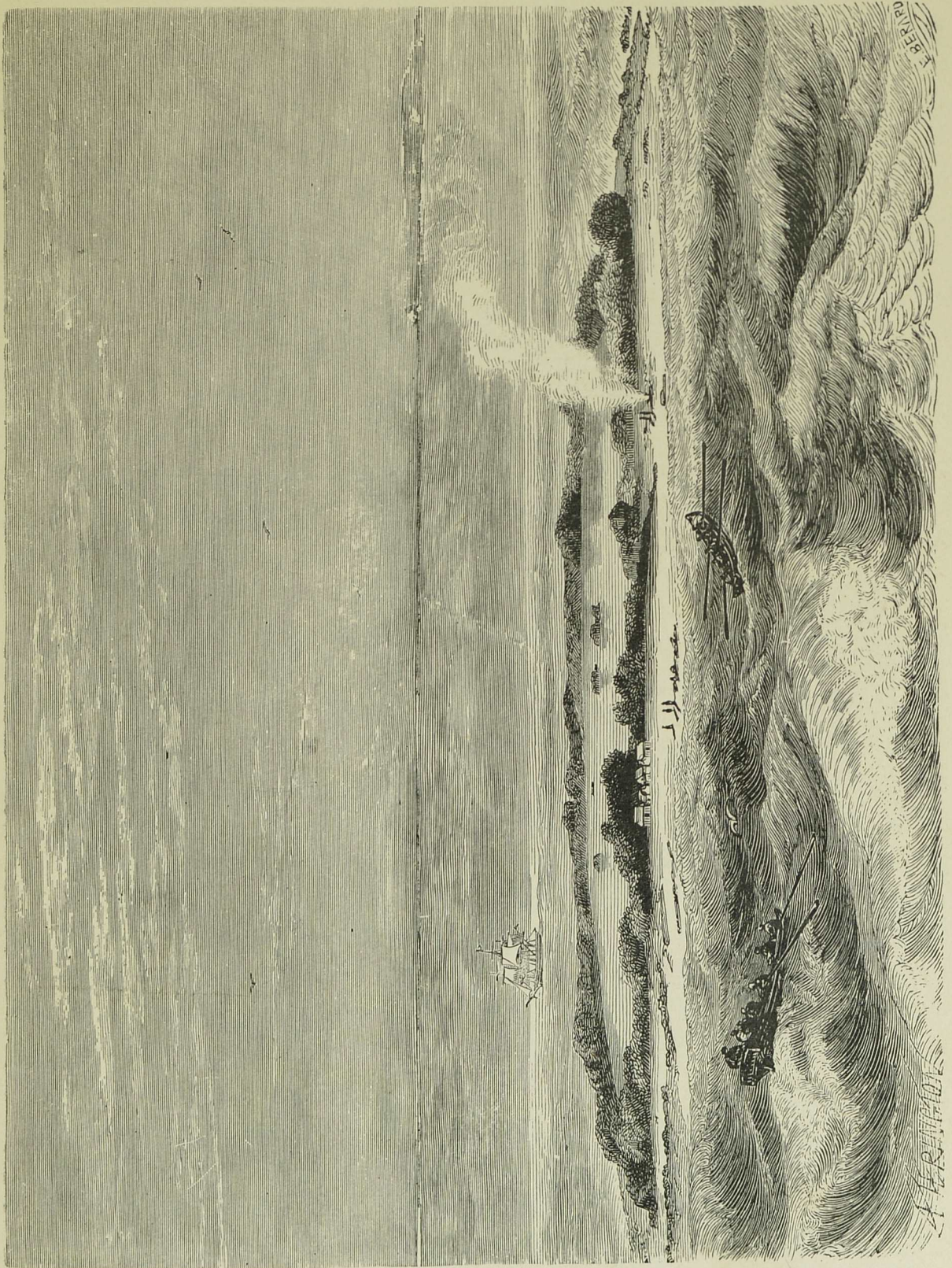
The polyps cannot live at any great depth. They do not like cold currents, and always work up to the light. So the foundation of their island is at no great depth, as far as the coral is concerned.

How, then, is the island supported?

On some rock beneath, which rises from the unknown depth of ocean. From this rock the polyps begin to build. The rock was probably of volcanic origin.

Generations and generations of polyps pass away, and still the work goes on. At last, the structure they are forming rises to the surface of the sea.

Then it stops. The polyp cannot live out of the sea, therefore it does not build above the water.



"FAIRY RING OF OCEAN"



The island is, at first, a rough kind of platform, covered with fragments of coral.

The tide, as it ebbs and flows, leaves weeds and shells upon it, so that a soil is gradually formed. It rises higher and higher. The crevices get filled up.

Seeds, that are floating in the air, drop on the newly-made ground, and take root.

In process of time, grass begins to grow, and trees and shrubs to flourish.

Birds and animals find their way there; and last of all comes Man, and takes possession.

Are there not great wonders going on in the ocean? It was thought a mighty deed for Man to build the Pyramids. But here is a polyp that has built us an island!

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## THE SEA - FAN.

THE coral-making polyp has a vast number of relations. And these are at work, in their own way, in the fields of ocean; I must tell you what they are doing.

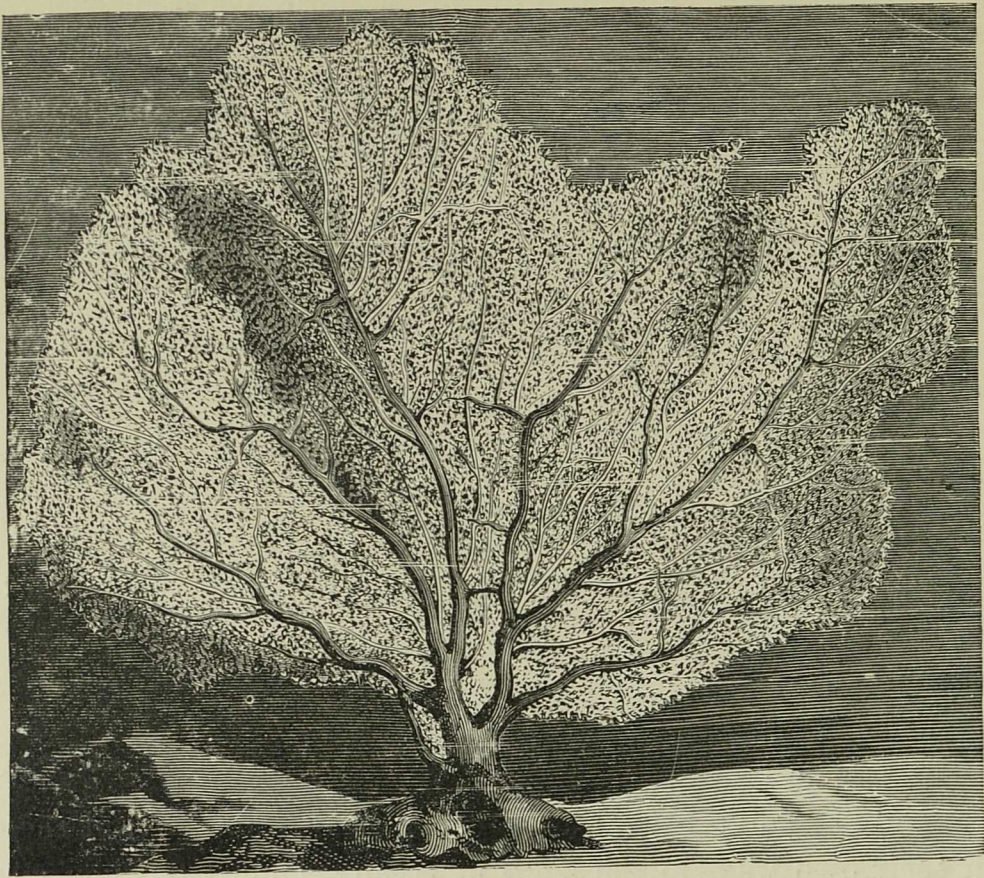
Do you see this lovely fan-shaped coral? The lower end is fast to some rock under the water, and the fan itself is stretched out, as though some sea-nymph were about to use it.

The fan is but another kind of living house, or houses, where hundreds of polyps dwell. Like a beautiful leaf, it waves gently in the water; its surface covered with star-like polyps, whose bright little heads are gay with all kinds of colours.

Why are they called star-like?

Because the little creatures, that live in the fan, have a number of leaf-like rays round the mouth, like the rays of a star-fish. So that the name of asteroid has been given to them, from *aster* a star.

When the sea-fan is alive, and is waving about in the sea, a thick jelly covers it, and the polyps make their cells in the jelly. But when it is



THE SEA-FAN.

taken out of the water, and the jelly and the polyps are gone, only the framework or skeleton is left. That is what you see in the picture.

I have not yet done with the star-like polyps.

There is a dull, yellow-looking thing, like a piece of sponge, or of seaweed, that is often thrown on shore. You might easily pass it by, as though it had no beauty or interest. But put the ugly thing into a vessel of sea-water. Now, what do you think of it?

It is alive with starry-headed polyps!

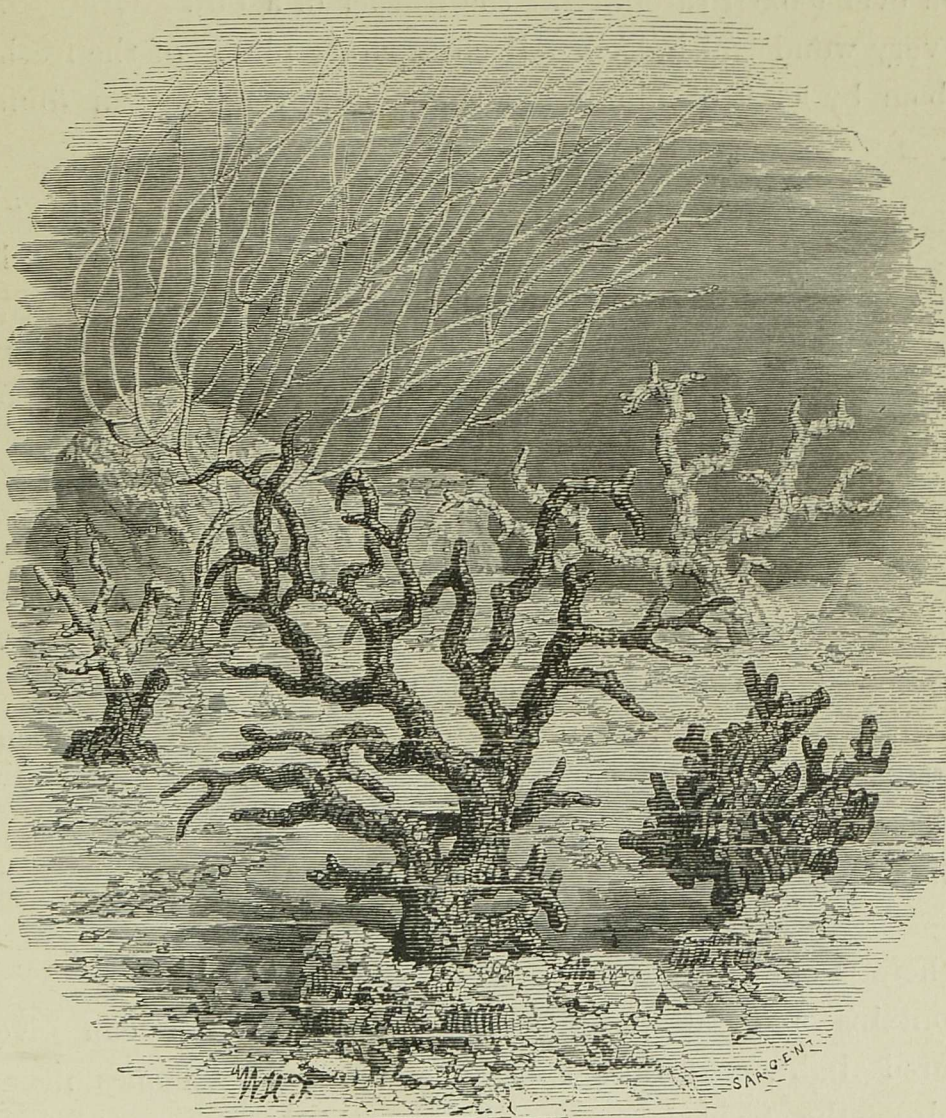
They push their tiny heads through numbers of holes. In fact, the rough, ugly thing blossoms all over with these minute flowers. Each flower is a separate animal.

If you touch the little heads, the polyps are frightened, and draw them in at once. Then, the starry flowers vanish, and the coralline on



which they live contracts, and has again the dull leathery look it had before.

But when the little polyps have recovered from their fright, they push



BRANCHING CORAL.

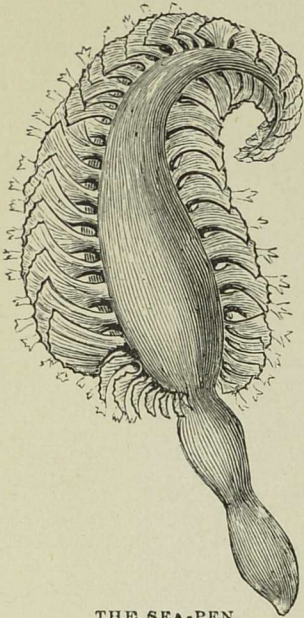
ALCYONIAN.

out their heads and suck in a quantity of water. Then the coralline swells out to more than double its size, and becomes quite soft and almost like a sponge. Its name is Alcyonian ; you may see it in the plate.

## THE SEA - PEN.

HAVE you ever looked carefully at the feather of a bird ?

It is very wonderful indeed. Each separate plume of the feather clasps its neighbour by a set of hinges. I think, however, the pen found in the sea is even more curious.



THE SEA-PEN.

Each separate plume of the sea-pen is alive. It is in fact a row of cells, or houses, for the polyps to live in. It has been called a street.

In these rows of houses, the polyps live by hundreds, and eat away as usual. What one polyp eats, helps to nourish the rest. Yet each polyp is quite independent of his neighbour, and pushes out his starry head, and draws it in, just as he pleases.

It was once thought that the sea-pen floated about in the water, and did not attach itself to anything. But this is not correct.

It is now supposed to live with its stem buried in the mud at the bottom of the sea. When a sea-pen has been placed in a vessel of water, it has always remained quite still. Indeed, it did not seem to have the power of turning itself over.

But there is one thing it can do.

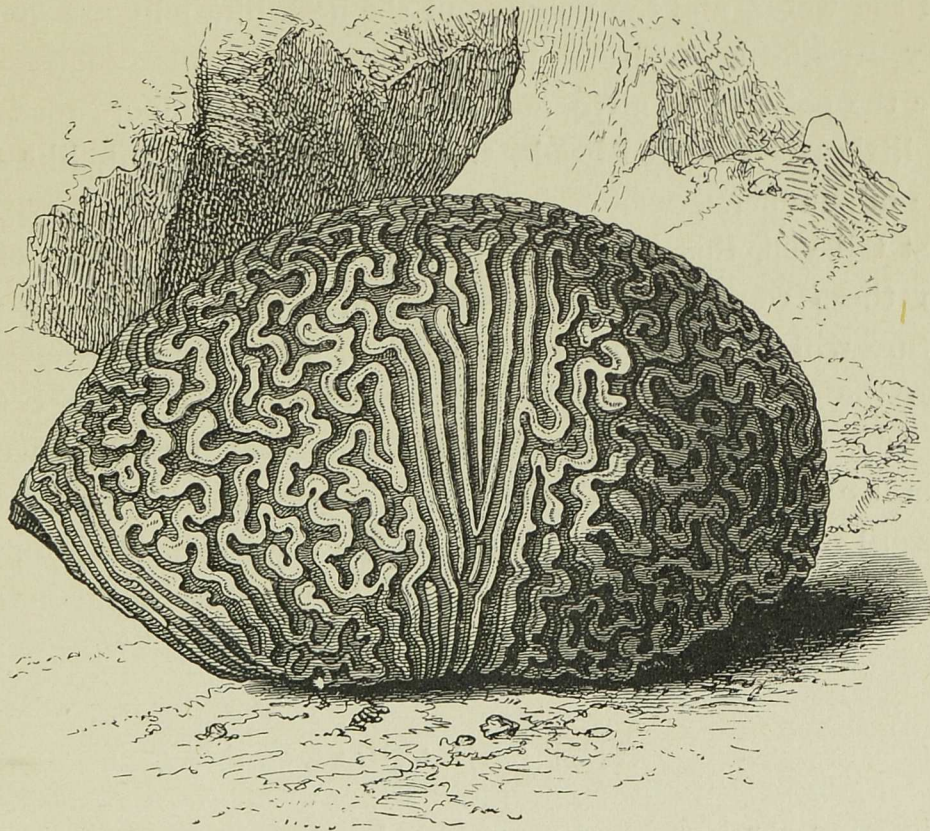
It contains a great quantity of phosphorus, and can give out a blue-coloured light. It does this, when an enemy comes near. And, people think, the feeble sea-pen has but this one means of defending itself.

A sudden flash of light, given out from its surface, might frighten away some creature that was coming to devour it.

This beautiful sea-pen lives on our own shores. The Irish fisherman often finds it sticking in his nets, when he hauls them up. He calls it the wonderful stick, which is not at all a bad name.

## THE BRAIN STONE.

SOMETIMES a ship, as she sails among the islands of the Tropics, meets with a terrible danger; the little workers in the sea have been doing mischief. They have been making a great stem, or trunk, like a tree. On the top of the stem are a number of lumpy knobs, like the one you see in the plate, and that is called a brain stone. The brain stones are covered with thick flesh-like jelly, in which the polyps live.



THE BRAIN STONE.

The polyps are called madreporé polyps, and are only met with in the hot seas of the Tropics. They work so fast, and their stony houses are so strong, that it is not at all pleasant to meet with them.

They fill up many a space that had better be left open—I mean a space over which a ship is going to sail. On comes the ship, and before the

captain is aware, it drives upon a rock. The rock has quite lately been built up by the madrepore polyps.

Do you see how curiously the brain stone is marked ?

It has twisted lines, or ridges, all over its surface. The polyps have their cells between these lines, and live in them as in so many valleys.

They throw out the lime, that makes their cells, in thin plates almost like sheets of paper. These plates, or layers, are arranged in a ray-like form round the middle of the cell, so that the madrepore head has a very curious effect. But it can only be seen when the structure has been raised to the surface of the water, and the polyps and the flesh-like jelly are gone. Then, the chalky ray-like heads are clearly visible.

While the polyps are alive and at work, the madrepore rock or tree is gay with little rose-coloured heads, that keep moving about, like flowers in the breeze of summer.

I must tell you, that the madrepore polyps build all kinds of fantastic shapes in these warm Tropical seas. Besides walls, and rocks, and trees, the structure will resemble a sheaf of corn, or a leaf, or a flower. There is no end to the strange devices of the little architects. The traveller, on board a ship, will often gaze at these whimsical forms in wonder and admiration, as they glow, in all their beauty, beneath the waters.

One word more, and I have done. In the coral reef, the lumps of brain stone lie at the bottom of the reef, and help to resist the action of the waves.

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## THE RED CORAL.

WHERE does my coral necklace come from ?

The shining red substance, that the beads are made of, came from the sea. It was made by the little architects, our friends the polyps.

In its rough state, the substance was part of a little forest, all made up of tangled stems and branches, growing among rocks under the water.

For a long time, this branching red coral was taken for a plant ; and, indeed, it looks very much like one.

The Greeks, who had a pretty name for everything, called it "The Daughter of the Sea."

But a Frenchman, named Pysonnel, who was a doctor in the French navy, found out that the coral was no plant at all. He saw that it was the work of a countless number of living creatures. In fact, he became acquainted with the polyps.

At first, no one seemed inclined to believe him. This happened, I must tell you, more than a century ago.

But, just at this identical moment, another clever man was busy making experiments. He had been watching the polyps that live in fresh water, and had found out all about them. Indeed, he had written a book on the subject.

People now began to suspect that the little creatures who had been said to live in the coral might belong to the same family, and be polyps as well.

Two naturalists set out at once to examine the red coral, and to see whether such was the case.

Thanks to all the pains and trouble that have been taken, we know, now, the whole history of the coral, and its wonderful little architects. We reap the fruits of other people's labours.

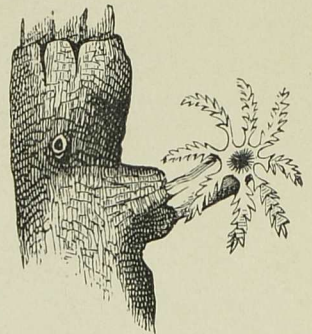
The polyp that makes the red coral lives in the Mediterranean Sea, the Black Sea, and many other places.

The branches are covered with little cells of the polyps, but their arms are not thread-like. They resemble rays, or stars.

Below the bark of the stem, if I may call it so, is the red coral, as hard as marble, and that can take such a shining polish.

Divers go down to fetch up coral, for it is an article of trade. A great deal of it is sent away, in its rough state, to other countries.

At Leghorn, in Italy, there are great factories and workshops where the coral is cut, and polished, and made into all kinds of toys and ornaments.



POLYP OF RED CORAL.

What gives the coral its red colour?

The little polyp secretes a red colouring matter, which mixes with the lime, or chalk, of its cell, and makes it red.

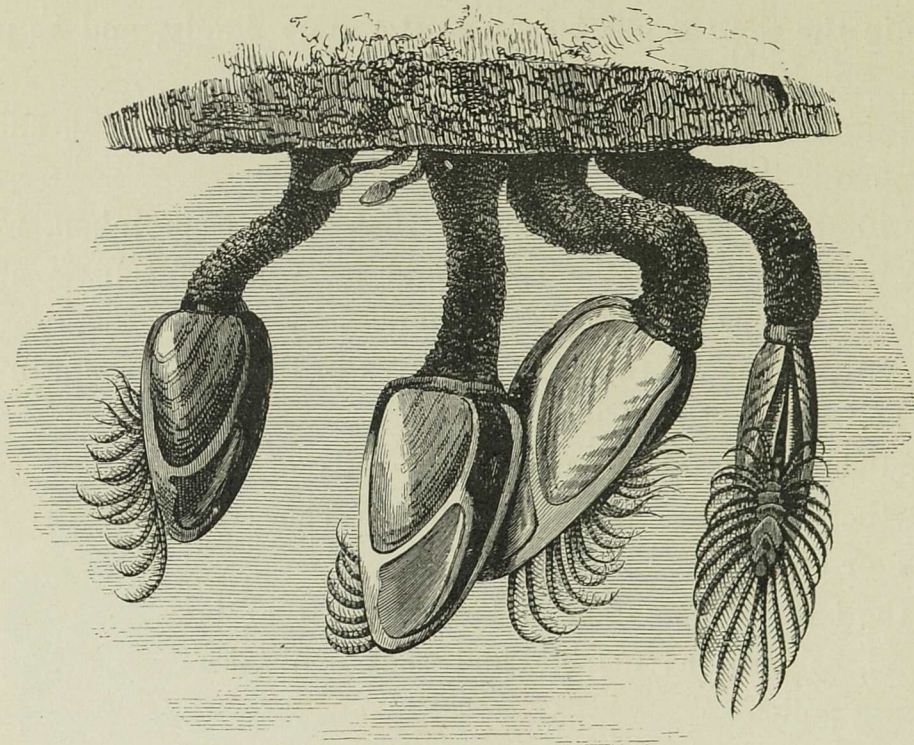
Some of the corals are so very red that they are called "blood foam."

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### THE BARNACLE.

COULD you have thought, for a moment, that the curious thing in the picture is an animal?

Nature has given to some of the creatures that live in the sea as whimsical a shape as possible.



THE BARNACLE.

This curious creature belongs to a family called Cirrhipedes ; but we do not give it this grand name every time we speak of it.

We call it a barnacle.

It is fastened, as you see, by a kind of stem to some substance, from which it seems to be growing. The substance, very often, is the bottom of a ship or boat. At the end of the stem is the body of the animal, which looks a little like the fruit or the flower of a plant.

It is covered with a strong case or shell, which is composed of valves, and from between the valves a number of feelers are put forth.

The feelers are called cirrhi, and the creature does nothing but keep drawing them in and out.

It has a round, soft body, not quite transparent, and is of a brown colour above, and the colour of flesh below.

For a time, naturalists were very much puzzled what to do with the barnacle. They could not tell to what order it belonged. Now, they have given it an order to itself, and put it between the worms and the crabs.

It is a very stationary being. It never moves from its pedicle; but the pedicle, or stem, to speak more plainly, does contrive to keep up a little movement of its own. It goes up and down, and to the right and the left; just, in fact, as the animal pleases to make it. The feelers, which you see put out from between the valves of the shell, are often called arms: they have tiny rings, like the body of a worm, and they are clothed with cilia, which gives them a very plume-like appearance.

Indeed, when they are at rest, they look like the young leaves of the fern.

There was a silly story once told about the barnacle.

Its oddness so puzzled people, that they pretended to believe it was a bird.

Or rather, I should say, that a bird came from it.

The name of the bird was the barnacle goose.

The fishermen pretended that they could hear the little goose making a noise within the shell; nay, some said they had seen it fairly come to life. First it put out its feet, then its body, and then its beak; then it dropped into the sea, and presently feathers began to grow upon it.

It was the barnacle goose!

For many years, numbers of persons who ought to have known better

believed this story ; and an account of the bird was printed by a learned society, and circulated as a fact.

I need not tell you, that very few persons are found to believe it now.  
What does the barnacle feed upon ?

It devours tiny insects, and minute creatures, which swarm in the sea. It has no eyes—at least not in this stage of its being ; but its feelers serve it instead. It spreads them out like a net, and catches all that pass by that way.

It has a famous mouth, and jaws too, like those of the crab or the lobster.

When the barnacle was newly come into the world, it had no stem. It floated about in the water, and had a number of little fins to swim with.

And it had one large eye in the middle of its body.

How very different it was from its parent !

When it grows up, the fins and the eye both disappear. Then it begins to have a stem, and fixes itself to some convenient place, like a true barnacle.

There is one of the family of cirrhipedes which has no stem at all.

It does not want one. It fixes itself to the shell of the turtle, or to the skin of the great whale.

It follows the whale about, wherever it goes ; in fact, it lives upon the huge body.

A strip of flesh, taken from the lip of the whale, is in the Museum in Paris. It has forty-five of these parasites upon it. They are arranged in order, like the stones in a pavement.

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## WORMS THAT LIVE IN THE SEA.

THERE are worms in the sea, as well as on the land.

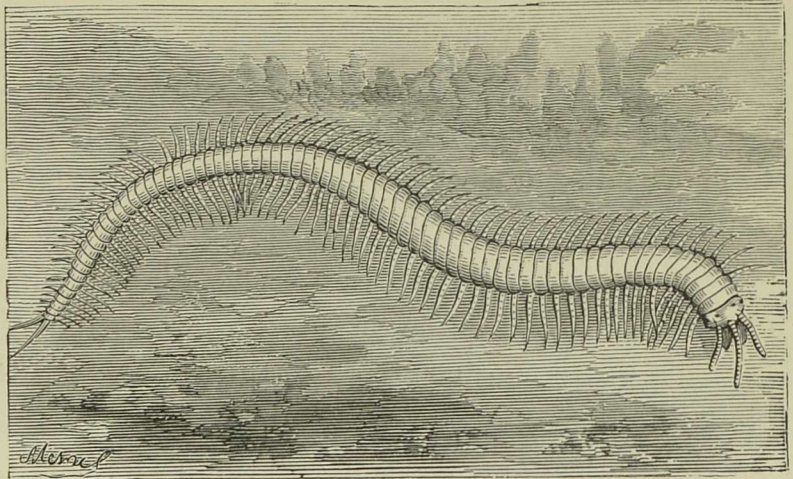
The worms that live in the sea, belong to a class called Annelides.

They have very pretty names given them besides this family name. One is called Nereis, another Eunice, and another Euphrosyne. They are called so because they are so beautiful.



Their bodies shine with all the colours of the rainbow. A writer once said, that we need not talk of the violet as the emblem of modesty because she hid herself in the green leaves. Here are these shining worms, as beautiful as can be, that hide down deep in the tufts of sea-weed, and at the bottom of the ocean.

Some of the annelides wander about, and glide hither and thither as they choose. They have neither house nor cell to carry with them, and on that account they are said to be *naked worms*.

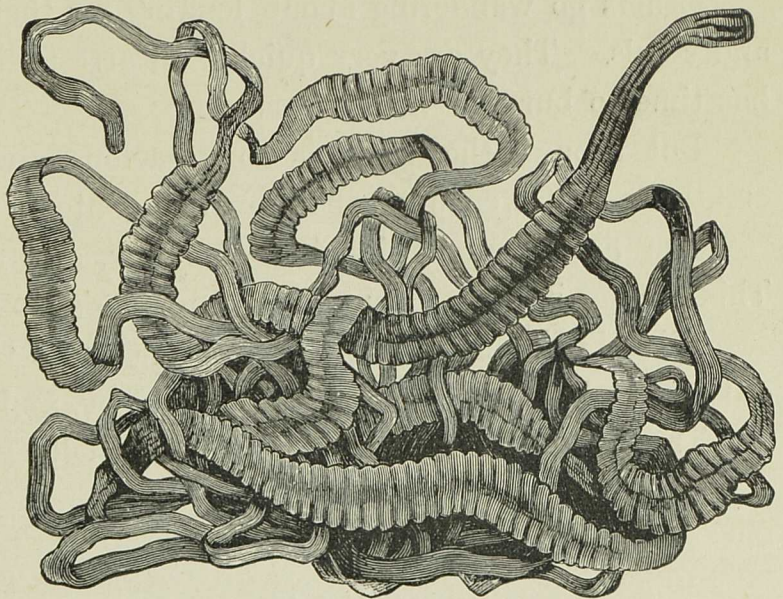


AN ANNELIDE.

Little tufts of hair-like bristles grow down each side of the body. These are the breathing apparatus, by which the creature draws in air.

You know very well the construction of the common worm. Its body is made up of a number of rings, with soft flesh between.

Just so is it with the worms in the sea. One worm has as many as three hundred rings round its body, and thousands of muscles to help it to move about. For in the Tropics these worms grow to a great size.



GREAT TANGLED WORM.

The tangled worm you see in the picture is nearly forty feet long. Its long smooth body is a little like a ribbon, of a violet or brown colour.

It lives in the hollows of the rocks, or among loose stones. It eats tiny shells for its food, and it seems to amuse itself by tying its long ribbon-like body into knots, and untying them again. Every now and then, it sets out in search of food. It has no muscles like its relation, the worm that I have just told you about; but it glides along, by means of a number of hairs, or cilia, with which its body is covered.

The cilia move backwards and forwards in the water, and help the giant worm on its way.

By-and-by, it comes to a stone like the one it has left; here it stops, and begins its old game of tying knots in itself.

This great worm has only a little hole for its mouth, and a head somewhat like a snake.

Nature has not given it feet; but she has done so to some of its tribe.

Some of the more perfect annelides have bristly feet, and they make good use of them.

When any little creature comes swimming by, the annelide will dart upon it, seize it with its jaws, and squeeze it to death.

Others go wandering about, looking for their prey among the sea-weeds and corals. They are very quick, and arrest the poor little victim before it has time to bury itself in the sand.

But though the worm is so voracious, and devours so many minute creatures, it has enemies of its own to contend with.

The fishes pursue it without mercy, and so do the crabs and lobsters. This is why it likes to hide itself in some snug hole or corner.

While it keeps in its hiding-place, it is tolerably safe; but if it puts out its head, a fish is sure to be passing by, and will snap it up in a minute.

There are some creatures with hard shells, called whelks, that will even dig it out of the sand.

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## WORMS THAT BUILD HOUSES.

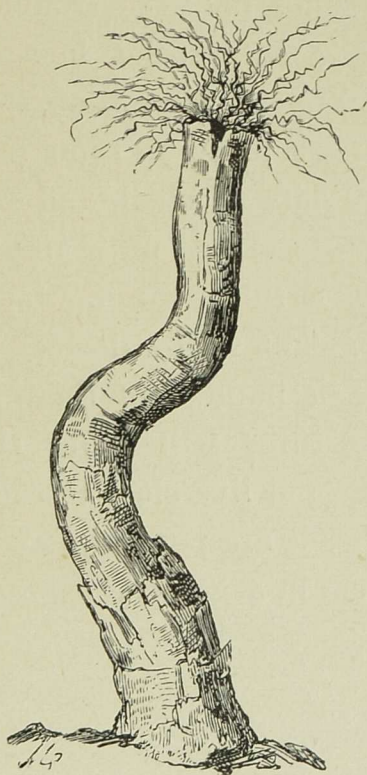
SOMETIMES a worm will spend its whole life in-doors. It will only, now and then, put out its head and give a peep at the great world around it.

What is its house?

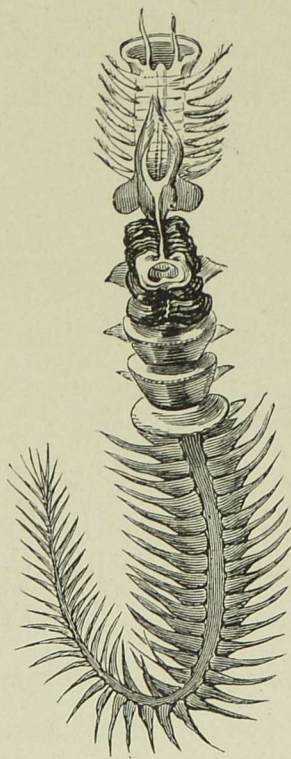
It is a cell, or tube, quite distinct from the body of the worm. The worm began to build it, when it was young, and had only just left its egg.

It has gone on building it, all its life. As it grew larger it enlarged its house.

Sometimes its house looks like stone, and sometimes like leather.



THE WORM IN ITS TUBE.



THE WORM TORN OUT OF ITS TUBE.

The worm leads a very stay-at-home life, in its tube.

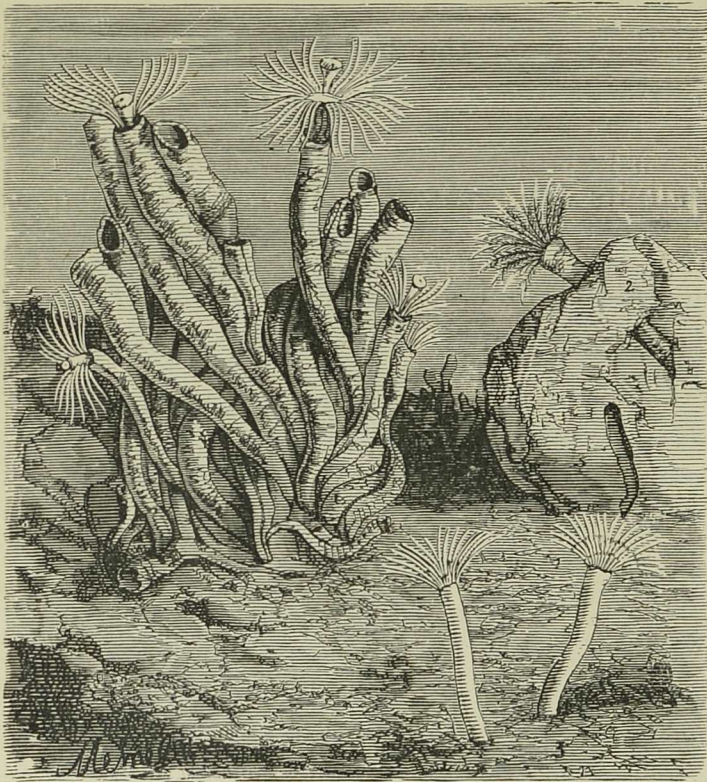
It has a head, with a number of feelers growing on it like a crown.

When it puts its head out of doors, its feelers float about in the water, and get a little air.

This is the time when the worm seizes its prey.

Its head, with the crown of feelers, is very handsome indeed.

It is blue, or orange, or violet, and expands like a flower. If there



WORMS THAT LIVE CLOSE TO EACH OTHER.

When the tide comes in, hundreds of heads are put out, gay with rainbow colours, and looking like brilliant flowers in a garden.

is the slightest sound, or ripple in the water, the beautiful head is drawn in, as quick as lightning.

Not an atom of it is seen.

Sometimes the worm does not take the trouble to build a substantial house like the one I have been speaking of. It picks up sand and broken bits of shell, and sticks them together, until it has made a tube. Sometimes it lives shut up by itself. But often a number of these little creatures will build their tubes and live close to each other.

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## FLOWERS OF THE OCEAN.

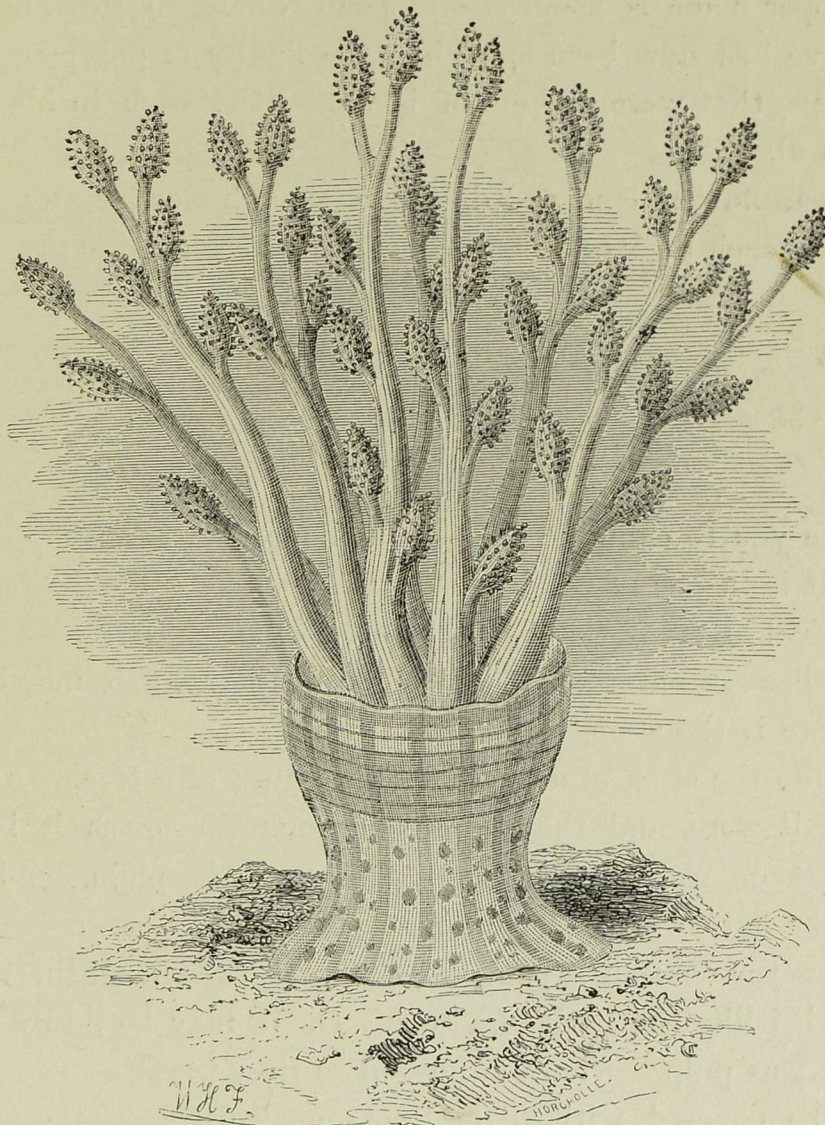
WE who live on land, far away from the deep recesses of the ocean, can form little idea of its hidden beauty.

Branching corals, and fantastic shrubs, and brilliant sponges, are on every side. Sea-weeds cling to the corals, and wreath them with gold and purple. The rocks are gay with flowers of ocean, that vie in loveliness with the lily and the rose.

Bell-shaped jelly-fishes float amid the fairy scene, dressed in violet and crimson. Ribbon-like creatures glide about, and cross and re-cross each

other. While brilliant-coloured fishes flash among the plants, and corals, as humming-birds do in the groves of the Tropics.

When night comes, the ocean-garden is still more beautiful. Millions of tiny creatures sparkle like stars. The larger animals look, many of



TREE-LIKE ACTINIA.

them, like bodies of fire. In the day-time, they had no especial beauty. But now, they shine with gold or emerald.

The ancients, who were very fanciful, might well people these fairy-like spots with sea-nymphs, and mermaids, and imaginary beings!

What kind of flowers are they which bloom in the gardens of the sea?

They are not real flowers. They are animals. They have been called plant-animals, because they are so like plants.

Their proper name is zoophytes. They belong to the large family of which we have just now been speaking, the family of polyps.

The polyps, that were makers of islands, lived each in his cell. They did not roam about.

These ocean-flowers can, and do move, though slowly.

They grow each on its stalk, and are called sea-anemones.

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## THE SEA-ANEMONE.

I SHOULD like you to examine the sea-anemone.

Though it is in one of the lowest ranks of the animal world, you will find a great deal about it that is very interesting.

Its body has six parts, or, if you like to call them so, members.

First, there is the stem, or column.

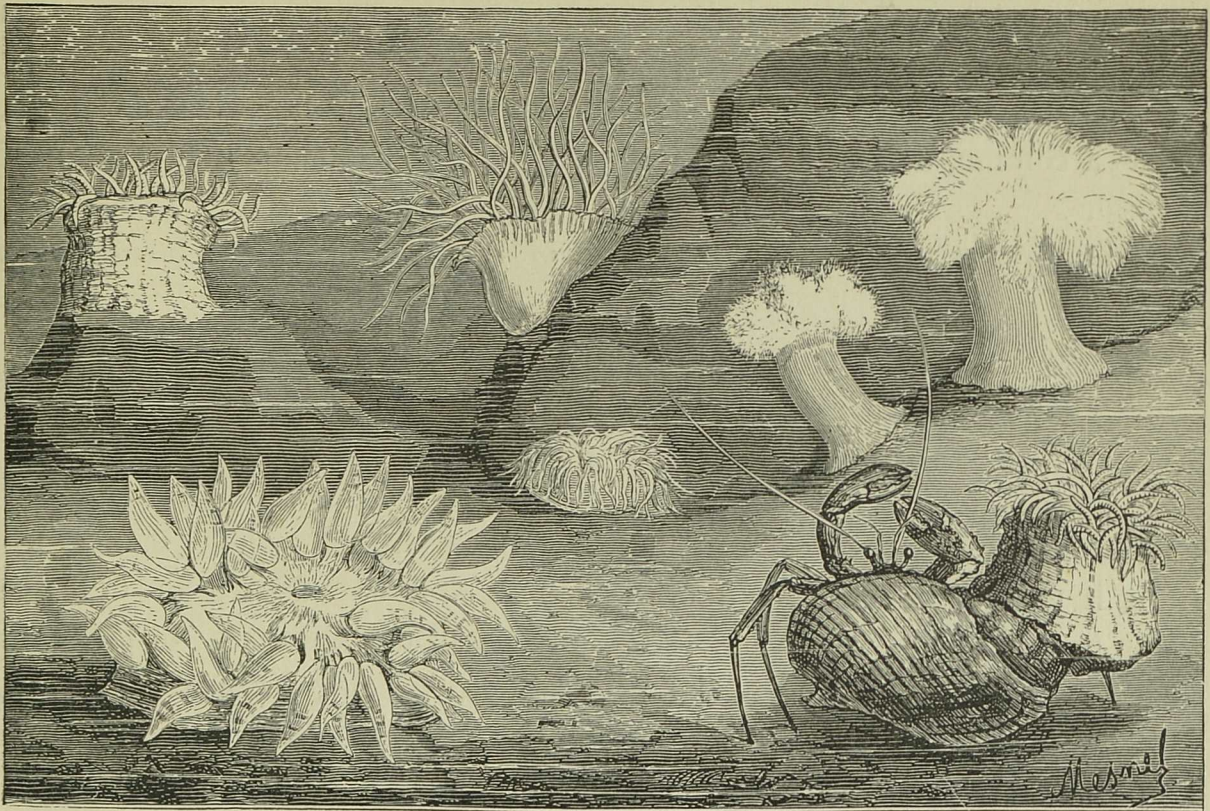
It rises like the stem of a plant, or the trunk of a tree. At the top, it is cut off, as it were, and there is a thick margin, or, as it is sometimes called, parapet or wall. Sometimes this wall is plain, and sometimes notched, or the outer row of feelers may grow to it.

Sometimes the column is smooth, or else marked with lines or furrows, or else wrinkled like the bark of a tree. Or it may be fleshy, or else like leather, or soft as pulp. There is no end to its varieties.

It may be covered with little knots or warts. These warts are, in fact, suckers, by which it can stick fast to any substance it chooses.

And sometimes the skin is full of minute holes, called loopholes, which are for a very curious purpose, and I shall tell you about them by-and-by.

The lowest end of the column is the *base*.



SEA-ANEMONES.—HERMIT CRAB CARRYING ONE ON ITS BACK.

It is a broad plate, forming a flat surface, by which the creature fixes itself.

The upper end of the column is called the *disk*. It is round, and sometimes its edge has a frill, or number of frills, round it. The feelers grow out of the *disk*.

The feelers are hollow, and are arranged in circles, round the edge of the disk. Each feeler has a foot, and a tip. We shall see, by-and-by, what a great deal of work is done by these feelers.

The anemone has neither eyes nor ears; but it has a mouth and a lip.

The mouth is placed in the middle of the disk. The thick lip goes round it.

From the mouth, there descends a hole or cavity like a sac, only gathered into folds. It is open at the end. This is the *stomach*. Indeed,

the stomach takes up the whole space within the column. It is divided into rude kinds of chambers or spaces.

You see, therefore, that the structure of the sea-anemone is very simple. It has a column, a base, a disk, a mouth, a lip, a stomach, and a number of feelers.

I am going to tell you what kind of life it leads, in its home in the water.

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### MORE ABOUT THE SEA-ANEMONE.

THE anemone likes to live among the rocks in some hole or crevice. Here, it will unfold its crown of feelers, as a flower does its petals, and wave to and fro in the water. Its crown will not always be of the same colour as the stem. It will be pale orange, or red, or white, or pink, or yellow. In fact, the anemone will be variegated, and wear all these colours at once.

How beautiful it looks when fully expanded! How brilliant are its colours! But touch it ever so lightly, and all its beauty is gone. It draws in its feelers, and shrinks down to a button, or little knob of jelly.

It is now ugly and disagreeable to look at.

But let it alone, and its courage will begin to revive.

It gradually rises. Its body gets filled with water. The column-like stem swells out. The frilled disk unfolds like a crown of leaves.

It will soon become as beautiful as ever.

Let us watch what happens. It is not merely going to display its beauty, in this pleasant nook it has chosen.

No. It is a hungry creature, and is watching for its prey.

A foolish worm comes swimming by. The anemone has no eyes to see it; but its feelers have been moving about, in the hope of meeting with something which is likely to serve for a dinner.

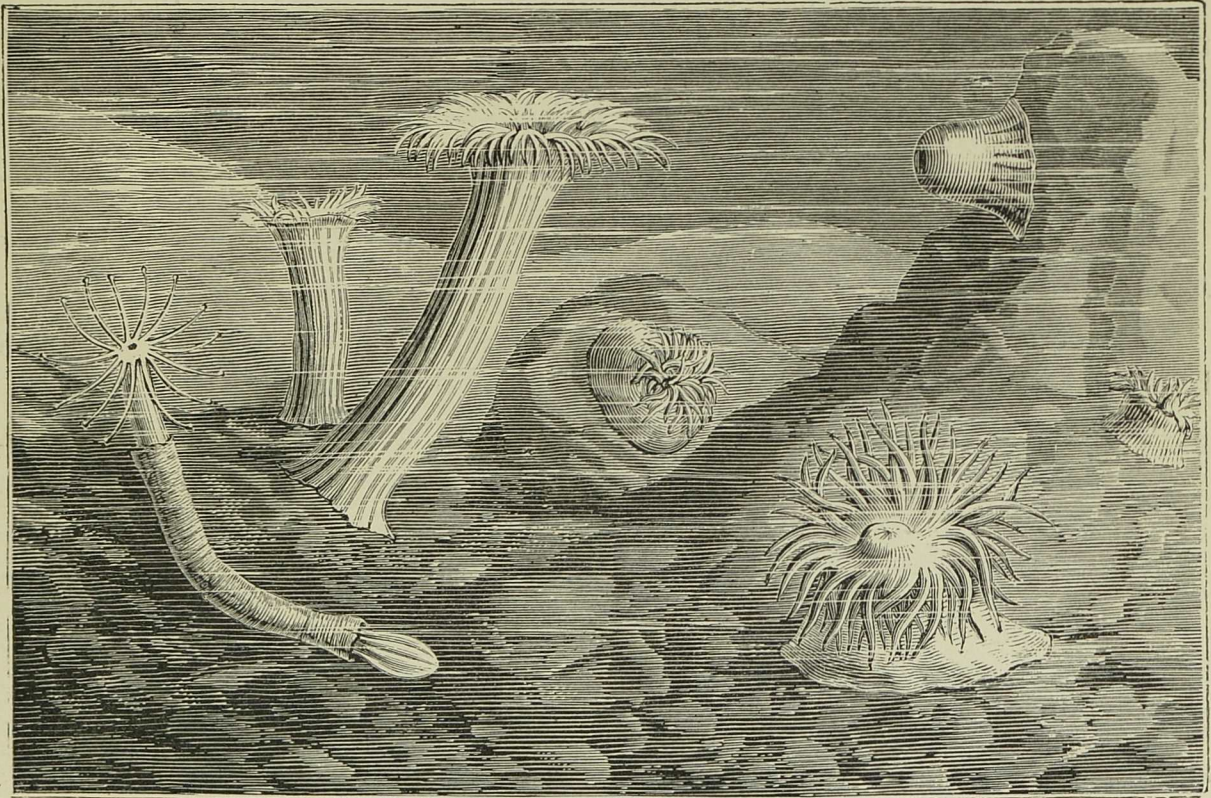
They quickly close round the worm.

Do you see how stunned the poor little victim is? A poison has been



ejected from the arms of the polyp. The worm is half dead with the poison, even before it is carried to the mouth. That wide, gaping mouth which is ready to receive it.

Now, if you could have taken the poor little worm from its captor, and looked at it through a microscope, what would you have seen ?



SEA-ANEMONES.

A number of darts, like so many minute pins, embedded in the flesh. Each dart is armed with poison.

Where do the darts come from ?

Do you remember the minute holes which I called loopholes, and which were found in the skin of the animal ?

From out these holes, and also from its mouth, it can shoot these tiny darts. They are more like threads than darts. They are curled up and tangled together like a bundle of cotton. When the thread is forced out from the hole, it makes a kind of loop, but if the creature is much excited, one

end of the loop gets free. After a time, it draws back the loop through the same hole out of which it came.

What a wonderful apparatus for defence and attack !

The slightest irritation provokes an onslaught from these minute weapons.

Minute to us, but how terrible to the countless swarms of creatures that live in the neighbourhood !

The poison of these darts is felt even by human beings.

Persons, bathing in the sea, often meet with the venomous threads of the anemone, and are painfully stung by them.

A naturalist, not long since, made a bold experiment. He let the feelers of a sea-anemone touch his tongue.

The creature seized the tongue eagerly, and had to be pulled away by force. But a wound was made, that for a time was very painful.

Where the poison is lodged, and how ejected, has not yet been discovered.

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## T H E M E D U S Æ .

It is rather too bad to give the name of Medusæ to the lovely fairy-like creatures I am going to describe.

For Medusa, as I dare say you know, was one of the Gorgons. She was said, in the Greek mythology, to be a beautiful woman, with snakes growing round her head instead of hair.

And, according to the same old story, whoever looked at her was turned into stone.

The medusæ I am speaking of, are a tribe of creatures that have all kinds of shapes, and wear all kinds of colours.

They float about in the sea, and are as transparent, sometimes, as the water.

Most of them, if not the whole of the family, have the power of shining in the dark.

They help as much as any other creatures to make the sea shine.

When they are thrown on shore, they look like a mass of jelly or blubber. The mass lies melting in the sun, and is as little like an animal as possible.

People call it "sea-jelly," or "sea-blubber," or "jelly-fish."

And as the medusæ have the disagreeable art of stinging very sharply, they are often called "sea-nettles."

The family name for the whole tribe is Acalephæ.

This was given it by the great naturalist Cuvier.

There is something very extraordinary in the history of these creatures.

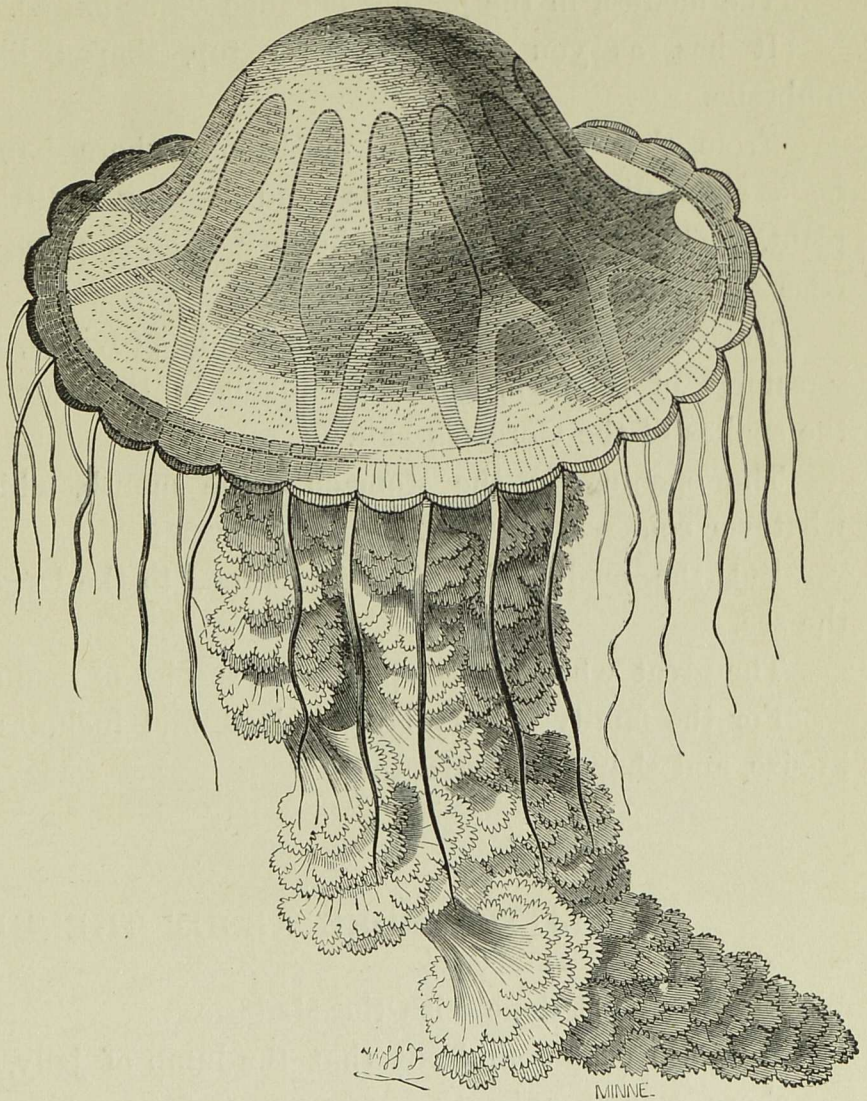
Look at one, as it lies melting away on the beach.

Surely it can be nothing but jelly!

What animal life or structure can there be in a creature so imperfect?

Let us look at it more closely, before we decide that question. Its body has nearly drained away. What is there left?

A little quantity of transparent matter, almost like cobwebs, and full of cells.



THE FINE-HAIRED MEDUSA.

This is the framework or body of the creature. The only kind of skeleton it has.

The medusa in the picture is called "fine-haired."

It has, as you see, a disk or top, shaped like a mushroom or an umbrella.

From the inside of the mushroom, there hangs down what might be a stem, divided into parts, and looking a little like the roots of a plant. The stomach, a very hungry one, is placed in the centre of this stem.

The edge of the disk or umbrella is provided, as you see, with long streamers of its own, that float about in the water, and are a little like the snakes of the Gorgon's hair.

The opening to the stomach is the mouth, which is ready to receive whatever comes in its way.

But the medusa itself serves as food to the larger animals that live in the sea.

The great whale feeds upon some species of medusæ.

For the family is very large indeed, and includes all kinds of varieties, in size, and shape, and structure.

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## A LITTLE MORE ABOUT THE MEDUSÆ.

WE have not yet done with the Medusæ.

How did people find out that the lump of jelly, fast melting away, on the shore, was an animal?

I will tell you.

A French naturalist squeezed some milk into the mouth of the creature. The milk spread itself through all the little cells and vessels, and enabled him to see them quite clearly.

Until that time, even the most learned men had called the medusa a mere lump of living jelly.

But now, they began to take a little notice of it. They examined it

more carefully, and found out that it was really an animal, with powers of moving about, and of seizing its prey.

But sea-water made up such a great part of its body, that when it died, or was thrown on shore, the body dissolved and dropped away.

I must tell you how the bell-shaped medusa moves about.

It is heavier than the water, and would sink, if it had not some means of keeping itself afloat.

But it uses its umbrella-like disk to swim with.

The disk contracts and dilates, a little as our lungs do in breathing.

By striking the waves in this manner, the creature manages to swim in smooth water.

When the sea is rough, it cannot resist the fury of the waves. Then it sinks down, to find a more tranquil spot, until the storm is over.

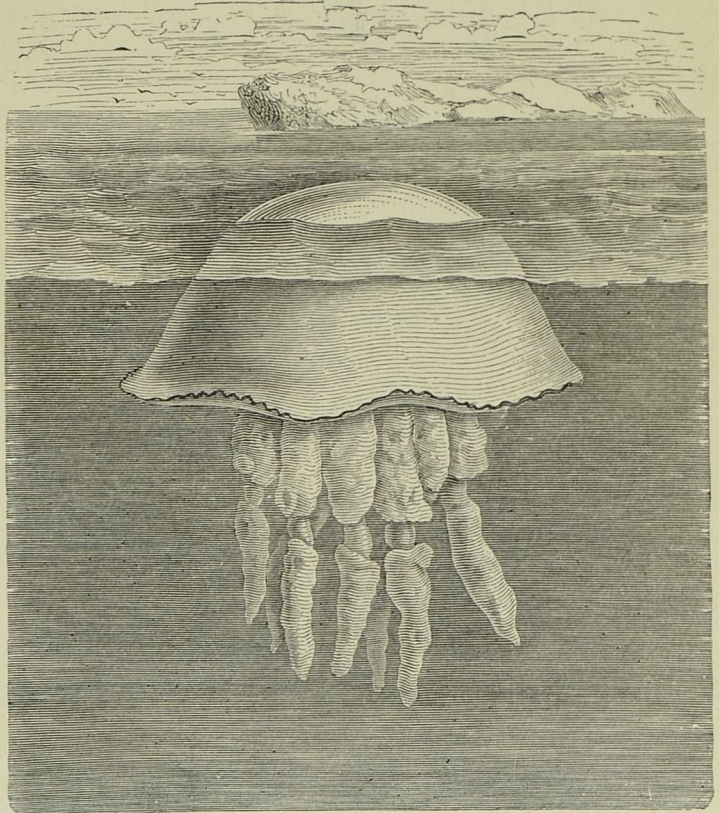
But some of the medusæ are provided with very different means of swimming.

These are not bell-shaped. As I told you, the family included all kinds of shapes and sizes.

They move about by cilia. The cilia might be called tiny oars or paddles, which help the creature along.

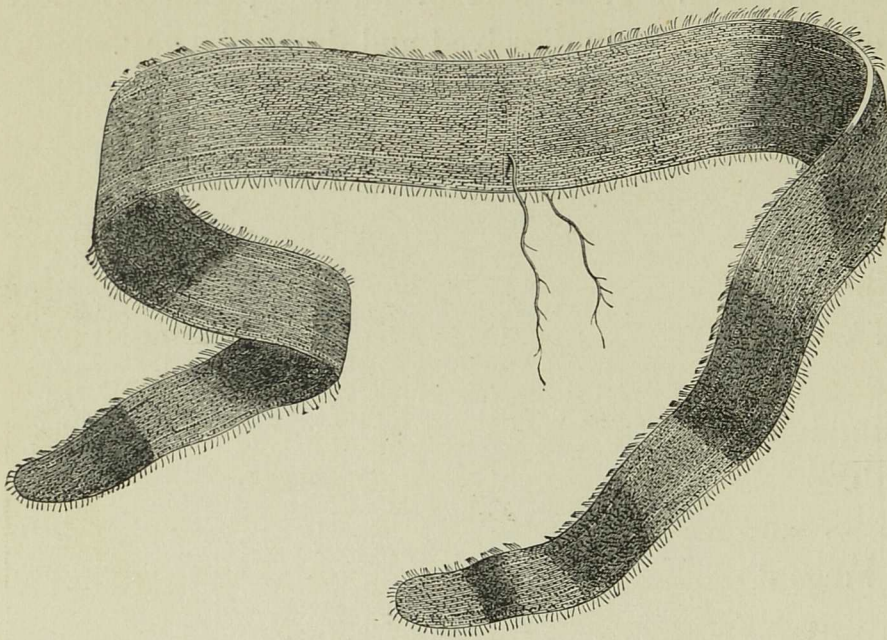
The beautiful ribbon-like creature in the plate on next page is called the "Girdle of Venus."

The edges of the ribbon are fringed with numbers of cilia, which are tinted with all manner of lovely colours.



THE BELL-SHAPED MEDUSA.

It is often five or six feet long, and shines in the dark, like the rest of its tribe.



GIRDLE OF VENUS.

There is a round medusa, with a body in the shape of a melon, and as clear as crystal.

It is called the Beroë.

Its body is divided by eight lines or ribs into eight equal portions. These lines are covered with flat cilia, a little like paddles, and placed

one above the other.

When the creature wants to move, it sets all its cilia in motion. These, like so many oars, drive the crystal-like along.

On it goes, gliding gracefully over the water.

If it wants to stop, it has nothing to do but leave off rowing; or if it wants to turn, it stops its oars on one side only.

It is a very lovely creature indeed; for the lines or ribs on its body sparkle with all the colours of the rainbow.

Besides its oars, it has two long streamers or tentacles that come out of its body. They are so elastic that they can shrink up, and be drawn back, so as not to be seen.

When they are drawn back, they are hidden in two sheaths, and are not at all in the way.

The filaments on the tentacle roll up when the tentacle is drawn in. If you looked at them through the microscope, you would see that they are covered with tiny prickles, which no doubt are used to kill its prey.

## CREATURES THAT WEAR ARMOUR.

HAVE you ever been to visit the collection of armour in the Tower of London?

Have you seen the helmets, and coats of mail, and steel gloves, which people used to wear, in the old days, when they went to battle? Sometimes, the suit of armour was very heavy indeed. When a soldier fell down, he could not get up again.

Nature does her work more skilfully than man. And she has made a whole race of creatures, who wear armour—armour that she has herself fitted upon them.

Here we find shields, and bucklers, and lances, and spears.

Weapons, you perceive, as well as armour.

It is a good thing these creatures are not very large, or else they would be dreadful monsters, and as dangerous as dreadful.

What are they?

They belong to a class, in the animal world, which is called *Crustacea*.

The name comes from a Latin word, which means "to harden," and the armour which they wear is as hard as can be.

They have rings round their bodies, as the annelides have. But the rings of these armed creatures are made of lime, and there is no soft flesh between them. There is either a piece of tough skin, or else the rings are close together, and form a compact case or shell.

You know most of these creatures as well as I do.

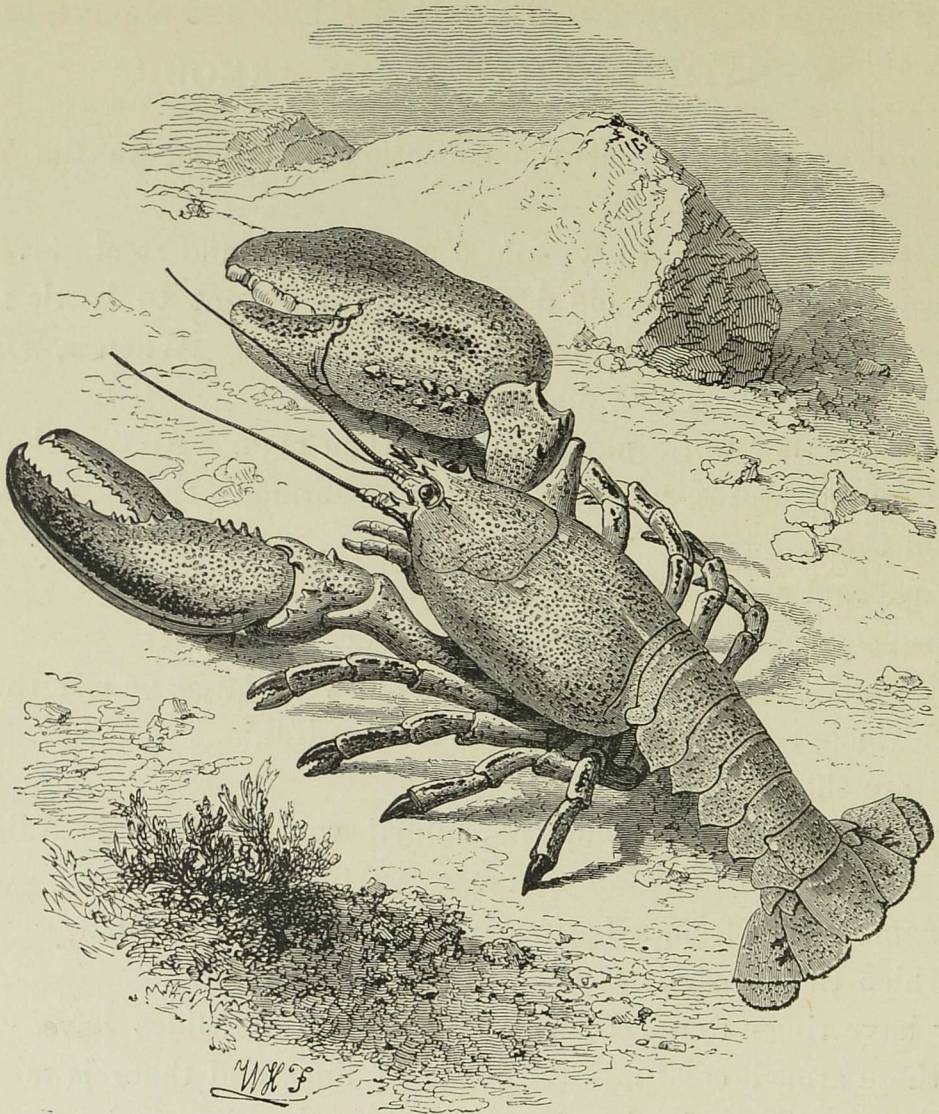
But you may not have noticed the wonderful manner in which their armour is made.

So we will begin with one which is perhaps the most familiar of all.

Let me introduce to you our friend the lobster.

He has a soft body under his hard shell, for we have eaten it, and know that it is rather a dainty.

But what is his shell or armour made of?



THE LOBSTER.

Nothing but those rings of lime, we spoke of a little ago.

A substance a little like glue, comes from the skin of the lobster, and mixes with the lime.

In the tail of the lobster, you can see the rings very plainly, for they overlap each other, and have hinges made of a thick tough membrane.

He has a famous shield on his back, but even in this the rings may be seen. His legs are cased in armour, like the rest of his body, but there are joints or hinges, so that he can move them easily. His armour is neither



too heavy nor too clumsy for him. It fits him like a glove, and allows him to go about just as he pleases.

Nature knew what enemies his poor soft body would meet with. All the creatures, far and near, would have liked to eat it up, so she took care to send him into the world well defended.

Instead of falling a prey to others, you may fancy what a formidable creature he is.

We have not yet done with him. There is a great deal more to be said of the lobster.

Do you not see three sets of feet, near his mouth?

These are called jaw-feet, and he can seize his prey with them, and break it to pieces.

It is no joke for a smaller creature to come within reach of those terrible feet, I assure you.

Then he has another set of feet, a little lower down, on his chest. He walks on these feet. There are five pairs of them.

And he has more feet still, on his tail, but they are called false feet, because they are used for swimming instead of walking.

And there is another use for these false feet. The mother lobster sticks her eggs upon them, and holds them there, until the time comes for putting them in the sand to be hatched.

Now, I want you to look at the feet of the lobster. The walking legs, you will see, are divided into five pieces, and they each end with a hook.

But the pair of legs nearest to the mouth is larger than the others, and ends in great claws or nippers.

One of these nippers is made like a saw, and catches hold of the prey. The other nipper lays hold of the stalks of sea-weeds, and prevents the lobster from being carried away by currents in the water.

The lobster, like a great many of his relations, has a very curious way of breaking off his own limbs. He can do this, to save himself from being seriously hurt by an accident.

If his claw is wounded, it might cause him to bleed to death; for the

blood-vessels in his body are of a very delicate structure. But the lobster seems to know a remedy. He breaks off his claw at a certain point, and the bleeding gives over, and his life is saved.

But is he maimed all the rest of his days ?

Oh no, nothing of the kind ! Very soon, a new claw begins to sprout from the old one. It goes on growing, without any shell to protect it ; but when the animal changes his shell (a habit about which you will hear presently), the new claw gets a covering. It never attains the size of the opposite claw, which has not been damaged, but it serves almost as well, and is quite as perfect.

Because the flesh of the lobster is so dainty, the poor animal is sadly persecuted.

Millions of lobsters are served up in London every year, and the lobster-fishery is a very important one.

The fisherman throws a wicker basket into the sea. The basket contains some nice morsel to tempt the lobster. Of course, the lobster soon comes up.

He creeps into the basket readily enough. But he has got into a trap. For the basket is so contrived that he cannot get out again.

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### MORE ABOUT THE LOBSTER.

I HAVE not quite finished with the lobster's coat of mail.

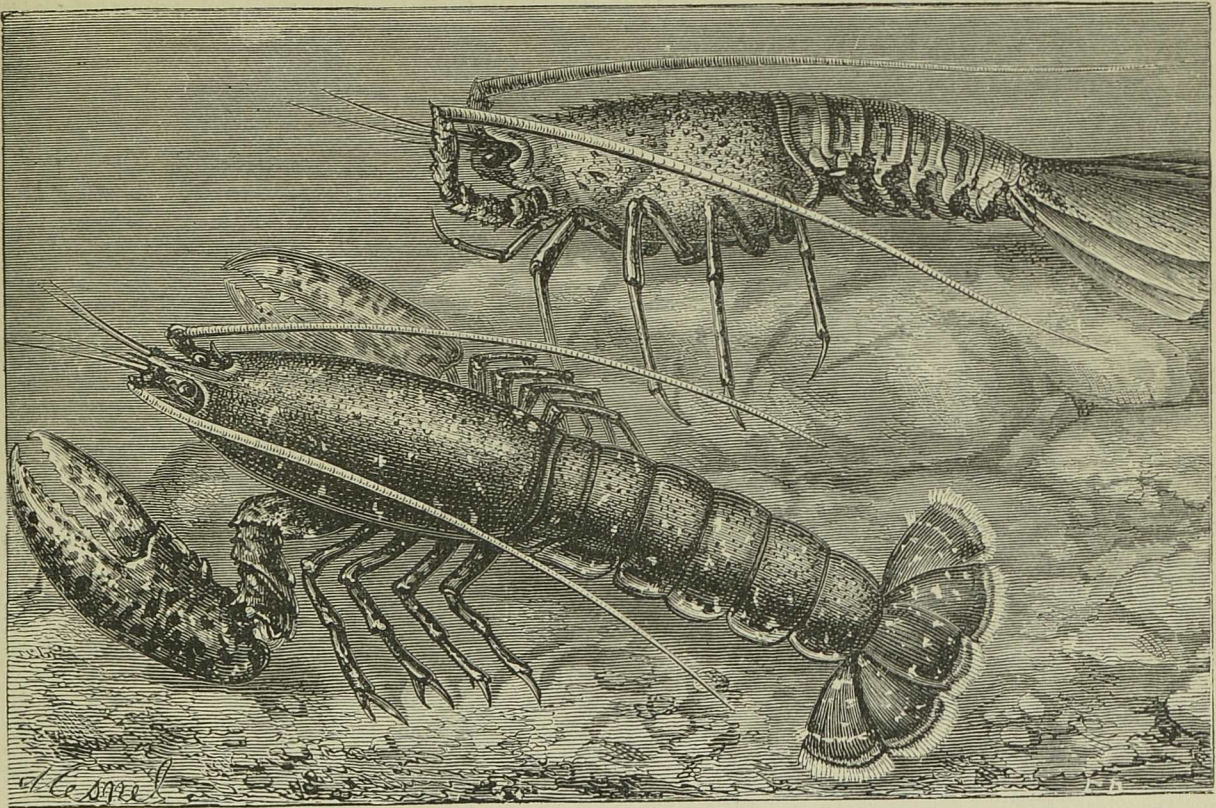
It is possessed by the creature soon after his birth ; and here, rather a difficulty arises.

As the lobster keeps on growing, what happens to the armour ? Does it grow as well ?

No ; and in process of time the body of the animal becomes too large for its house. It is bound, and pent in, on every side.

In fact, the lobster is in rather an unpleasant position.

He leaves off eating, a sure sign that something is the matter. And he goes away and hides himself in some hole or corner. Here, he gets very



RELATIONS OF THE LOBSTER.

thin, which is just the best thing he can do. His body shrinks away from the shell, and this makes what he is going to do more easy.

Now begins the struggle. The creature swells itself and wriggles about, till the old shell splits down the back and makes an opening. Then the claws burst at their hinges, and the lobster draws them off, as you would draw off a pair of boots.

Next, the head throws off its covering or helmet, and then the body creeps quite out of the shell.

The old shell lies complete in all its parts. You might think the lobster was yet inside it. But the poor lobster, with his armour gone, creeps into some safe place.

His brother lobsters would soon eat him up, if they met with him in this defenceless state. So he takes care to keep out of their way.

He is very tired and weak, and, now and then, a lobster dies during the

struggle I have been relating. If he has got through it safely, he lies resting himself in his hole.

Nature will soon provide him with a new suit of armour.

His thick skin becomes covered with a kind of glue, and forms a new shell.

All he has to do, is to fill his body with water, and swell it out as much as he can.

The skin directly begins to get hard, and the new armour forms itself into the same shape as the old.

The lobster recovers his appetite, and comes forth with new strength and vigour.

When the lobster is in his native element, he is not the same colour as when he appears at table.

His coat of mail is black, not red.

He is only red when he has been boiled.

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## THE CRAB.

THE crab is, as you know, a very near relation to the lobster. He wears armour on his body, and his family name is Crustacea. But he does not like cold seas, and will not live in them. The nearer you get to the Tropics the more crabs you find.

The foreign crabs have all kinds of curious habits.

They live not only in the sea. They swarm in every brook and river. And they even live on dry land.

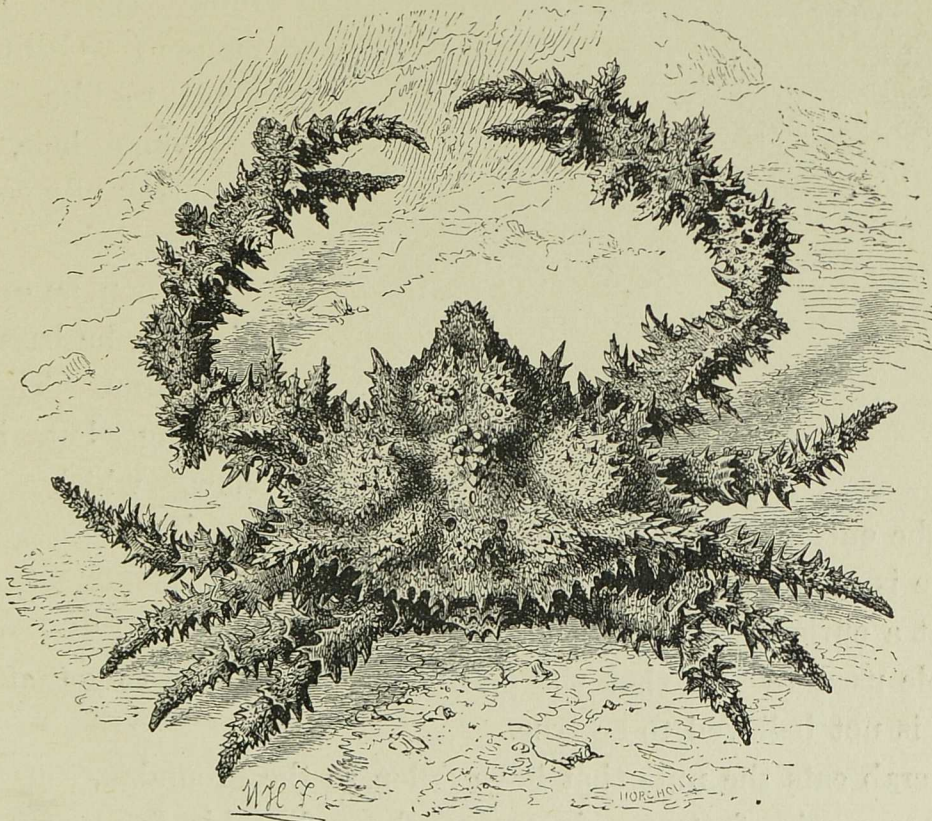
There is one crab that would die if you threw him into the water. He would be drowned. He is called the land crab. He likes to live in the shadow of some damp, dark forest. The forest will often be a great way from the sea. But he does not care about that. He hides himself in a hole, and lies there as snug as possible. When it is getting dusk, he comes out of his hole, and runs about a little, very likely to catch something for supper.

Nature has provided, in a very ingenious manner, for the wants of these land crabs.

I must tell you that the gills, or breathing apparatus, of the crab, lie in the centre of the body, and look like a number of loose fringes.

It is necessary to the creature's health that these gills be kept damp.

But as the crab will often go a journey—for crabs, as you will hear, are great travellers—how is it to be done?



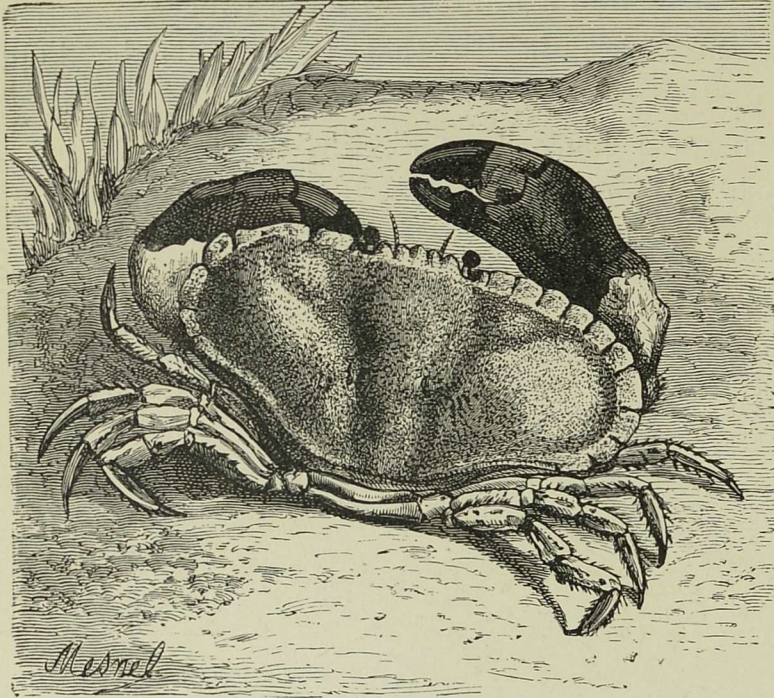
GREAT CRAB OF MADAGASCAR.

A number of little sacs, like water-bags, are placed under the gills. Before the crab sets off, he takes in water by filling his sacs, just as an engine might do.

As he goes along the dusty road, drops of water keep falling, out of the sacs, on to his gills, and keep them moist, so that he does not suffer either from heat or dryness.

But what do you think of a crab that has one claw nearly as large as his body?

The other claw is very small and feeble indeed.



CRAB WITH GREAT CLAW.

When the crab runs along, he holds his great claw over his head, and it seems as if he were beckoning you to run after him. The crab has the name of "Calling Crab" given to him. He lives in some hole, on the muddy, sandy coast of the Indies.

When he creeps into his hole, he bars the door after him. The door is nothing but his great claw, which he puts

against the entrance, and so blocks it up.

There is another crab, which lives on the cocoa-nut.

What a curious thing for a crab to eat!

People used to say, that the crab climbed the tree to get at the nuts. But this is not believed to be true.

The crab eats the nuts that have fallen to the ground.

He has a pair of strong pincers at the end of his front claws. When he has found a nut to his mind, he begins to tear away the husk, fibre by fibre.

And he hammers on the three weak places in the shell, which are called the eyes of the nut. He soon hammers a hole right through them.

He has another pair of pincers in his hinder claws. These are not so strong as the others, but the crab begins to scoop out the kernel with them.

He soon scoops out enough for his dinner.

He lives in a deep hole, and the hole gets quite full of fibres of the cocoa-nut which have been torn off.

He rests on these as on a bed.

This cocoa-nut eating crab is quite a delicacy. He gets so fat, that sometimes a quart of oil is yielded from his body.

You may think how strong the pincers of the crab must be, to break the hard shell of the cocoa-nut.

A captain of a ship wanted to bring one of these crabs home. He shut the creature up in a tin box, and tied the lid down with wire. He thought the crab could not possibly get out.

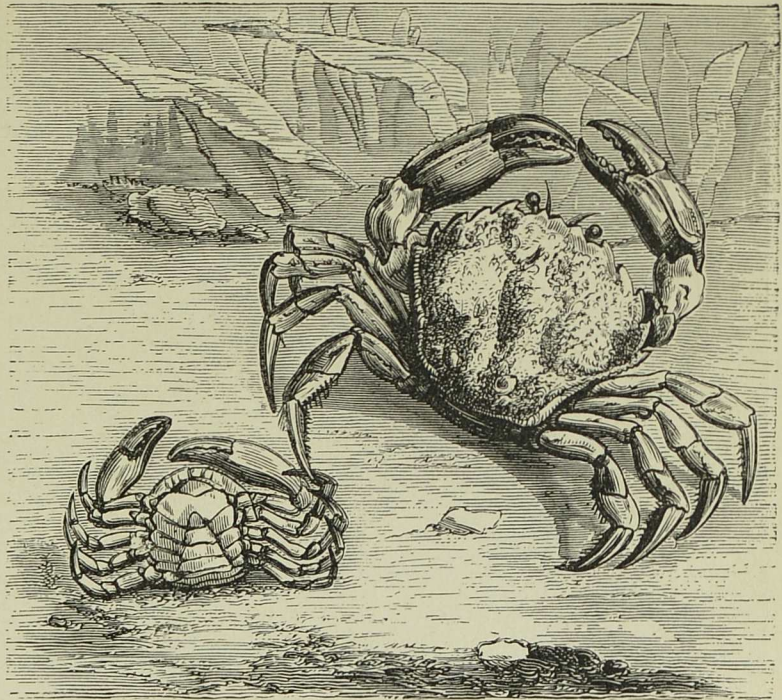
But he was mistaken.

The crab used his strong pincers to turn

down the edges of the box, and thus got away. In doing so, he had even punched holes through the tin.

I ought to tell you that crabs are very quarrelsome creatures.

In the plate, two crabs are having a battle. I am afraid the poor crab that is beaten will be torn in pieces, and eaten up by the victor.



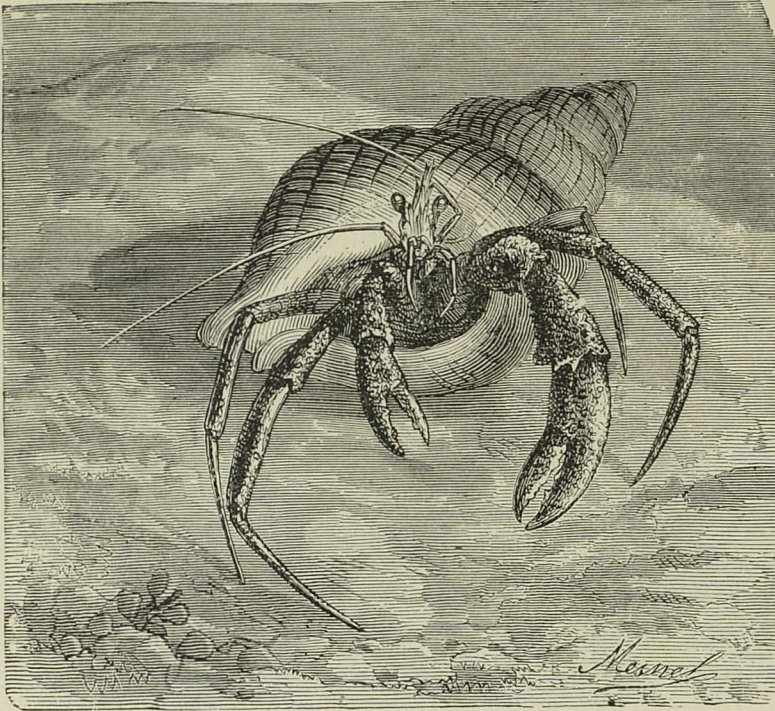
CRABS FIGHTING.

## THE CRAB THAT STEALS A HOUSE.

THE body of the crab has, as we have seen, a famous armour to cover it. His legs are cased in armour, and furnished with claws; so that he is able to take good care of himself.

But there is a family of crabs that Nature seems to have neglected. The fore part of the body is armed, and has claws. But the hinder part has no covering at all. It ends in a soft tail.

This poor creature cannot swim, like the rest of his tribe; and he cannot run. So that he is very helpless indeed. He seems to know that



HERMIT CRAB IN HIS NEIGHBOUR'S HOUSE.

he is helpless, for he looks about to find some place of shelter.

There are a great many shells on the beach. He picks out one that will do, and thrusts his tail into it.

This serves him for armour.

At first, he takes empty shells; but as he grows older, he gets more daring.

If he sees a shell to his mind, he will not care

whether it is empty or not. Indeed, he wishes for food as well as shelter.

As he prowls about, he will catch sight of a snail that has just put out its feelers.

It draws them back in a hurry, the moment it sees the crab, and tries to get into its house again. But the crab seizes it with his sharp claws, and drags it out and eats it.

Then he marches into the snail's house, and takes it for his own. When the crab outgrows his house, he casts it aside, and sets about looking for another.

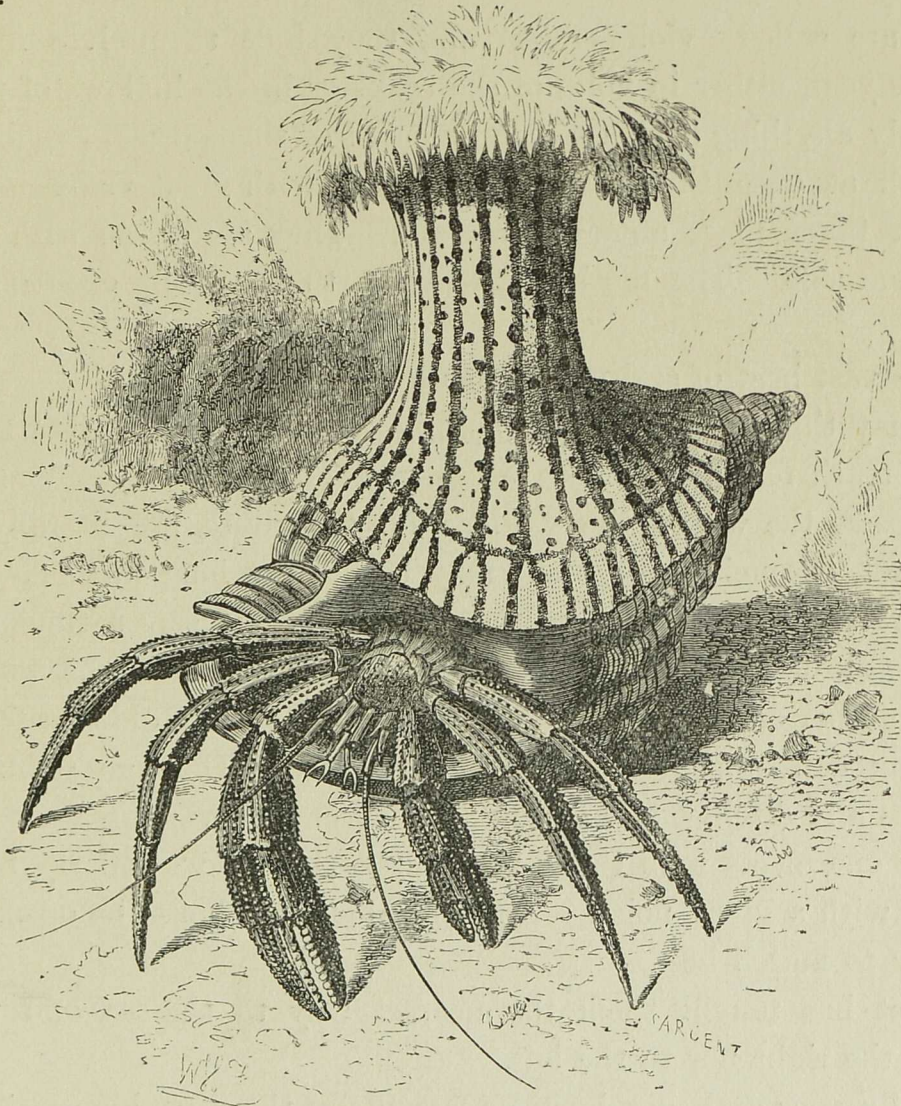
What is the name of the crab?

He is called the hermit-crab. I think he had better have been called the robber.



He is very fierce and rapacious, as you perceive. But in spite of his fierceness, he often carries another creature on his back, and cannot get rid of it.

The creature is one of those curious plant-animals, which are called zoophytes.



HERMIT-CRAB WITH ZOOPHYTE ON HIS BACK.

The crab does not like to bear this burden, and makes great efforts to shake it off. But the zoophyte has fixed itself firmly on the shell of the hermit-crab, and sits there, quiet and contented; so that often, in spite of himself, the crab has to carry the lazy creature on his back.

## INSTINCT OF THE CRAB.

IN the mountains of some of the West India Islands there live a number, I might say a host, of crabs.

They are called "violet-crabs," and they hide themselves for a great part of the year, either in holes of the rocks or in the hollows of trees.

Scarcely anything is either seen or heard of them.

But all at once, the rainy season sets in with great violence. Then a commotion takes place among the crabs. They are seized with a wish to go to the sea-side. The mother-crabs want to lay their eggs on the sea-shore.

So the vast host of crabs sets out on a journey thither.

You may think how vast this host is, when I tell you that the line of crabs will reach for three miles.

The roads, the woods, the gardens, on the route, are literally covered with crabs. The noise they make may be heard a long way off.

The crabs travel by night, because this is the safest time for them. The strongest of the crabs go first, as it were to clear the way. Next come the mother-crabs. And last of all, those that are old and feeble.

Nothing can stop the crabs on their way. They go scrambling on over hedges and ditches, and eating all they can find.

If any one meets with them, they rattle their claws and try to frighten him away with a great noise. And if a door of a house be open, they are very likely to march in.

Instinct has taught them the nearest way to the sea, and they turn neither to the right nor to the left.

Should a poor crab get hurt, or fall ill by the way, his cruel brethren will halt a moment and eat him up.

At length, the army of crabs reaches the sea. And here a great deal of business has to be done.

First of all, the crabs take a bath in the waves. Then the mother-crabs lay their eggs on the shore.

When this is over, all the crabs retire into holes and snug corners, to cast off their armour.

After the wriggling and struggling has been gone through, the crabs come out weak and faint, and have to wait a little time before they can do anything more.

As soon as they have recovered strength enough, and their new armour has begun to appear, they set off home again.

But the journey back is not quite so pleasant.

The crabs are tired and feeble, and a great many of them are caught and killed by the way. Indeed, but a small remnant of the host gets safe back.

What becomes of the little crabs ?

After a time, they come out of the shell ; but they are not in the least like their parents.

The young crab is the most absurd-looking creature in the world.

Its head is like a helmet with a long spike sticking out of it.

Then it has a long beak, and a pair of great eyes. At this period of its history, it swims merrily about in the water.

It takes some little time before the young crab grows to be at all like its parents. But, by degrees, it undergoes a series of changes, and leaves off swimming.

It is now, in fact, a true crab, and is ready to set off to the mountains.

Then the roads, far and near, are sprinkled over with little crabs scrambling along as fast as they can, and led by that wonderful guide—Instinct.

Dangers beset them on every side, and birds and animals alike feast upon them.

But the little army still pushes bravely on, and at length a remnant of it reaches the mountains in safety.

## THE SHRIMP.

THERE is another little creature that wears armour. You know it very well. It has the misfortune to be dainty eating, like its relation the lobster. And therefore Man, its great enemy, is always trying to catch it.

Have you not often seen men and boys go out shrimping?

They do so when the tide is out, and the sea quite calm. If the sea were rough, there would be no hope of getting any shrimps.

The shrimper goes about his work in a very simple way. He has a



WOMEN FISHING FOR SHRIMPS.

net, like a bag, fastened to a pole or stick. He wades into the water as high as his knees, and then pushes the net before him along the sand. The net is held open by a hoop of wood, or even a mere bit of wood put across the mouth will be enough. The shrimps on the sand are frightened when they see the great hoop coming pushing towards them, and try to get away. But they are almost sure to be entangled in the net, and caught.

This is the simplest way of catching shrimps. Women and children are often employed in it.

There is, however, another shrimp-fishery, that is carried on in boats. Here, great strong nets are used, and the boats push off a little way from shore.

Perhaps there is some sand-bank near, or place where the shrimps live in great numbers.

The fishermen throw out their nets, having first tied heavy weights to

them. The nets drag at the bottom of the water, and entangle numbers of shrimps.

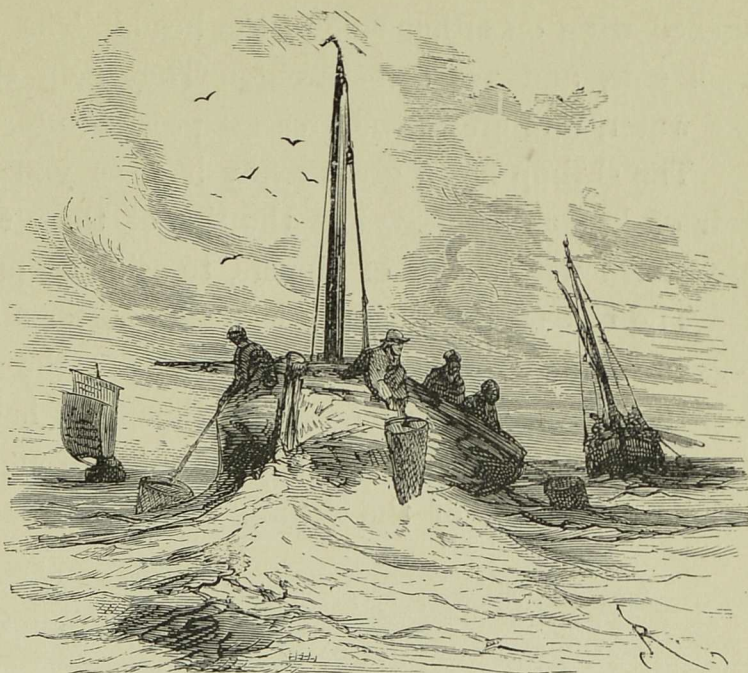
I told you the shrimp was a creature that wore armour. But its coat of mail is feeble, compared to that of the lobster. It consists of a thin shell or covering, which is transparent, and spotted with gray.

Between the head and tail of the shrimp the armour is divided into six parts, each part having a joint, and working into its neighbour. These joints make up the body of the shrimp, which is generally doubled up, as you perceive.

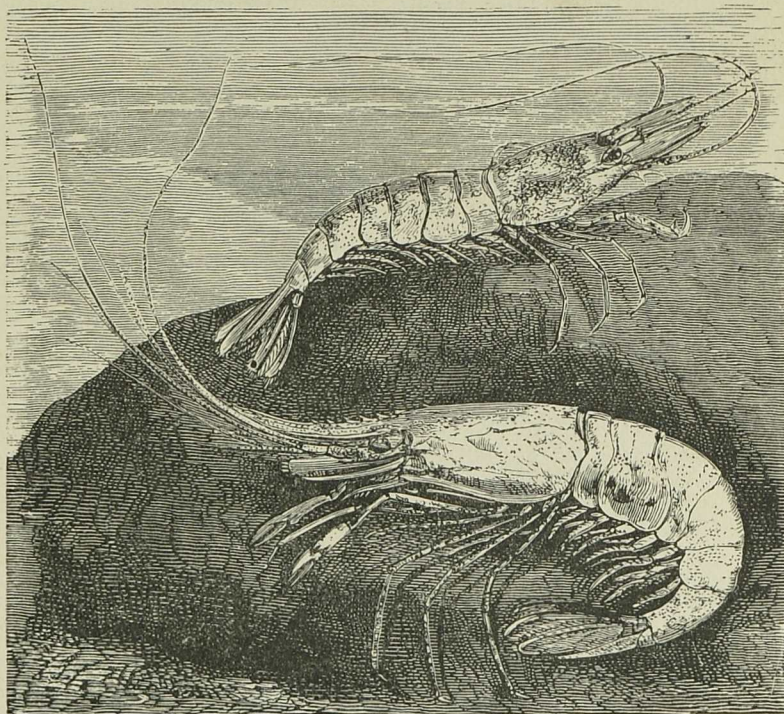
Its tail is a kind of wing-shaped apparatus, which helps the creature to swim about. It can be expanded, or folded up, just as the shrimp likes. The two outer parts of the tail have spines upon them.

Do you see the pair of feelers that grow from the head? They are as long as the creature itself.

There is also a fan-



FISHING FOR SHRIMPS.



SHRIMPS.

shaped wing on either side of the head. The wings have tiny feathers on each side, and are transparent. They help the shrimp to move about in the water, and are of the greatest possible use.

The shrimp has a great many legs, as you perceive. It uses the first pair of legs as hands. For the tips of these two legs—in fact the feet—are armed with a pair of nippers, to seize its prey.

The rest of the shrimp's legs get shorter and shorter. And these short legs are armed with bristles. Altogether, the shrimp has thirty-two legs.

It is not a very good walker, though it has so many legs. But it can contract its tail, and give famous jumps through the water.

The daily life of the shrimp, in its native waters, has not been much



SHRIMP-CATCHERS AND THEIR HUTS.

studied. No doubt it spends most of its time in seizing its prey, and devouring it.

In the plate, a number of shrimpers are waiting until the tide is down, before they begin their work.

One of our great writers was once walking by the sea-shore, when he perceived what looked like a cloud or thick mist over the edge of the water.

Can you imagine what the cloud would be ?

When he came to look at it more closely, he found it was a cloud of young shrimps leaping up into the air !

In fact, the little creatures were at their gambols.

There is one kind of shrimp which is called the opossum.

The opossum is, you know, an animal that carries its young in a pouch.

The mother shrimp does just the same thing with her young ones.

She has a pouch, in which she first carries the eggs. When the eggs are hatched, and the young ones grow into little shrimps, they may be seen in the pouch, lying side by side, and their heads all the same way.

You have heard of many creatures that are food for the great whale.

The shrimp is one of these. And not only the whale, but the herring is as fond of shrimps as we are.

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## A LITTLE ABOUT OXYGEN.

To breathe is to live. Were the breath, that comes and goes every moment, to stop, we know that we should die. The body is like a machine, complete in all its parts. The contrivance by which we breathe, is as the main-spring to the watch : all depends upon it.

Have you heard the main-spring snap, when you were winding up your watch ?

Then, you knew that, for the time at least, the watch was useless. All its busy little wheels and springs ceased to act.

The watch could be repaired, and made to tick again, as it did before

But if the breathing machine ceases to act, it can never be made to go on any more. All the springs and wheels of the busy life within are

stopped. Then the body, which has been cherished with such care, becomes a piece of useless clay.

How important is the apparatus by which we breathe!

What do we breathe? What is the material, or air-food, that keeps our bodies alive?

This material is provided for us in the greatest abundance. The whole air, and earth, and sea are filled with it. It is a gas; and it is called *oxygen*.

Oxygen is the most important agent that exists. It enables the vast family of created beings to *live*. You cannot see it; for though it is heavier than the air, it has no colour, and cannot be distinguished from it.

But you breathe oxygen every moment. Your lungs are filled with it, and then emptied again. This is what keeps you alive. It gives the blood its bright red colour, and makes it bound healthfully through the veins. Till the blood has tasted oxygen, it is dull, and dark, and used up; there is no life or nourishment in it. In the beautiful machine of the *lungs*, blood and oxygen meet.

Then mark the change! The dark, sluggish stream loses its impurities. It is now a bright red, and courses along full of life. It carries health and vigour with it. But as it goes in its circuit through the human frame, carried by countless vessels—which are called, as you well know, veins and arteries—it begins to flag. Its supply of oxygen gets used up. By the time it comes back to the lungs, it is dull and dark again, and can give no more nourishment. But its benefactor is waiting for it. A fresh supply of oxygen has rushed down through the mouth. This restores the colour and life of the blood. On it bounds, with renewed energy.

The union of oxygen with the blood takes place every moment. This is what makes us live.

But do we breathe pure oxygen?

No; for then we should breathe too quickly; the machine would wear out with over-work.

There is another gas in the air, which clogs the wheels of the machine, and, if we may use the expression, steadies it. This gas is *nitrogen*.



If you had to give a stimulant to a patient, and fancied it would be too strong for him, you would mix it with water.

Our air-food is mixed with nitrogen. Nitrogen has no air-food in it. If an animal were put into pure nitrogen, it would die. Its lungs would get no food, and it would be suffocated.

There is more oxygen in the atmosphere than nitrogen; the air-food is none the worse for the mixture. It is made just the right strength for us.

Creatures that live in the sea, need oxygen as much as we do; and oxygen is as busy in the sea as on the land. But as it had a partner in the air, so it has a partner in the water. This last-named partner or associate is a gas called *hydrogen*.

Water is made up, for the most part, of these two gases—oxygen and hydrogen. There are other materials besides, as we know; but we need not speak of them here.

And I need not say much of hydrogen, except that it is the lightest substance known. It is lighter than air.

Now, there is not so much oxygen in the water as on the land; and the breathing machine of the creature in the sea does not go on so quickly.

This breathing machine has also another name.

You have heard of the gills of fishes. We shall describe them in another place. They are the lungs of the creature,—the machine by which it breathes.

Sometimes you will hear the word “branchiæ.” These are lungs as well, and belong to a vast tribe of ocean creatures. They are called by this name because they spread out in the water like leaves or branches. The great object to be attained is, for the water to freely bathe all parts of the breathing machine, just as the air enters the lungs of an animal on the land. The oxygen in the water mixes with the blood, and makes it pure and healthy.

But the whole process is feeble and languid, compared to what it is in land animals.

Indeed, in some creatures the spark of life is very low indeed. The

blood is neither red nor warm. And the supply of oxygen is so scanty, that the creature will often come up to the surface of the water, and draw in a little air.

We shall see, presently, that there are many beautiful contrivances to enable the creature in the sea to breathe under all circumstances. The machine is placed in different parts of the body, as may be necessary.

There is a fish which can go on breathing when half its body is buried in the body of some other fish it is devouring. Its machine is placed far back, so as to be out of the way.

I must say one word more about breathing.

We draw in oxygen to our lungs. What do we expel, every other moment, when the lungs empty themselves like a pair of bellows?

I will tell you.

Not fresh, pure air like that which went in; but air mixed with poison.

The poison is called carbonic acid gas.

Where does the poison come from?

You will be surprised to hear that oxygen is its parent.

It has another parent, called carbon.

Carbon exists in our bodies, and is in reality nothing but charcoal.

You know what a burned, black-looking substance charcoal is.

Carbon is pure charcoal, unmixed with anything.

The oxygen meets with it, unites with it, and there is formed a gas—carbonic acid gas.

You will see how important it is not to keep breathing the same air over and over again. In hot, crowded rooms people do this, and feel ill and faint.

They have been breathing poison!

In the course of the day, how much poisoned air must escape from the lungs. In crowded towns, this makes the air unwholesome.

Nature has provided a simple remedy.

All the trees and plants are busy sucking the carbonic acid gas into their leaves. They take from us this load of poison. On the under side

of the green leaves are tiny vessels, like so many little mouths, to suck it in. It is their food.

They keep the carbon for their own use, and set the oxygen free.

So they take in poison, and give out health.

How wonderful are the workings of Nature!

The beautiful array of plants and grasses, which clothe the earth with green, purify the atmosphere and render it fit for man to dwell in.

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## THE COLOUR OF THE SEA.

THE sea is not always green, though we talk of the green sea waves.

It is all kinds of colours.

When the water is clear and deep it is of a beautiful blue.

In the Greenland seas, the water is as blue as in the Mediterranean.

The Black Sea is called black from the storms that rage upon it, and from the gloom of its sky. But, in some parts of the ocean, the waves are really black. And on the coast of Africa, a ship seemed to be sailing through a sea of milk. The waves were white.

What made them so?

Millions of tiny white creatures were swimming in the water, and quite changed its colour.

The Red Sea is full of a minute red weed, which sometimes covers it.

A French traveller tells us about it. He had put his head out of the cabin-window to get a breath of air, when he saw the sea of a deep red colour, as far as his eye could reach.

The ship sailed for a long time through this sea of red, and then the water became blue again.

Sometimes a ship sails through bands, or stripes, of different colours—yellow, green, orange, brown, red, and white. These stripes are really nothing but tiny creatures, or minute sea-weeds, which give their colour to the water.

I have told you that the Greenland seas are of a deep blue. Now and then this deep blue changes to a muddy green.

Shall I tell you why?

Because these same tiny creatures give a colour to the water.

There are more of them than I can tell you of.

A mile of sea contains twenty-four thousand, not millions, but *billions*!

Here the great whale comes to feed, and swims about with his huge mouth open.

These tiny creatures are his favourite food. Man has found this out, and he goes after the whale with his harpoon, to kill him.

When the sea is perfectly clear, as it is in some places, you have no idea how beautiful it is.

People can look down, and see into the very heart of the ocean world.

There are hills, and dales, and rocks, and caverns. The fishes swim about. Beautiful star-like flowers open their arms. Soft-bodied creatures, of all kinds and all colours, float in the water. Some are like strings of beads, some are like ferns, some like lilies. Others, of all shapes and sizes, glide about, transparent as the water in which they live.

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## A LITTLE ABOUT THE FISH.

THE home of the fish, as I need not tell you, is in the water. He is made for swimming. His smooth, slippery body glides about in the sea or the river.

A salmon swims so fast, that he could make the tour of the earth in a few weeks if he liked.

Every part of the fish's body helps him to swim.

His fins, his tail, his backbone, that he can bend about as he likes, all help him forward. He can twist, or turn, or do anything he pleases, in the water.

If he has to swim across great portions of the ocean, as some fishes do, his fins will be very strong and large. He will want to contend with

waves and currents, and it would not do for his fins to be feeble. If he lives in some quiet nook, and keeps at home, instead of travelling, his fins are soft, and have not so much power.

He has a bladder, filled with air, in his body. He can make himself heavier or lighter, just as he chooses. If he wants to be heavy and sink, he presses out the air from the air-bladder. He has a set of muscles given him for the purpose. But if he wants to rise, he relaxes the muscles, and the air-bladder fills. Then he rises as lightly as a feather.

Is this not just what people do, when they go up and down in a balloon?

The air-bladder of a fish is called the *sound*, and isinglass is made from it.

Some fishes do not need an air-bladder. They live in the mud, at the bottom of the water, and never want to rise.

Nature gives nothing in waste. These kinds of fishes have either no air-bladder, or a very small one.

The fish has a covering of scales on his body. They lap over each other, like the tiles in a roof. Sometimes the colour of the scales is very beautiful indeed.

In the seas of the Tropics, the fishes are as gaily dressed, after their fashion, as the humming-birds are.

They are all the colours of the rainbow, and glitter and shine like gems and precious stones. The gayest coloured fishes live among the coral reefs. They glide from one coral branch to another, as the brilliant fly-catcher does from flower to flower.

These beautiful fishes are not good to eat.

The sailor would rather keep to his salt beef, though he is getting very tired of it, than dine on fish taken from a coral reef.

The reason is, that the water is too warm; and the flavour of the fish is spoilt.

## FISHES THAT WALK ON DRY LAND.

I WONDER what kind of fish that can be!

Before I tell you, I must say a word of the way in which the fish breathes.

The fish wants air as much as you or I do.

But he gets air, not from the great open space in which you and I live and breathe. No; he gets air from the *water*.

The lungs of the fish are not like ours, because he has to breathe in a different way.

And Nature has given him the sort of lungs he will want.

The lungs of the fish are called gills.

You have perhaps seen the gills of the fish many times.

They are the two openings, one on each side of the head.

The fisherman often puts a string through them to carry the fish away.

When the fish wants to breathe, he opens his mouth and takes a gulp of water. The water passes from the mouth, through a little grating, into the gills. Here it cannot get out; for some bony lids, called gill-covers, shut down, and keep it in.

While the water is shut up, it bathes a number of feathery membranes in the cavity of the gills. These membranes are covered with delicate blood-vessels, and thus the blood gets a supply of oxygen.

When this important business is over (and, like our breathing, it only takes an instant), the gill-covers open, and let the water out again.

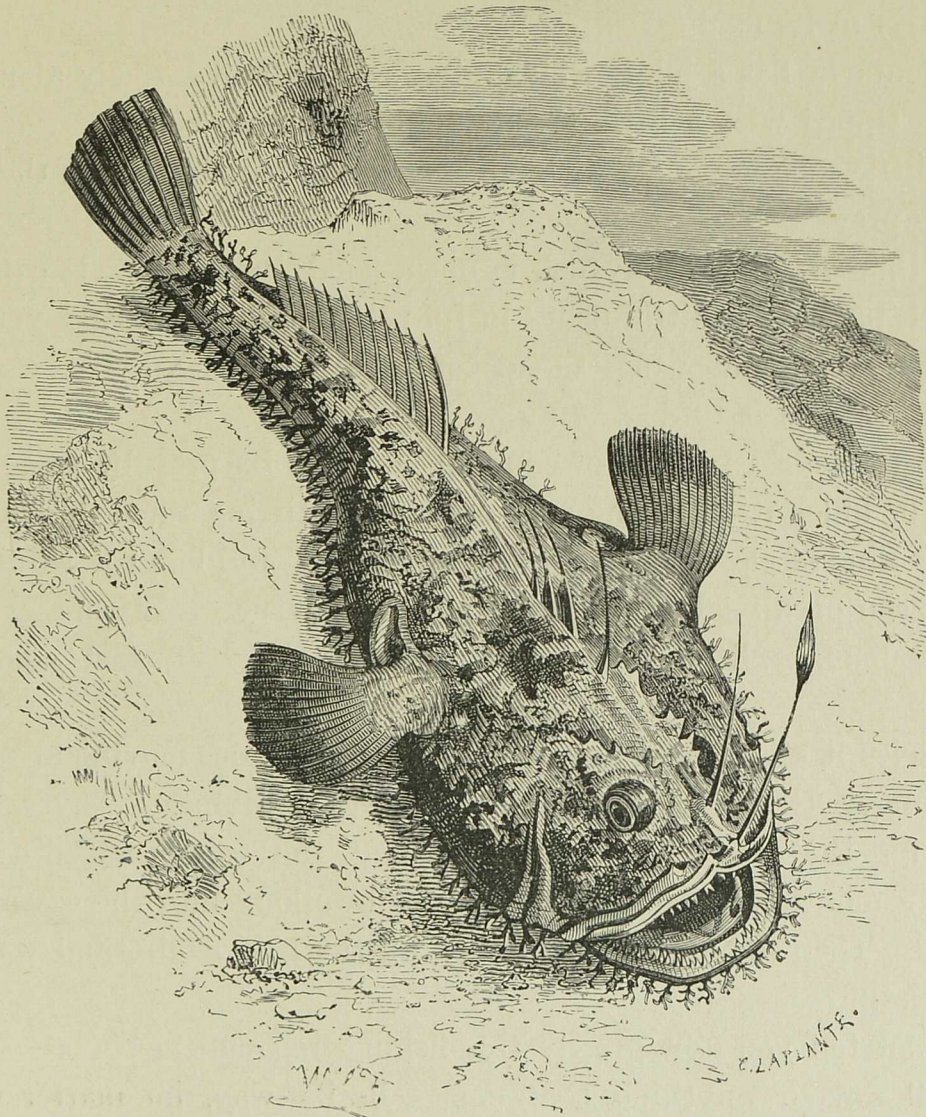
At the same moment, more water comes in at the mouth, and the fish keeps on breathing.

When a fish is taken out of the water, it dies for want of air. The delicate gills fold together, and get dry. Then the fish cannot breathe.

In some fishes the opening of the gills is very narrow, and does not dry so quickly. And there is a little cell, full of water, which opens on to the gills, and keeps them moist. These fishes can live much longer in the air.

There is a fish which can live some days out of the water. It has so much water in its cell, that the gills are kept damp. And it will climb up a tree to look for insects, which it is very fond of.

It may well be called a fish out of water!



THE FISHING-FROG.

I HAVE a great deal to tell you about this frightful looking creature.

Do you see its wide gaping mouth, a little like that of a frog? It be-

longs to a tribe of fishes that have their gills so contrived that they can live a short time out of the water, and even creep on dry land.

An old Greek author, called Aristotle, calls this fish a kind of frog, and tells us that it gets its living by angling.

Indeed, Nature has provided it with a famous line and hook.

That long tentacle which sticks up on the creature's head is the implement it uses in its fishing.

The tentacle has a joint, which allows it to move freely about. And the end is tipped with a little membrane of a shining colour.

This little membrane, as we shall see, is the bait by which the creature entices its prey.

Now this great ungainly fish is not a good swimmer. It cannot dart about and pursue the little fishes in its neighbourhood. And yet it has a voracious appetite, and wants to eat continually.

What, then, is it to do?

It has to use a vast deal of cunning, and get its prey by treachery.

First it hides itself in the mud and sand, stirring them up round itself to make a kind of cloud. Next it sets up its bait, and lets the shining membrane be seen on all sides, moving it about in every direction.

Before long, a little fish is sure to see the bait, and come swimming up.

It fancies it sees a worm or something equally nice moving about. And as it is hungry as well as its enemy, it begins to nibble.

Alas for the poor fish! In a moment, the bait is withdrawn and a cavern of a mouth opened. The fish goes headlong into the cavern, and is swallowed. Then the expert angler sets up the bait again, and watches for another victim.

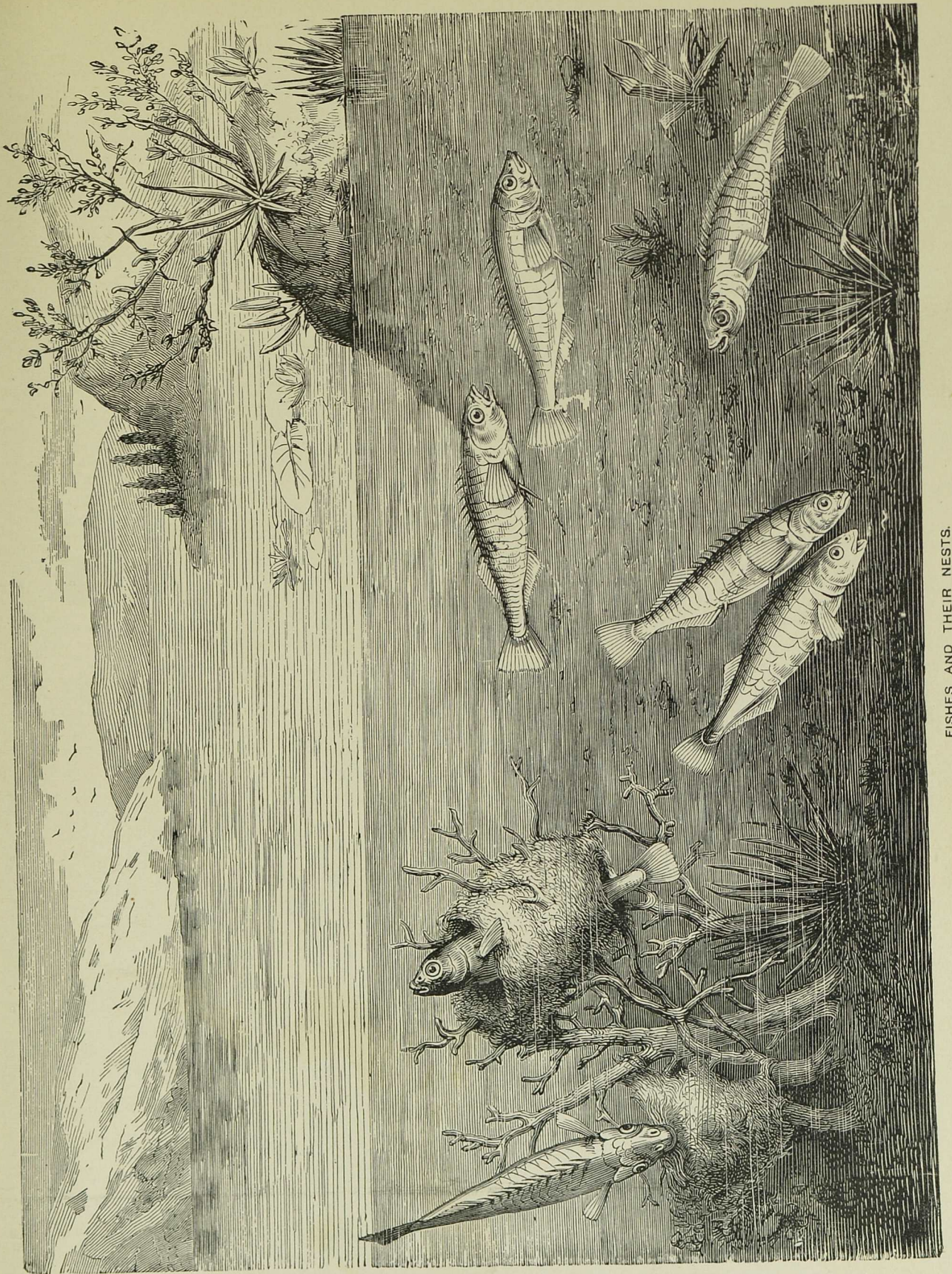
I cannot tell you how greedy this fishing-frog will be!

It will devour anything that comes in its way, no matter what the thing may be.

A fishing-frog once tried to swallow a mop.

The mop was put into the water by a sailor. A fishing-frog was plying its trade close by. Perhaps it thought the mop was some kind of fish;





FISHES AND THEIR NESTS.



at any rate it was unwilling to let anything go by. It caught the mop in its great cavern of a mouth. But the teeth stuck fast in the wool, and as the fish could not pull them out in time, it was hauled into the boat and killed.

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## FISHES THAT BUILD A NEST.

FISHES have not warm blood as we have. They do not care about their young ones. They lay their eggs in the water, and leave them to hatch, without taking any trouble.

This is the usual habit of fishes; but there are a few exceptions to the rule.

There is a fish called the hassar. It lives in America, in pools and streams. And when its pool dries up, it sets out to find another.

It has the sac of water under its gills, so it can travel on dry land, and bear the heat of the sun.

It builds a nest for its young.

In the fine spring weather, it begins to make its little house.

Its house is like a hollow ball, flat at the top. It is made of the fibres of the rushes and the water-plants. It has a hole, through which the fish can get in.

People are very cruel to the poor fish.

They find out its nest, and come with a basket and a stick.

They hold the basket to the hole, and begin to beat the nest with a stick.

The fish gets very angry at being disturbed. It spreads out its hard fins, with their sharp points, and gives a spring forward.

Then it falls at once into the basket, and is caught.

There is an active little fish that lives on our own shores, and has fins on his back.

He is called the stickleback, and also the thornback.

He takes all the trouble from his partner, for he makes the nest himself. He twists bits of sea-weed and corallines together, and glues them

with a gummy matter, that Nature has given him, and that comes out like a thread.

The nest is in the shape of a pear, and has a way out and a way in. It might be said to have a front door and a back.

The fish takes a great deal of pains with his nest, and will alter it over and over again before he gets it to his mind.

When the eggs have been laid by the mother fish, he keeps guard over them. And when an enemy comes near, and wants to devour them, he darts out and pushes him over.

Naturalists are very fond of watching the stickleback taking care of his young. They say it reminds them of a hen and her brood.

If a young fish ventures too far from home, the stickleback swims after it, seizes it in his mouth, and carries it back again.

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## THE SWORD-FISH.

THE life of a fish is not so easy as it seems.

When you watch him gliding about in the calm waters, now rising to the surface, now diving, or winding about in graceful sweeps or curves, you think he has nothing to do but enjoy himself.

This is not the case. The fish has to spend a great deal of his time in fighting, or in running away from his enemies.

Fishes prey upon each other, without mercy. The ocean world is like a battle-field, where the strong are always attacking the weak.

There is a fish called the sea-wolf, that is a terrible creature to kill. He has six rows of teeth in each jaw, and he makes a pretty good use of them.

He grinds up the shell of a lobster, or a crab, and eats both shell and animal together.

When he is caught, he bites on all sides, and fights so fiercely, that the sailors are quite in dread of him. They kill him, as soon as they can, with hard blows on the head. But he has been known to get the anchor between

his teeth, and leave the marks upon it : and as for a gun, which was pointed at him, the sea-wolf bit it all to pieces, as if it had been glass.

He is a very large fish, which makes him all the more dreaded.

He is six or seven feet long, and in cold countries will be found larger still.

He may well be called wolf-fish. He is as much dreaded in the sea, as the wolf is on land.

Do you see the fish in the picture? He is armed with a sword.

This is why people call him the sword-fish.

The sword is a very terrible weapon indeed. You see how long it is!

The sword-fish swims very fast, and is as bold and strong as can be.

He is one of the deadliest enemies of the great whale.

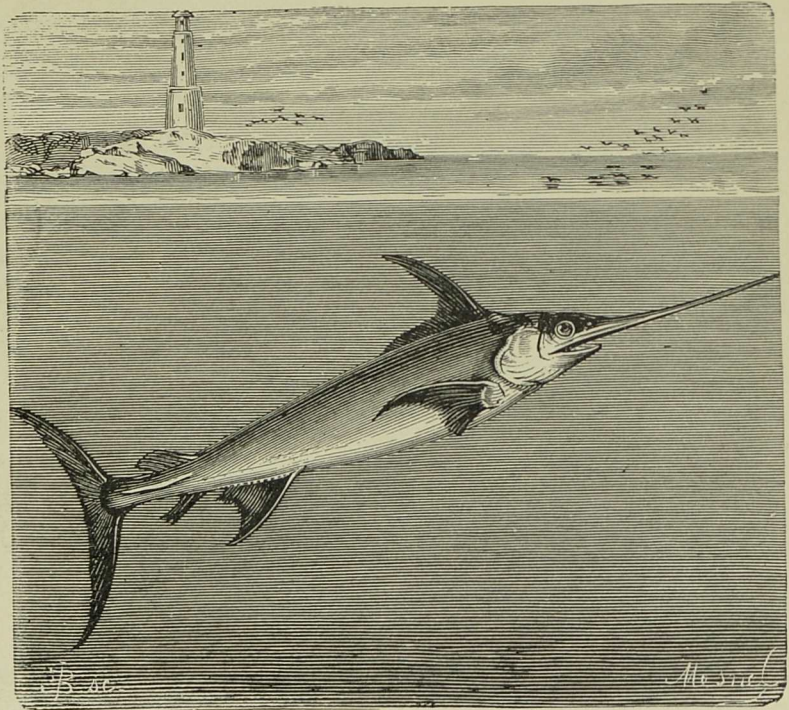
He attacks him with that cruel sword of his, and wounds him terribly.

The whale has no weapon but his huge tail. If he could strike the sword-fish, the blow would kill him ; but the sword-fish contrives to keep out of the way.

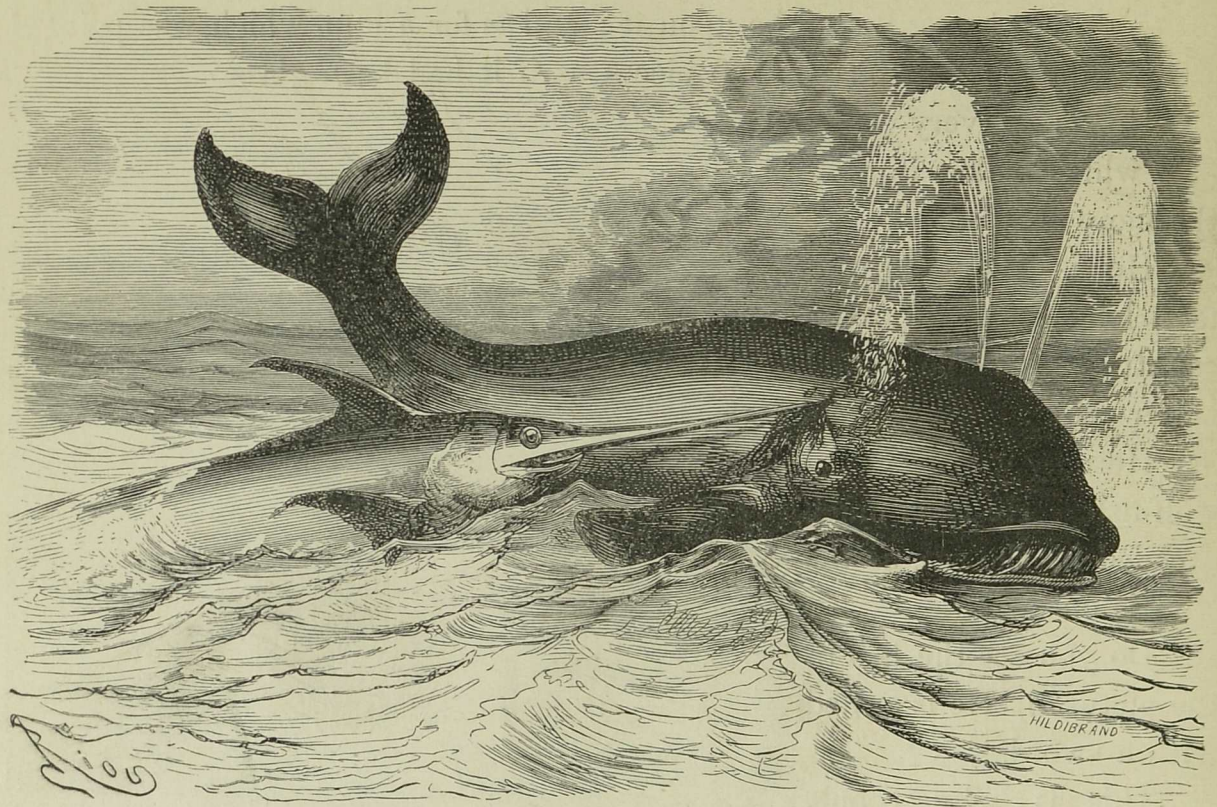
There is a very fierce battle indeed, and the noise is heard a long way off. It does not end, until either the whale or the sword-fish is killed.

The sword-fish will, now and then, run his sharp weapon through the bottom of a ship. He cannot get it out again, and there the sword sticks.

A naturalist once saw a fish trying to pull out the sword from the bottom of the vessel.



THE SWORD-FISH.



SWORD-FISH ATTACKING THE WHALE.

The fish struggled violently, and was obliged, at last, to swim away, and leave the sword behind.

Of course the poor fish was very soon seen to roll over, and float dead on the waves.

### CUNNING FISHES.

THERE are some fishes that have not sharp weapons given them to keep off their enemies. They would be badly off, if Nature had not endowed them with cunning.

There are many clever ways by which these helpless fishes catch their prey.

There is one fish which keeps close hidden in the mud, and does not let himself be seen. He is called the "sly," which is a very good name.

He just shows the tip of his head, and that is all.

Now this fish has a kind of beard growing on his lips. The hairs of the beard keep moving about in the water, and the little fishes are so silly as to think they are worms.

They come swimming up to catch them ; but instead of catching worms, they are caught themselves by the sly creature, that lies hidden in the mud.

There is another fish, that shoots his prey.

How can he do that ?

He makes a kind of pop-gun of his round snout. He shoots at flies, and other insects.

When he sees a fly settle on one of the plants that overhang the water, he fixes his eyes upon it.

Then he swims to the place from which he can take aim the best. He keeps quite under water, and does not let himself be seen. But, all in a moment, a drop of water is shot with such force against the fly, that it is brought down. Then the fish swims up and seizes it, without any more trouble.

This shooting-fish does not live in the sea, but in the rivers and lakes of India.

There is another fish, which is called the sucking-fish.

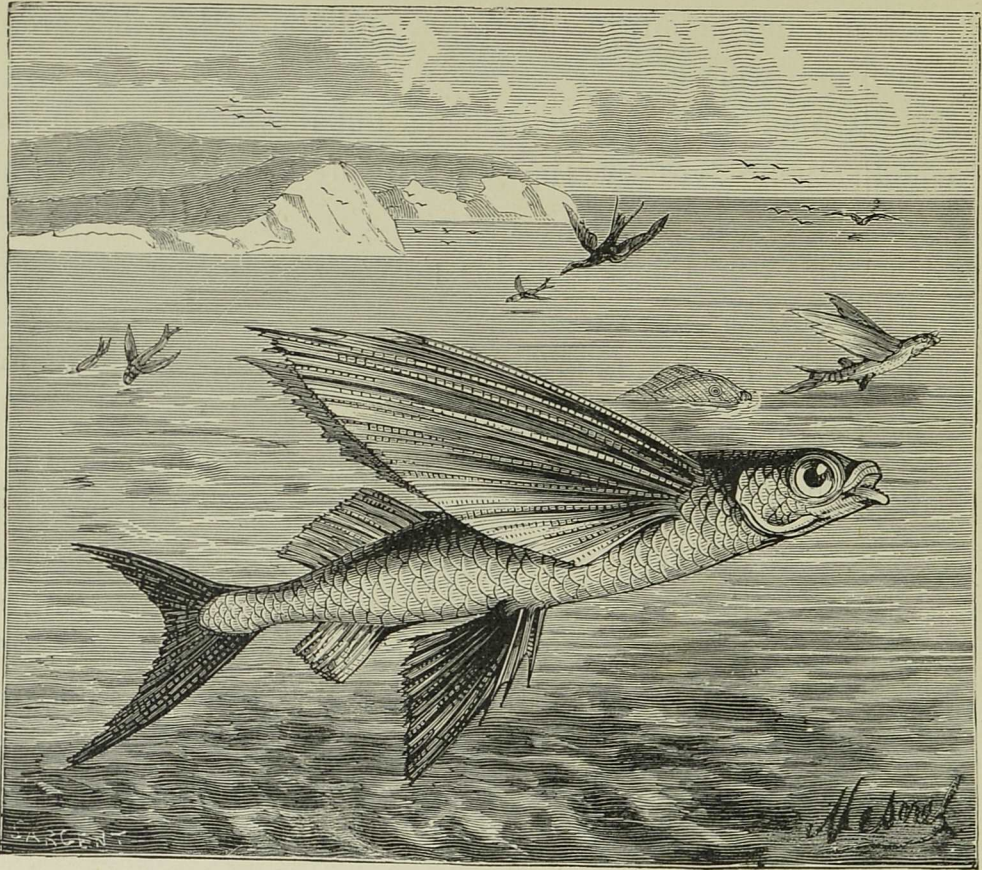
He has a kind of plate on his head, by which he can stick fast to any object he likes. Nothing can pull him away, when he has chosen to fix himself.

The people in the West Indies once used the sucking-fish to hunt the turtle.

They tied a strong cord to his tail, and let him down into the sea, in the place where the turtle was asleep on the surface.

The sucking-fish would stick to the turtle with such firmness, that both fish and turtle were drawn up together.

On the coast of Africa, people catch turtles in this way still.



THE FLYING-FISH.

The fish in the picture is called the flying-fish, because it can give great jumps out of the water.

This is the nearest approach a fish can make to flying.

The air-bladder of the flying-fish is very large. When it is filled with air, it takes up nearly the whole of the body.

Its fins are, as you see, very large, and almost like wings. They do not hinder it from swimming; when it is in the water, they are folded close to its body, and quite out of the way.

When the fish takes its jumps, it not only expands its fins but its tail. It skims along a little like a swallow. Indeed, the ancient writers called it *hirundo*, which means a swallow.

It can fly about fifty or sixty yards at a time, then it drops into





FLYING-FISH PURSUED BY DOLPHINS.

the water, and moistens its gills. After that, it can take another spring.

The fish gives these jumps to get out of the way of its enemies.

In the Tropics, a shoal of flying-fish is often seen springing out of the water.

Their silvery fins, and blue bodies, glitter in the sun, and look very beautiful.

But this plan of flying is not always a safe one.

There are a number of sea-birds ready to pounce on the poor fish when it gets out of water.

The gull and the great albatross are always on the watch. For, in Tropical seas, the birds abound in far greater numbers than you have any idea of.

In the picture, the poor little flying-fishes are being pursued by dolphins. In vain they give their flying leaps out of the water. On come the

dolphins close after them. More than one little fish has fallen into the mouth of its enemy.

I am afraid that, one by one, they will all be devoured in a similar manner.

On board ship, people amuse themselves by watching the flying-fish. If a light is brought, a shoal of them will drop on deck attracted by it. Then they get caught. The sailors think them a great delicacy, and say they are as good to eat as mackerel.

Thus, you see, the poor flying-fish has no peace. It is hunted both in the air and in the water.

Now and then a flying-fish has been found near our own coasts. It has made its way in the Gulf Stream.

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## THE HERRING.

THE great wide ocean supplies man with an abundant store of food.

At certain seasons shoals of fishes, miles in length, come near the coasts, and pour into all the creeks, and bays, and coves, from the shores of Norway to those of Ireland.

Their number exceeds belief; they are packed so closely that a stick would stand upright among their ranks. They pour on, and on, until there seems no end of them.

Armies of birds hover above, and keep thinning their ranks.

The shark feasts upon them to his heart's content, and so do many other greedy fishes that follow in their track.

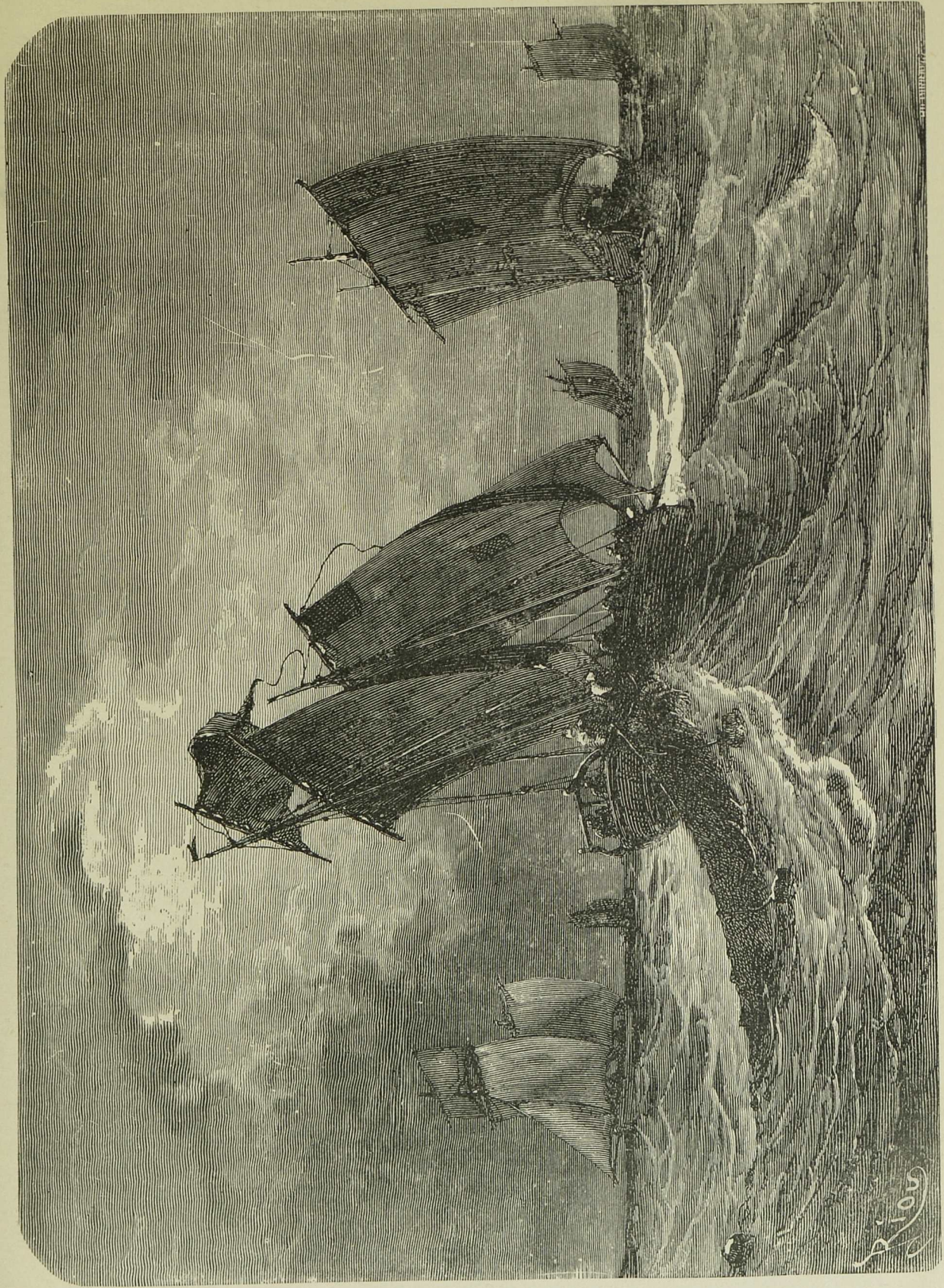
What is the name of the fish?

It is the herring.

When the fishermen in the seaport towns know the herrings are coming, they are very busy indeed.

Whole fleets of boats put off from the shore, and cast nets into the sea.

The herrings will not go into the nets, except in the dark. So that all the fishing has to be done by night.



HERRING FISHING.

*Alton*



The darkest night is thought to be the best. Then, the sea is alive with torches.

The poor fishes run headlong into the nets. The holes in the net are just wide enough to let the fish get in its head. But there it sticks—it can neither get backwards nor forwards.

The herring dies directly it is taken out of the water. The covers to its gills—those lids that I told you about—are very large, and open very wide. So the gills get dry in a minute, and the fish cannot breathe.

You would scarcely believe how many herrings can be caught in a night!

Great boats have had to cut their nets, lest the weight of the fish should sink them!

What brings the herring to the coast?

It comes to lay its eggs, or to spawn, as it is called.

When this work is over, the herrings go back again to the depths of the ocean.

The herring finds plenty of food in the sea. It devours myriads of tiny creatures, and minute shell-fish.

The fishermen tell us, that in places where the jelly-fishes abound, the herrings are most abundant.

These well-peopled spots in ocean are like rich pastures for the herring to feed upon. But the herring is not very particular in its appetite. It will eat a young herring without the least scruple.

It is also rather whimsical.

The great shoal of herrings, of which we have been speaking, will not always continue to visit the same place. After it has done so for years, it will suddenly forsake it.

There are some small islands on the coast of Scotland, where the herring-fishery was once carried on. But the great shoal does not visit those islands any longer.

I must tell you that now and then the herring shoal pours in with such haste and tumult that half the fish are stranded on the beach.

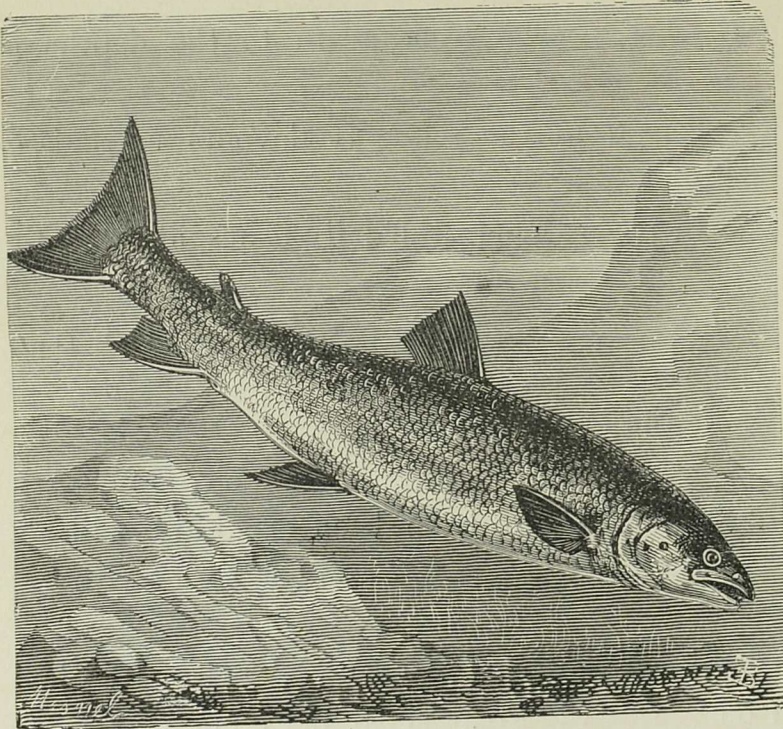
This once happened on the coast of Scotland. For miles, a deep ridge of herrings lay along the shore. There was not salt enough in the whole neighbourhood to pickle half of them, and tons of wholesome fish had to be wasted.

There is an odd-looking fish, called the "chimæra," found in most of the seas of Europe, and also in the Pacific Ocean. It pursues after the poor herrings as they are on their way, and devours as many as it can.

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## THE SALMON.

THERE is one fish, that is the most valuable and delicate of all the fishes. I mean the salmon. It has a relation called the trout, that is found in fresh-water streams.



THE SALMON.

The salmon lives in fresh water as well as in the sea. It is not found so far south as the Mediterranean. But from the rivers of France, up to Greenland, it has its home.

At certain seasons of the year, the salmon come within reach of their great enemy, Man.

Instinct leads them to approach some river, and swim up it; thus getting away from their old safe haunts in the sea.

The salmon wants to lay its eggs in the bed of the river, and nothing can stop its progress.

It runs up into the rivers as far as it can get. The higher it has reached, the less valuable it becomes in the eyes of the fishermen. The flesh is not so dainty as when the fish is newly come from the sea.

Often, a shoal of salmon will come to a roaring waterfall ten feet in height.

Here they stop, and swim back a few paces, as if they were taking a view of the danger before them.

They have, as you see in the plate, to leap up the wall of roaring water, and this is the most wonderful thing in the story.

The instinct of the fish is so strong, that not even this difficulty can stop it in its course.

It lies still a few minutes, and then curls its body into a bow, so that its tail seems to touch its mouth. Then it gives a great spring upwards, hoping to reach the top.

Very often it does reach the top. Then it swims away in a moment, and is lost sight of.

But now and then it misses its aim, and is dashed upon the bank. There it lies a few seconds, stunned, and then struggles back into the water.

And sometimes it will nearly reach the top, and be brought back again by the force of the water.

The salmon leap you see in the picture is a famous one in Scotland. A great many fish often miss their aim at this leap, and fall upon the bank.

People are on the watch to catch them. And the owner of the place once had a great iron pot set upon the rocks close by, and numbers of fish dropped into it.

The salmon is often caught at these leaps as it falls back spent and stunned. Women have been known to catch it in their aprons.

There are some famous salmon leaps in Ireland, and also in Wales.



SALMON LEAP AT KILMORACK.

When the season is over, the salmon goes back again to the sea.

The eggs are left behind, in the shallow creeks of the river. They have been covered with sand, by the mother fish, and lie buried till the following spring. Then the little salmon make their appearance, and begin to swim to the sea.

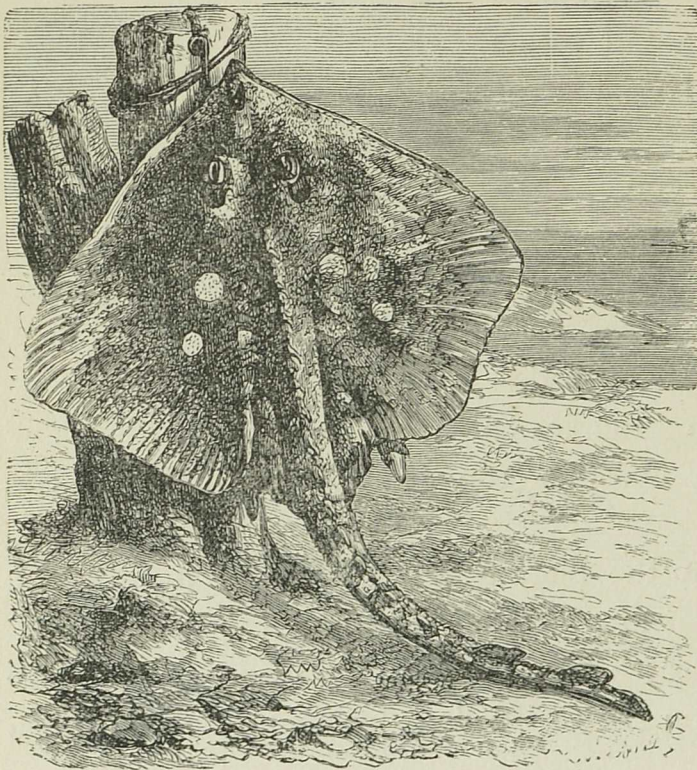
In course of time they too come to lay their eggs in the river. And they will never visit any river except the one in which they have been born.

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### STINGING FISHES.

You have seen the kind of weapons which the fish has for his defence.

He is either very strong, or very swift, or very cunning, or he has a terrible mouth, armed with rows of sharp teeth like the shark.



THE RAY.

There is a tribe of fishes with flat bodies, which are called rays. They are very ugly to look at. The broad flat body has a long, narrow tail, with two or three broad fins. There is a row of spines along its whole length; the spines are the weapons it has to defend itself with. When the fish is attacked, it bends itself round, so that the tip of its nose almost touches the end of its tail. Then it lashes its tail about, and gives wounds with the spines.



The spines are very sharp indeed, and in one species they sting violently. This species is called the stinging ray; it lives in South America.

There are many stories told about this stinging ray.

An Indian, once, was wounded by a ray, as he was crossing a river.

He was in such agony, that the moment he reached the bank he fell on the ground, and rolled about, as if he were scarcely able to endure the torment.

A boy wounded in the same manner, cried and howled and bit the ground in his anguish.

Indeed, the sting of this ray has been known to kill a man.

These Tropical rays are of a monstrous size, compared with those that live in our European seas.

There is one called the sea-devil of the Pacific.

It is sometimes as much as fifteen feet broad, and its black-looking body lies on the top of the water, looking like a stone. As a rule, however, the flat fishes keep at the bottom.

The inhabitants of the Society Islands kill the stinging ray with harpoons, and then make files or rasps of its skin.

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## THE TORPEDO.

THERE is a relation of the rays that has a mysterious and powerful weapon of defence.

It lives in the Mediterranean Sea, and is called the torpedo.

Have you heard of the electrical eel? It can give shocks as powerful as an electrifying machine. The torpedo has the same power of giving a shock, but it is much more feeble.

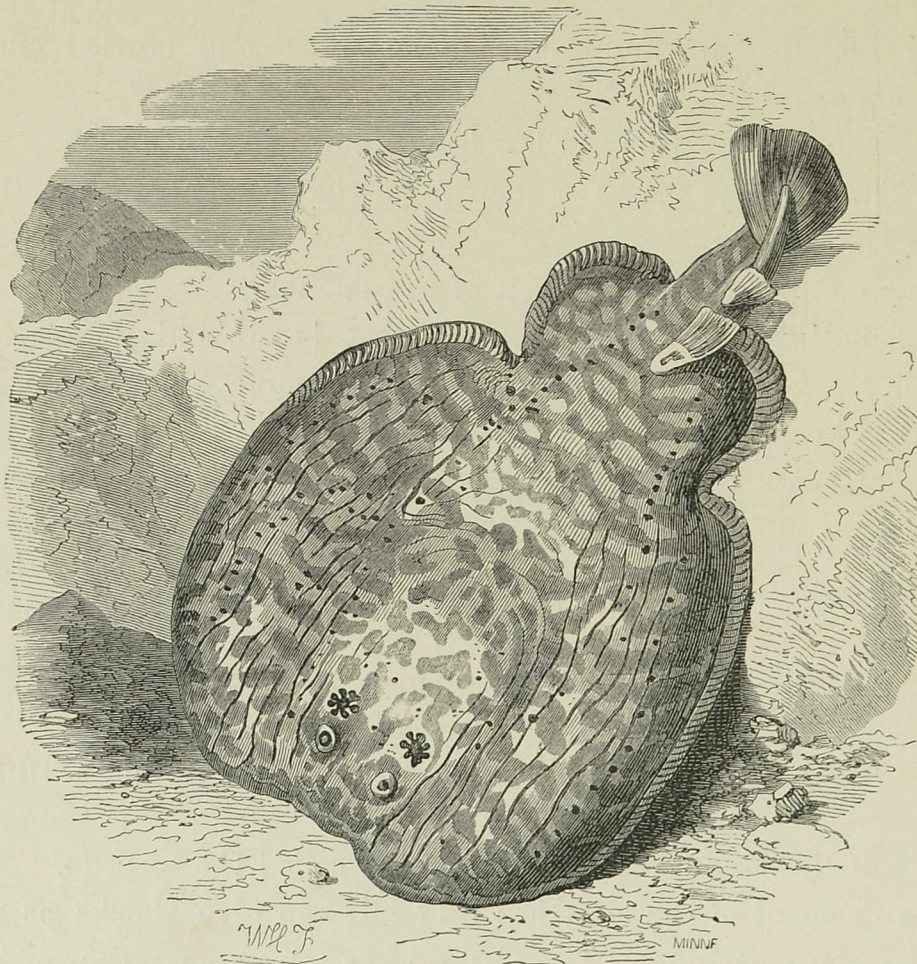
You can see that the torpedo has a clumsy body, in shape a little like a musical instrument.

The machine Nature has given it, and that produces the shock, is very curious.

It consists of a number of tubes, and is not unlike a piece of a honey-comb. The tubes take up the whole length of the body, between the upper and under surface, and a secretion of thick mucus is found in them.

The torpedo is very much dreaded, as you may think, by its neighbours in the sea.

It feeds upon fishes, and whatever it can find, and it is thought that it may use its machine to stun its prey.



THE TORPEDO.

In the warm seas of the Tropics very large torpedos are found. If you were to touch one it would give you a curious sensation. You would feel as you do when you give your elbow a blow against some sharp corner.

The torpedo is a sluggish creature, and likes to bury itself in the sand.

This is just the time when it is most to be dreaded. If an unlucky person were to disturb it by accident, it would give him one of its most angry shocks.

In these days a great deal is said about electricity, and the doctors are trying to make use of it to cure many complaints.

But so long ago as the days of Antony and Cleopatra, the torpedo was used as medicine too. Its shocks were thought to cure pains in the head, and various other maladies. And in later times, if a man had the gout, he was told to put his foot on the torpedo, and to keep it there, until he felt a sensation of being numbed, as high up as his knee.

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## THE MACKEREL AND ITS RELATIONS.

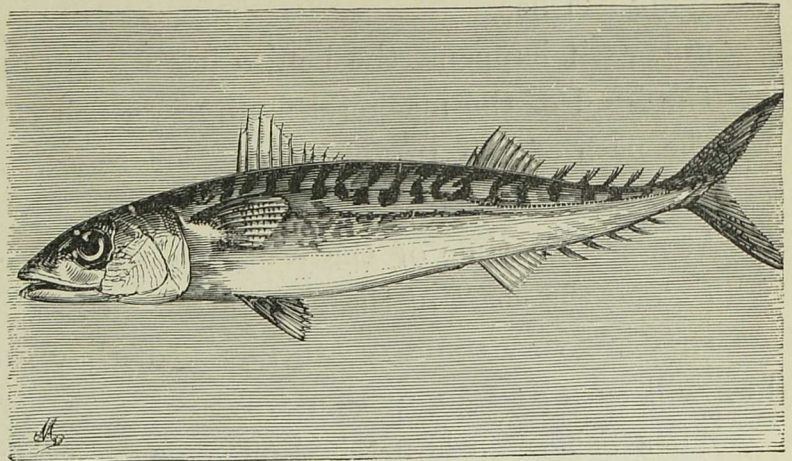
You may often have seen the smooth shining mackerel, with its beautiful scales.

It is a very greedy fish, though it is so beautiful. And though it is a good swimmer, it has no air-bladder in its body.

It follows the shoal of herrings, and preys upon them, without any mercy.

It lives in the North Atlantic Ocean, but it pays a visit, every year, to the British shores.

A fish called the garfish always comes before it; people have called it the mackerel guide.



THE MACKEREL.

The garfish has a round body a little like an eel, and a long mouth, full of sharp teeth.

The mackerel is easy to catch, because it bites greedily at any kind of bait.

People make a little fish, with bright scales, that looks as if it were alive, but in reality it is only made of metal, or even of scarlet cloth.

The mackerel thinks the fish is alive, and darts at it with great swiftness. It is caught in this way, either with a line or with a net.

People who live at Yarmouth, on the coast of Norfolk, are very active when the great shoal of mackerel comes.

The boats stand out, and the beautiful shining fish are brought in by thousands. They very soon die when they are taken out of the water, and their beautiful colour begins to fade.

For a little time, they will shine in the dark as if they were on fire.

The mackerel has a great many relations, living in different parts of the sea.

There is a fish called the bonito, which is a kind of mackerel.

It lives in the South Seas, and the islanders catch it by using the flying fish as a bait.

They put a flying-fish on a hook, and draw it along the water as if it were flying.

This brings up the bonito in a minute, for it is one of the worst enemies the flying-fish has.

But, as it happens, the bonito itself gets caught.

The head of the mackerel family is a fish called the tunny.

The flesh of the tunny is excellent to eat, and the tunny-fishery is a source of riches to the people engaged in it.

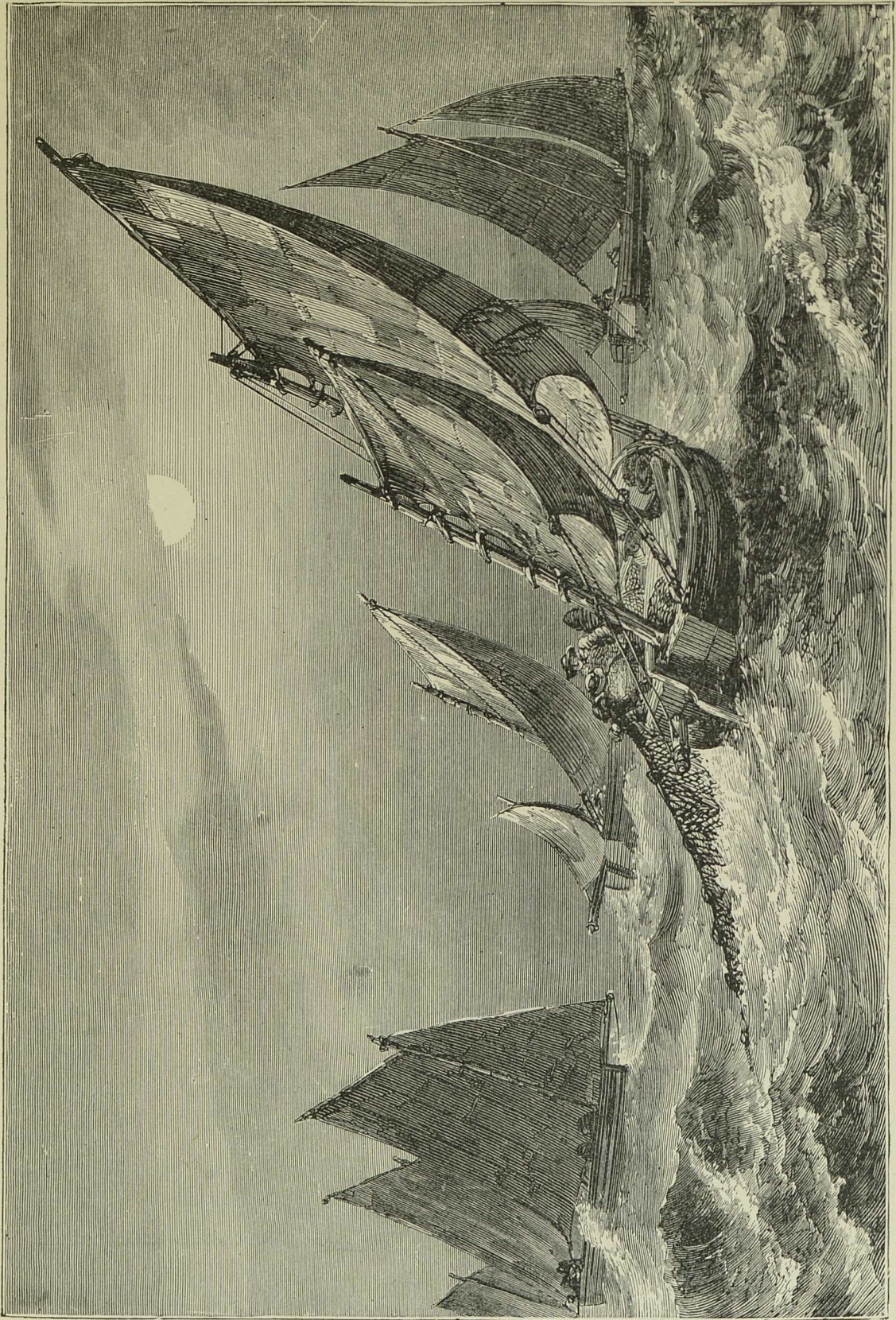
At a certain time of the year the tunnies come in vast numbers and swim along the coast of the Mediterranean Sea.

They are very timid creatures, and if they see an enemy in the distance they will turn and go another way.

But a fisherman is perched on some high place to keep a sharp look-out. When he sees the tunnies coming, he gives a signal.

Then a great many boats set off in the direction pointed out by the fisherman.

They throw their nets into the sea, and keep driving the poor fishes towards the land.



FISHING FOR MACKEREL





FISHING FOR TUNNY.

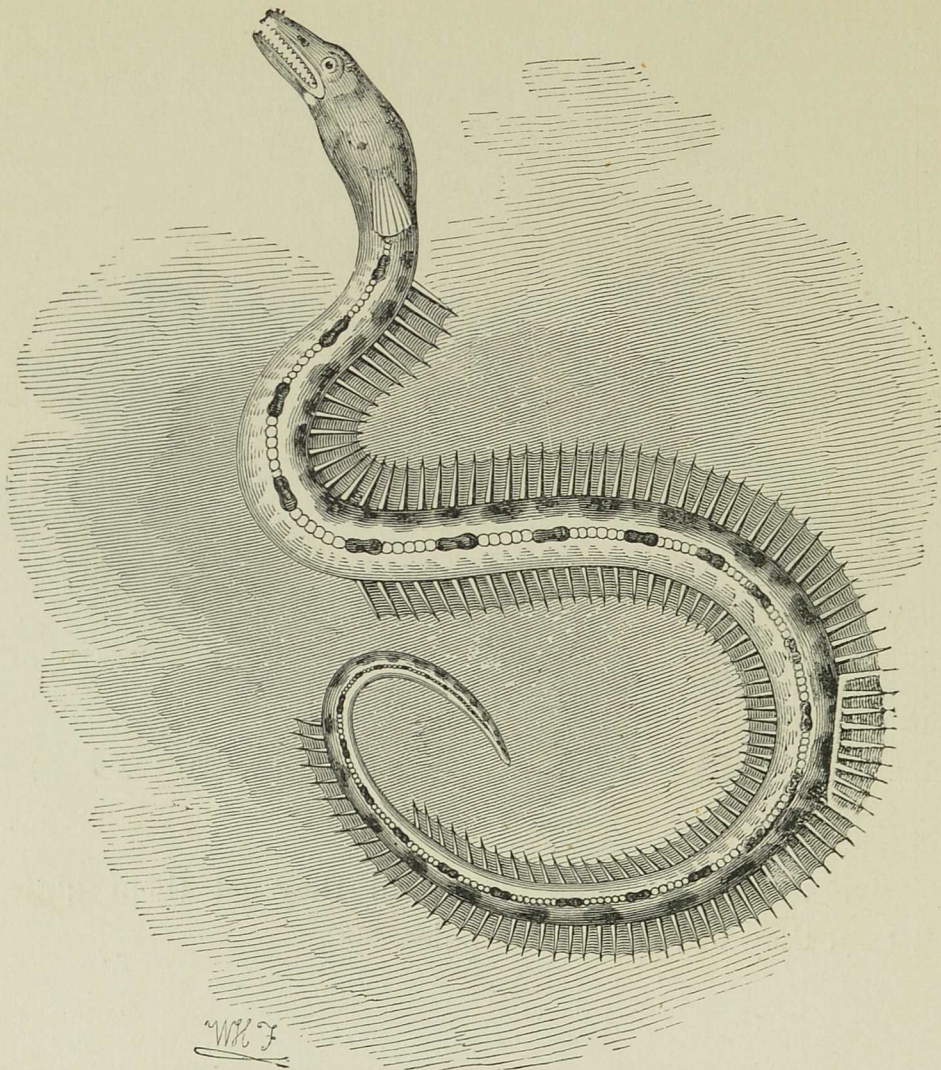
They drive them closer and closer, till they get them quite on the beach, and then they kill them with poles.

### THE REAL SEA-SERPENT.

THE fish in the picture on next page is really the sea-serpent. Its body is as thick as a man's arm, and about six feet long. It has a kind of snout, as you perceive. Its colours are brown on the upper part, and a silver-white beneath. It lives in the Mediterranean Sea.

It does not approach, in any degree, to the fabled monster which goes by the name of the Great Sea-Serpent. Yet, in form, it is as much like a snake as can be.

Can you think of no other fish that is like a snake?



THE SEA-SERPENT.

There is the eel. The eel has a snake-like body, and wriggles about in the mud. Yet it is a true fish, and has gills to breathe through.

There is an eel in the Mediterranean Sea which the old Romans had a great fancy for. They used to keep it in fish-ponds near the sea-beach, and prize it as we do gold and silver fish ; only that we do not eat the gold and silver fish. But the Romans used to eat the murey. They thought its flesh a great delicacy. Julius Cæsar, at one of his banquets, had six thousand mureys given away to his friends.

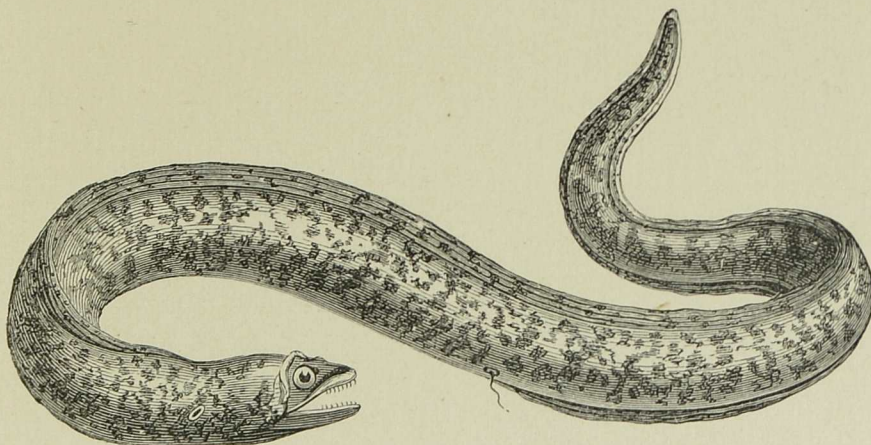
But the old Romans were guilty of cruel acts ; and they had a shock-



ing way of punishing their poor slaves. If a slave offended his master, he would be thrown into a fish-pond, to the greedy and voracious mureys, who would soon eat him up.

A Roman noble, named Pollio, was very fond of having a poor slave thrown to the fishes ; and he would think it famous sport to stand by and see the fishes devour him. You would hardly believe that such a hard-hearted wretch could be found !

One night, the Emperor Augustus was supping with this wicked noble. In the middle of supper, one of the slaves who was waiting on the guests broke a crystal goblet. His cruel master ordered him, at once, to be thrown into the fish-pond.



THE MUREY.

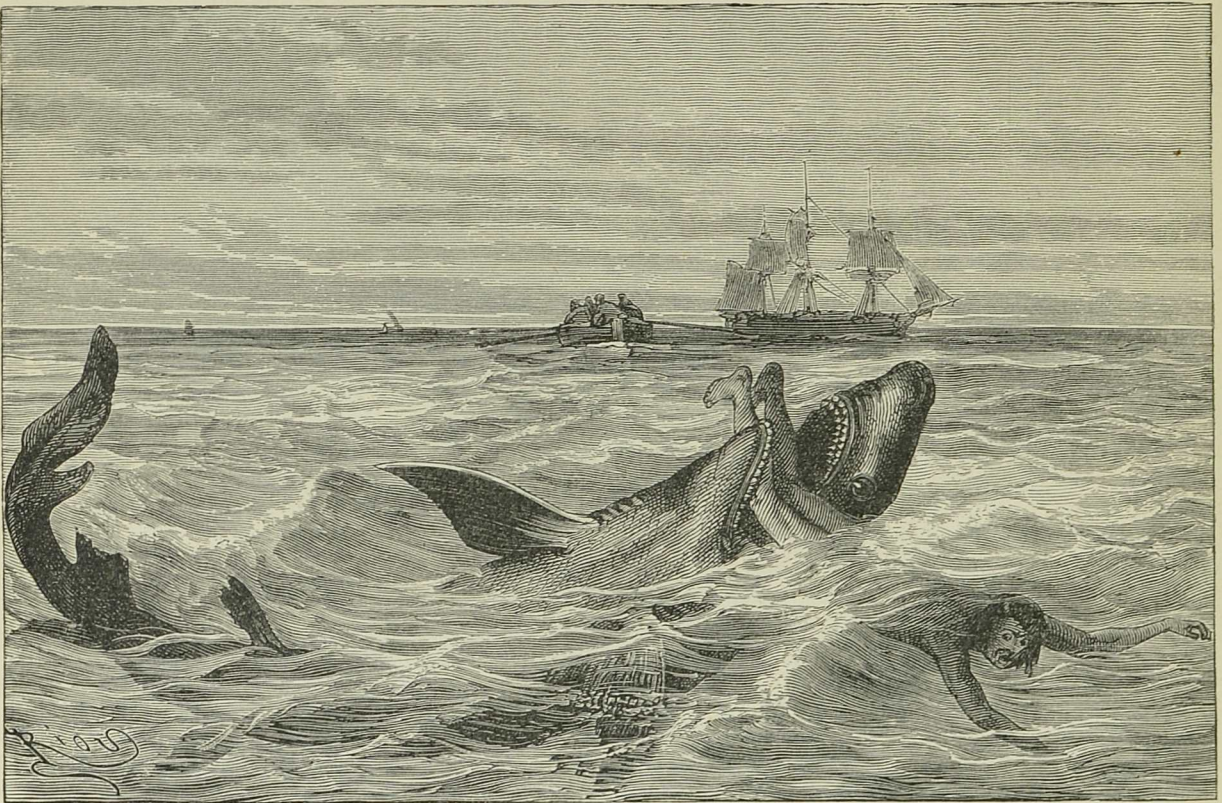
The poor slave was in a terrible fright, and begged and prayed for mercy. He begged and prayed to the Emperor, and went down on his knees before him. I dare say he had no hope from his master's mercy, because he had none. The Emperor was sorry for the slave, and asked Pollio to forgive him. But Pollio would not, even though it was an emperor who asked him.

At last the Emperor grew angry, and pardoned the poor slave himself. Then he caused all Pollio's beautiful goblets to be broken, and his fish-pond to be filled up ; which was a much less punishment than he deserved.

## THE SHARK.

ALL the creatures who live in the sea, as we have seen, prey constantly upon each other.

The world of waters is like a great battle-field, where the weakest go to the wall. But the fiercest, the most dreaded, and the most hateful of all the monsters of the sea, is the shark.



WHITE SHARK SEIZING A SAILOR, WHILE BATHING.

You have heard his name a great many times. Happily, he does not come to our shores. A relation of his, called the basking shark, is often seen; but he is quite harmless, and nobody is afraid of him.

The white shark is the creature that does all the mischief.

If you could peep into his huge mouth, you would see how well able he is to destroy whatever comes in his way.

He has six rows of teeth, which lie down when they are not used ; but the moment a fish approaches, up they all start, ready for action. They are very great teeth, nearly two inches broad, and of a three-cornered shape. The edges are like a saw, and as sharp as the sharpest knife.

No creature, not even man, has much chance against these terrible teeth. If a man falls overboard from a ship, he is almost sure to be swallowed by a shark.

For a shark can swallow a man with ease ; and he is always following in the wake of the ship, to see what he can get.

The female shark lays two eggs, instead of a great shoal of eggs, as most fishes do. The egg has a kind of horny covering, and there are tendrils, or, as they are called, processes, shooting out from the covering. These tendrils get entangled among the seaweeds, and so hold the egg in one place, instead of letting it drift into danger. The little



CASES OF SHARK'S EGGS.

fish is doubled up in the egg ; but by-and-by it makes its way out, and begins a life of cruelty and plunder, as its parents did before it.

You need not wonder that the shark is so dreaded by the sailors.

In the midst of the tempest, when the winds are howling, and the night is without moon or stars, a shining light will here and there be seen heaving on the billows. The sailors know full well what it is, and point it out to each other.

The light comes from the scaly body of the shark, who is close at hand.

If a poor seaman is washed overboard, or if the vessel should be wrecked, then the shark has a banquet.

The French have called him "requin." They say, if a man falls into the sea in sight of a shark, then the "requiem" may be sung.

I dare say you know that in Catholic countries "requiem" means the prayers for the dead.



THE HAMMER-HEADED SHARK.

There are many different kinds of sharks.

There is the blue shark, who is really very handsome. His back is a bluish-green, and the under part of his body is white. He is only eight feet long. The white shark is thirty feet in length. But the blue shark is very fierce, and will devour a man as readily as his dreaded relation.

But his principal food is fish, such as herrings and pilchard.

Then there is the fox shark, with a head a little like a fox, and a tail that can beat the water into foam for miles round.

And there is the huge hammer-headed shark, that you see in the picture.

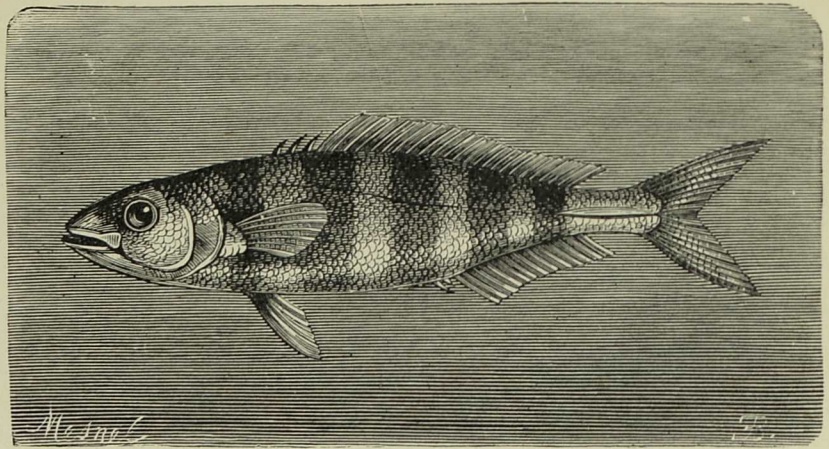
Its head is the shape of a hammer, and, as you perceive, the eyes are placed one at each end.

This hideous creature lives in the Indian seas, and also in the Mediterranean. It likes also to inhabit the waters near the coral islands. It is as fierce as it is ugly, and though it does not grow to the size of the white shark, it is as much dreaded.

I have not quite finished with the shark.

There is a fish a little like the mackerel that follows him about.

The sailors called it the pilot-fish, because they said that it guided the shark to his prey, and warned him of danger. But this is a fable. The pilot-fish only follows the shark in hopes of picking up some stray morsel that the monster has dropped.



THE PILOT-FISH.

There is still another fish related to the sharks, and that has a terrible weapon.

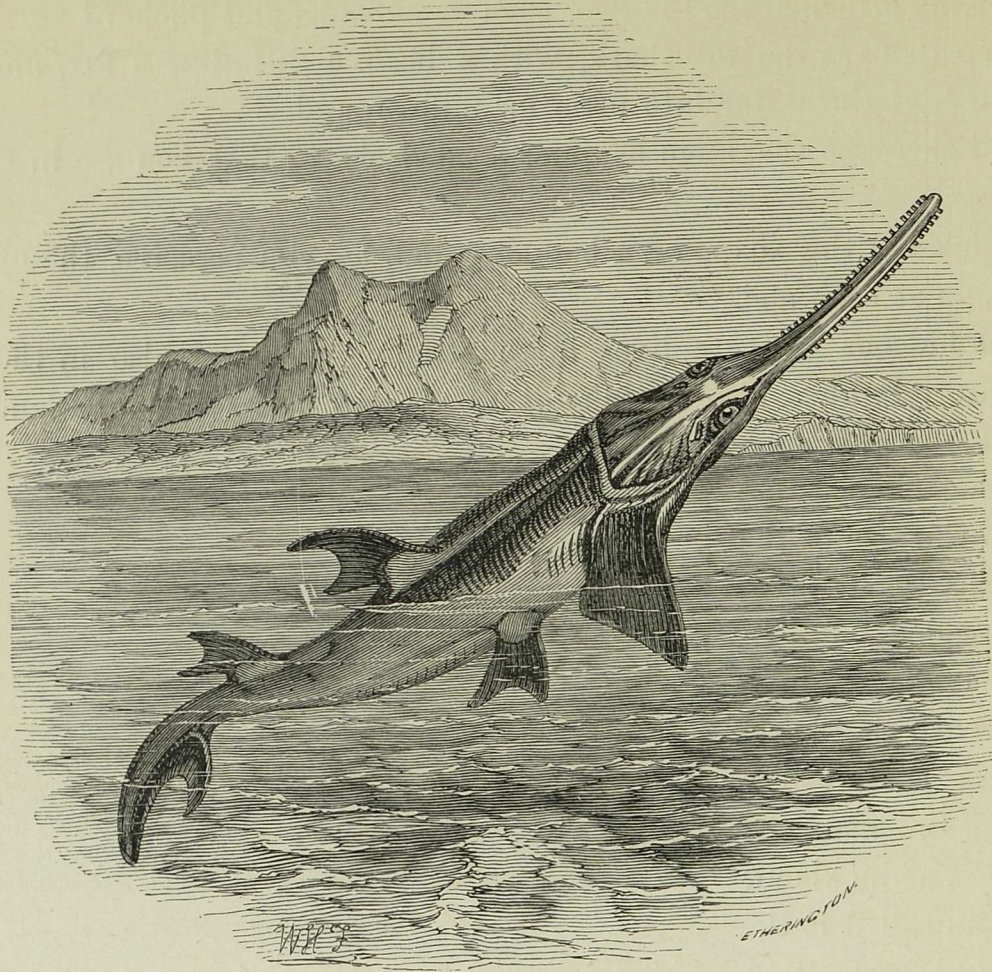
It is called the saw-fish.

Do you see its long saw, jagged at both edges?

Its body is covered on the upper surface with sharp spiny knobs, a little like the rays.

It is as savage as its relation the shark, only, happily, it is not so often met with.

It attacks the whale, as the sword-fish does, and will bury its weapon



THE SAW-FISH.

in the huge animal up to the very roots. It will also plunge its saw into the side of a ship.

You would wonder how the edges of the saw could be forced through either the whale or the ship. But the fish comes to the attack with such violence that nothing can resist the shock.

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### THE COD.

MAN obtains a vast amount of food from the ocean. It is like a mighty storehouse which can never be exhausted.

I am going to tell you about a fish that is no doubt very familiar to you—the cod. The cod and its relations are all very greedy creatures. The cod's great mouth is ever open. It will swallow whatever comes in its way. The crab, with its hard shell, is gulped down without any difficulty; and such is the power of digestion which the cod possesses, that the shell gives it no uneasiness whatever.

I may as well say here that fishes, as a rule, possess powers of digestion that are almost past belief. Their food is snatched



THE COD.

greedily, and often swallowed whole. All kinds of substances find their way into the hungry mouth. Yet the fish thrives and eats, and is as healthy and vigorous as ever.

The cod, in spite of its greedy disposition, is one of the most useful fishes we have. It produces such an amazing quantity of eggs, that you would hardly believe it possible. Three millions of eggs have come from one fish! So that the supply of cod-fish is hardly likely to fail us.

Every part of the cod is of use. Its flesh is firm and white, and affords excellent food for man.

Its tongue, when salted, is thought by many persons to be a great delicacy. Its gills are used by fishermen to bait their hooks with. You have heard of cod-liver oil. In these days it is a famous remedy for weakness of the chest, and various other maladies. The swimming-bladder gives us isinglass; and the fisherman will boil the head, and use it for food for himself and family.

In Norway the fisherman will feed his cows on cod-fish. Cod-fish and sea-weed mixed together are thought to do the cows good, and make them yield more milk.

In Iceland, also, that dreary country, the people give the bones of the cod to their cattle; and in Kamschatka the dogs are fed with the same diet. Nay, on the shores of the Icy Sea the poor people dry the bones of the fish, and burn it instead of coal.

Thus you see how many people and countries are benefited by the cod.

The cod-fishery is more important than the herring-fishery, and is on a far grander scale. It requires large boats, and abundance of stores and implements.

Of late years the English fishing-vessels have been contrived with wells in them. The fish can be brought to England in these wells actually alive!

The great Newfoundland Bank is a famous place for cod. A fisherman may there catch four hundred fish in a day.

Each man has a space allowed him in which to fish, so that he does not interfere with his neighbour.

But now and then he has to call upon his neighbour to help him. The fish will be so large and heavy that he cannot pull it up.

He very often does not see his neighbour, though he can hear him talk.

The fog is so dense that it is like a thick cloud, and hides everything from view.

The men have lanterns and alarm trumpets; but in spite of these the ships are in danger.

There will come a storm, and the ships, unable to see each other in the mist, get dashed together and broken to pieces.

So that fishing for cod is rather dangerous work, and makes many poor children fatherless.

On the coast of Norway there has been a cod-fishery for more than a thousand years. All the bays and gulfs on the shore, at a certain time of





FISHING FOR COD OFF THE GREAT NEWFOUNDLAND BANK.



the year, swarm with cod; and along the whole of the coast fishermen are busy with boats, and lines, and hooks, and nets, all with one intent—that of catching the poor cod.

In these days it is the fashion to rear fishes in tanks or pools made on purpose for them. Here their habits can be studied.

In the Hebrides of Scotland there are some of these tanks that communicate with the sea.

A fisherman has the care of the fish, and he goes regularly to feed them. The fish know him quite well. When he comes with his basket, they swim towards him, and open their mouths to receive the food. They will even take it from his hand.

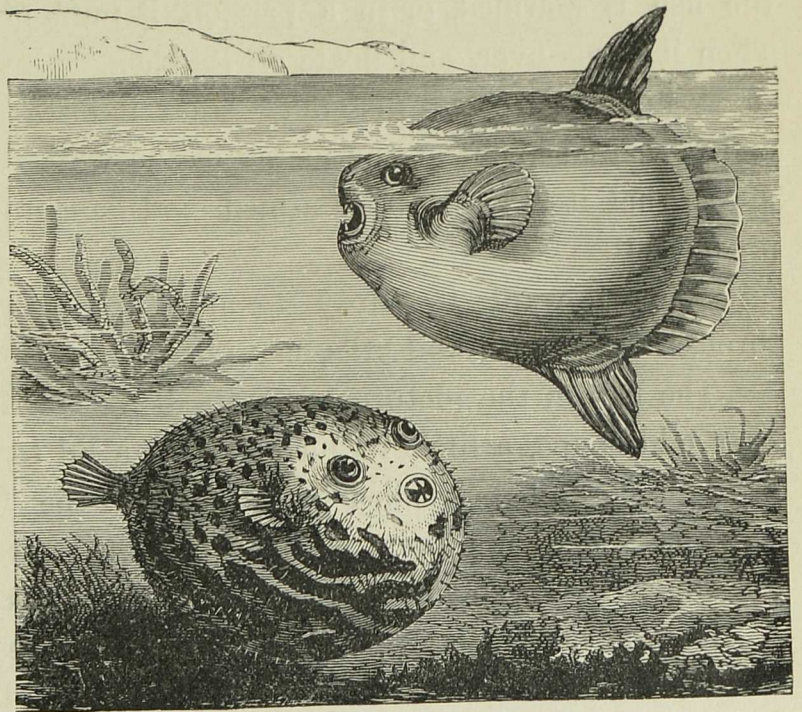
### FISHES THAT PUFF THEMSELVES UP LIKE A BALL.

SOME of the fishes have, as you have seen, very whimsical shapes. There is no end to their variety.

Here is a creature that looks like the head of a monster fish, cut off from the body. It looks, in fact, to be all head and fins.

Now and then, the fisherman sees this great round fish lying on the water, and floating, as if it were dead. He knows it is the sun-fish, and he will draw it out, and by-and-by carry it round on a board and show it as a curiosity.

This happens at Brighton, and other places on the south coast; but it is only by accident that the sun-fish comes near our shores.



THE GLOBE-FISH.

THE SUN-FISH.

The sun-fish has a great many relations called globe-fishes. They are some of them no larger than a foot-ball, and others a great deal larger.

They are armed with spines, or prickles, like the hedgehog. And some of them have a regular coat of mail. They may be said to be among the armed creatures of the Ocean.

But the most curious part of their habits has yet to be told.

The whole family have a means of defence such as we have not before met with.

When one of them is alarmed it can puff its body out like a round ball. Then its spines stand up, and appear to its enemies like an array of spears.

One of the globe-fishes is called Pennant's globe-fish, because it was discovered by a famous traveller of the name of Pennant. It has a crop a little like the crop of a fowl. It is, in fact, one of its stomachs. When the fish is alarmed, or in a passion, it puffs out this crop like a balloon. Then it turns over, and floats on its back.

While it is in this distended state it loses all power of guiding itself, and is drifted about at the mercy of the waves. But its prickles all stand up, so that it is really fully armed, and dangerous to any creature that approaches it.

When it wants to empty the air from its crop, it lets it off by degrees through the mouth and gills, making, as it does so, a rushing kind of noise.

The fish in the picture puffs its body out, as you see, and makes it a very odd shape, a little like a box with a lid to it.

This is why it is called by the French the "coffre-fish."

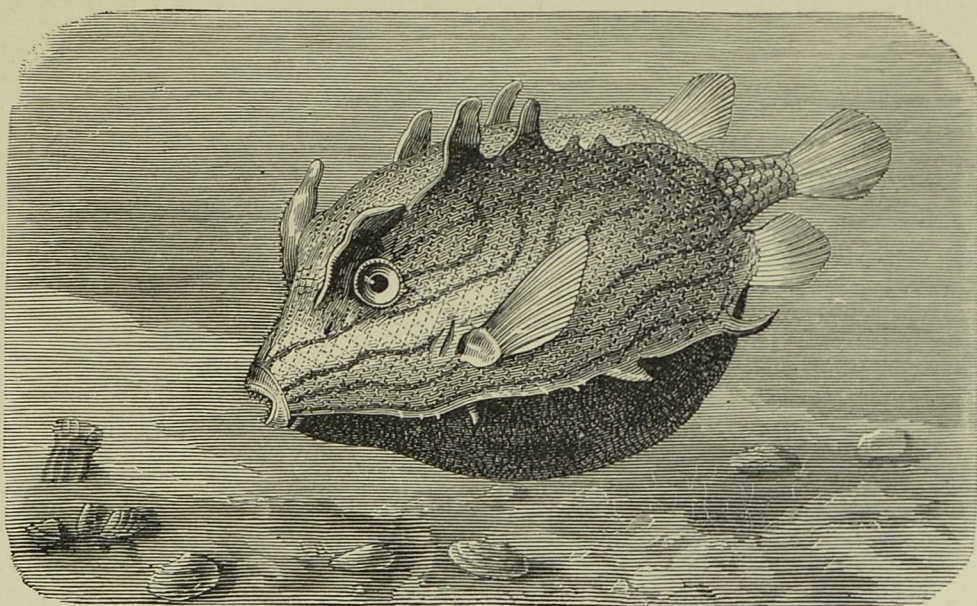
And it does not swim with its fins, as other fishes do. It seems rather to balance itself, and move from side to side, like a boat on the sea.

Do you notice the horny spines over its eyes and upon its back?

They have a touch of poison in them. And in many instances the flesh of the fish will be poisonous as well.

The natives of the countries where the globe-fishes are found, are careful never to eat them. And they will warn strangers of their poisonous nature.

There is a story told of a sailor who was resolved to try, at all risks, and taste what the flesh of the fish was like.



THE COFFRE-FISH.

He thought it was only the curious shape of the fish that made it disliked.

But he paid dear for his rashness. When he had had the creature cooked, and had eaten it, he was taken ill and died.

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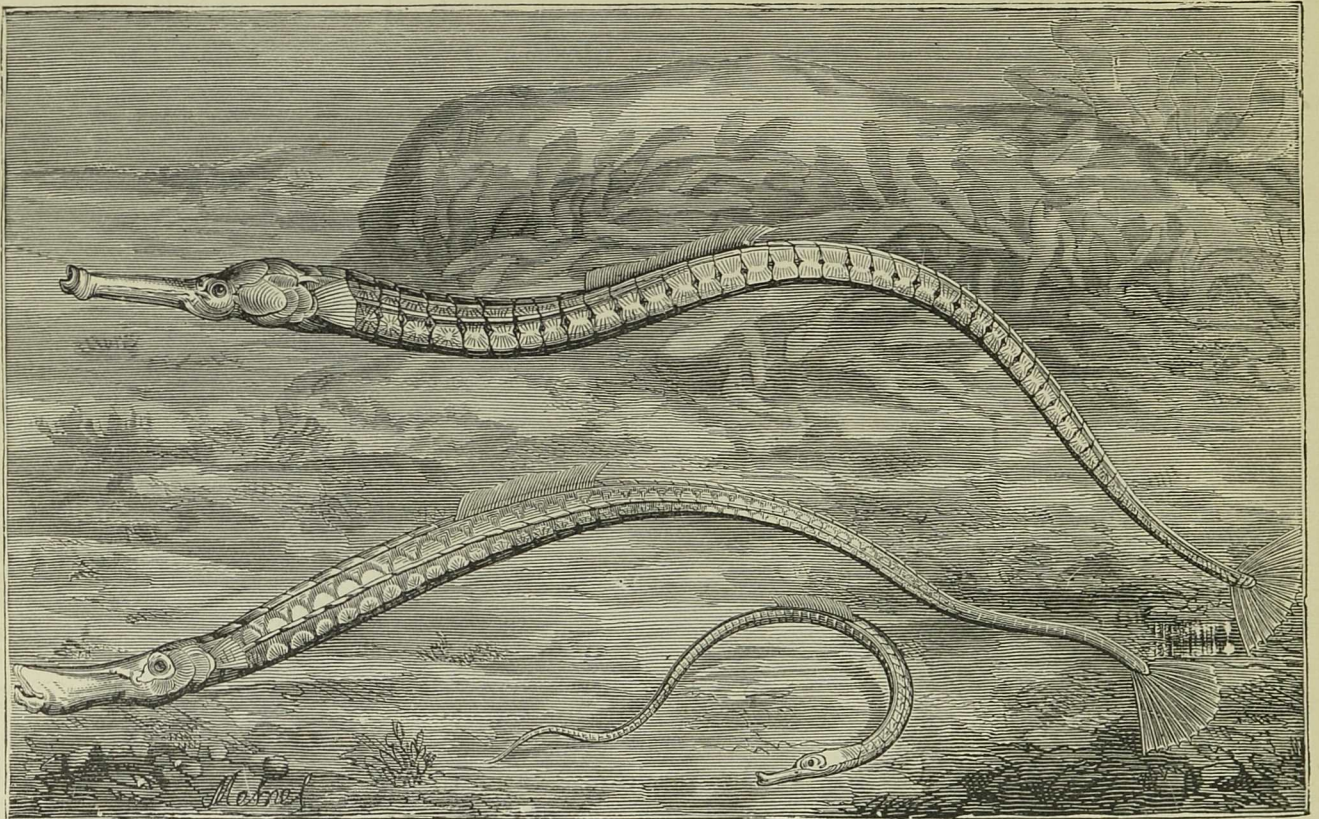
### THE PIPE-FISH.

THE pipe-fish has a long slender body, and its jaws are united, and form a tube. The entire body is covered with horny plates something like a coat of mail. Yet the horny plates are flexible, and the fish can twist itself about pretty much as it likes.

Some people call it the needle-fish; but the name by which it is known is the pipe-fish.

The pipe-fish swims about, often with its head downwards, and it will put itself into all kinds of curious contortions.

It is looking about for tiny creatures to feed upon. It is thought that



PIPE-FISHES.

the fish draws up its food through the long tube-like mouth, as water is drawn through a syringe.

The fish is of no use itself as an article of food. It has scarcely any flesh on its dry, hard body.

The pipe-fish is very fond of its young ones. The father pipe, and not the mother, carries them in a pouch or bag. When the little pipe-fishes are swimming about, and anything frightens them, they run to their parent, and get into the pouch.

A fisherman one day caught a pipe-fish, and shook the young ones out of the pouch into the water. The poor little creatures did not swim away. They kept close to the spot, and when the fisherman held the old fish near them, they all jumped into the pouch again.

There are many different kinds of pipe-fishes, and they have curious names. Most of them live on our own coasts, and are often found

among the sea-weeds at low-water. There is one called the deep-nosed pipe-fish, and another the snake, and another the worm pipe-fish.

In the picture, you see that two of the fishes have short, stiff tails, like a brush. In another part of the family the tail is long and slender, and can twist round anything, and hold it fast.

The fish likes to hold fast to some support by its tail. Indeed, if there is nothing at hand, a good many pipe-fishes will twist their tails together, and present the most curious appearance.

No one would believe that this very odd-looking little creature was a fish at all. But such is the case.

It is a kind of pipe-fish, but it is not very common. When it is dead its body curls up, and its head and neck look like a horse's head.

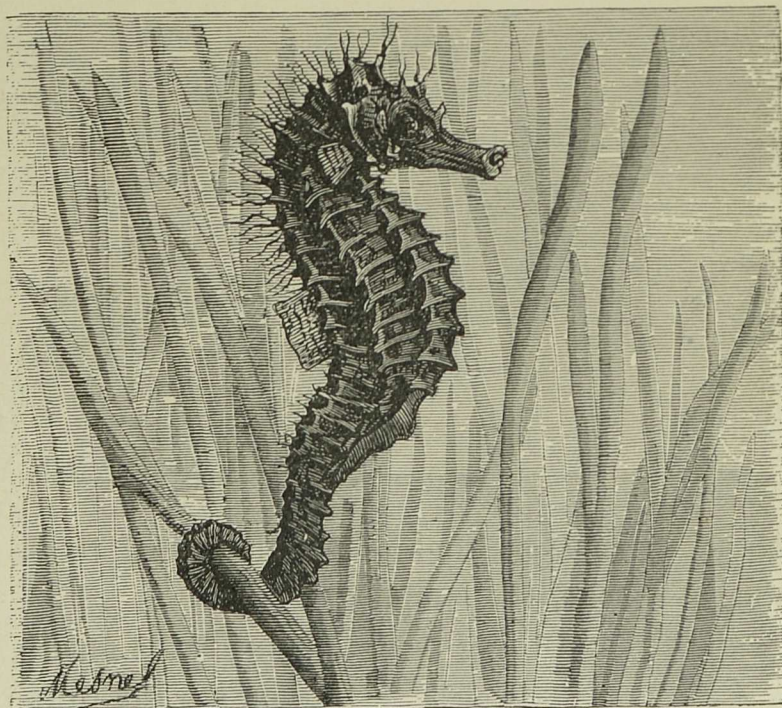
People often put it in their cabinets and museums, for a curiosity, and call it the sea-horse.

A gentleman kept two of these funny little fishes in a glass vase, as we do gold and silver fish, and amused himself by watching them.

They were not very comfortable at first, for they wanted something to twist their tails round, and keep themselves steady. But when, by-and-by, some sea-weed was put into the water, they seemed very glad indeed. They soon fixed themselves firmly upon it.

Do you not perceive how the sea-horse, in the picture, has its tail twisted round the stem of a marine plant?

When the fishes were at rest, and, as it were, anchored, they began to

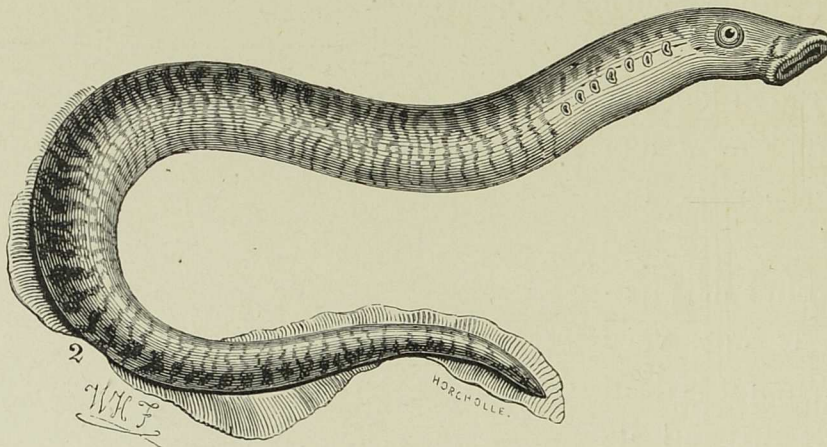


THE SEA-HORSE.

watch for prey. The moment a tiny worm or insect was seen out they darted, and caught it in a minute.

They would also amuse themselves by darting at each other, and tying their tails together, and then pulling them asunder.

More than one little sea-horse has been found coiled up in an oyster-shell.



### THE LAMPREY.

HERE is another kind of eel that used to be much prized in the olden time—I mean, the lamprey.

The round thing in the picture is its mouth, which it uses as a sucker.

Do you see the rows of sharp teeth all round the mouth? By means of these sharp teeth, the lamprey can devour almost anything.

But as it cannot swim well, and is feeble and helpless, its prey might escape it.

Nature provided against this, when she gave the lamprey its wonderful mouth.

Suppose a fish came swimming by, and the lamprey was very hungry. I will tell you what it would do.

It would contrive to fix its mouth on the surface of the fish's body.



SUCKER OF THE LAMPREY  
(MAGNIFIED).



The round sucker of a mouth would adhere, as the leech's does. Nothing could pull it away.

But how can it breathe while its mouth is fast to the body of a fish?

Not in the usual way, for no water can get into its throat.

But you will see a number of holes along the side of the neck. These are really the gills, and the water can flow in and out of them without going in at the mouth. Thus the lamprey can breathe all the time it is fast to the fish.

The lamprey is a very imperfect fish. The bones of its skeleton are very soft, almost like gristle, and it is one of the lowest in the order of the *Vertebrata*. It has neither fins nor air-bladder.

I have not quite done with its sucker.

It fastens itself to a stone or rock, and keeps steady even though the waves are rough.

And when the mother lamprey wants to lay her eggs, the sucker is very useful indeed.

Like the salmon, and many other fishes, she comes to lay her eggs in a river. She wants to hide them under a stone in some safe place. But how can she move the stone?

She fastens her sucker to it, and pulls it up. Her partner will come and help her, and you would be surprised at the great stones they can lift.

In old times people thought the lamprey a great delicacy, and lamprey-pie was set on the royal table. Even now, the town of Gloucester presents a lamprey-pie, every Christmas, to the reigning sovereign.

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## THE GLUTINOUS HAG.

THE lowest of all, in the tribe of fishes, has rather an ugly name.

It is more like a worm than a fish; and Linnæus, the famous naturalist, did class it with the worms.

Now-a-days it has been examined with great care, and is found to be a relation of the lamprey.

It has really no skeleton at all. A bare tube, or thread, of gristle runs through the body, and when boiled the whole tube goes to jelly.

It has no eyes. And you would suppose it to be the most defenceless of its tribe. But no such thing.

It is a very unpleasant neighbour, and is quite able to take care of itself.

Blind though it is, it contrives to get inside some other fish. How it can do so is not clearly known, but a fish has been found completely devoured, the skin only remaining, and the glutinous hag within it.

The hag has eight feelers round its mouth; they have a very acute sense of touch. As the fingers of a blind man can almost do the work of eyes, so these feelers guide the blind fish, and help it to find its food.

On the palate there is a single tooth like a hook. The fish hooks on to its prey by this hook, and is thought by some persons to make a hole for itself to get in.

It keeps hold with its one hook until the two rows of teeth that are upon the tongue can come into play.

It eats with its head buried in the fish it is devouring, so that Nature has made the same provision that she has in the case of the lamprey.

The breathing holes of this disagreeable creature are placed so far back that it can eat and breathe at the same time.

Why is it called the glutinous hag?

Because there are pores down each side of its body that give out a glutinous matter. When the creature is attacked it can throw out a quantity of this slimy secretion, and hide itself in it.

It has another name besides the glutinous hag. It is called the borer, because it bores or pierces into its neighbours.

## MUSICAL FISHES.

THE fishes are supposed to have no voice at all ; and, indeed, this is the case with most of them. But there are exceptions to every rule ; and so it is with the fish.

There is a fish which utters a cry when it is seized. There is another which wails, like a child, when it is taken from the water. Another fish makes a sound as it swims—that is, at one season of the year ; all the rest of the year it is silent.

But what do you think of a fish that sings ?

There is a little white fish, with blue spots on its back, which lives in America, and which can actually make a sound like music.

A traveller was one day lying on the beach resting himself, when suddenly he heard a sound : it was like music in the distance. He got up and looked about him ; but nothing was to be seen. A boatman was close by, and he asked him if he heard anything. “ Yes,” said the boatman ; “ I hear a fish *singing*.”

The fish was called by some people the “ siren ;” by others *musico*, or “ musician.”

The traveller pushed off in a boat, to hear the music better. He heard a number of voices singing together. It was like a concert in the water. The sound was a little like an organ playing at some distance.

These musical fishes are said to begin to sing at sunset, and keep on singing during the night. They are not very timid, and will continue their music, even if people are standing by to listen.

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THE LILY STARS.

YOU have heard of animals which are like flowers, and like bells, and like ribbons.

Nature has a great many other varieties of shapes, to present to you.

Here is a tribe of creatures called star-fishes.

It is rather a grand name to give them. For in reality they occupy a very low place in the animal kingdom.

But the shape of the common star-fish resembles the form of a star.

People were rather puzzled to know in what class to place the star-fishes and their relations. But now all this has been settled.

The name of the class in which naturalists have placed them, is *Echinodermata*.

It comes from two Greek words, meaning "a hedgehog" and "the skin."

Some creatures in this family, you will see, are not unlike a hedgehog.

There is a great deal that is very curious and interesting to be said of the race of star-fishes. Should you like to know the link between them and the polyps?

I will tell you.

The coral-making polyp had, as you remember, the power of secreting a stony substance, so as to form a case or framework outside its body. Its soft body was snugly hidden within the case, but distinct from it.

The star-fishes, and their relations, secrete a stony substance as well. But they secrete it *within* their bodies instead of *without*.

The framework or skeleton of a star-fish consists of hard pieces, almost like stone, and joined together by a substance like gristle.

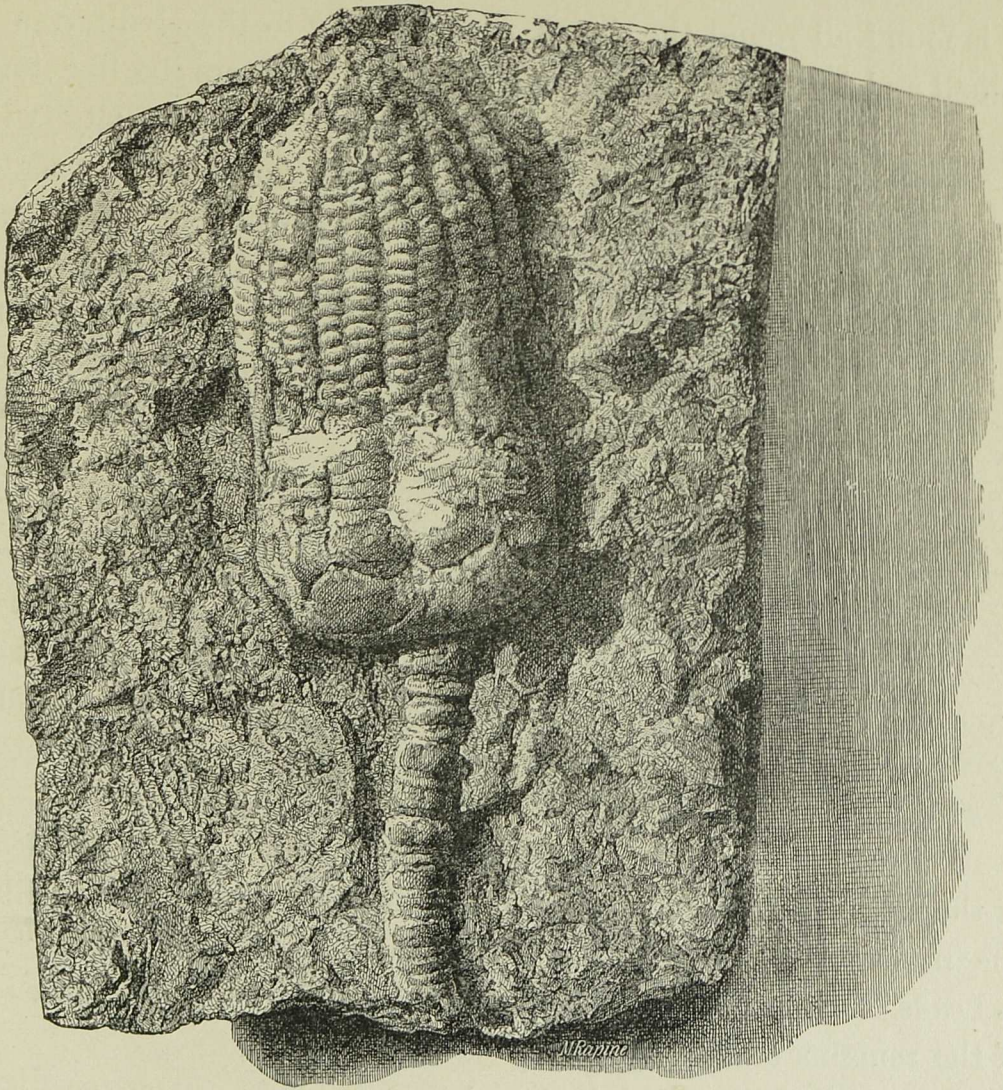
We shall hear more of this framework presently. And we shall find, also, that some of the tribe have long bodies, not in the least like star-fishes, but resembling worms or annelides.

The ocean is full of star-fishes. The floor is literally paved with them. They are more abundant than any other creature. They devour almost everything. Dead and refuse matter is cleared away by them. But they are not restricted to one kind of food. Numbers of living creatures fall victims to their rapacious appetites daily. In fact, as we shall see, they are much to be dreaded by the smaller inhabitants of the sea, on account of their voracity and the weapons with which they are armed.

In the primeval ocean the star-fishes swarmed in the same numbers.

They were not like our present star-fishes; and a more elegant name has been given them. They are called "lily stars"

The skeletons of the lily stars are found in a fossil state. They were not formed to rove about freely in the water. They were fixed to a slender stalk, that could bend all ways.



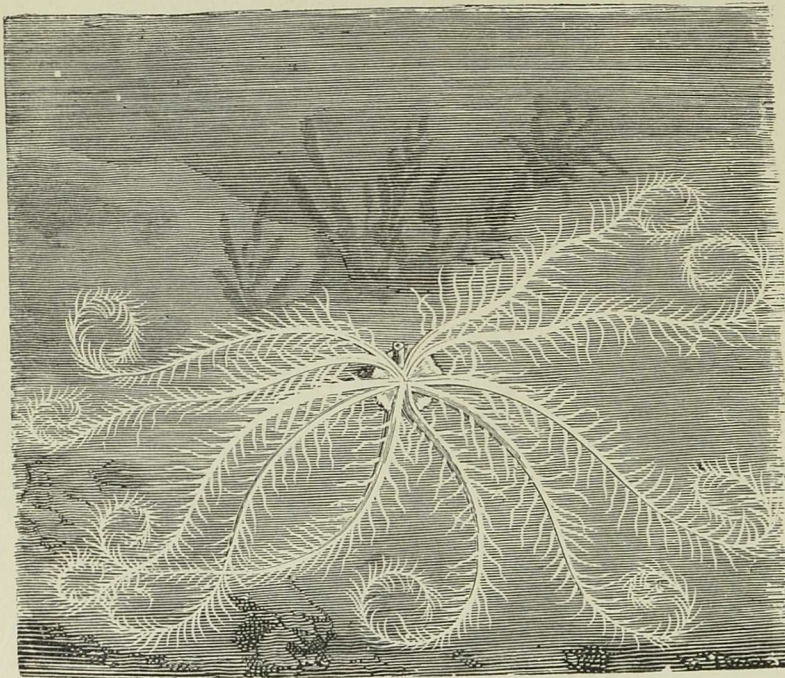
FOSSIL OF THE LILY STAR.

Their rays or arms were long and delicate, and almost like feathers. In fact, the appearance of the creature was more like that of a flower than an animal. Hence its name of "lily star."

Nearly the whole of this beautiful race of creatures has been swept away, and are extinct. Except in a fossil state, one only of the family remains. This is called the rosy feather star.

Its long slender rays are a deep rose colour, and very beautiful. It swims freely about in the water, and is only attached to a stalk when it is young.

It is found all round the shores, from Norway to the Mediterranean Sea. It is small and insignificant, compared with its ancestors the lily stars.



FEATHER STAR WITHOUT THE STEM.

The plate will show you the same feather star when it has left its stem, and is only a star.

Nothing is known of the internal structure of the lily stars. But the skeleton is composed of thousands of stony pieces, which were embedded in the living part of the animal, and kept together simply by the flesh. These pieces were secreted by the lily star itself.

After its death, and when the flesh had dried up, the pieces fell apart and looked like beads. In the north of England they are often found, and are called "St. Cuthbert's beads." One of our favourite marbles, used for mantelpieces, is made up of the remains of the lily stars.

They are called lily encrinites, and the marble is called encrinite marble.

## THE BRITTLE STAR-FISH.

IF you were to take the flower of the lily star from its stalk, you would find a creature with a small round body, from which spring a number of long slender arms.

The body is made up of the same stony pieces that compose the arms, or rays, as they are called. In the middle of the body is an opening, which is the mouth.

The arms or rays are not like those of the common star-fish. They are long and thin, and each springs from the body quite separately from its neighbour.

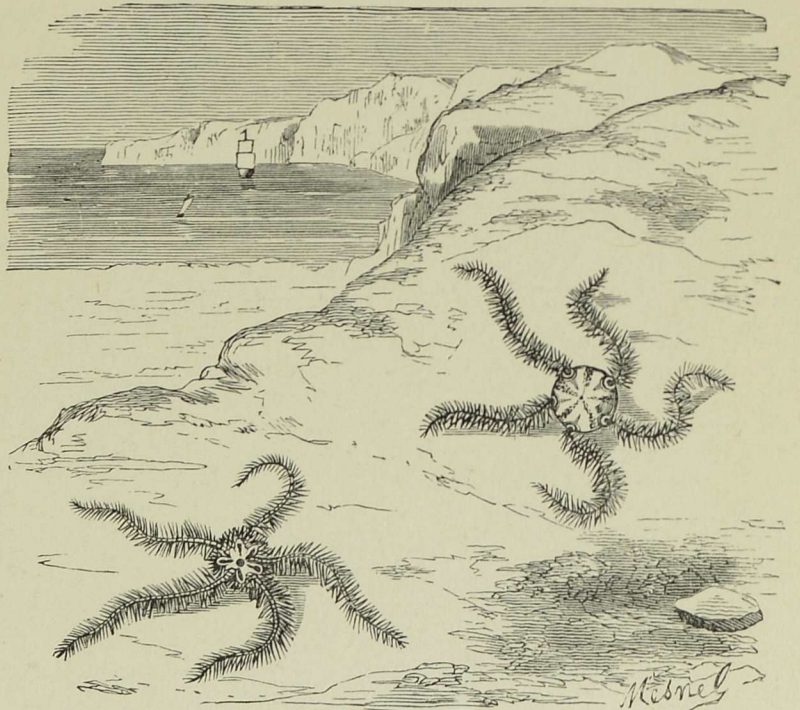
In one species of star-fish, the arms divide and subdivide into a great many branches. These branches are like so many legs, by which the creature can crawl at the bottom of the sea, or twine itself among the sea-weeds and ocean plants.

As the creature swims, it stretches out all its branches. When its prey happens to come too near, the branches hook it, and draw it, as in a net, to the mouth.

I am going to tell you about the brittle star-fish. You may see what it is like by looking at the picture.

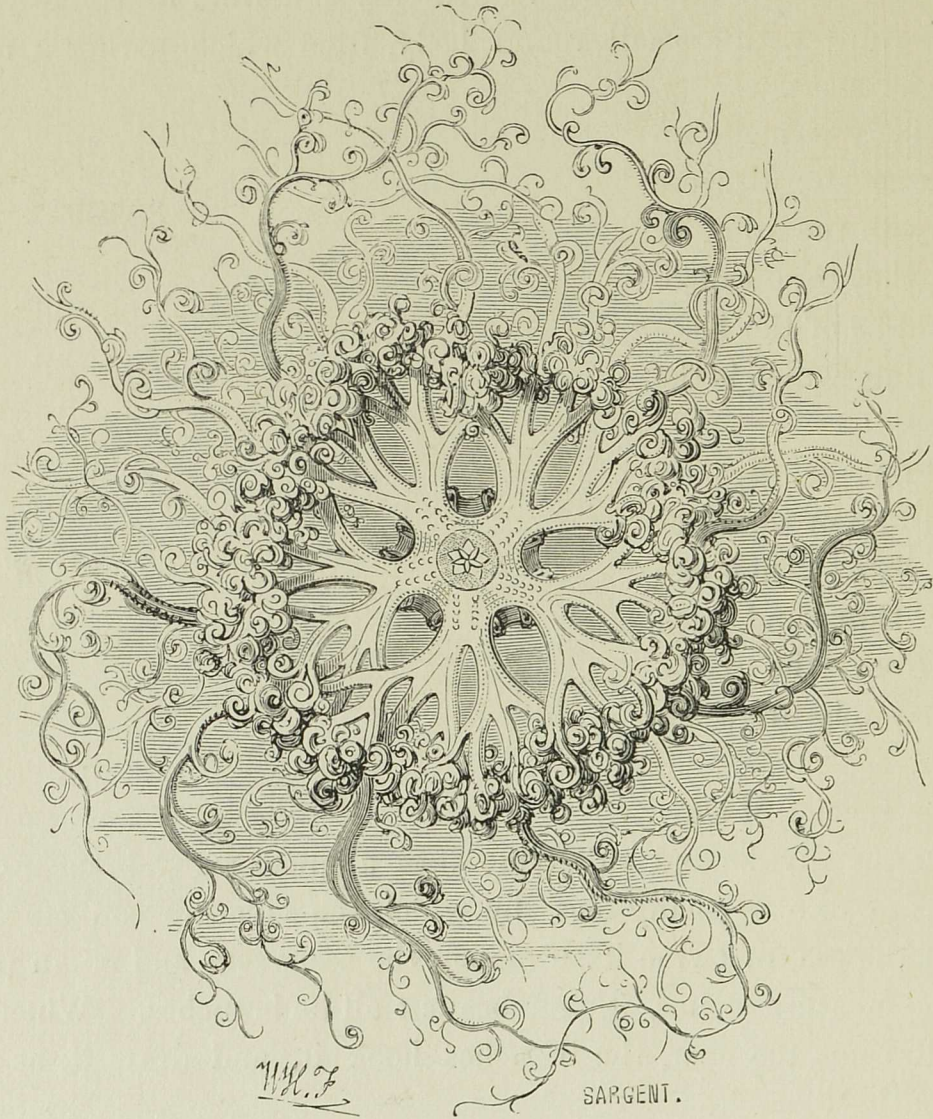
Its long arms are like the tails of serpents. These arms are so easy to bend about in all directions, that the creature can use them as legs to crawl, or as fins to support itself in the water.

The body is made of a number of pieces, fitted close together with the



BRITTLE STAR-FISH.

utmost nicety. The mouth is surrounded by furrows or grooves, in which are some tiny holes. Through these holes, minute bodies, called suckers, can be pushed. I shall by-and-by describe these suckers in a more particular



STAR-FISH WITH A GREAT MANY BRANCHES.

manner. They can take hold of any object, and keep it in a firm grasp. Or they can help to retain the food of the animal while it is being digested.

These star-fishes, with their snake-like arms, are very beautiful.

Their bodies are all kinds of tints and hues, and it is very seldom that two of them are alike.



But the whole race of brittle star-fishes give the naturalist a great deal of trouble.

The creature has the art of breaking itself up into pieces. The moment it is touched, or even approached, it begins to fling off, first one arm, and then another, till scarcely anything is left.

Often, the fisherman will bring up a number of these creatures in his net. They will twist about and put themselves into such strange attitudes, and fling their arms about them in so reckless a manner, that he will be quite uneasy, and shovel them back into the sea.

But the naturalist does not want to throw them back into the sea. He wants to save a specimen for his collection, and this habit the creature has of breaking itself up is very annoying.

He has but one way of proceeding. He must plunge the brittle star-fish into a vessel of cold fresh water. This will kill it at once, before it has time to get rid of any part of its body.

But even then the creature will often be too quick for him. He will slowly and cautiously approach, and lower his bucket of fresh water. But before he has time to do more, the brittle star will begin to break itself up. First will go one arm, and then another, till the naturalist will seize hold of such parts as he can get, and carry them away, in despair of obtaining a more perfect specimen.

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## T H E S T A R - F I S H .

IF you were to pick up a common star-fish from the shore, you would see at once that it is very different from those of its race which I have been describing. The rays are not long and thin, and they do not spring separately from the body. They are joined to it at the base, and are so much larger and thicker, that some of the internal parts of the animal are lodged in them.

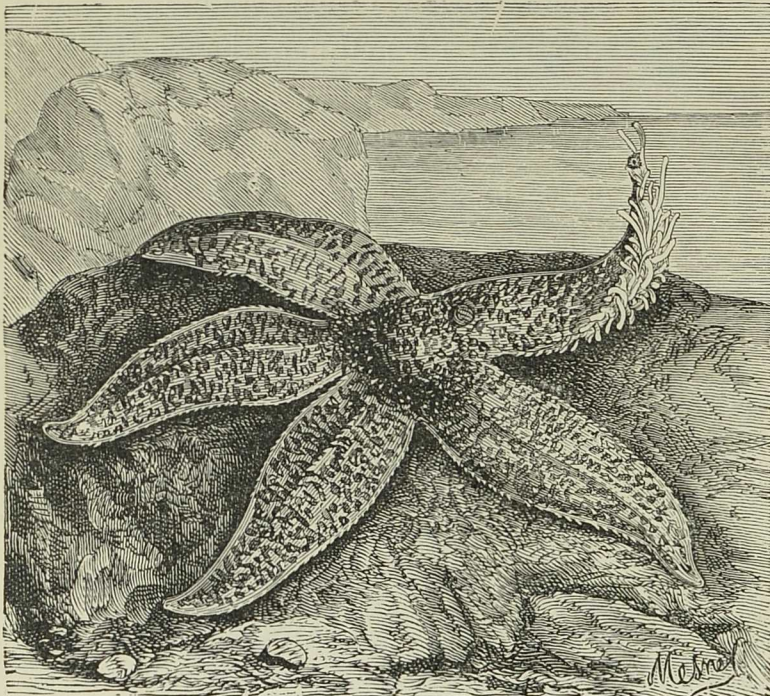
But these rays, thus thick and joined together, cannot act as the long slender ones did.

And yet the star-fish seizes and holds its prey.

We will suppose a victim, of any kind, being so unlucky as to come near a hungry star-fish.

Let us see what happens.

The star-fish bends its rays, so as to form a kind of cup. Then it lays hold of the creature it is going to devour.



COMMON RED STAR-FISH.

But the grasp is not so strong or so secure as that of the slender rays. The victim might struggle hard and get away. Then the star-fish would go without its food. But a wonderful apparatus has been provided to meet the case.

I told you of the suckers which were round the mouth of the brittle star-fish.

The common star-fish has hundreds of them.

From the under surface of the rays, they spring up in myriads. Each sucker lays hold of the prey; so that, in spite of all its efforts, it cannot escape.

It is dragged to the greedy open mouth, and devoured.

Thus the star-fish, that looks so helpless, is one of the most cruel tyrants of the ocean.

I must tell you more about these suckers, for the history of them is as curious as can be.

Each ray is made up of stony pieces joined together. On the under side of the ray, there are minute holes left between the pieces. These holes are arranged in rows, and are outlets for the suckers. The suckers can be pushed forth together, or separately, at the will of their owner.

If you were to put a star-fish into a vessel of sea-water you could watch the whole process.

At first, it would lie huddled up as if it were dead. Its rays would shrink up, and be drawn into its body. But, by degrees, it would recover itself. The rays would begin to expand. Hundreds of tiny suckers would push through the holes. They would lay hold of the side of the vessel and help the star-fish to pull itself up.

Thus you see what a wonderful machinery is found in the body of one of the humblest and simplest of Nature's works.

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### THE SUCKERS OF THE STAR-FISH.

I SHOULD like you to know how the suckers of the star-fish are pushed up and down through the holes.

Each sucker is mounted on a hollow tube, and just below the tube is a round bag, full of liquor.

When the star-fish wants to use its suckers, it squeezes the liquor up into the tubes. The tubes swell, and push the suckers out through the holes. They are then ready to lay hold of its prey.

But when the star-fish has finished its meal, and does not want its suckers any longer, it draws the liquor back into the bag.

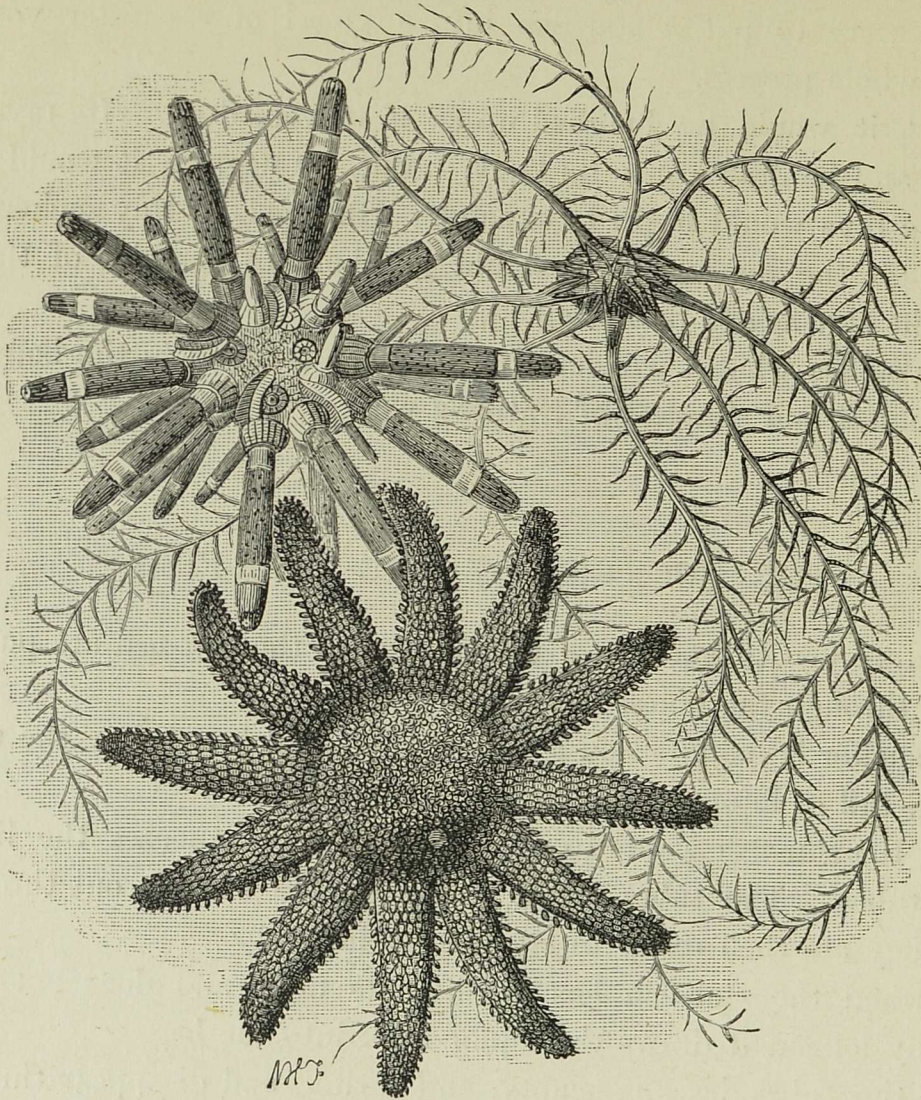
Then the tubes become empty, and shrink, and disappear through the holes.

You may think how terrible a creature must be, armed in such a manner.

Even the oyster is not secure from the danger of an attack. The star-fish will contrive to force an opening into the shell, and eat the oyster.

It is thought to drop a liquid into the shell, and so stupify the victim.

One day a naturalist, who was studying the habits of the star-fishes, saw a number of them on the shore rolled into a ball, and their rays all entangled together.



DIFFERENT KINDS OF STAR-FISHES.

In the middle of the ball was an unlucky oyster.

The star-fish had contrived to introduce between the valves of the shell a round bag, filled with fluid.

Five of such bags were arranged round the neck of each star-fish. Some were as large as nuts, and some were smaller.

The bags were mounted on little stems, and at the top was a round hole, through which the liquid dropped into the shell.

When the star-fish was touched, the bags shrank up and became invisible.

There were several of these balls of star-fish, each of them huddled round a shell in this manner. Sometimes the poor oyster was nearly devoured. But even if it seemed scarcely touched, it had lost the power of closing its shell, and was either stupified or dead.

The naturalist felt certain that the liquid had the power of stunning the oyster, and perhaps killing it.

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### THE SEA-URCHIN.

HE is often called hedgehog, because of his prickles, or rather his long spines.

He is not at all like the star-fish ; but he belongs to the same class.

His shell is the most wonderful part of him.

It is not always covered with spines. In the picture one shell is quite smooth, and has only little knobs, or tubercles, all over it.

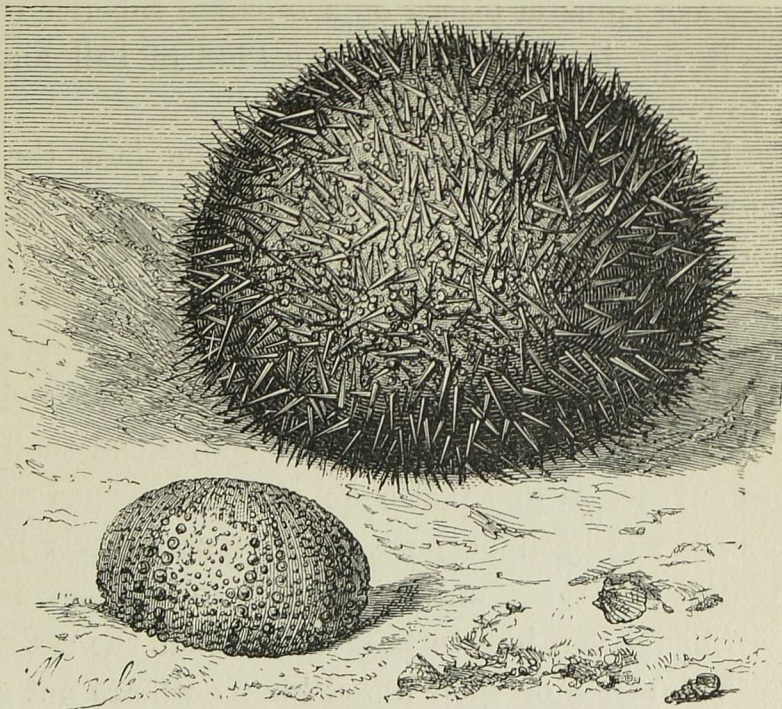
Have you ever examined this wonderful shell ?

It is made up of several hundred pieces, of different sizes, closely fitted to each other.

The joinings are so close and compact, it is scarcely possible to see where they are.

The shell is filled with sea-water. And the internal parts, in fact the body of the animal, is suspended in it.

At the top of the shell is a hole, which is the mouth.



SEA-URCHINS.

But, as the animal keeps growing bigger and bigger, what is to be done with the shell? How are all the parts to be kept together?

I will tell you. A thin membrane, or skin, goes over the whole shell. It dips down between the edges of the different pieces of the shell. This membrane keeps depositing earthy matter round the edge of every piece; so that, without altering its shape, the piece keeps getting larger, until it has attained its full size.

We cannot imagine a more simple or beautiful contrivance.

In the picture, there is a sea-urchin covered with long spines.

His spines are of use to him, when he wants to bury himself in the sand. He has suckers, too, like those of the star-fish, and he moves about by means of them both.

I must say a few words about the spines.

Each spine is placed on a separate tubercle or knob.

It fits into the knob by a kind of ball and socket joint, that enables it to move about with ease.

It was rather a puzzling question how the spines grew; but, as we know, the whole race have, like the polyps, the power of secreting stony matter.

One of the spines was taken from the animal, and examined while it was quite fresh. It was found to be the work of the same thin skin, or membrane, that had enlarged the pieces of the shell. This membrane had, therefore, secreted matter for the spines and shell too. A piece of the spine was cut across and polished: then, by means of the microscope, the whole process was seen at once. Layer upon layer had been laid on, with the greatest exactness, until the whole spine was completed.

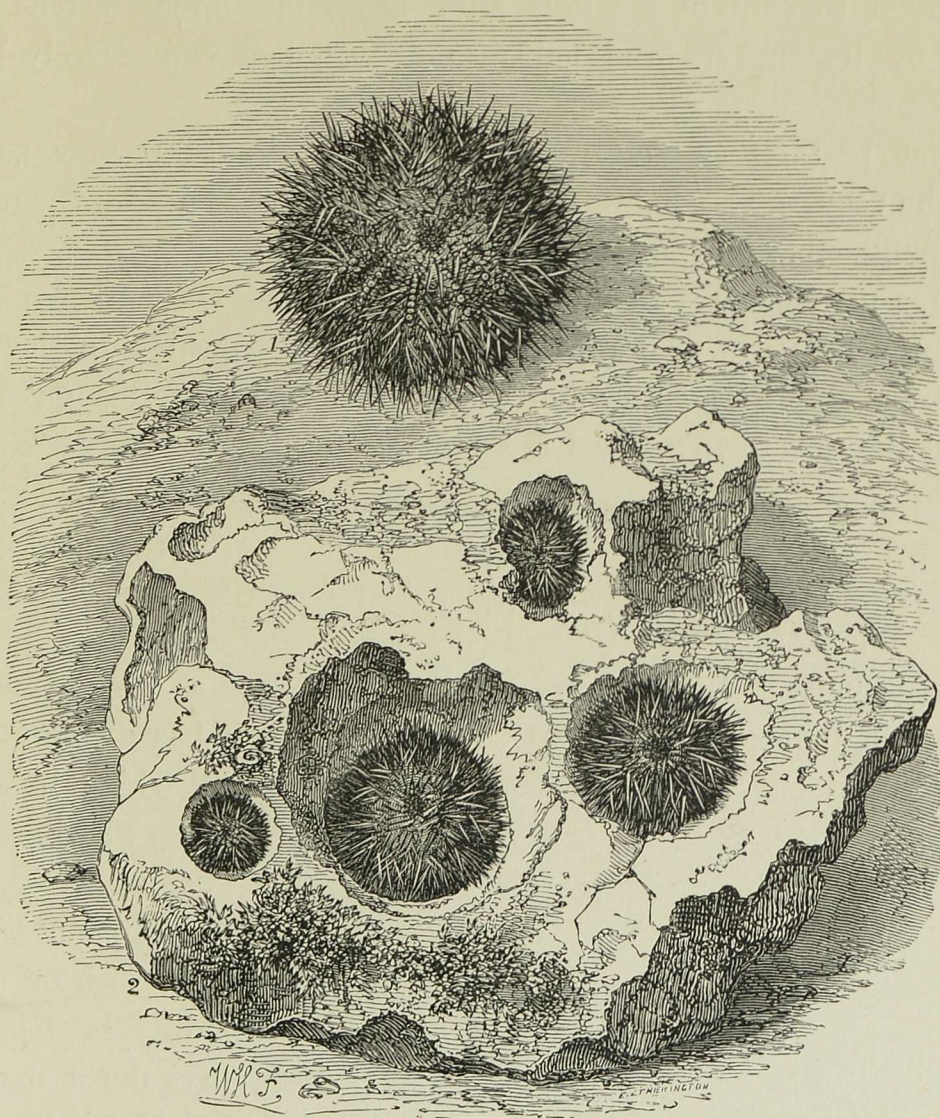
Should you like to hear more about the sea-urchin?

The pieces of shell round his mouth are not so firmly fixed as the rest; for his mouth is always ready for prey, and if the prey is large, he can stretch his mouth to receive it.

The mouth itself is a simple opening; but it can boast of five sharp strong teeth.

These teeth can crush up the hardest shell with ease; in fact, scarcely

any substance can resist them. But sharp and strong as they are, their points would get dull in time; for they are always at work, crushing and breaking. As if to provide against this danger, they keep on growing. Thus they are preserved sharp and fit for use.



SEA-URCHINS IN THE ROCK.

The jaws of the animal are very curious indeed.

There are five jaws; for each tooth has a jaw to itself. The five jaws are united by muscles, and form a kind of pyramid, the top of which reaches to the opening of the mouth.

The pyramid is called the Lantern of Aristotle, because the ancient philosopher compared it to a lantern.

The sea-urchins are found everywhere.

Some of them bury themselves in a hole or cleft in the rock, just large enough to contain a single animal. The animal fastens itself to the hole by its suckers, and holds so fast that it can scarcely be forced away.

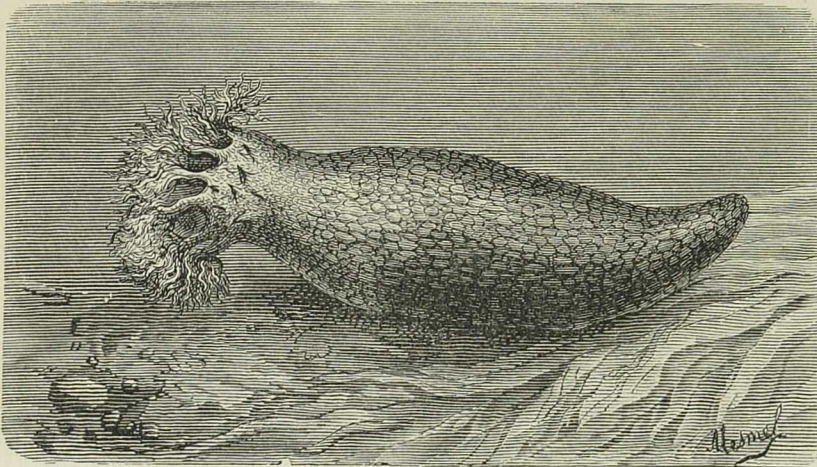
In some parts of Ireland, numbers of these creatures may be seen in holes in the rock. The holes, I must tell you, are made by themselves—in what manner is not known.

In some places, the sea-urchin is used for food. On our own shores, it is often eaten by those who are in want of a better meal. In the Mediterranean Sea, where it is larger and better flavoured, it forms an article of food; and the fisherman's board is seldom seen without it.

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### THE SEA-CUCUMBER.

THERE is a long, soft-bodied creature, a little like a worm, and which contracts and dilates its body as the worm does. It has a common name, by which it is known everywhere,—the sea-cucumber.



SEA-CUCUMBER.

It is not like either a star-fish or a sea-urchin: it has neither rays nor a shell.

But it has a thick, tough skin; beneath which is another covering, called the tunic.

This second covering is made up of fibres, crossing and recrossing in every direction.



The fibres are imbedded in a gristly substance, which makes the covering very elastic. It can spread out or shrink up, just as its owner likes.

There are also muscular bands running all over the body, both cross-ways and lengthways. These help the sea-cucumber to move in every direction.

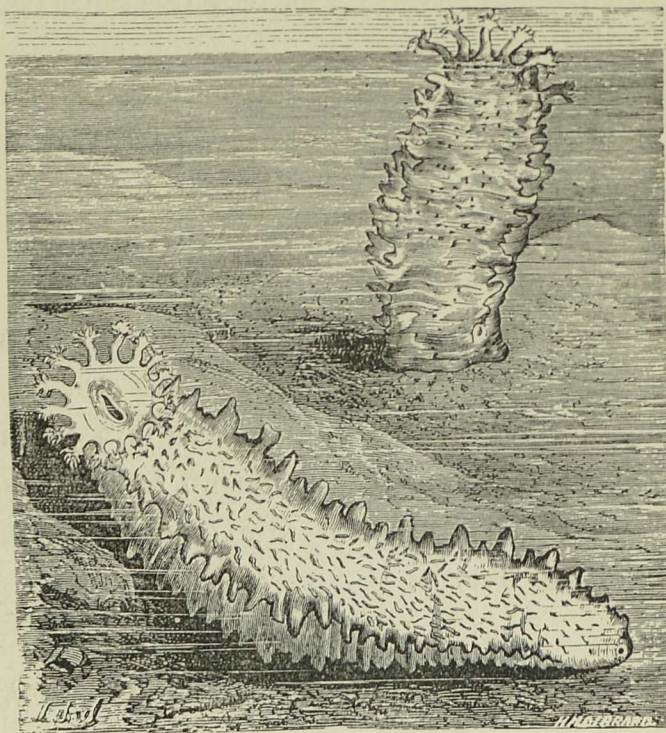
But though the creature has no shell, and no arms or feet, it has suckers like those of its neighbour the star-fish. These suckers act in the same way, so there is no need to describe them again.

In some species, the suckers are found over the whole body, and push themselves through a myriad of holes.

In other species, they are found only in the middle of the underpart of the body, and then the creature crawls along like a snail.

Besides the suckers, the creature will sometimes have hooks or spines, which can be pushed in and out, and still further help it along.

It has a mouth about the width of a quill, and placed in the middle of a ring in the upper end of the body.



SEA-CUCUMBERS WITH SPINES.

Round the mouth are a number of feelers, which look a little like feathers.

These feelers can change their shapes in the most curious manner. Sometimes they will stretch themselves out, and look like worms. Then a feeler will contract itself in the middle, so as to look like an hour-glass; or it will fill itself with sea-water, and swell out into a little balloon.

There is one sea-cucumber which is very large indeed. It is a foot long, and can stretch itself out two feet longer.

When it is alarmed, it acts like its relation, the brittle star-fish. But

it has no arms or legs, so it cannot throw them off. Instead of this, it ejects its stomach through its mouth. When it has performed this feat, it still continues to live.

We can never be surprised at anything which takes place among the creatures of the ocean.

I shall tell you a little story of a sea-cucumber.

It was kept in a vessel of sea-water, and lived there safe and sound. But one day its owner forgot to change the water ; and, what was more, the poor creature was left, not one day, but three, and no one attended to it.

It became very uncomfortable, and began to throw off its feelers. Next it ejected its internal parts, one after the other. Each part fell to the bottom of the vessel.

The efforts it made were violent. But still the creature lived ; and the empty skin, in which nothing was left, was so irritable that at the least touch it twisted itself into all kinds of shapes.

The most curious part of the story has to be told. Some one had pity on the poor creature, and gave it a fresh supply of sea-water in its vessel. Then the parts actually began to grow again in the empty body.

At the end of a few months the sea-cucumber was as strong and as lively as ever !

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## FISHING FOR SEA-CUCUMBERS.

I HAVE not done with the curious habits of the sea-cucumbers. The history of the ocean world is a succession of wonders.

A sea-cucumber remains, for a time, still and stationary. Each end of its body begins to swell and to flatten itself out. At the same time the middle part gets thinner and thinner, till it is like a thread.

What does all this mean ?

It means that the body of the animal will shortly break into two parts. There will be two sea-cucumbers instead of one ; for, by-and-by, each part will become a complete animal, and the image of the other.

The Chinese eat many things which we would not touch ; and they have a great fancy for the sea-cucumber.

This kind of sea-cucumber is called trepang, and it is found in the seas of New Holland, and in other places.

Hundreds of little vessels, called proas, are fitted out at the right season for the trepang fishing.



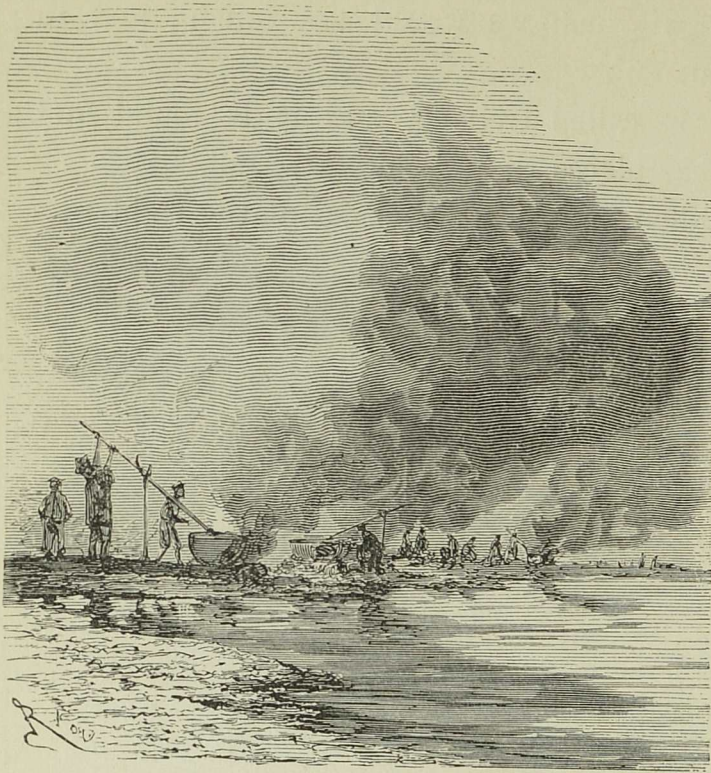
FISHING FOR TREPANG.

The fishermen come from Malacca. They are very expert at their trade, and dive down to fetch up the trepang.

The trepang crawls at the bottom of the sea, and is very much the colour of the ground it crawls upon.

But the Malay fisherman spies it out in a minute. It is easily caught, because it crawls so slowly.

The people of an island near New Guinea fish for trepang, and prepare it for the market. Then they sell it to the Chinese, who come in their junks to trade for it.



PREPARING TREPANG FOR THE MARKET.

reefs, and can be picked up when the tide is out. But these are by no means so valuable.

## THE CUTTLE-FISH.

THE molluscs, or soft-bodied animals, compose a very large class indeed. Creatures of different shapes and sizes belong to it.

I shall introduce you first to the fiercest, and the ugliest, and the most dreaded of the whole tribe.

I mean the cuttle-fish.

Can you imagine any creature more frightful?

The name of the order to which he belongs is called *Cephalopoda*. The word is taken from two Greek words meaning "head," and "feet."

And, as you perceive, his feet grow out of his head.

You can call them arms, if you like. He can not only creep on them at the bottom of the sea, but he can seize his prey with them.

The Chinese give woollen and cotton stuffs in exchange for the trepang.

In every hut may be seen heaps of dried trepang, looking very much like heaps of leather, and which are waiting for the Chinese to carry them off.

The Chinaman thinks the trepang is as wholesome as his favourite dish—edible birds' nests.

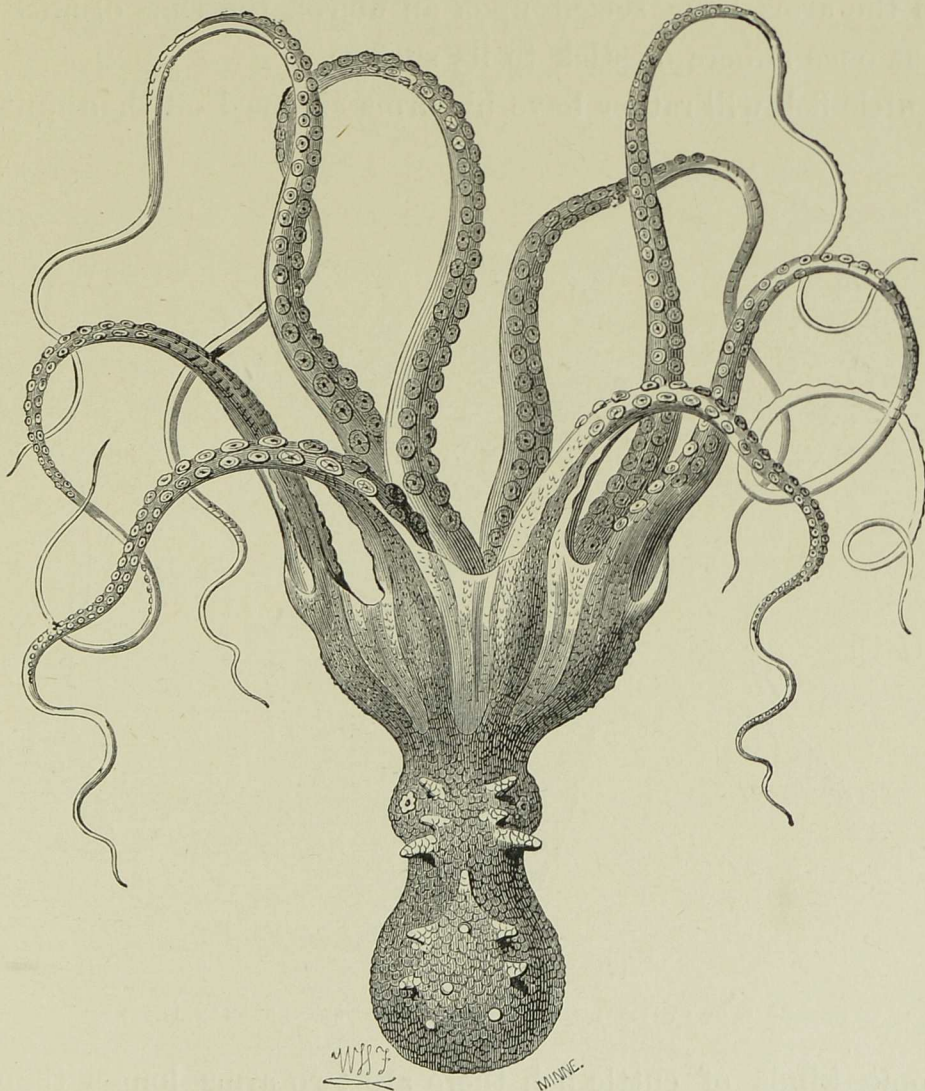
The best kind of trepang is found in deep water, and men have to dive for it.

Other kinds are found on

Fancy being grasped by arms such as these !

Yet it has happened even to men. Persons bathing in the sea have felt their legs entangled in the embrace of a cuttle-fish !

For, in some parts of the world, the cuttle-fish grow to a monstrous size, and are very terrible to behold.



THE CUTTLE-FISH.

I want you to notice the deadly apparatus in the arms of the cuttle-fish.

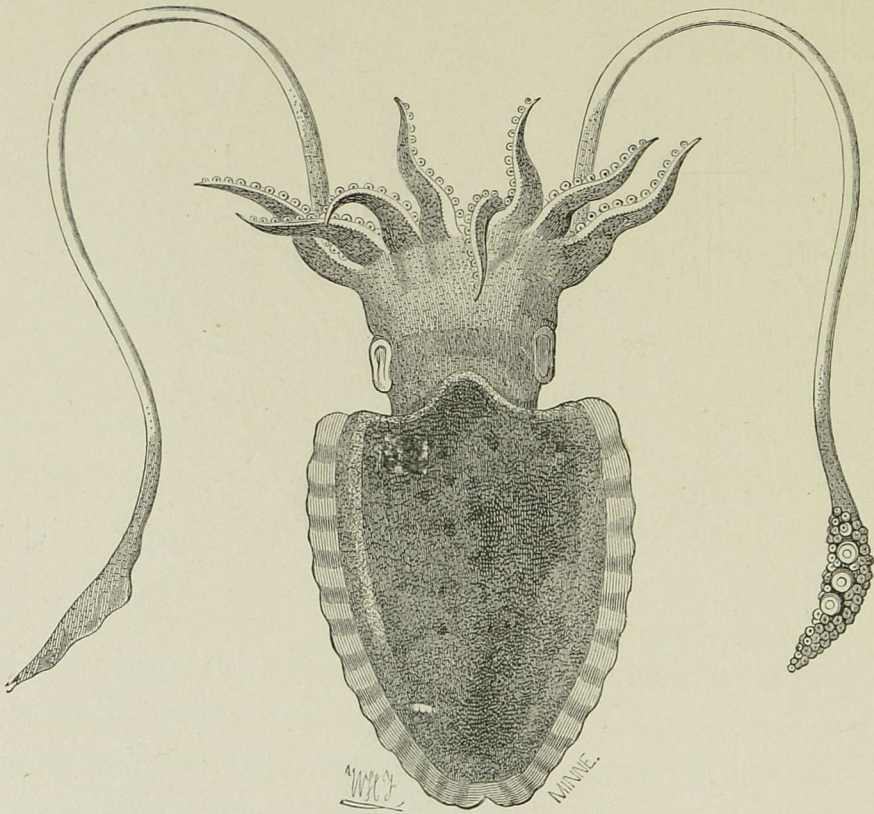
There are rows of suckers down each arm, as you may see in the picture. These do not suck the blood of the victim, as is sometimes stated. No ;

they are so many wonderful machines to enable the arms to cling closer to the prey : so close indeed do they cling, that no power can force them away.

Each sucker is a kind of cup, composed of a muscular membrane, and with a thick fleshy rim. The creature has the power of exhausting the air within the cup.

When the arms have seized upon an object, the rims of all the numerous cups at once adhere or stick to its surface.

The cuttle-fish will rather have his arms chopped off than quit his hold.



ONE KIND OF CUTTLE-FISH, WITH TWO ARMS LONGER THAN THE REST.

In some kinds of cuttle-fish there are two arms longer than the rest. From the middle of each sucker there is a sharp strong hook, which can be plunged into the slippery surface of the prey and help to secure it.

The prey, thus seized, is hurried to the mouth. If it has a shell, the shell is soon crushed by a hard, horny beak, like that of a parrot, and with which it comes in contact.

I said like that of a parrot, but there is a little difference. The upper part of the beak is the shortest instead of the longest, and there is no bony socket to the jaw, as in the parrot. Instead of this, the inside of the jaw is filled with gristle, which makes it very strong indeed. The jaws are also literally imbedded in muscle, and open and shut with the utmost force. Thus a victim, once dragged to this terrible mouth, is very soon devoured.

The tongue of the cuttle-fish has the power of tasting its food, and it is also useful in helping to swallow it. A number of sharp horny hooks are placed on one part of the tongue. These hooks bend backwards, and so when the cuttle-fish swallows, they help to drag the pieces of food down its throat.

The creature has two eyes, of a remarkably unpleasant expression.

In one species the eyes are placed on little stems or stalks made of muscle. They can thus move about, and see all ways at once.

What a frightful monster must the cuttle-fish appear to its neighbours in the ocean!

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## THE BONE OF THE CUTTLE-FISH.

THE cuttle-fish stands at the head of its tribe. In its body we find some pieces of gristly substance, which a little remind us of the skeleton of an animal.

Still the cuttle-fish cannot be admitted into the rank of the vertebrated animals—that is, animals with a bony skeleton.

Like the polyps and the star-fishes, it secretes a hard substance within its body. But these secreted pieces are quite different from the bones of animals. They have no connection with the body, and do not possess, in themselves, the means of growing, as our bones do.

They are mere dead shells or pieces of stony substance, formed layer by layer, and laid on from without.

The bone of the cuttle-fish is, in some species, very much the shape of a spear, and is lodged in the back.

People call it “cuttle-bone.”

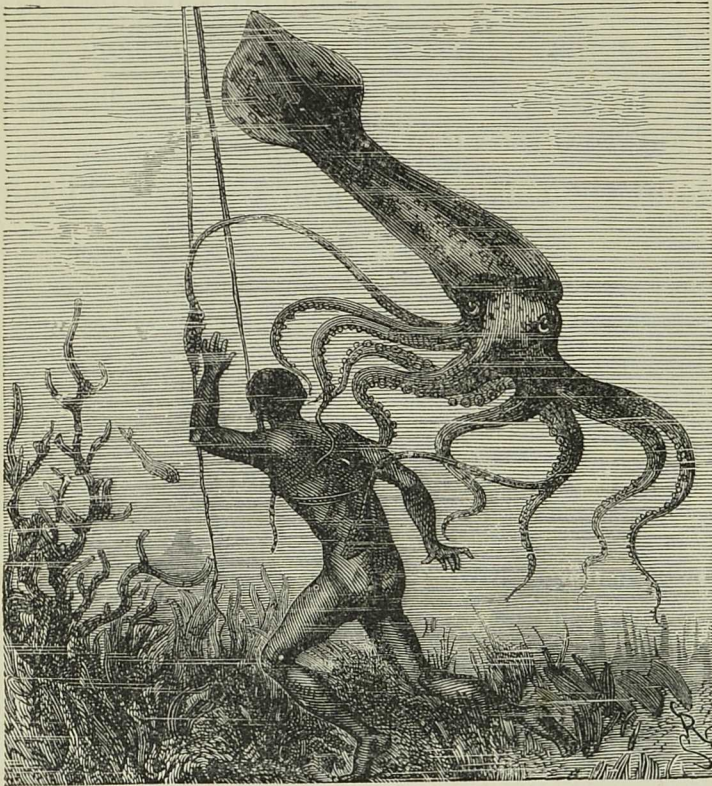
It looks large and heavy, and as if it would hardly allow the creature

to swim freely about; but in reality it is as light as possible. It is made of a number of very thin plates, as thin and fine as can be. These are placed at a little distance one from the other, and are kept apart by millions of tiny pillars.

Thus, instead of being heavy, the bone is so light that it can float with ease—indeed, it is a help rather than a hindrance to its owner.

One of these bones is very beautiful indeed. It is the shape of a pen, and looks like mother-of-pearl.

The bone of the cuttle-fish is pounded and used for tooth powder.



DIVER ATTACKED BY A CUTTLE-FISH.

The cuttle-fish is formed to live in the sea, and it breathes as the fish does, through gills, or, as they are called, branchiæ.

These gills are hidden in a hollow of the body. This hollow or tube expands and contracts, as our lungs do. It is open to the water by two slits; one lets the water in, and the other allows it to flow out.

Sometimes the cuttle-fish will suddenly and violently expel the water in its tube. This sudden movement will cause the creature to shoot

through the water like an arrow. Sometimes it will even spring up into the air, as the flying-fish does.

A vessel was once sailing along when a number of cuttle-fish sprang up from the sea. Some of them fell on deck, and others darted right over the vessel.

In the plate, a diver is being attacked by a cuttle-fish.

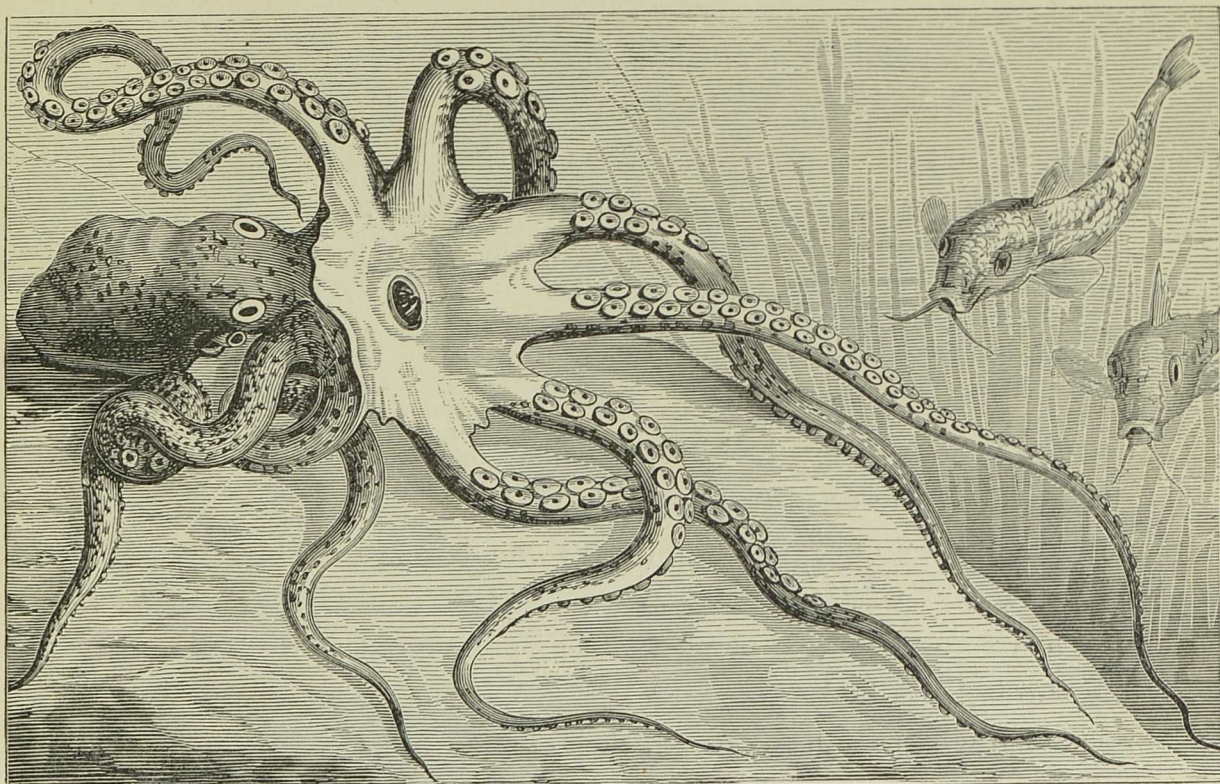


## FISHING FOR THE CUTTLE-FISH.

THE sea is full of cuttle-fishes, as it is of star-fishes. They are found everywhere.

There is one hideous creature called the poulpe or polypus.

It leads a solitary life on some rocky coast. It lies in a hole or cleft of the rock, its arms stretched out ready to seize a victim.



THE POULPE.

But, as a rule, the cuttle-fish likes society. Except the poulpe, all the other tribes wander in flocks or troops.

They are so greedy, that they make havoc among the smaller inhabitants of the sea. When they are near the shore they eat up all the fish they can find, so that there are none left for the fishermen to catch. And they are cruel as well as greedy: like the tiger on land, they will kill for the mere sake of killing.

A cuttle-fish was once left in a pool of water, by the tide.

A number of little fishes were in the same pool.

For the mere pleasure of destroying, it killed them all, though it did not eat one of them.

But the cuttle-fish, in spite of its weapons and its savage nature, falls itself a victim to numbers of enemies.

These enemies thin its ranks, and prevent it from getting too numerous.

The larger kinds of fishes, and the sea-birds as they skim the waves, are among its foes.

Man destroys myriads of cuttle-fishes.

In some parts of the world he uses their flesh for food—indeed, the poorer classes feed much upon them. On the shores of the Mediterranean Sea there are ridges of cuttle-bones some miles in length. They have been left there by the tide. This shows how plentiful the supply of cuttle-fish must be!

The fishermen go out to hunt for cuttle-fish, to see how many they can find.

The men paddle about, looking into the shallow pools and clefts of rock, where they think the creature is lying.

They are almost sure to find it in some snug spot, its frightful arms stretched out, and waiting for some poor fish or crab to come that way. Before it has time to move, much less to get out of the way, a sharp spear has gone through its body and killed it.

The people who live in the South Sea Islands use the cuttle-fish for food.

They have a very ingenious way of taking it.

They have a piece of polished board about a foot long. At the end they fasten a number of shells one over the other, so as to look like one great round shell, the size of an egg.

The fisherman goes out to sea in his boat, and takes the piece of board with him. He fastens a long line to it, and lets it down deep into the water.

When it has nearly reached the bottom, it is sure to come in contact with a cuttle-fish.



FISHING FOR THE CUTTLE-FISH.

The cuttle-fish sees the shell, and thinks there is a nice soft mollusc inside. It grasps the bait with its great arms, and its suckers come into play.

When the fisherman is sure that the cuttle-fish has hold, he begins to draw up his line. The creature will do anything rather than quit its hold, and the line keeps going up and up, till it is dragged out of the sea and into the boat. Then the cuttle-fish, in spite of its arms, falls an easy prey.

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## SEPIA, OR THE INK OF THE CUTTLE-FISH.

As the cuttle-fish has so many enemies, Nature has given it a means of defence besides its suckers and its long arms.

There is a bag in its body full of a black fluid like ink. If the crea-

ture is alarmed, it throws out a quantity of this ink, and makes the water so black that no one can see where it is. Under cover of the black cloud it escapes.

This ink is called sepia. It is very useful to artists in painting their pictures; and when dried, it can be kept any length of time without spoiling.

The ink-bag taken from a fossil cuttle-fish had ink in it just as good as if it had been fresh.

Cuttle-fishes multiply themselves in a wonderful manner, so there is no fear of the race being destroyed.

The eggs are in a great bunch, something like grapes, and are fastened to the stem of a sea-weed.

But if the cuttle-fish lives a long way from the shore, its bunches of eggs are not fastened to anything. They float on the surface of the sea. The warmth of the sun hatches them. Then out come the little cuttle-fishes, and begin at once to wander about in troops, and to lead a life of plunder.

I have not much more to tell you about the cuttle-fish.

In some parts of the world it grows to an enormous size.

Happily, we have no such monsters near our shores.

A captain of a ship once saw a huge creature rolling about in the sea. It had arms like snakes; each arm was seven feet long. What a frightful creature it must have been!

All kinds of stories were told about these huge cuttle-fishes.

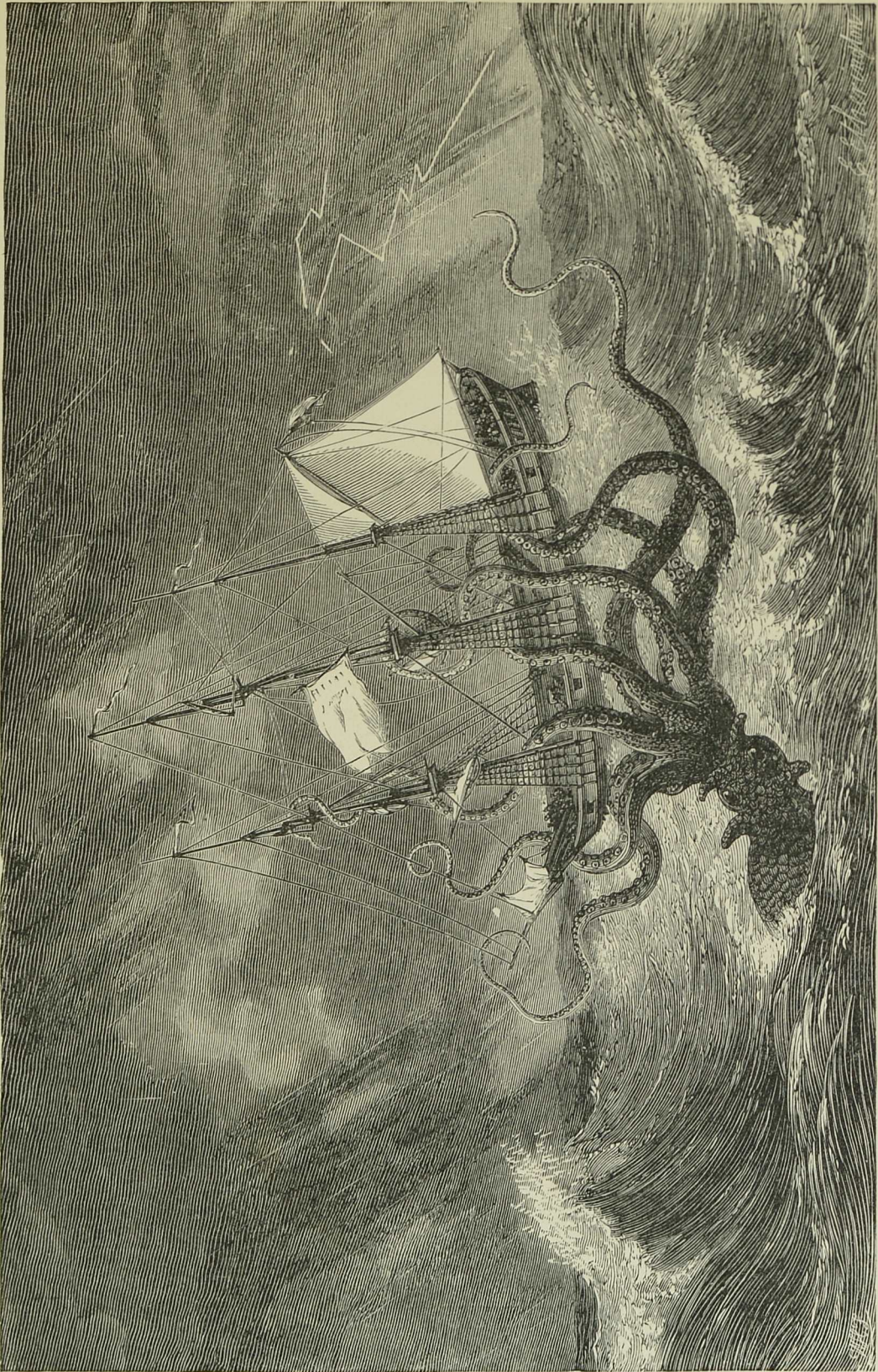
They were said to lay hold of vessels with their arms and try to drag them under water. But, as it often happens, half these wild stories are mere exaggerations.

The wildest story was of the Norwegian Krakin, as it was called.

The back of this monster was said to be as big as an island, and so covered with tangled sea-weed that it was often taken for land.

Every now and then the krakin was said to come up to the surface for a little sun and air.

Then, if a vessel chanced to be near, the sailors were sure to think it



IMAGINARY CUTTLE-FISH TAKING HOLD OF A SHIP.



was an island, and to land upon it,—they would even be so unlucky as to light a fire. But the krakin did not quite approve of such a liberty. When the hot coals began to burn its back, it would descend to the depths from which it came. Then the poor sailors would have the ground taken from under them, and be thrown into the water.

These stories of the krakins are, of course, mere fables; like those of the sea-serpent, they have never been fairly proved.

No doubt they took their rise from the sight of some monstrous cuttle-fish which really did exist.

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## THE ARGONAUT.

WE have seen how frightful the cuttle-fish is. And we can hardly expect to find anything either elegant or beautiful in his whole family.

But we are mistaken.

One of this family lives in the most beautiful dwelling that was ever formed by the hand of Nature. A dwelling that has been the wonder of mankind in all ages.

I mean the shell of the paper nautilus, or argonaut.

Only one of the tribe of *Cephalopoda* is possessed of an outward shell; and, certainly, it makes up for the ugliness of its race.

That is, as far as the shell is concerned.

The creature itself is a mere cuttle-fish like the rest, with long arms.

It sits quite loosely in its shell, and is only joined to it by a pair of muscles.

It had the name of argonaut given to it. For it was once thought to be a first-rate sailor; and, if you remember, the Argonauts were a band of heroes, who went in search of the Golden Fleece.

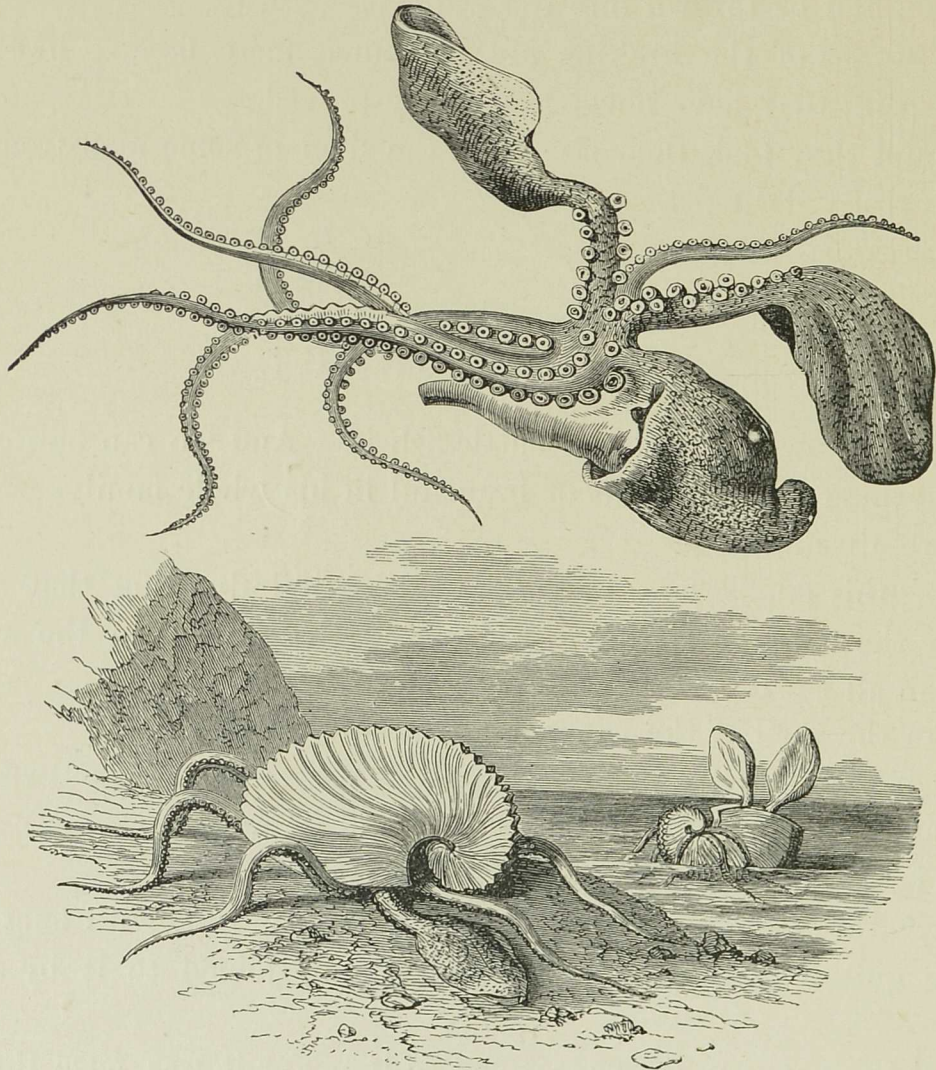
It was even fancied that the first idea of a ship was taken from the shell of the nautilus as it glided over the sea, using its arms for sails.

A great deal of poetry, and of prose too, was written on the subject.

But it has all turned out to be a mere romance.

The argonaut is not often seen to sail. It creeps at the bottom of the sea, using its arms as feet.

If it swims, it is by forcing the water through its air-tube, as the cuttlefish does. It is, now and then, found on the surface of the waves; but the



ARGONAUTS—CREEPING, FLOATING, AND WITHOUT SHELL.

moment it is alarmed, it hides itself in the shell, drawing in the whole of its body. Then the shell loses its balance, turns over, and sinks to the bottom.

It is therefore no easy matter to catch sight of the paper nautilus, much more to get possession of it.



The two arms of the creature, which were thought to be used as sails, end each in a broad membrane.

The broad membranes do indeed look a little like sails, but they are never used for any such purpose.

The creature often keeps them folded over its shell, as if to protect it. Then the shell is quite hidden from sight.

But what is the use of these two sail-shaped arms?

The arms, or *vela*, as they are called, of the argonaut! I will tell you. The use of them has been found out by careful study.

They are the organs by which the beautiful shell is made, and by which it is kept in repair.

You remember the membrane which covered the shell of the sea-urchin. I told you how it kept depositing earthy matter round the pieces of which the shell was made, and so gradually enlarging them.

The *vela* of the argonaut have just the same faculty. They can deposit earthy matter wherever it is wanted. I will tell you how this was found out.

A lady devoted herself to the study of the argonaut.

She was determined to begin at the beginning, and she reared some little argonauts from the time they came out of the egg. As they grew up, she watched them very narrowly indeed.

She saw the process of depositing the shell, and its gradual growth.

When the shell was fully formed, she made an experiment.

She broke a shell, and then left it, to see what would happen.

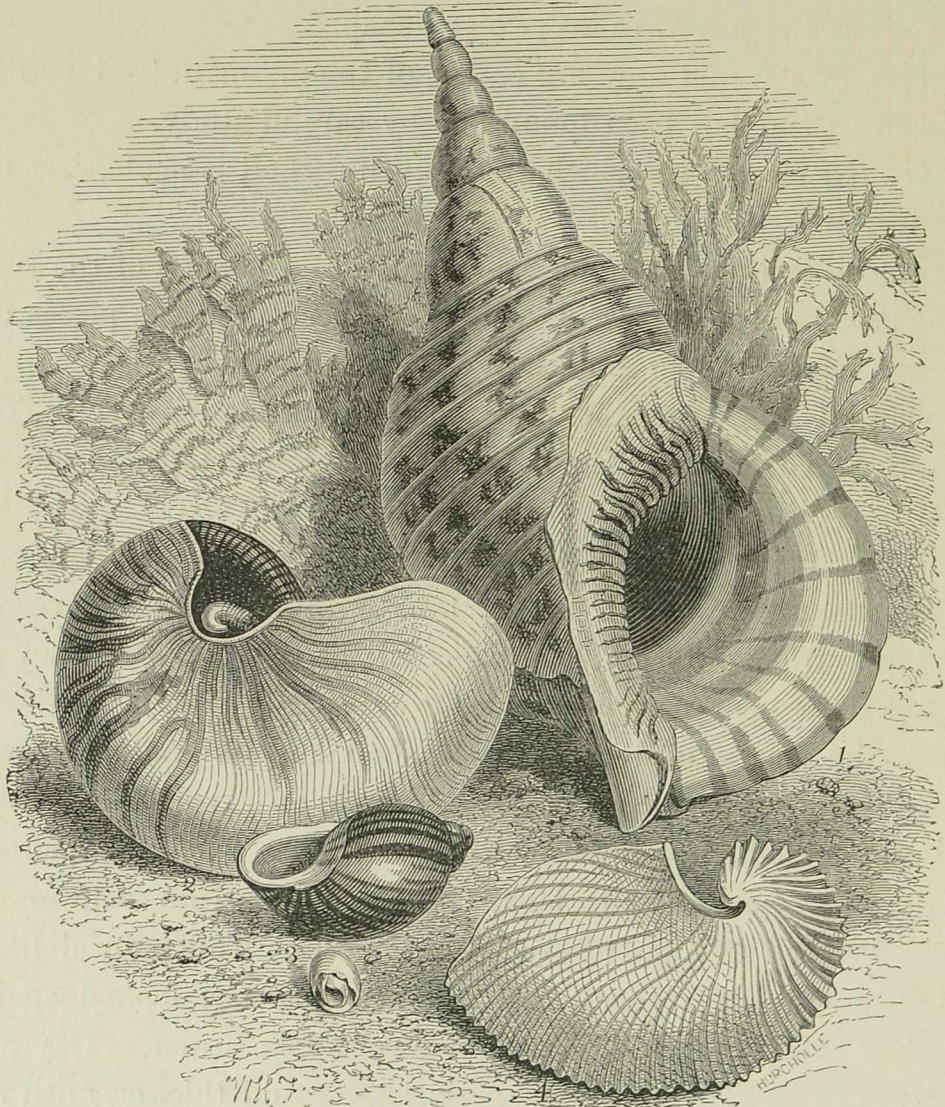
The next day, she went to look. She found a thin cobweb-like substance spread over the edges of the broken pieces. This cobweb-like matter slightly joined the edges together. The next day she looked again. The substance had thickened, and the edges were much firmer. Day after day, the repair went on. The substance grew harder and thicker, until at length the edges were firmly joined and the shell mended.

The lady had watched the whole proceeding, and she declared that the argonaut applied its *vela* to the outside of the shell. And she felt certain that the glutinous substance which mended the shell came from the *vela*.

## THE PEARLY NAUTILUS.

THERE is a relation of the argonaut that makes a shell with chambers in it.

This is a shell which no doubt you have seen many times, for it may be met with in every collection of shells.



SHELLS OF THE ARGONAUTA, ETC.

1. *Triton imbricata*.      2. *Nautilus pompilius*.      3. *Helix ovata*.      4. *Argonauta papyracea*.

It is called the pearly nautilus.

The creature that lives in the shell is so timid, and keeps in such deep

water, that it is very rarely caught sight of. Only once has the shell been taken with the animal in it.

It was floating on the sea, and looked like a dead tortoise-shell cat.

The captain of the ship sent off a boat for the purpose of finding out what the object really was.

But the creature began to sink so fast, that it was with the utmost difficulty it could be caught.

Indeed, the shell was broken by the boat-hook striking it so quickly.

For no time had to be lost. In a minute more, it would have escaped.

The mollusc that lived in the shell was thus, for once, found at home.

It was firmly fixed to each side of its shell, and had a mantle of a purple colour, with a reddish tint, and with spots of a deeper colour still.

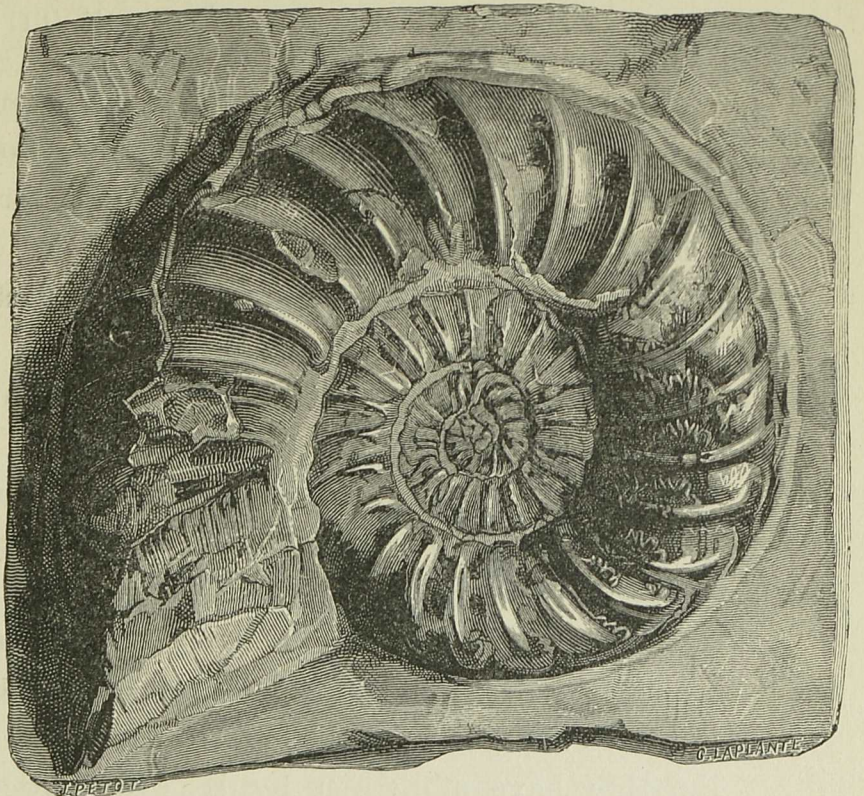
This is the only instance of the creature being carried away in its shell and exhibited as a curiosity.

The shell of the pearly nautilus is as curious as it is beautiful.

It has a number of chambers in it, one after the other.

The last formed is the largest; and here the creature lives, the empty rooms being behind it.

At first, there was but one room; the creature lived in it. But that



AMMONITE.

wonderful membrane of its went on secreting shelly matter, until it had formed another.

When all the chambers were finished, and as it were shut up, the nautilus had attained to its full size. Then it lived in the last cell of all, having crept to it through the rest.

A fleshy tube unites all these chambers together, from one end of the shell to the other. This tube ends in the body of the animal, and increases with its growth.

Ages and ages ago, when the lily stars were in their beauty, a kind of nautilus that is now extinct lived in the sea.

The remains of the shells are found in a fossil state, and are called ammonites.

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## THE WINGED INSECTS OF THE SEA.

YOU have seen the moths come out, on a summer's evening, when it is getting dusk. They have lain hidden all day; but no sooner is the sun down, than countless numbers issue forth to look for prey.

They are called night-flying insects.

There are some little creatures in the sea, that are very much like insects, and have the same habits as the moths.

They have been called the winged insects of the sea.

And another name has been given to them. They are called wing-footers, because they whirl about, as if they had wings.

These wings are two fin-like flaps, which proceed from the foremost part of the body.

In reality the flaps are only one organ. A bundle of muscular fibre passes through the neck, and spreads out at each side like a paddle.

These little creatures have no foot to creep on, or arms to seize their prey. But they have a distinct head, as the cuttle-fish has. Sometimes the head is hidden in a thin transparent shell. When the animal is alarmed, it draws its wings, and, indeed, its whole body, into the shell.

But though the wing-footer seems to sport about, and be so innocent

and harmless, it is furnished with an array of weapons that can scarcely be surpassed.

Let us take one of the tribe—the little clio, on which the whale feeds—and look at it through a microscope.

What are those six feelers that project from its head? And why are they of that red and speckled hue?

Look more closely, and you will see that a number of tiny points are dotted all over them. There may be thousands of these points.

Each point or speck is a sucker, like that of the star-fish. And it can be pushed out, and can seize hold of its prey in the same manner.

When the little clio does not want its weapons, it draws them in, and they lie hidden and protected by a kind of sheath that covers them.

Look a little further, and you will see a mouth furnished with sharp horny teeth, that have a metallic lustre, and shine in the sun.

The tongue has hooked spines on it, that curve backwards, like those of the cuttle-fish, and help to drag the food down into the stomach.

Could you have imagined that the merry little clio was so terribly armed?

When twilight comes, hosts of these little creatures whirl about in search of prey. They dance merrily on the waves, sinking and rising, and seeming to be full of gambols.

The sea is alive with them. But their gambols do not last long.

Before the morning dawns, they have disappeared, and no trace of them is to be seen.

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## THE SEA-SNAIL.

I TOLD you, there was a mollusc which creeps like a snail. It has a flat foot, or disc, on which it moves slowly along, for it cannot dart about as the cuttle-fish does. It is a degree below the cuttle-fish in rank. In fact, it is a humble snail, and nothing more.

It belongs to a class named *Gasteropoda*. This means "stomach," and "foot."

The sea-snail has a head, with two bright black eyes. Sometimes it has a shell, and sometimes it is without one. The species which are found without shells are called "naked."



NAKED GASTEROPODS, OR SEA-SNAILS.

These naked molluscs are very helpless creatures. They seem quite at the mercy of the star-fishes, and cuttle-fishes, and the thousands of enemies around them. They hide themselves under stones; and when they are laid hold of by some hungry foe, they will leave part of their mantle behind them, and escape.

Do you understand what I mean by the mantle?

The mantle is a thick elastic skin, which is wrapped round the body of the mollusc like a hood. It does not grow to the shell, when the mollusc has a shell, but is only attached to it by one small part. You will see, by-and-by, what a very important organ the mantle is. For it can make and mend the shell, just as the vela of the argonaut did.

The snails without shells are not to be despised. They are among the most beautiful creatures in the ocean. Their bodies are as clear as crystal, and have tints of red, or blue, or yellow.

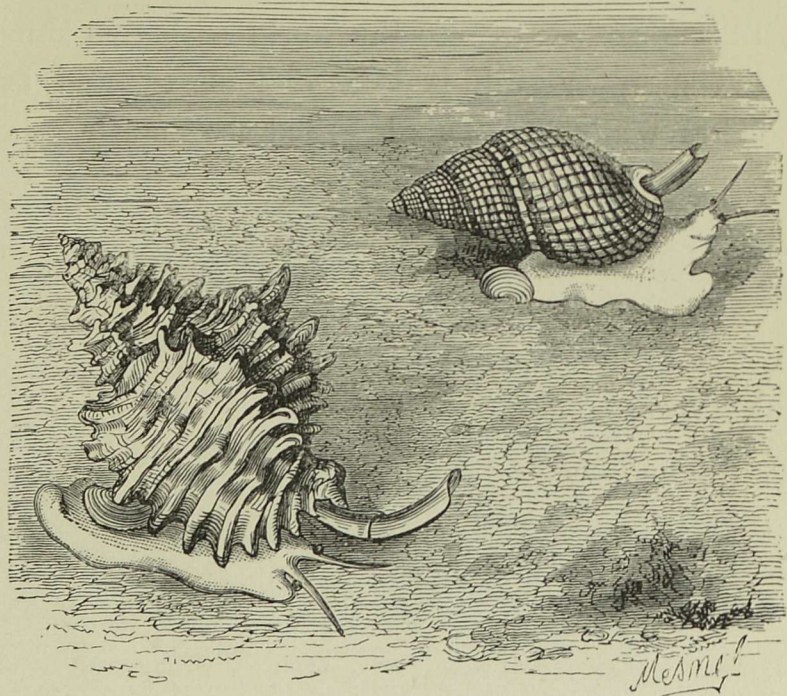
The snails are divided into groups, according to the different arrangement of their gills, or breathing apparatus. Sometimes the gills are hidden under the mantle. Sometimes they are arranged in elegant tufts or feathers, and are without any covering at all.

There are some great snails, that have strong stone shells. These

creatures have also a lid to their house, that shuts quite close, and seems to defy all enemies. But, alas! the poor sea-snail is not always safe even in its stone house.

Some bird spies it out. It swoops down and carries the stone shell up into the air. Then it lets it drop against a rock, and the poor snail's house is broken to pieces!

I have not room to tell you the names of half the beautiful shells which are found in the sea. Some are so rare, that they are only to be bought with gold. Yet these rare and beautiful shells are but dwellings for the molluscs to live in.



GASTEROPODS WITH SHELLS.

Nature is very prodigal of colour. The flowers are of all tints and hues. The birds are dressed in the gayest apparel. And in the deep sea, far from the reach of man, countless shades of colour adorn the creatures that play in the waters.

No objects are more beautiful than the shelly homes of the molluscs. Here and there, one or other is obtained as an ornament to our drawing-rooms. But myriads on myriads throng the deep places of the ocean, or float on the high seas, each one of which would be a treasure.

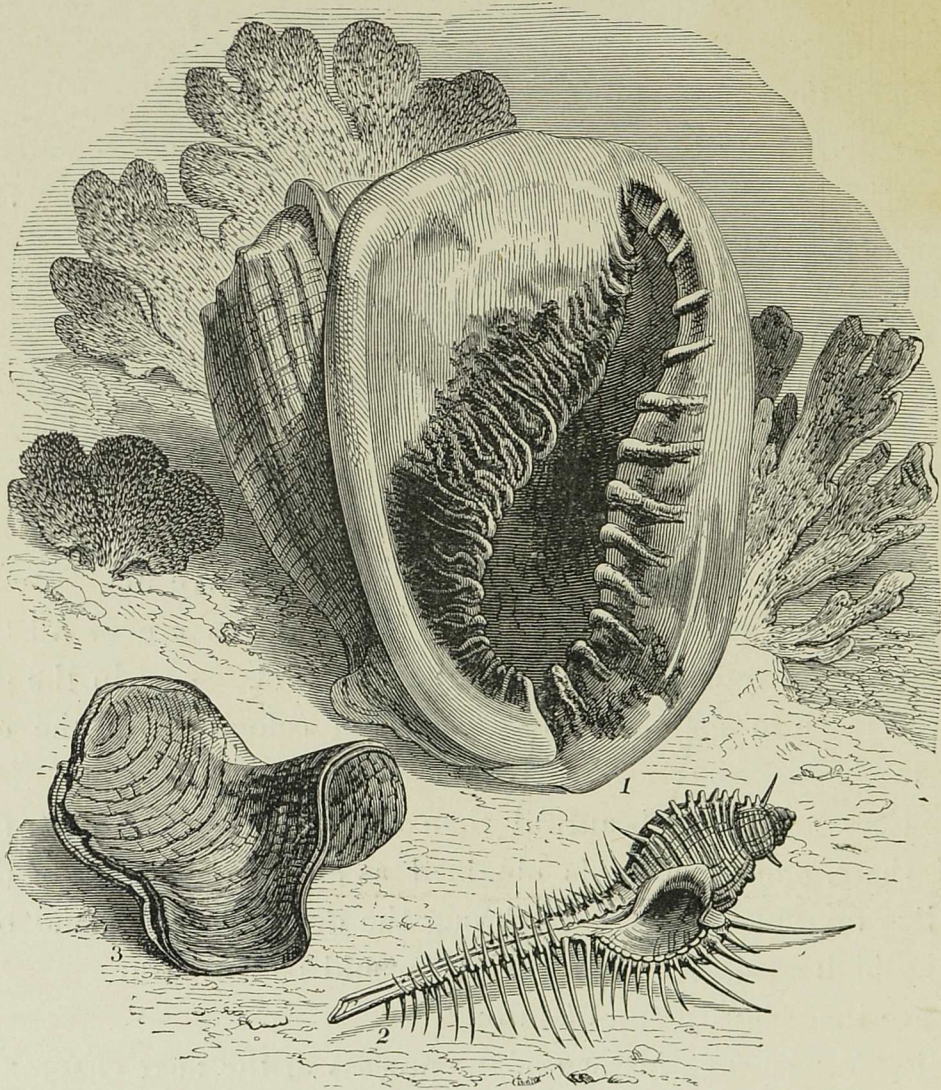
How are these lovely tints laid on?

I shall tell the whole history of the process in the next chapter.

## HOW THE SHELL IS MADE.

THE mollusc comes into the world with two skins over its soft body.

The upper skin is loose and elastic, and is, as you know, a kind of hood or wrapper. This is called the mantle.



GROUP OF SHELLS.

1. Helmet Shell

2. Spiny Rock.

3. Saddle-like Shell

The mantle is the storehouse from which comes the material that makes the shell.



What kind of material is it ?

It is a mixture of lime and glue, and a sticky substance called albumen. You have seen albumen many times.

It is, in fact, like white of egg.

These materials are drawn into the body of the mollusc from the food it lives on. They pass into the mantle in a fluid state, and become the material of which the shell is made.

The shelly fluid, which is very sticky, is exuded from the mantle.

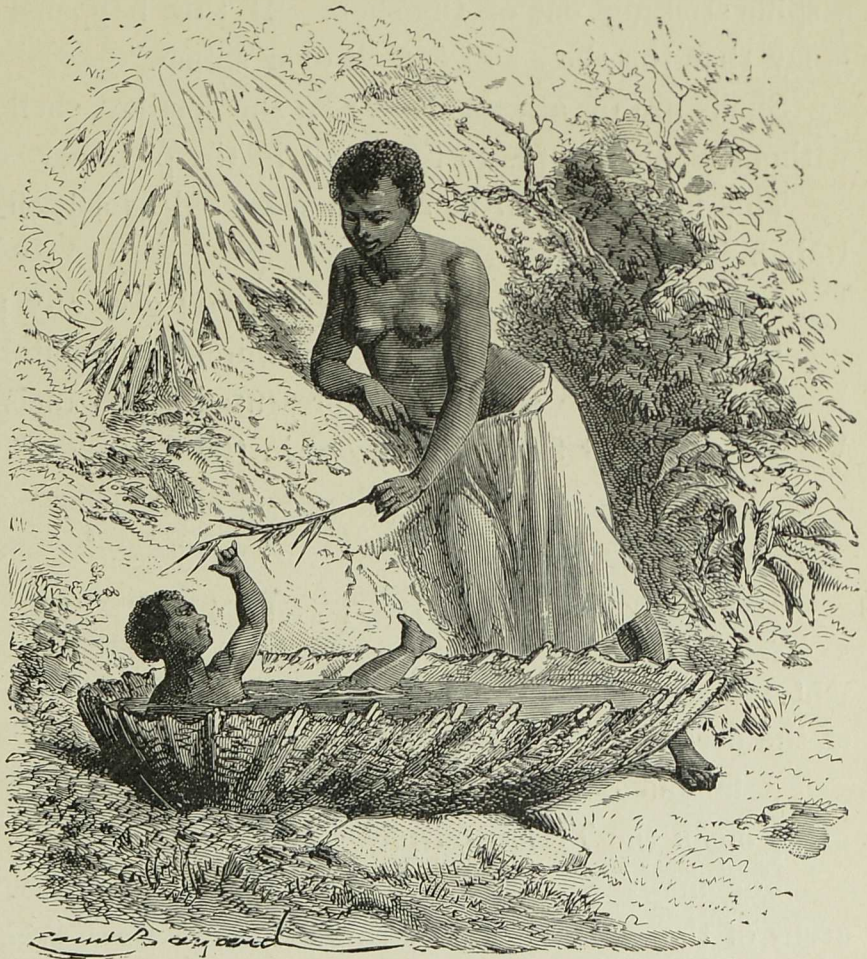
Sometimes from every part of it, and, at other times, only from the edge.

The edge, in this case, is thickened, and is called a collar.

If a shell is formed of one piece only, as myriads of shells are, it is called univalve. When the shell is formed of two pieces, it is called a bivalve.

If you were to examine the collar of the mantle, you would see streaks or lines of bright and beautiful colours. This is the colouring matter which is to paint the shell.

As the mantle lays on layer after layer of cement and fibre, the colours grow as well. A person who is watching the shell can guess which colour is coming next, so clearly are the red and blue and purple stripes seen.



GIANT SHELL USED AS A BATH.

Some shells have long spines on them. I dare say you have seen many such.

How are the spines made?

The mollusc will, now and then, push a part of its mantle quite out, and fold it into a little tube.

It will do this to draw water into its mouth.

The shelly liquid keeps coming out of the mantle all the time, and it fills up the end of the tube and makes it hard. Then the tube is left like a spine sticking out of the shell. If this happens often, you may easily fancy that the shell will get all over spines.

Shells are of all sizes. From the smallest shell, which cannot be seen without a microscope, to the giant in the picture.

This monster shell is, as you see, used as a bath, by the people of the Indian Islands.

It is so rare, that shell-fanciers would give any price for it.

It is also used in the Catholic churches to contain the holy water.

Some of these shells were presented to Francis I. by the Republic of Venice, and used for that purpose in the Church of St. Sulpice in Paris.

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## THE TYRIAN PURPLE.

ALL manner of beautiful and useful things have been fetched from the bosom of the ocean.

A famous dye was brought from the same mighty storehouse.

I mean the Tyrian purple.

For many years, as far back as the days of King Solomon, the monarchs of the earth had their robes dyed in the Tyrian purple.

The Roman Emperors, in later times, forbade any one under the rank of a prince to wear the purple. If he did so, he was punished with death.

Where did this famous dye come from?

From the shell of a mollusc.

The mantle of this little creature was the storehouse of the royal purple !

The exact manner in which the dye was prepared, is not known in these days. The Tyrian purple is a thing of the past.

For modern skill has found out so many beautiful dyes, that nothing can surpass them.

When Tyre was in its glory, its chief manufacture was the dyeing of stuffs and robes intended for the temple or the court.

The dress of the Jewish high-priest was commanded to be purple.

Very little is known about the preparation of the dye.

A Roman writer tells us, that the finest colour was obtained from the largest shells. And that the smaller ones were ground in mills.

The dyeing liquor was boiled for some days, to clear it from impurity. Then a piece of cloth was dipped in, to see if the colour was good. But often the liquor had to be boiled over again.

I can tell you a story about a purple dye.

A fisherman, named Alonzo, had often to wait a long time in his boat, while he watched his nets.

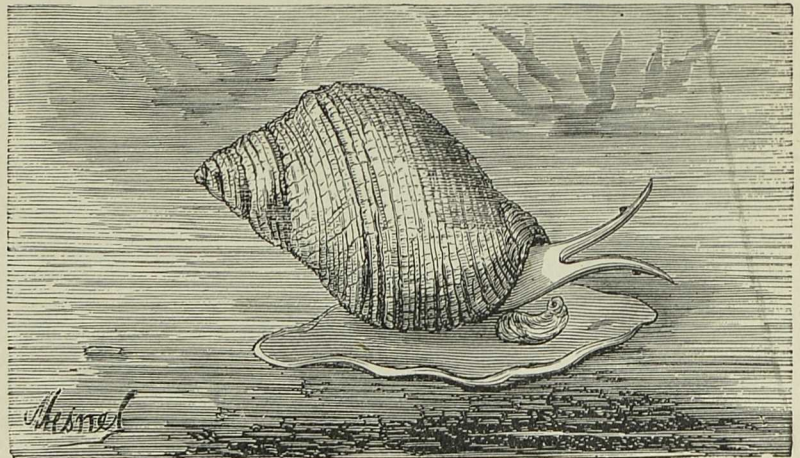
He used to amuse himself with marking pieces of linen with letters and designs.

A ring served him as a stamp to mark with.

The marks were of a rich purple colour. His master happened to see them, and wanted to know how they were done.

Alonzo offered to show him. He dipped his ring into the slimy matter of a shell-fish. The mantle of the creature had been torn, and the slimy matter was oozing from it.

He made marks and lines upon the linen with the seal of his ring. But at first nothing was to be seen.



THE SHELL YIELDING THE PURPLE DYE.

“Wait a minute,” said the fisherman, “until the sun has shone upon them.”

His master waited patiently, and soon he perceived a very disagreeable smell. At the same time, the marks became visible. They changed into a bright violet colour.

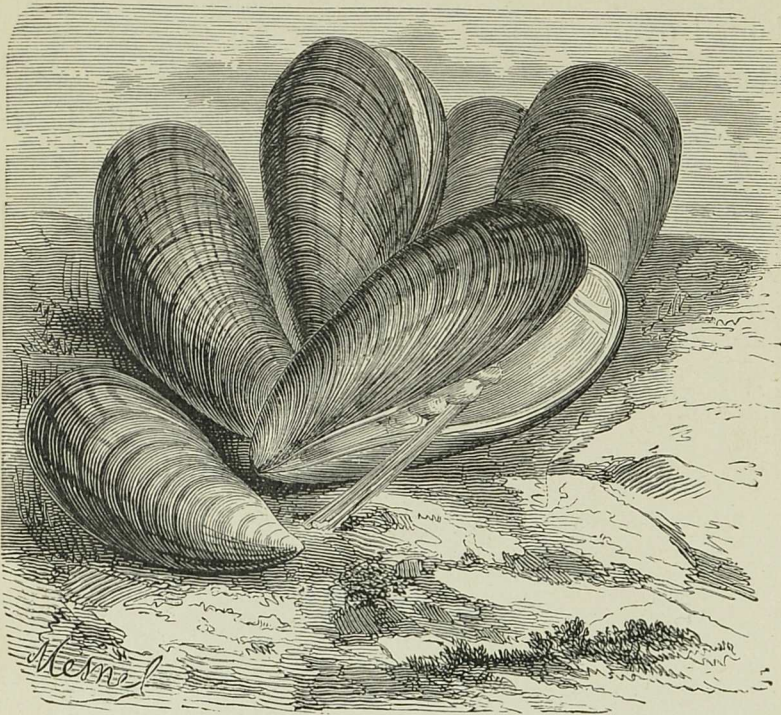
There is a group of molluscs which are called “purpura,” because they yield a purple dye.

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## THE MUSSEL.

WHEN a mollusc has two shells, connected by a hinge, you remember, it is called a bivalve.

You can think of many bivalves in a moment, I dare say.



MUSSELS.

There is the oyster, and the cockle, and the mussel, all of which are familiar as a household word.

They seem very inert creatures, for some of them live fixed to a rock. Shut up between the valves of their shell, they do not appear to lead a very joyous life. They cannot whirl about as the little wing-footer, or hunt for prey like the cuttlefish.

The shell is the bivalve's little world. There, it has a safe retreat. It can pull the elastic hinge that fastens the two valves together, and shut itself up quite close and tight.

If it wants to open its shell, it leaves go, as it were, of the hinge. Then

the shell uncloses. When the shell stands wide open, and is not shut at all, it is a sure sign that the poor little mollusc is dead.

What kind of habits have these creatures, so shut up from the outer world? They have neither head nor arms. They cannot hunt for prey, and unless the prey came to them, in many cases they would perish.

The mussel has a very ingenious way of fixing itself to the rock.

It does so by threads of its own making. You may see them in the picture.

The foot of the mussel is of no use to it in moving about. But it is a complete machine for helping it to fix its threads. The threads are of a horny substance, and about as long as the foot itself.

Under the foot is a deep groove, in which the horny threads are formed. The substance which forms them comes from a gland in the foot.

The mussel fixes the end of the thread to the rock by its foot. When it has done this, it draws its foot away, and the thread is drawn out as long as the creature chooses.

It always tries the thread to see if it is strong enough to hold. If one thread is firm, it proceeds to make another. And so it goes on, till it has fixed as many as a hundred and fifty threads.

Then its anchor, or byssus, as it is called, will be finished, and it can be held fast to the rock, out of reach of the tempest.

I can tell you a little story about the mussel and its threads.

The people who lived in a town where there was a bridge, with many arches, had a great deal of trouble with it.

The tide rushed so strongly against it, that it was always being thrown down.

The people grew tired of mending the bridge, and they sent for the mussels to help them.

Boat-loads of mussels were fetched, and thrown down against the bridge.

This was the best thing that could be done.

The industrious little creatures set to work, and began to fasten their threads to the stone-work of the bridge. There were so many of the

mussels, and they stuck so fast, that the bridge gained a support. It was able to resist the tide, and has never been washed away since.

There is a relation of the mussel which spins a thread as soft and delicate as silk. This creature is called the pinna.

The byssus of the pinna has even been spun into gloves and other little articles of clothing.

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## THE RAZOR-SHELL.

HAVE you never seen an empty shell, a little the shape of a razor, lying on the beach?

It is called the razor-shell.

The creature that lives in it is called the solen.

It has a foot, like the mussel, but it does not use it in the same way. It lives in the sand, and it does not want to spin threads.

It has one great enemy, and when he comes in sight the quicker it buries itself in the sand the better. This enemy is the fisherman.

Many persons think it good to eat. So the fisherman goes out to catch it. He treads very softly, but the moment the solen hears him coming it begins to dig with its great foot in the sand. It digs with such swiftness and energy, that long before he reaches the spot it is nowhere to be seen.

But the fisherman is not taken by surprise. He knows what to do. He holds in his hand an iron rod with a barbed point. He soon finds the hole into which the solen has gone.

For the creature, in its fright and hurry, has thrown a jet of water out of its body. And this tiny jet betrays its hiding-place.

The fisherman plunges his rod down into the sand, and is almost sure to strike the poor solen and drag it out.

If he misses his mark, he never tries a second time. He knows the solen will have pushed down to a depth beyond the power of his rod to reach.

There is another way of catching the solen.

The fisherman puts some salt on its hole. The salt penetrates to the solen; it comes up to see what is the matter, and is caught.

## THE COCKLE.

THERE is another active little creature, that can hop and jump about in a wonderful manner.

I mean the cockle.

It has a great foot, that looks more like a tongue than a foot. And it is strong as well as large.

The cockle, when it means to jump, plants the tip of its foot against the ground. The muscles of the foot give a sudden spring, and the creature is thrown into the air.

It alights at some distance, and then gives another skip.

So that it can get over the ground as quickly as if it were flying.

I have not yet done with the curious habits

of the bivalves. You see some of them can spin, and some can dig.

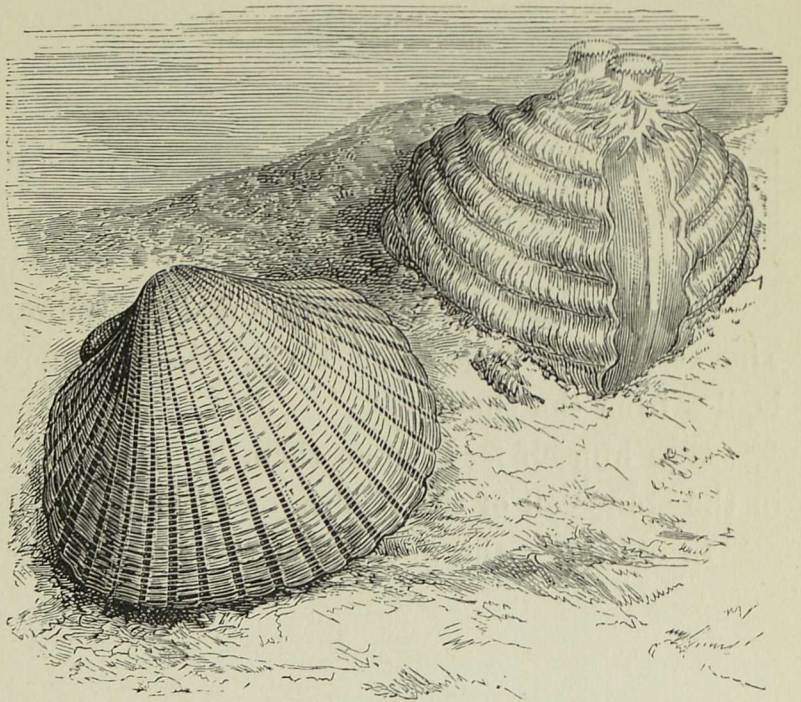
But here is a mollusc that can bore through stone.

It is called the pholas.

The shell is so thin that there is no protection in it. So the pholas digs itself a kind of grave, and buries itself there all its life.

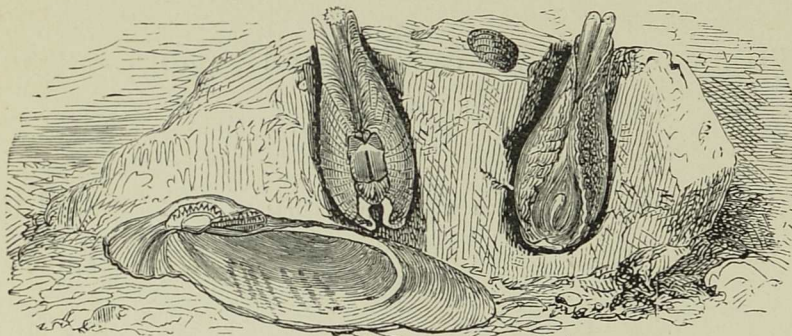
The cell is not much larger than its body, so it can move only a very little. It does not bore with its foot. It uses it as a sucker, by which it fixes itself to the walls of its dwelling.

The pholas uses the sharp edges of its shell to make its cell. And it drops a juice which has the power of dissolving the stone.



COCKLE.

Though it is so small, it can do a great deal of harm to man. It bores into his stone piers, and actually undermines them !



PHOLAS IN THE ROCK.

But how can these creatures live, thus shut up in stone ?

Their food is brought to them by currents in the sea. They are not great eaters, like the cuttle-fish; and the num-

bers of minute plants and animals wafted into their very mouths more than satisfies them.

But they have enemies, like the rest of their neighbours.

All the birds, both of the sea and the shore, are on the watch for them. The star-fishes feast upon them, without mercy, and suck out their soft bodies from the shell.

Man himself feeds upon them by thousands, so that there is no security in the stone cell of the pholas, or the nimble hop of the cockle.

In old days, the pholas was liked better than the oyster.

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## THE OYSTER.

THE oyster is called the king of the molluscs, for it is one of our greatest dainties, and we should not like to do without it.

The oyster is wrapped in a mantle, like the rest of his tribe; but it is left open in front, so that when you open the shell, you see the whole of the creature's body.

The mantle is thick at the edge, and surrounded by a fringe of tentacles or feelers.

The mantle is, as I have told you before, the apparatus by which the oyster forms its shell. It lays on a layer of fibres, and then a layer of cement. As the oyster keeps growing, layer after layer is laid on. The



layers lap over each other, a little like tiles, as you may see by looking at a shell.

The oyster has neither head nor feet, but it has a mouth. The mouth has no teeth, but a fringe hangs round it. I shall tell you directly the use of this fringe.

The oyster, shut up in its shell, seems to have no means of seizing its prey; but Nature is never at a loss to provide for the wants of the creatures she has formed.

She has contrived that the food of the oyster shall be conveyed to its mouth without any care or trouble. To explain this, I must first tell you how the oyster breathes.

Its gills or lungs are in the shape of four delicate leaves. They float loose in the water, except at one end, where they are joined to the body. If you looked at these delicate leaves through a

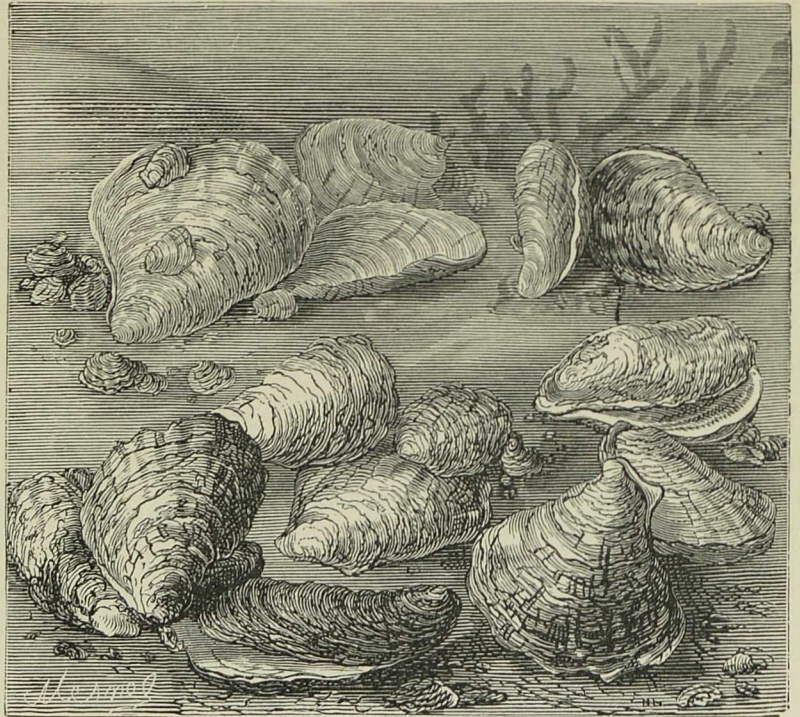
microscope, you would see a countless number of hairs or cilia. These are always on the move, and make tiny currents, which drive the food into the mouth of the oyster.

I need hardly tell you that the food consists, for the most part, of the microscopic plants and animals with which the sea abounds.

But where is the mouth of the oyster?

In a little hood, just at the place where the gills are joined to the body.

The fringe of which I have spoken, belongs to the gills. It is of the greatest use to the oyster. It not only keeps up the little currents, but it enables the oyster to reject any particle of food that it does not like.

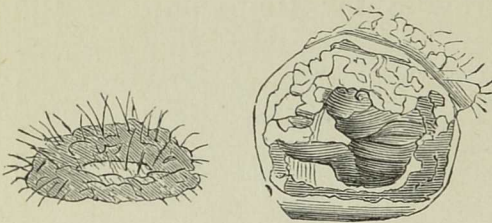


OYSTERS.

## YOUNG OYSTERS.

ALL the summer, the oyster is busy laying its eggs. It lays an almost incredible number.

One oyster will lay two millions in a single season!



YOUNG OYSTERS.

It does not leave its eggs to their fate. It keeps them, for a time, hidden in its mantle. The young oysters swim about in the water. They have a swimming apparatus, such as you see in the picture.

The apparatus is merely a band or fillet, covered with cilia, that keep moving, and row the little creature about.

At first, the young oysters keep near their mother, and at the least danger hide themselves in her shell. But, by-and-by, they fix themselves to some solid body, and begin to make their shells. In three years' time, they are fully grown.



A GROUP OF OYSTERS AND YOUNG.

The best oysters are found on the English shores. As far back as the time of the Romans, the oysters of Kent were thought nicer than those of Italy.

But the oyster, like many other things, is better for being cultivated. In the rough and open sea the oyster does not fatten so well as in the oyster-parks, or banks, where it is reared.

Here, in calm water, the animalcules, and other food for the oyster, accumulate and are in greater abundance.

There are several of these oyster-banks in England, and the most valuable oysters are brought from them.

The rearing of this delicate mollusc might be made a more profitable branch of industry than it is.

## T H E P E A R L .

THE gland that secretes the material for the oyster-shell has, in some species, a very extraordinary power.



PEARL-OYSTER WITH A MADREPORE GROWING ON ITS SHELL.

It secretes a substance which is as precious as gold.  
Men risk their lives to get it, and queens and princesses wear it.  
I mean the pearl.

Down in the depths of the ocean the oyster prepares this beautiful gem.

Why it does so, was once a great puzzle.

In these days, it is thought that the oyster throws out the pearly juice in a moment of irritation, caused by the entrance of some tiny substance—such as even a bit of sand—into its shell. Then it sets to work to cover over the intruder with a quantity of matter, which forms the pearl.

The Chinese, who are very ingenious, can make artificial pearls.

They put atoms of grit or glass into the oyster's shell, and watch to see what the creature will do.

They find that it pours out the pearly juice over the atom, whatever it may be.

It cannot turn out its enemy, so it does its best to conceal it.

The oyster that produces the pearl is not the same as the one that is eaten.

The shell of the pearl-oyster is lined with a beautiful substance called mother-of-pearl.

In the poetical language of the East, the pearl itself is called a drop of solidified dew. And the best pearls are like drops of pure water.

There was a fable once told about the formation of the pearl.

The oyster was said to rise to the surface of the water and open its shell. It did so to let the dew fall in and make the pearl.

This was a pretty story ; but, I need not say, quite untrue.

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## FISHING FOR PEARLS.

ONE of the most famous pearl-fisheries is on the coast of Ceylon.

Ceylon is, as you know, one of the most beautiful islands in the world. But that part of the coast where the pearl-fishery is carried on, is not beautiful at all.

It is a flat, sandy shore, where nothing is to be seen but a few prickly shrubs, and here and there a straggling village.

One of these shrubs I might just name to you, because an insect feeds upon it, called the cochineal. The cochineal gives a beautiful scarlet dye, that is as much thought of as the Tyrian purple.

Here is a plate of the insects on the cactus.

The desolate shore of which I am speaking becomes, at one time of the year, a scene of bustle.

A number of rude huts are put together, as a shelter from the sun and rain, and people of all kinds flock to the spot.

There are merchants, and jugglers, and snake-charmers, and a great crowd, as if a fair were going to be held.

It is the pearl - fishing which is going to take place.

The natives of Ceylon are not very brave, and do not like to dive.

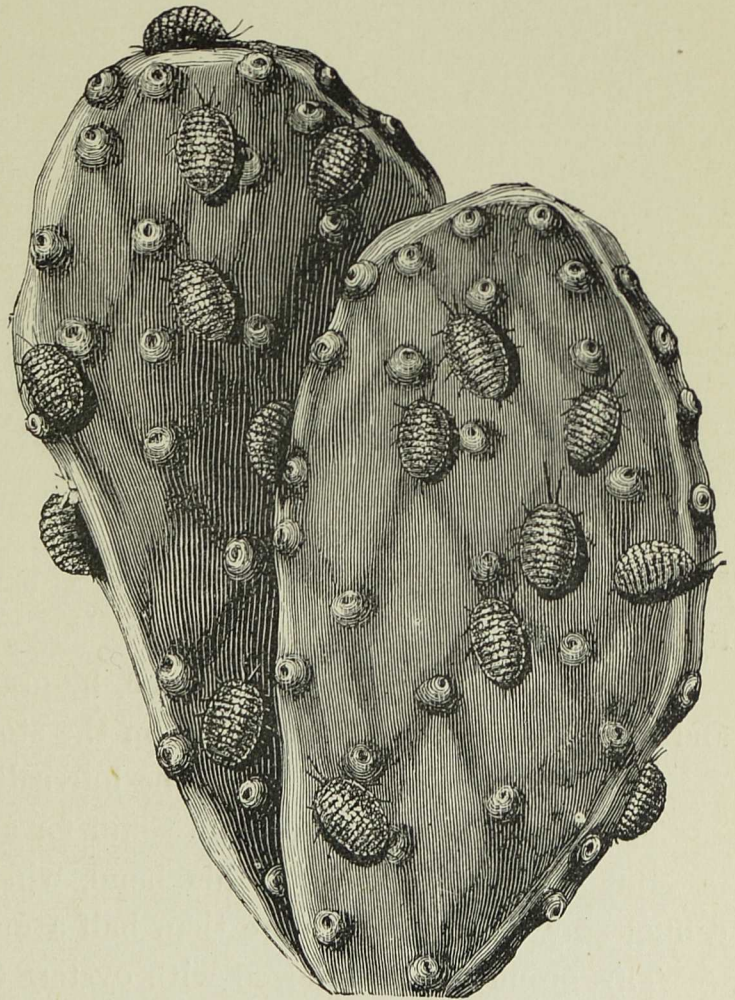
So the divers come from India, and are Hindus.

But even the poor Hindu does not like to risk his life without saying some kind of prayer.

He goes through a number of ceremonies, in order to prevent any harm happening to him.

I may tell you that very few of these divers live to be old men. They generally lose their sight, or are covered with sores; while many of them are suffocated under water, or get devoured by sharks.

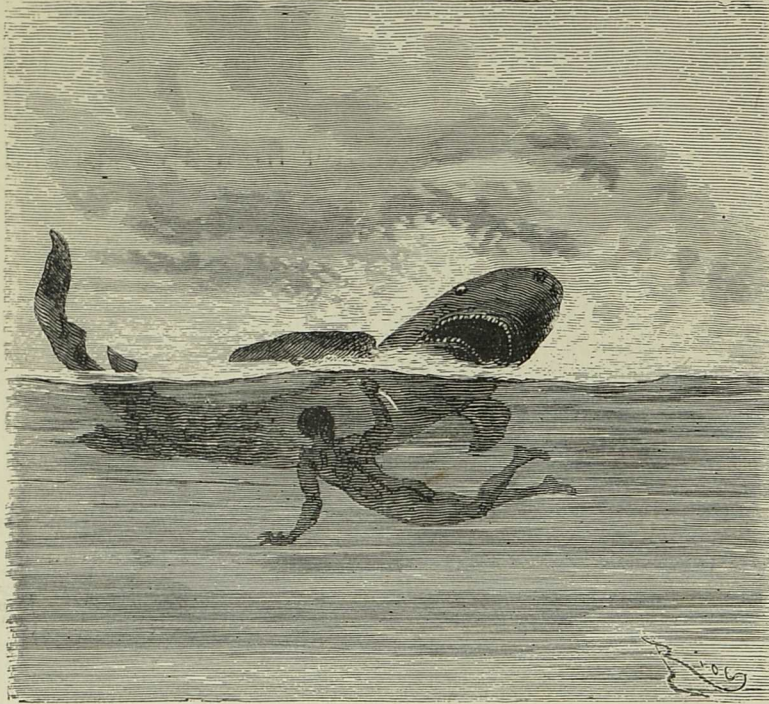
So that their business is not at all a safe one



COCHINEAL-INSECTS ON THE CACTUS.

The diving begins about seven in the morning, when the sun's rays are getting hot.

A little scaffold of wood is fixed on each side the boat, for the diving tackle to be suspended from.



PEARL-DIVER ATTACKED BY A SHARK.

There is a stone with a hole through the top of it. A rope goes through the hole, and there is a loop on the top of the stone, which forms a stirrup for the diver's foot.

The diver is already swimming about in the water. He takes hold of the rope, and puts one foot in the stirrup. Here he stands a few minutes, supporting himself by one

arm. The people in the boat throw a basket to him. This is to put the oysters in.

When he is ready for the plunge, he grasps his nostrils with one hand, and then goes down, still standing on the stone.

When he touches the bottom, he hurriedly fills his basket.

The stone has been drawn up again for another diver.

But he holds a rope in his hand, which he very soon pulls, for he cannot stay under water more than half a minute.

The ground is so strewed with oysters that he can get a great many in that time.

As he goes up, he most likely meets another diver coming down.

The fishery is carried on for thirty days, and all the time a great deal of excitement is kept up.



PEARL-FISHING.





## THE BIRD.

THE land birds are countless in their number. Every wood, every field, every garden is thronged with them.

They are always with us or around us. Their sweet notes are warbled in our ears, and delight us. Their swift movements fill us with wonder. The whole wide space above us is their home.

Man may snare and entrap them, but he cannot follow them. They can spread their wings and fly out of his reach.

What gives the bird such strength and swiftness?

There is one thing which helps to do it.

I mean our old friend *oxygen*.

The breathing machine of the bird fills the entire body. He is all lungs.

The blood, amply supplied with air food, rushes with speed through his whole frame.

Besides this, the air gains entrance to every part of him, even to his bones.

Thus he is bathed in oxygen.

Life is going on as fast as can be.

The animal heat of which I told you before, is raised to a high degree. Oxygen, hydrogen, and carbon are uniting with such force, that the body of the bird is very hot indeed.

How restless and active he is! Is there any other creature to equal him?

How unceasing are his movements! What hours and hours he keeps on the wing! Some birds rest but an hour or two in the twenty-four.

A bird, then, has a double share of oxygen in his blood, and a double share of heat.

What kind of clothing should such a creature have?

Something warm to keep in the heat, and something light that will not be the least burden to him.

What can be warmer or lighter than feathers?

## THE FEATHERS OF THE BIRD.

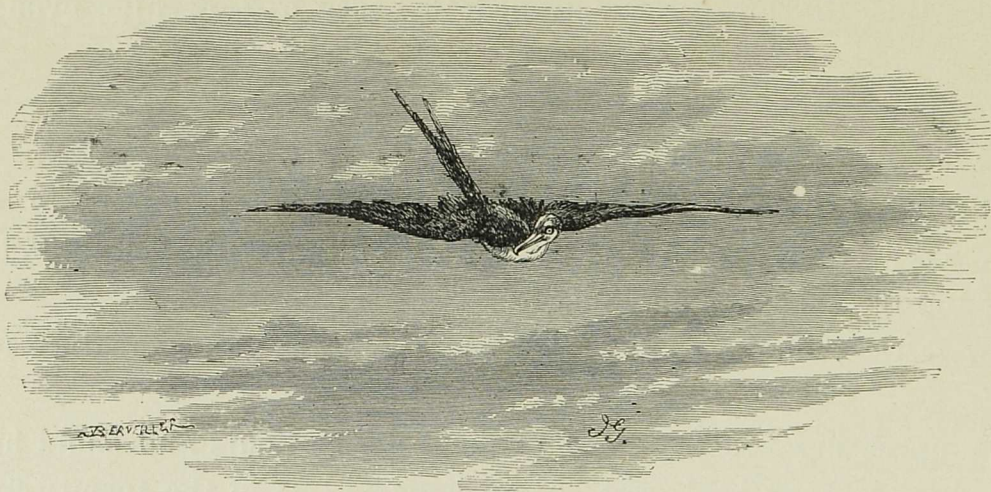
THERE is a great deal to be said about the feathers. We cannot pass them over in a moment.

Do you see the soft down on the breast of the bird? The little creature had no other covering when it came out of the egg.

If you look at the down, you will perceive that it is made up of tiny threads or filaments.

They grow out of the skin in bunches, and do not hold together. They hang loosely down, and form the softest and warmest under garment you can imagine.

The quill feathers are the most important part of the bird's flying machine—its wings. You may see them when the bird stretches out its wings. There they are, firm, strong, and elastic. With these, it gives the air a powerful blow. Then what happens?



THE POWER OF THE WING.

The air, which has been struck, is in the hollow of the wing. It cannot escape upwards through the feathers, or forwards. So it escapes backwards, and gives the body of the bird a push. Then comes another powerful blow, and the same thing happens. All this is done as rapidly as possible, and is, in fact, flying.

Some birds are more clever at flying than others. And some do not use their wings at all to raise themselves in the air. Their bodies are too heavy, and their wings too small, to fly with. We shall hear more of these birds by-and-by. We have not yet done with the feather.

What is it made of?

Not bone, or muscle, or flesh, or even horn. It is a substance quite distinct from either.

Nor is it like any other part of the bird.

When the bird came out of its shell it had, as we know, no feathers at all. It was not fledged.

The skin of the little downy creature was full of tubes, or tiny moulds, out of which the feathers were to grow.

Let us watch the progress.

The mould becomes lined with fibres, which are deposited by the blood. When the fibres are dried up, we call them the pith of the quill. At the time we are speaking of, the pith is moist, and the fibres go shooting along the whole length of the mould.

They are kept in place by rings of the same pith-like material, and which keep forming as well.

When all is ready, the feather begins to sprout from the mould.

Each fibre in the feather part of the quill clings closely to its neighbour. Yet there is nothing that you can see to hold them together.

But if you look through the microscope, the secret will be out.

There are a number of minute hooks on one side the fibre, and a number of minute teeth, a little like latches, on the other. The hook fits into the latch, and both are made fast together.

Should the two fibres be torn apart, they will spring back again and reclasp.

The bird spends some time, every day, in dressing and polishing its feathers.

Nature has given it a material on purpose.

There is a little bag of oil placed near the tail. The bird turns his head round, and squeezes out some of the oil.

Then he draws feather after feather through his bill, and gives it a polish.

He goes on doing this, until his plumage is dressed.

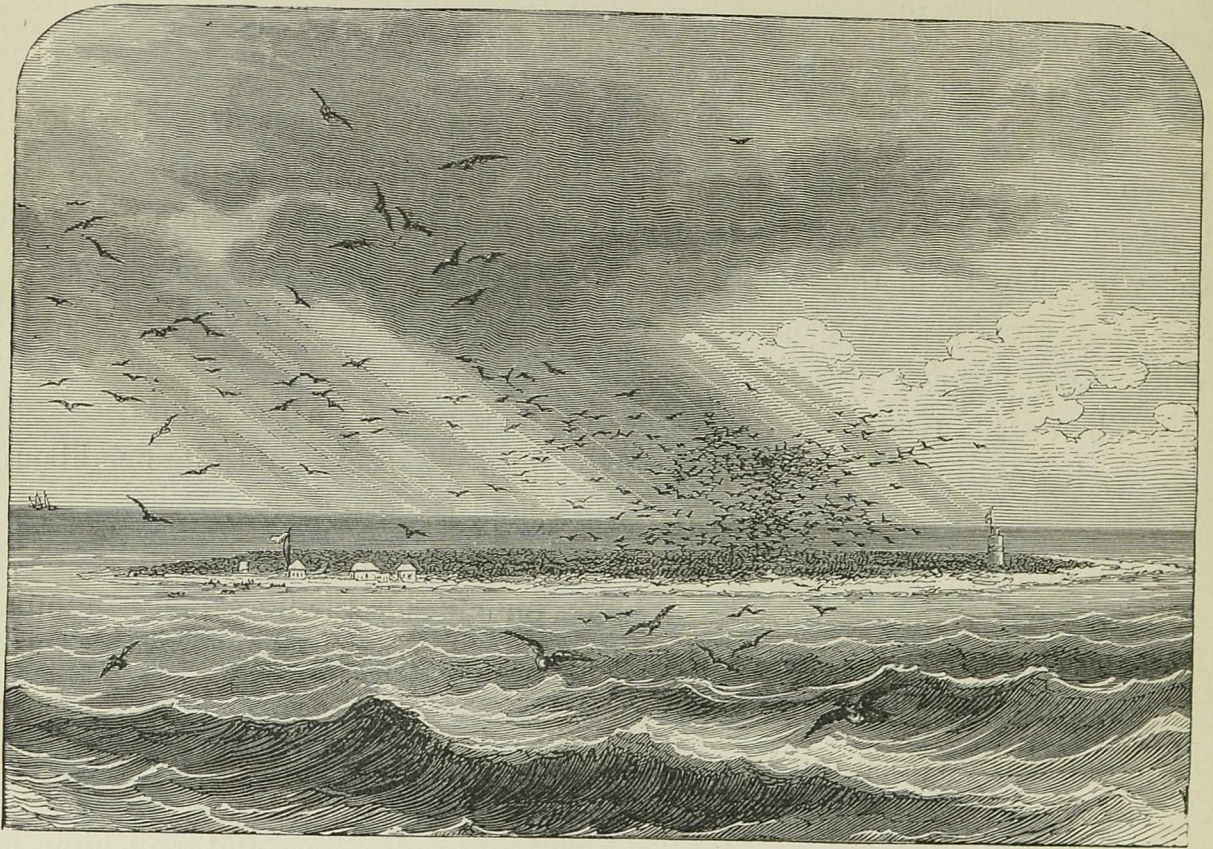
Until, in fact, he has finished his toilette.

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### BIRDS OF THE SEA.

THE birds of the sea equal in number those of the land.

Every rock and cliff, every solitary island, swarms with them.



FLOCK OF SEA-BIRDS OVER A CORAL ISLAND.

A vessel making its way to distant shores is often beset by a flock of birds.

The petrel, the gull, the albatross, and numbers more have their home

on the waters. The ocean is the store-house where the sea-birds find their food. They devour fishes, and molluscs, and sea-worms, and whatever else comes in their way.

The habits of the sea-bird are quite different from the habits of the land-bird. Its voice is often a harsh cry. It does not take the same pains with its nest.



SEA-BIRDS.

The sea-lark merely scoops a hole in the sand, where she lays her eggs. But she has the same love for her young ones as her sister of the field and the wood.

If she sees a dog coming near, she will fly out of her nest, and droop her wing as if she were lame. The dog begins to run after her, and she flies along, still drooping her wing, until she has led him a long way from her nest. Then, all at once, she leaves him, and darts away as fast as she can.

The sea-lark lives on the shore ; and so do a tribe of birds that are called strand-birds. Some of them stride about among the shallow pools of sea-water. They have long legs, and long bills that can seize the prey before it has time to bury itself in the sand.

One of these strand-birds has a bill turned up at the point.

He is called a turn-stone, and I will tell you why.

When a poor little worm hides itself under a stone, up he comes, and nothing is so easy as for him to turn the stone over with his bill. Then



STRAND-BIRDS.

he gets a feast upon what he finds beneath it.

There is another of these birds with a bill shaped like a wedge.

The under part comes beyond the upper. He is very fond of shell-fish, and is always looking about for some on the beach.

He waits patiently until an unlucky mollusc opens its shell. Then he pops in the wedge-like bill, and all is over with the mollusc. It is as nice a morsel to him as the oyster is to us.

This bird is called the sea-pie. He can skim the surface of the water and catch shrimps, and little fishes, and whatever comes in his way.

But where are the real sea-birds ?

You may find them far away on the ocean. They love the wild dashing spray and the foam of the billows. Their cry is heard in the storm. Their feet scarcely ever tread the solid earth.

Their clothing is suited to their habits.

They live in the spray and the foam ; so Nature has given them a coat of extra warmth and thickness, and a large supply of oil.

The bodies of some of the sea-birds are as full of oil as can be. So that, however the spray may dash over the feathers, they are always dry and firm and compact.

## THE FRIGATE-BIRD.

THE frigate-bird has feet partly webbed. He has a long bill, a forked tail, and two strong wings that sweep the air, and can bear him anywhere.

He may be said to live on the wing. But he cannot rise from the ground, as the little birds do.

He is obliged to start from some lofty point. Then he flings himself into the vast open space.

Does he fall ?

Oh no ! His great strong wings bear him up. He is quite at home in the air. He wants no rest.

He rests on the breeze.

Often there comes a storm, and the fierce winds battle with each other. Then the frigate-bird is rejoiced.

He skims boldly over the foaming waves. He knows that all kinds of shell-fish will be thrown up by the fury of the gale.

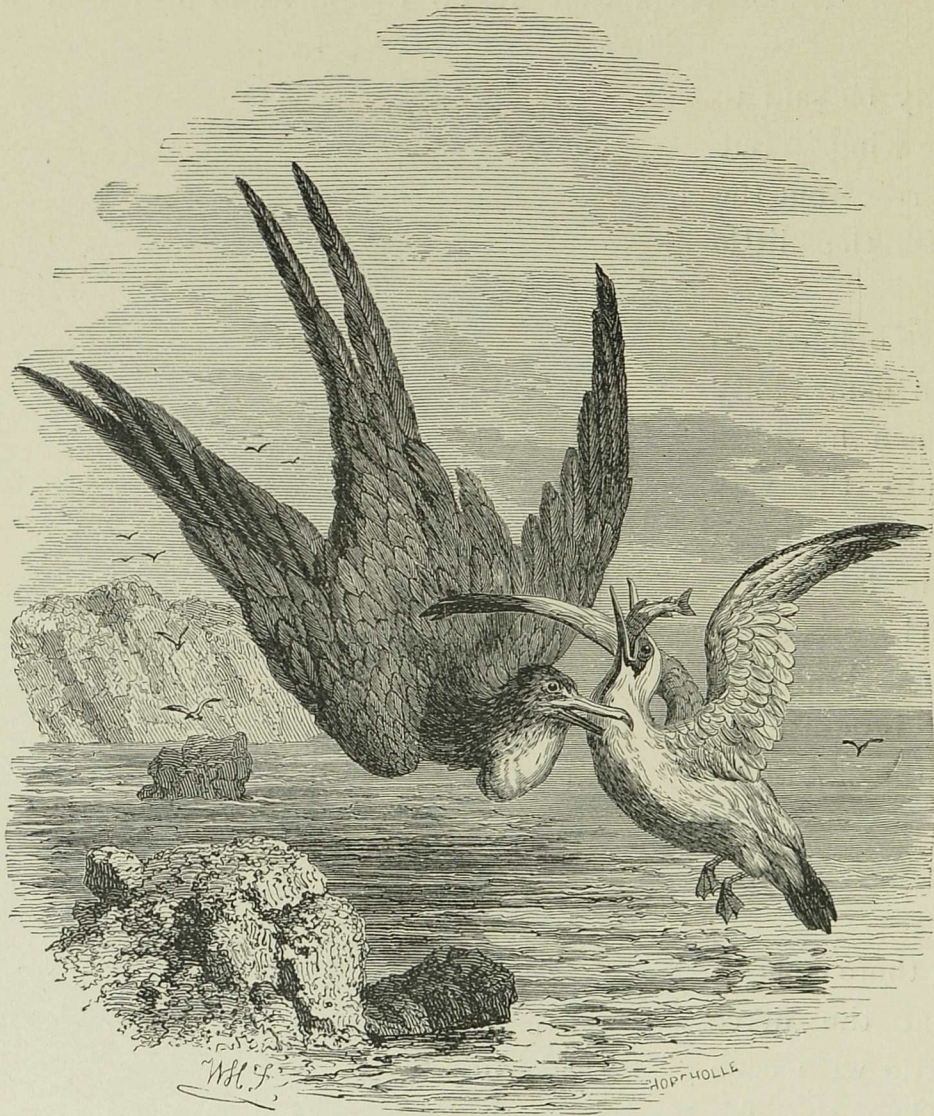
He feeds on shell-fish, and on fishes as well. And he knows he shall find plenty of food—thanks to the storm !



THE FRIGATE-BIRD.

You would not believe how far those strong wings of his can bear him. He might be nothing but wing! On he goes, through the vast plains of air, now skimming the waves, now sweeping over them, mile after mile.

He is called the eagle of the ocean. He has been said to sleep on the storm.



FRIGATE-BIRD ATTACKING A GULL.

In the picture, he is very hungry, and has not been able to get any food. So he has turned robber, which, I am afraid, he often does.

The poor gull had caught a fish for dinner. But, before it had time to swallow it, down pounced the great strong-winged bird.



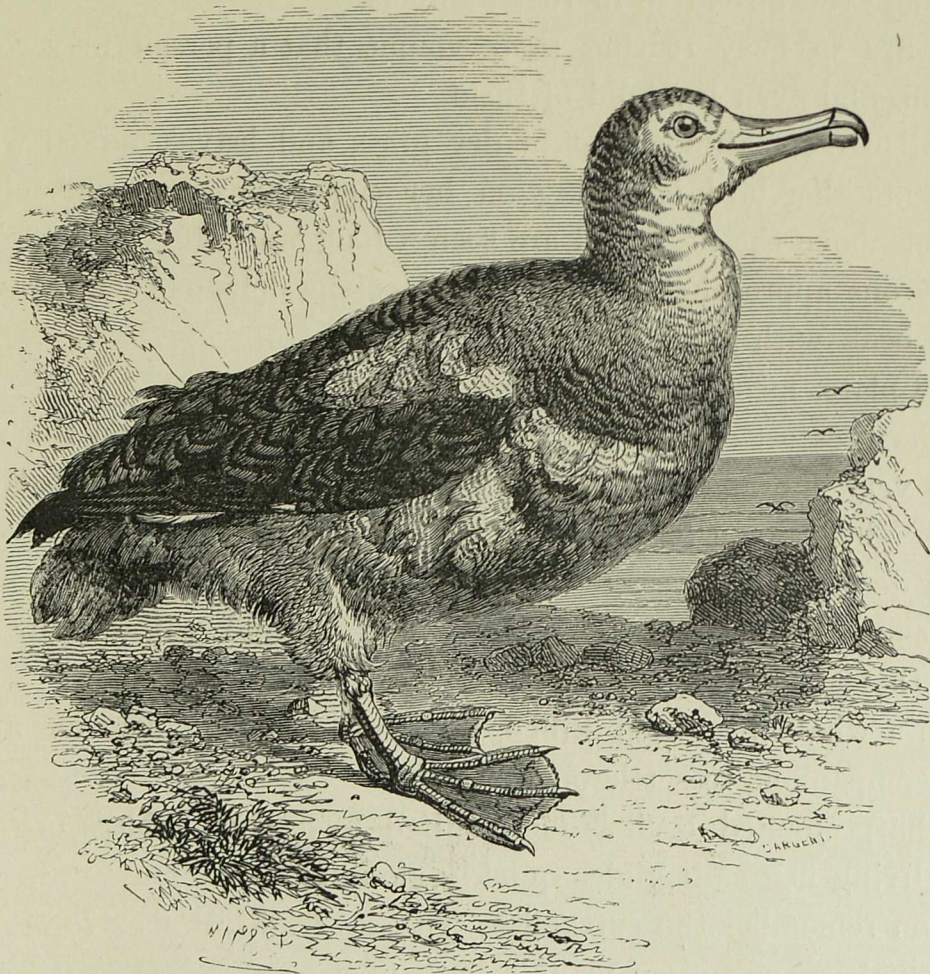
You see how fiercely he is attacking the gull. There is no doubt he will carry off the fish and eat it himself.

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## THE ALBATROSS.

THERE is a bird that may be called the monarch of the sea.

He is larger than the swan, and has a white body with black wings



THE WANDERING ALBATROSS.

He is quite at home on the billows.

He skims along without touching the water. He rises and falls with the wave. He bids defiance to the storm.

For days and weeks he will follow the ship. The sailors know him well. They call him the wandering albatross.

His favourite resort is the stormy seas about the Cape of Good Hope and Cape Horn.

When the ship is approaching these points, a cloud of albatrosses appear.

The sailors know the sign, and can guess where they are.

At certain seasons the albatross seeks the land. There are some lonely islands where the birds live in vast numbers.

They are so busy rearing their young, that a person may come close up to them, and even lay hold of them.

The albatross makes a nest of dry grass and leaves, mixed with sand. When the mother bird is sitting on her eggs, her snow-white head and neck tower above the nest, and are seen a long way off.

If any one approaches to steal the eggs, she defends them bravely, and snaps her beak with great fury.

In the plate, men are driving the birds off their eggs.

But her greatest enemy is a fierce gull, that is always on the watch.

He is very cunning, and hovers about until he sees the albatross leave her nest. Then, down he pounces, and eats up her eggs.

What does the albatross feed upon?

He has very much the habits of a vulture, and will devour all dead creatures that are floating on the water.

When a whale has been killed, he scents it a long way off, and comes with his companions to settle on the body.

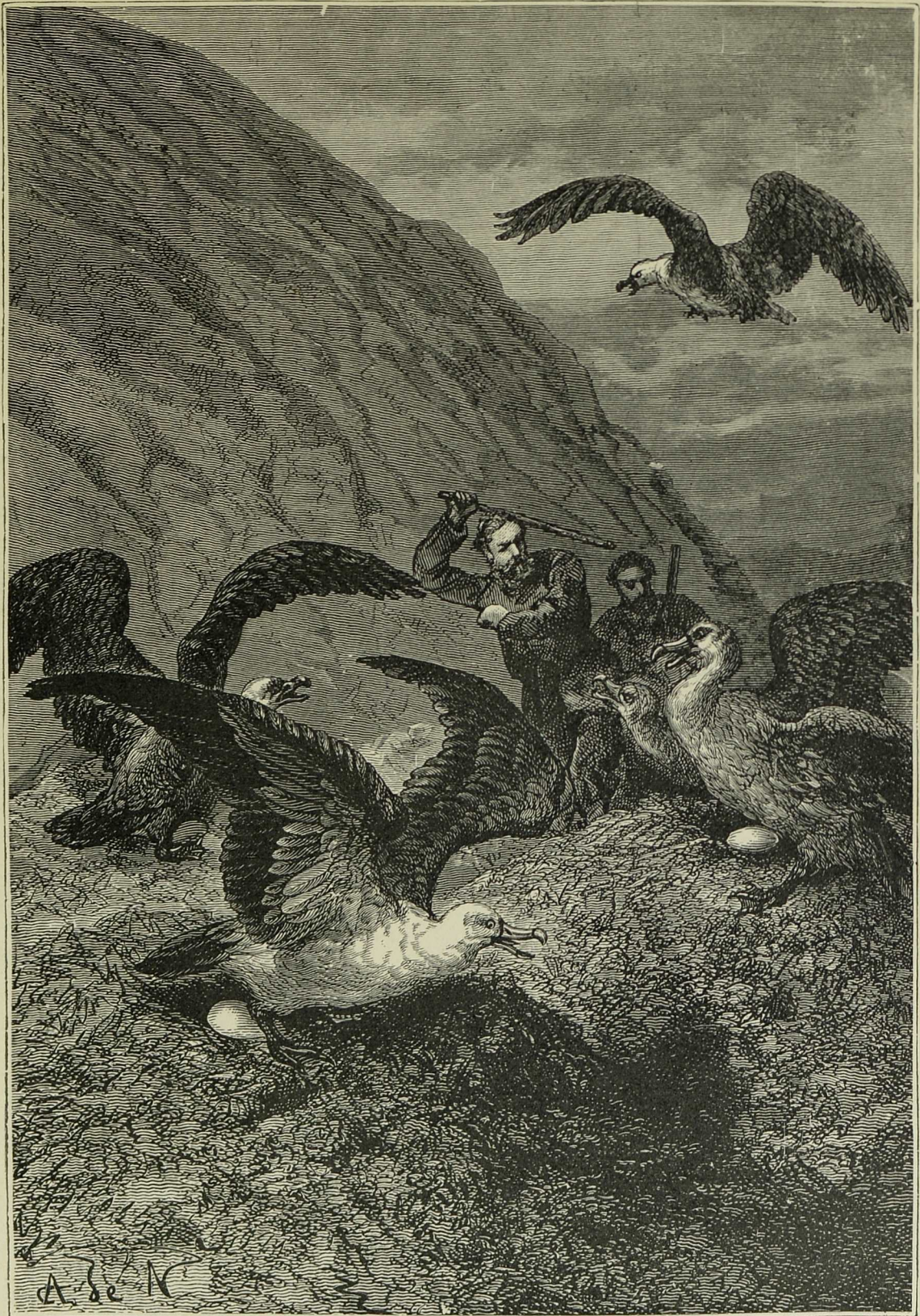
His sharp crooked beak is more suited to feed on lifeless prey, than to seize the living fish as it glides quickly along.

Do you remember the cuttle-fish, with its frightful arms?

The albatross will often make a meal of it.

And the albatross is a great enemy of the flying-fish.

He is ever to be seen, hovering about, near to a shoal of these pretty little creatures. When they are pursued by the dolphins, he comes and joins in the chase.



ALBATROSSES DRIVEN FROM THEIR NESTS.



The poor flying-fish gives a dart into the air to escape the dolphin, and is pounced upon by the albatross.

But I should tell you that the albatross seems to have an affection for that odd-looking bird, the penguin.



ALBATROSS ATTACKING A SAILOR.

In the lonely Falkland Islands, the penguins and the albatrosses once lived side by side.

The great nest of the albatross towered up some two feet above the ground. All round it would be the nests, or rather holes, of the penguin.

At one time, the ground was covered with these nests. They looked in the distance like a plantation.

Man has come and taken possession of the sea-birds' home.

The nests are nearly all destroyed, and the penguin and the albatross are gone to live in more remote regions.

I can give you an instance of the fierce nature of the albatross.

A poor sailor fell overboard. His companions made haste to lower a boat, to rescue him.

He could have kept himself afloat until the boat reached him; but a party of albatrosses happened to be near. They made a swoop upon the poor man, and attacked him with their wings and beaks. He could not contend against them, and actually sank under the eyes of his comrades who were coming to save him.

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## THE PENGUIN.

WHAT a curious-looking bird he is!

He has great webbed feet, which are placed so far back that his body stands quite upright. His wings have small scaly feathers upon them. They are very little wings, and he cannot fly with them.

He never tries to fly.

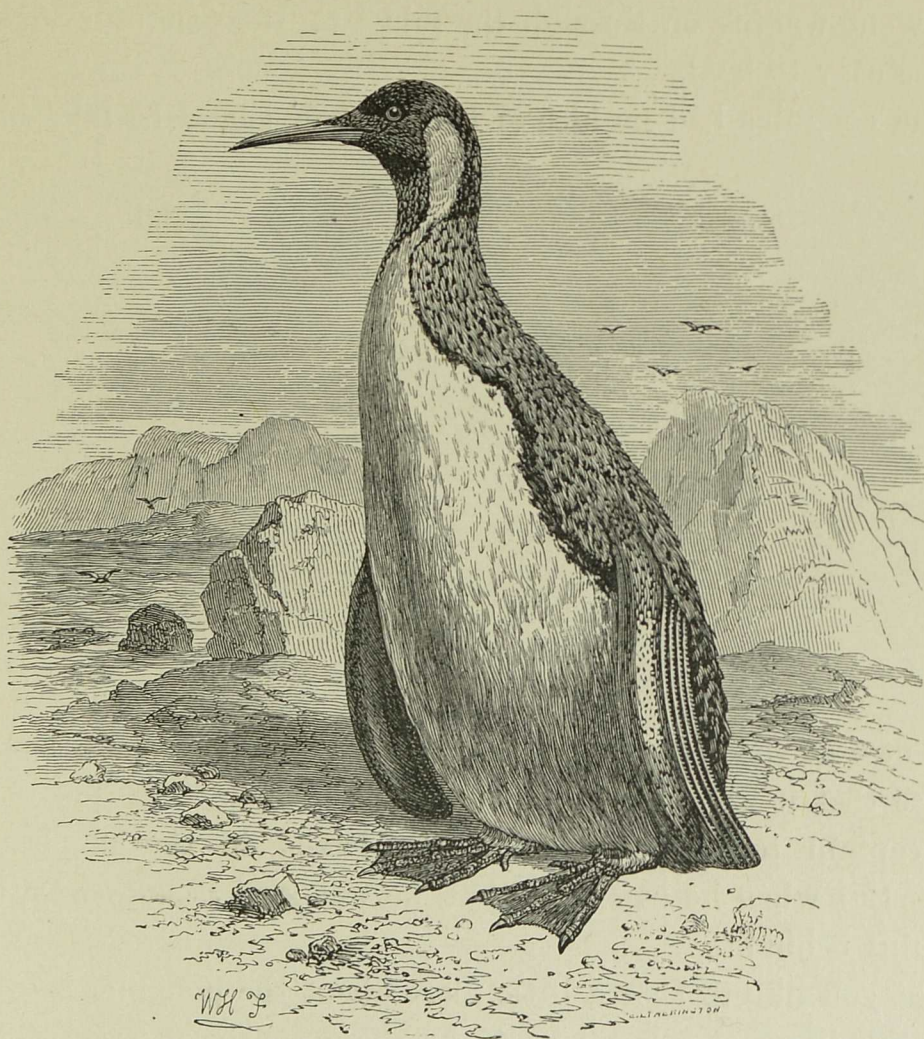
He lives on the land and in the sea. He can dive like a fish, and then he uses his funny little wings instead of fins.

He uses his wings for another purpose as well. When he wants to climb up the cliffs, his wings serve him as fore-feet. He climbs with them, so that he looks at a distance as if he were going on all fours.

He is quite at home in the sea. And he does not swim as other water-birds do. He keeps his great body under water, and only his head is to be seen.

And he swims so far and so fast that he can keep up with the fishes. He has been seen paddling a thousand miles away from land.

Where does the penguin live?



THE PENGUIN.

He lives in islands where men have not taken up their abode. There the penguins reign in all their glory.

There is a desolate rock in the seas near to the South Pole.

It is called Possession Island.

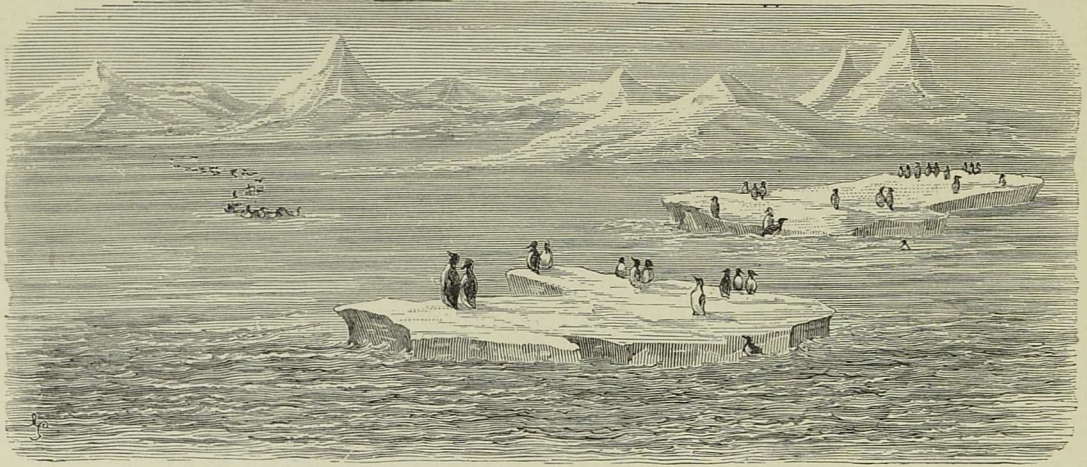
Nothing grows there of any kind. But millions of penguins cover the ground and the sharp ledges of the rock.

It is an island peopled by penguins.

A ship once came to the island, and the sailors wanted to land. They saw the strange-looking birds all along the coast; but at first they did not mind them.

They went wading on through the midst of the penguins, and thought it would be easy to land.

But the penguins had no idea of letting their island be taken by storm.



ISLAND OF PENGUINS.

They flew at the sailors, and pecked at them, and made such a loud harsh noise that it was not to be endured.

The captain took possession of the island in the name of Queen Victoria. But when he had done that, he was glad to sail away, and leave the penguins behind.

Should you like to hear a little more about the penguins?

They live in some other islands in these southern seas. The islands are called the Falkland Islands.

A curious grass grows there called the tussock. It grows in a great round ball, high enough and big enough for men to hide in.

The penguin likes to take his afternoon's nap in the tussock grass. He is very greedy, and eats a great deal of fish. He dives into the sea to catch it.

On fine afternoons, when the penguins have woke up, they waddle down to the beach, and make such a noise with their harsh voices, that people can hear them a long way off.

When the young ones are old enough, the whole band go away, nobody knows where.



The penguin gets very fat with eating so much. The mother penguin does not take the trouble to build a nest. She lays her eggs in a hole, or burrow, in the sand.

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## S A I N T K I L D A .

SAINT KILDA is an island which is only six miles round. Great rocks shoot up all along the coast, and there is only one place where people can land. Indeed, they cannot land at all unless the weather happens to be fine.

Where is Saint Kilda ?

It is one of a group of islands on the coast of Scotland, called the Hebrides. There is one rock, or precipice, which is the highest in all Britain. The view from the top is very grand indeed.

Far below, the white foam of the ocean dashes about. You are thirteen hundred feet above the level of the sea.

In this wild lonely spot the sea-birds love to dwell. The bare naked rock is covered with them. The air is darkened by them. The waves below are alive with them.

Every narrow ledge is crowded with birds. If you were to roll down a stone, a strange confusion would happen. Down it would go among the thousands of birds sitting on their nests. A cloud of birds would fly out and darken the air. But when the stone reached the bottom of the rock, and lay there quite still, the panic would be over. The frightened birds would come back to their nests, and begin to sit again.

What birds are they ?

There is the great auk, which, as you see, is a little like the penguin. The mother auk does not sit on her eggs. She holds them close to her body till they are hatched. If she is disturbed, she waddles away, taking her eggs with her.

Her mate all the time is very busy. He goes fishing every day, and brings her home plenty of food. When the young bird is hatched, both

parents fish for it, and it gets so fat that it can hardly stir. But the parent birds get thin with the hard work they are doing.

There are a great many gulls at Saint Kilda. One of them is called the kittiwake.

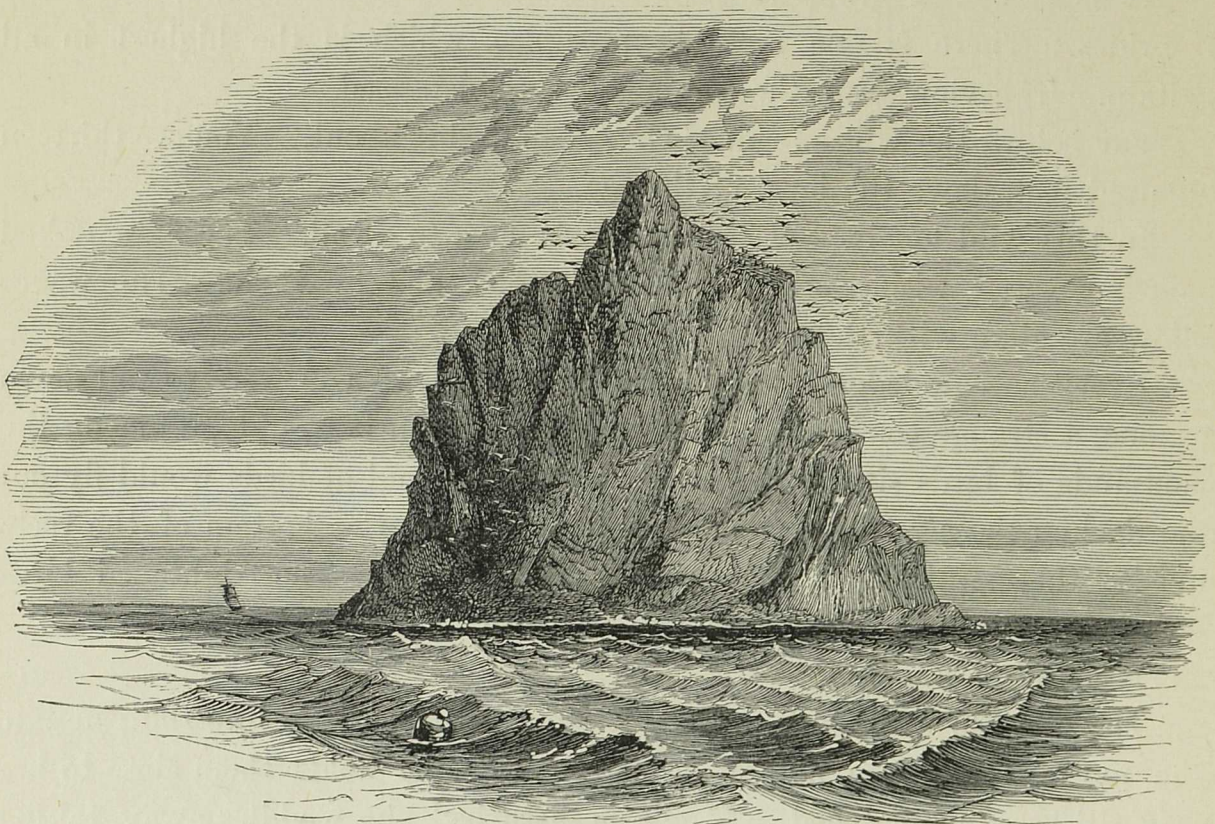
If you go near the nests of the kittiwakes, they will all fly out, and begin to cry "Kitti-wake! Kitti-wake!" till you are nearly deafened.

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### THE BIRDS OF SAINT KILDA—THE FULMAR.

SHOULD you like to hear a little more about Saint Kilda?

It is not a very pleasant spot to live in, as you may think. The wind



ROCK OF SAINT KILDA.

blows so fiercely, that people cannot build houses more than four feet high. If they did, the house would be blown down. They make as much room



SEA-BIRDS OF THE NORTH AND SOUTH—AUKS AND PENGUINS



as they can, by digging into the ground. But it is like living in a cellar.

They have no windows; but only holes in the roofs of their houses. And there are little places round the walls, something like ovens to look at. These are the bedrooms.

There are not more than a hundred people living on the island.

They are not unhappy, though the place is so dreary. They keep a few sheep, to eat the patches of grass which grow here and there among the rocks. And in one place, which is a little sheltered from the wind, they can till the ground.

But their great riches are on the ledges and among the crevices of the rocks.

Here live the birds of Saint Kilda. I cannot think what these poor people would do without the birds. The birds give them food, and light, and medicine, and warm beds to lie upon in the cold winter nights.

The lamps they burn through the long evenings are made of a bird.

Made of a bird?

Yes; and a very useful bird, too. The people of Saint Kilda would not be without it on any account.

It is called the fulmar.

This is the only place in Great Britain where the fulmar lives. It likes to live on the little grassy shelves on the rocks. And every such shelf is as full of birds as it can hold.

When the fulmar is seized, it throws a yellow oil from its beak. The oil has a very disagreeable smell. It taints the nest of the bird, and even the rock on which it sits. But still the oil is precious as gold.

The islanders burn it in their lamps, and they think it cures the rheumatism.

It is very dangerous work to hunt for the fulmar.

Two men go together, and take a few coils of rope with them.

One of the men is let down the face of the cliff, by a rope fastened under his arm. He holds another rope in his hand. The man who is

with him lets him down. He has to take great care, and let him down very slowly and carefully. He has the rope tied round his foot, for fear it should slip.

When the man reaches a ledge of the rock, he stops. Here the birds are all sitting, and he begins to take the eggs and the young ones.

He knocks down the old birds with a stick. He puts the eggs in a basket, and goes creeping along on his hands and knees in the most dangerous places.

Indeed, he seems to take a delight in showing off his bravery. If any one is looking, he will give great jumps from the rock, and spring back, as if he were a tight-rope dancer.

The dead body of the fulmar is so full of oil that it will burn like a lamp. The natives do not take much trouble with it. They put a rush through it, and make it come out at the beak. Then they light the rush, and it goes on burning till all the oil is used up.

You would often see these bird-lamps in the cottages at Saint Kilda.

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## THE GULL.

WHO that has visited the sea-shore but has seen the gull?

They are birds of the sea. Their home is on the waves; and they only seek the land to rear their young.

The larger gulls are rarely seen except on the high seas. They lead the life of pirates. They cannot dive or plunge on account of the size of their feathers. So they plunder their neighbours, and snatch the fish out of their mouths.

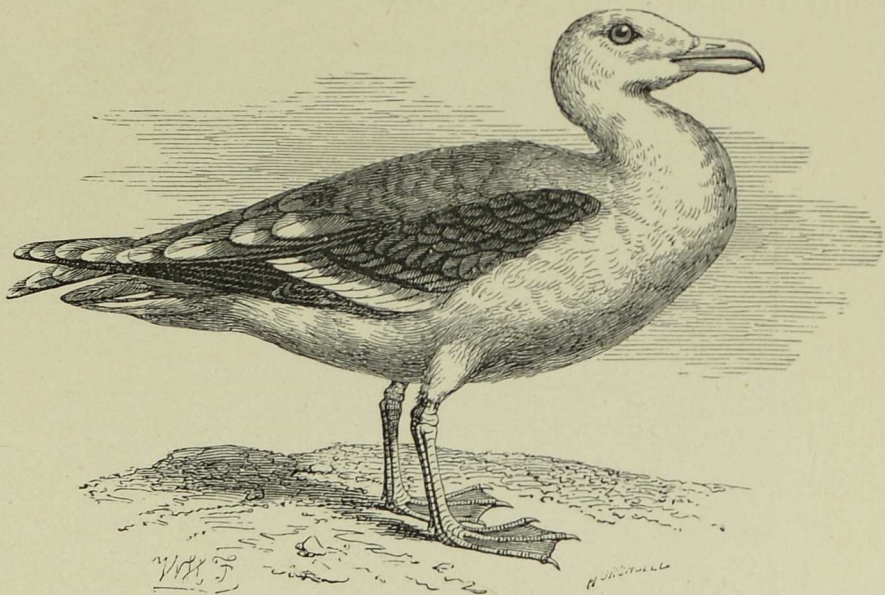
The smaller gulls are often seen near the shore. They wheel about, or skim on the waters, their silvery wings shining in the sun. Sometimes they seem to tread or walk on the waves, upheld by their strong pinions. They will even ascend the rivers in search of prey.

They are noisy, greedy, and rapacious. They feed on all kinds of

creatures, dead or alive. They pursue the shoals of herrings on their way to and from the sea, and thin their ranks.

They plunge headlong on the fish, and snatch it from the waters. It happens, now and then, that the gull does not succeed in carrying off the prey.

The frigate-bird, if he chance to be near, will take a fancy to the fish himself. He will dart upon the gull, and force him to drop it. Then, by a dexterous swoop, he will catch it in his beak and devour it.



THE BLACK-BACKED GULL.

The gulls have all the fierce nature of the sea-birds.

It is not safe to be at their mercy.

Once it happened that a fishing-boat was upset near to the seaport town of Yarmouth.

All the men on board were drowned except one. He was a good swimmer, and tried hard to reach the shore, but the tide was against him, and he drifted out a long way from land.

As he floated, exhausted and almost hopeless, on the water, he heard a flapping of wings. It was a party of sea-gulls coming to seize him for their prey. He could feel their wings touch his face, and he tried to strike at them with his arms, and drive them away. You may fancy how dreadful a situation this poor man was in! Happily, at this very moment a ship came in sight. He cried out with all his might, and the man at the helm heard him. Soon after, a boat came plashing along to rescue him.

Thus the cruel gulls were disappointed of their victim.

The family of the gulls is a very large one. It includes all kinds of varieties.

There is the black gull, and the herring gull, and the Iceland gull, and many others.



SEA-MEWS.

And there is the green-billed gull, or the sea-mew. The sea-mew has a hoarse, harsh voice, between a laugh and a scream



On some wild rocky coast, the strange note of the bird mingles with the noise of the waves and the moaning of the wind.

Saint Kilda is, as I have told you, a favourite spot for the gulls.

They like inaccessible rocks, and wild desolate islands.

In some places, the clouds of gulls darken the air when they fly. And the noise they make is quite deafening.

It is a trade to collect the eggs of the gull, as it was to take the fulmar.

During the season, men are busy from morning till night. The eggs lie so thickly on the ground, it is scarcely possible to help treading on them.

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### THE CLIFFS OF THE SEA-BIRDS.

THERE are some small islands, on the coast of Iceland, that are called the Westmannas.

Their towering rocks are very picturesque. But a traveller seldom dares to cross the stormy sea that divides them from the mainland. If perchance he did cross it in safety, he might have months to wait before he could get back again.

Only one of these desolate islands is inhabited by man. The island is about ten miles round, and there are two little villages in which the people live.

You may imagine how lonely the situation of these poor people must be, cut off from the outer world, and for a great part of the year cut off even from Iceland itself.

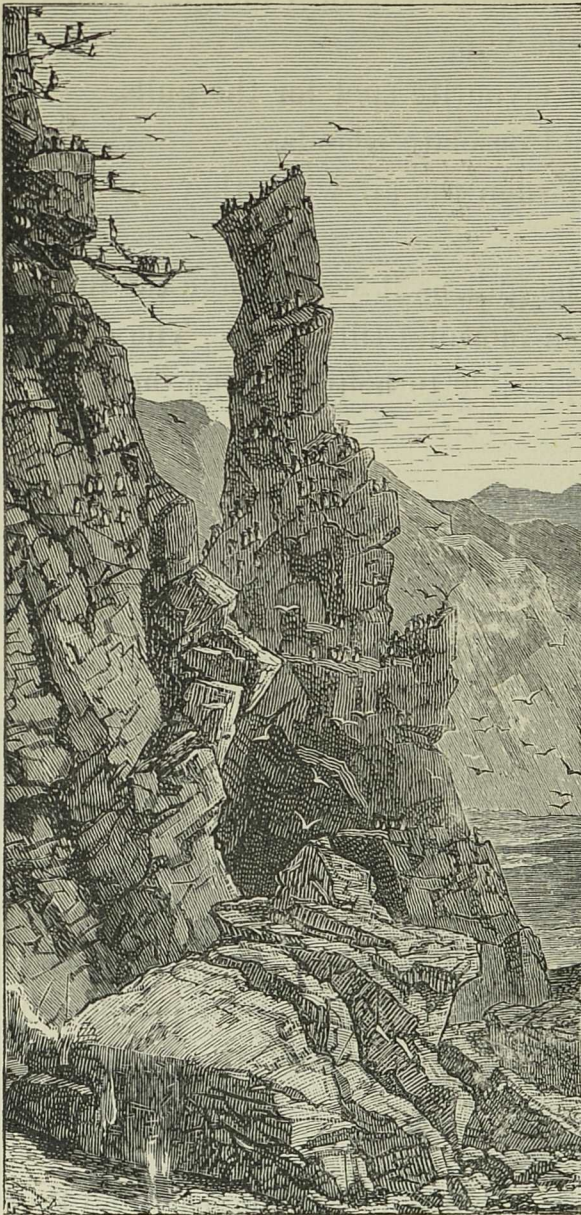
They have but few means of subsistence.

The boats can seldom go out for fish in that tempestuous sea; and there is a very scanty supply of grass for cows or sheep.

They would at times perish of hunger, but for a supply of food that is within their reach.

On the naked rocks and cliffs, close by the sea, birds herd by thousands and hundreds of thousands.

Here they make their nests and rear their young. Here they whirl about in dense clouds, darkening the air. Here their shrill, hoarse voices



CLIFFS OF THE SEA-BIRDS

wheeling about, and strike him with their wings. Often a bird will not cease to torment him until he has killed it with a club.

The rarest of the sea-birds is the giant auk, or ger-fowl. Its home is on a rock close by the Westmannas.

This great bird is three feet high, and has a black bill with furrows and ridges on it. Its wings are like those of the penguin.

may be heard amid the dashing of the spray.

The poor people depend on the supply of eggs and of young birds to save them from want.

When the nests are full of eggs, they come to get as many as they can. It is a perilous task, as you may suppose, for one false step would be fatal.

The men contrive to climb to the top of the cliff, then they let one of the party down by a rope. He is gradually lowered until he reaches a little shelf, or ledge, on the face of the cliff.

Here he plants his feet as firmly as he can, and begins to collect the eggs and put them into a bag.

When his bag is full, he gives a signal, and is drawn up.

Later in the season, the hunter goes again to the rock. Again he is let down; this time to kill as many of the young birds as he can.

It is a more dangerous task than taking the eggs. The old birds come

You may think how rare it is, when I tell you that thirty pounds have been given for a single egg!

The giant auk has not been seen for some years. Naturalists begin to fear that the race may have become extinct.

And the home of the ger-fowl is so inaccessible that man is not able to visit it.

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## THE PUFFIN.

THE flesh of the sea-birds is not the most wholesome diet.

Both at Saint Kilda, and also at the Westmannas, the poor inhabitants suffer much from diseases brought on by that fare.



ISLAND OF SEA-BIRDS.

The eggs of the gulls are very large, and have not a disagreeable taste.

Along the coast of Norway there are cliffs peopled almost entirely with gulls. And there are bird islands.

A man will own an island, and it will descend to his son, and his son's son after him. Indeed, it may have been in the family for generations.

Once a year, the owner comes to take the eggs.

The old birds seem to know that he will leave a great many eggs behind, and they do not make any opposition.

But if a robber comes, as is sometimes the case, they are up in arms in a moment. In spite of their clamour, they cannot prevent the strange man from taking the eggs. And often he will not leave one behind.

Then the birds make a great lamentation. Clouds of them rise up into the air, uttering the most doleful cries. Indeed, if the robber comes too often, they will forsake their nests and seek a safer place.



PUFFINS.

There is a curious-looking bird, called the puffin, that likes to make its nest on these islands.

It is only about the size of a pigeon ; but it relies for defence on its great bill.

The bill is flat, of a three-cornered shape, and ending in a sharp point ; for the upper half of the bill bends a little downwards.

It can bite famously with this great sharp bill.

When an enemy, perhaps the sea raven, comes to steal a little puffin, the mother bird seizes him under the throat, and holds on to him by her claws. She will not let go, and she is carried away by the raven till they come to the sea.

Here they both drop together, and often the raven will be drowned.

The puffin has its legs so very far back, that when it is on land it is constantly tumbling down.

It does not take the trouble to make a nest ; but it lays its eggs in a hole in the rock, or on the shore.

When the hunter comes to take it—for he wants its feathers—it will behave very much as the booby gannet does.

The hunter's dog scents the puffin, and goes to its hole. He pulls out the first puffin. The next puffin is so silly as to lay hold of the tail of the one that is being dragged out. And the third puffin lays hold of the tail of the second.

And so they go on, until all the puffins in the hole are dragged out in a chain of their own making.

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## THE GANNET.

THE birds of the sea, as I have told you, spend most of the year on the salt sea waves.

They rarely, if ever, seek the land, except to rear their young. Then they choose a place as far as possible from the reach of their enemy—Man. Some desolate island, or steep rock, is their favourite spot in which to build their nests. These places may be called bird cities. They are crowded with birds till the very air is filled with them.

The Bass Rock, in the Frith of Forth, is a place densely peopled by birds.

The rock itself is of red-coloured stone, but at a distance you would fancy it consisted of white chalk. It has this look on account of the myriads of white gannets that cover it.

The top of the rock is like a platform, and is covered with grass. The sides are steep and bare, and only at one place can a person land.

Wild and steep as the rock appears, man has taken possession of it.

The owner of the rock will not allow the old birds to be disturbed, or the eggs to be taken. But when the young birds are large enough, he sometimes sends a number of men and boys to hunt them.

The poor birds are knocked down with a stick, or else taken by the hand.

They are also often shot from boats at the foot of the rock, and are picked up when they fall into the sea below.

The birds are not good for food, but are valued for their feathers.

The gannet is really a kind of goose. It is often called the solan-goose.

Like many of the sea-birds, it has to let itself drop down from some steep rock before it can fly. Its movements are very swift and graceful. When it spies a fish swimming on the waves, it first rises up in the air, exactly over the spot; then it drops down headlong upon its prey, and rarely fails to seize it.

The force with which the gannet pounces in this way is very great. Many creatures would be killed by the shock; but a special provision has been made by Nature.

The front of the head is covered with a horny kind of mask. And to help the bird to breathe more freely, it has three air-cells in its body.

These air-cells break the force of the fall, for they are light and buoyant, like swimming-bladders. And they also prevent the gannet from plunging too deeply into the water, and help it up again to the surface.

The beak of the bird is pointed and strong. It pierces into the fish like a spear or dart.

Indeed, the gannet is often taken at sea by a trick. The sailors fasten a fish to a board, and let it float on the water.

In a few moments, down comes the gannet with a tremendous force. It is stunned by the shock it receives on the board, and is easily secured.

I must tell you that the gannet is a great devourer of the herrings.

It keeps close by the shoal of fish, and takes as many as it can.

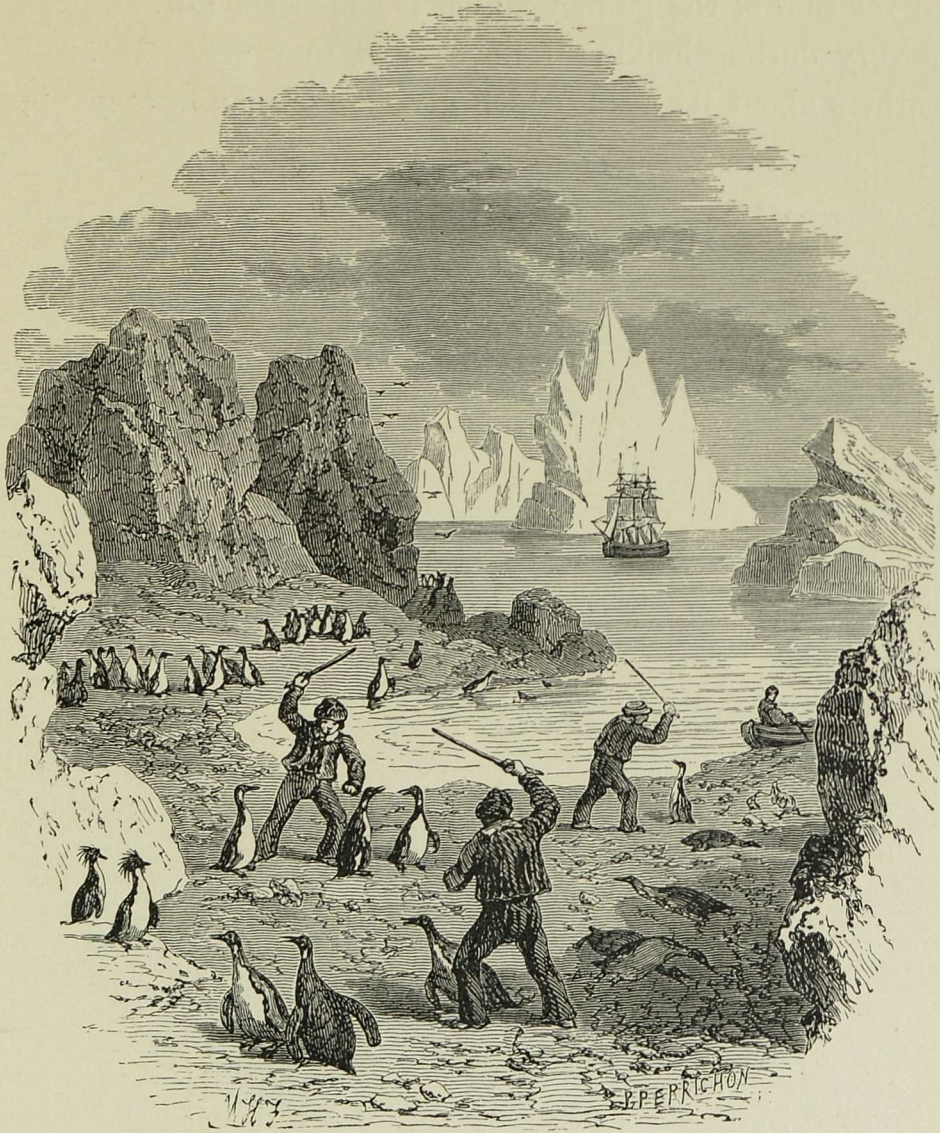
When the fishermen on the coast see a gannet, they know the herrings are not far off.

They begin to prepare their boats and their nets directly.

For the gannet never comes near the shore except to feast on the herring. It will snatch it even from the very nets and boats of the fishermen.

There is a relation of the gannet that is called the booby. It is so very stupid, that it never gets out of the way, but sits quite still while the hunters knock it over with a stick. It is not so stupid when it goes to look for its prey. Then it is quite sharp and cunning.

It will hover over a shoal of fishes, till it spies one of them rising to the surface of the water, then down it pounces with a shock like that of the gannet.



HUNTING THE PENGUINS.

In a moment the fish is seized and swallowed.

The frigate-bird seems to be a sad robber. As often as not, he will swoop on the poor booby, and force him to give up the fish.

## THE TOWN OF THE GORFOU.

THERE is a relation of the gannet which is called the gorfou.

It is a very curious-looking bird, as you may see. It has a quantity of loose feathers about its head, which give it rather a strange appearance.



THE GORFOU AND ITS TOWNSHIP.

But the most interesting part of its history is the manner in which it chooses to live.

The gorfou, like many of the sea-birds, is sociable. It lives surrounded by its companions in a kind of camp or town.



A town inhabited by gorfous !

They set to work, all at once, to make their town.

Instead of choosing a wild cliff, or rock, they begin on the level ground.

Indeed, they take pains to select the piece of ground that is most suitable for them.

The ground must be quite flat, and with as few stones in it as possible.

When they have fixed on a piece of ground, they make a number of squares, such as you see in the picture. The squares are arranged in a regular manner, as by line and plummet, and there are passages left between, which we may call the streets of the city.

When all this has been done, each gorfou chooses a square for her nest.

In the picture, you see the birds sitting on their eggs, each in her square.

The mother bird would not leave her eggs on any account, for I am sorry to say that honesty is not much regarded in the bird community.

The next door gorfou would steal them in a moment. Indeed, as a rule, the mother gorfous are always on the watch to steal their neighbour's eggs. So that, when the young birds come out of their shells, one nest can hardly hold them.

Half the family will not belong to the gorfou who reared them, but to another bird, from whom she has stolen them.

The Americans call these towns of the gorfous, "rookeries."

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## T H E G R E B E .

YOU have seen the firm silky plumage of the grebe.

It is the fashion to make it into muffs and tippetts, and ladies often wear it in their hats.

The grebe is a relation of the duck, but it is rather different in some respects.

It has a long bill, and its short legs are placed very far back on its

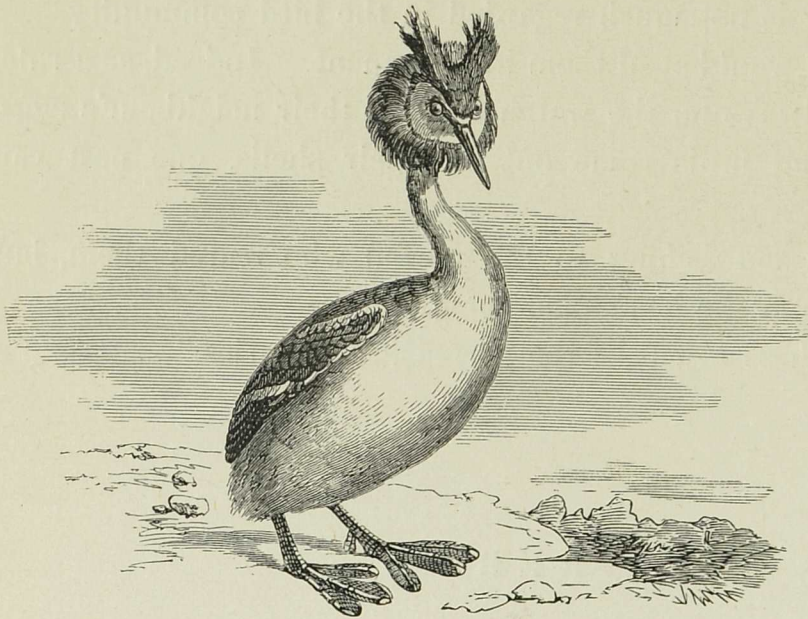
body. When it comes on land, it has to stand upright, or it would lose its balance and tumble over.

It is more fitted for swimming than for walking. Neither can it fly very well, on account of the shortness of its wings. So that it seldom leaves the water. It lives in shallow pools and meres, and makes its nest among the reeds and flags.

The mother bird is very good to her young. She feeds them on small eels that she picks out of the mud. And when her little ones are tired, she will carry them on her back to the nest again.

The old birds live on fish, and are constantly diving to get it. They are seldom seen on land, and they are so shy that it is not very easy to shoot them.

People hunt them for the soft silvery plumage of the breast. It is as firm and as glossy as satin, and this is the part used for the muffs and tippetts.



THE CRESTED GREBE.

The most beautiful grebe of all is found in Siberia, and has a tuft of orange-coloured feathers springing from the side of each of its eyes.

There is a pretty story about a grebe.

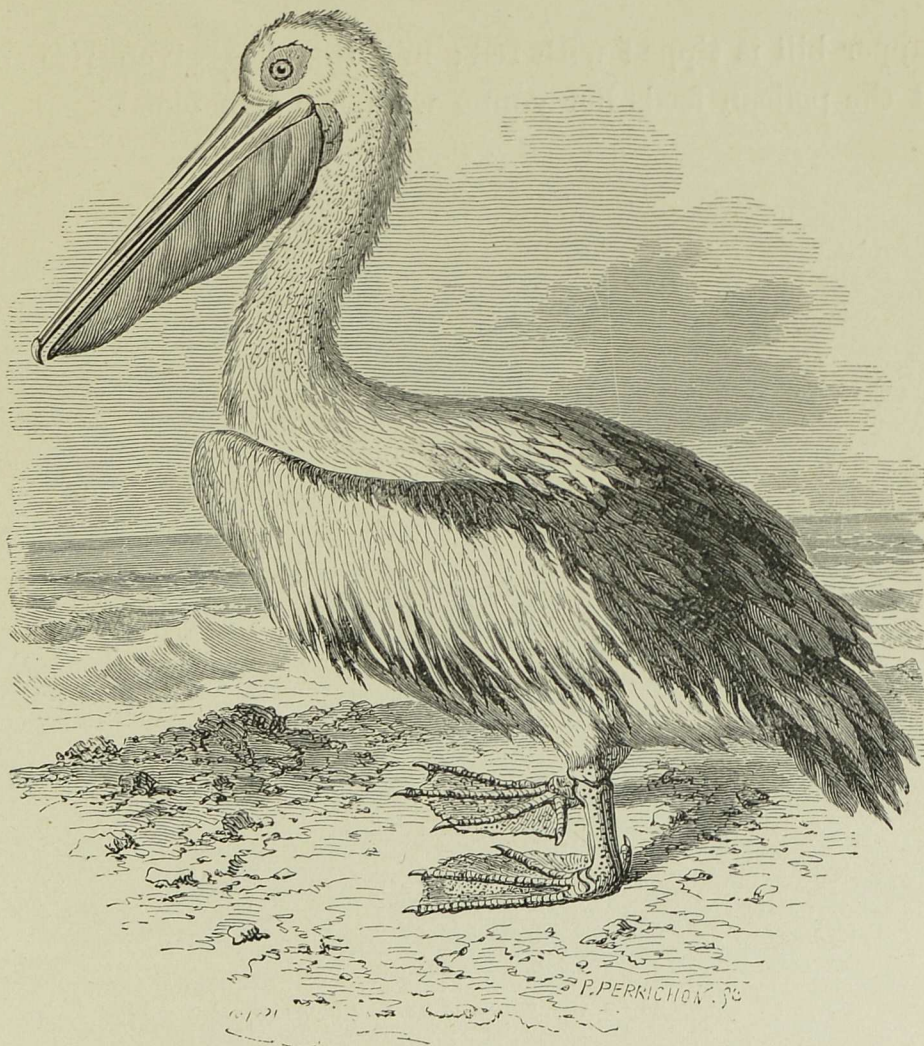
She makes her nest of twisted stems and plants. It is lighter than the water, and can float.

Here the grebe lays her eggs and rears her young. She uses one of her webbed feet as a paddle, and paddles her nest about on the pool or stream.

If anything alarms her, she will use her oar, and push her nest along, to get out of the way.

A great many floating plants get entangled round the nest, and drift about with it.

So that the nest and the weeds look like a little island.



THE PELICAN.

Do you see the curious pouch of the pelican ?

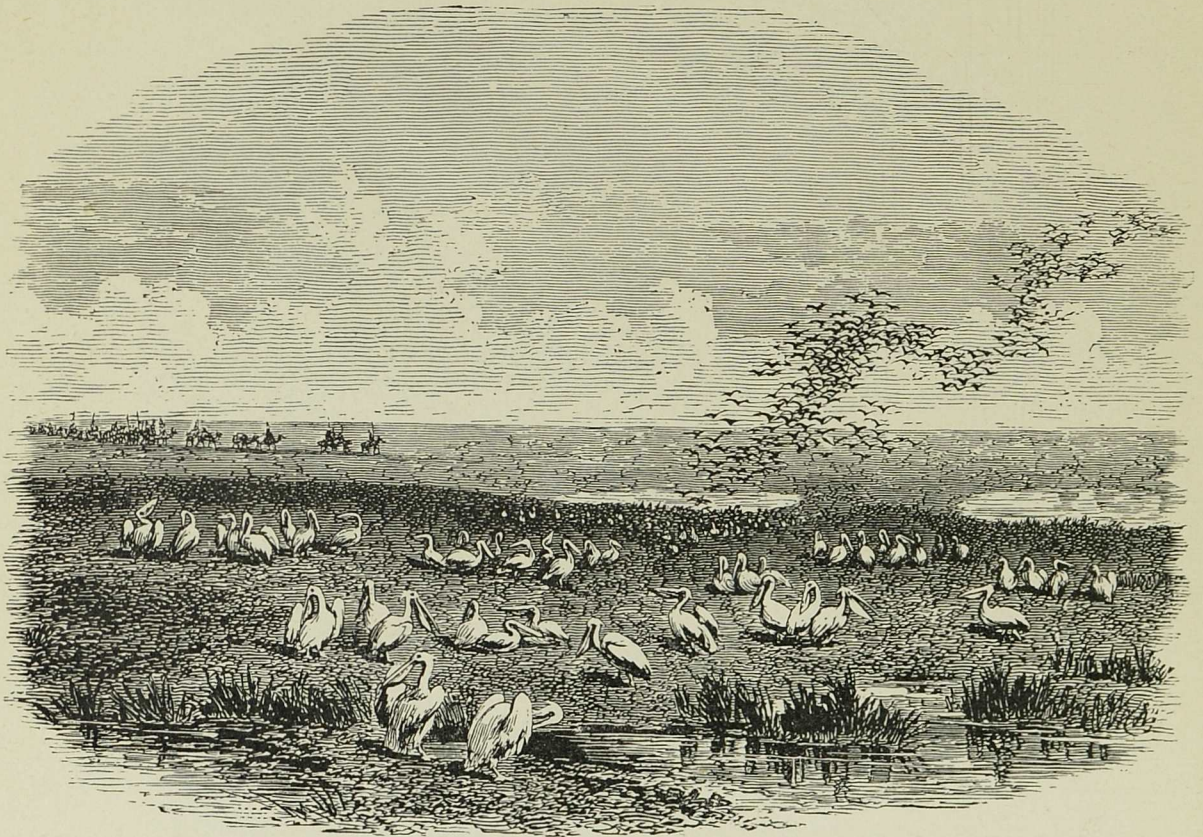
It is as elastic as can be, and stretches out like an india-rubber bag. It will hold a great many fish. When the pelican is fishing, nothing can be more convenient than this great pouch. The bird can carry away quite a

store of food to give to its young, or to devour at leisure. When the pouch is empty, it can be wrinkled up, and takes very little room.

The pouch is lined with a short downy substance, as soft as satin.

When the mother bird gets home, and wants to feed her nestlings, she begins to empty her pouch, by pressing her upper bill against her neck and breast.

The upper bill is tipped with red; and this has given rise to the silly story that the pelican feeds her young with her own blood.



PELICANS ON THE BORDERS OF THE CASPIAN SEA.

The pelicans are good swimmers, but they do not venture into the open sea. They live in flocks along the sea-coasts of both the Old World and the New.

Sometimes they rise into the air, as the gannet does, and pounce headlong on their prey.

As they pounce down, they strike the wave with their wings, and make such a splash that the fish is too much bewildered to escape.

But the pelicans can catch their prey in another manner.

They form themselves into a circle on the water, and keep driving the fish into the middle. By degrees, they drive them into such a small space that every one is devoured.



PELICANS FISHING IN A CIRCLE.

They first fill their pouches. Then they eat as much as they can, and retire to digest the meal.

The fish will keep good a long time in the pouch of the pelican.

The Chinese, who are very ingenious, turn this to account.

They tame the pelican, and make it catch fish for them.

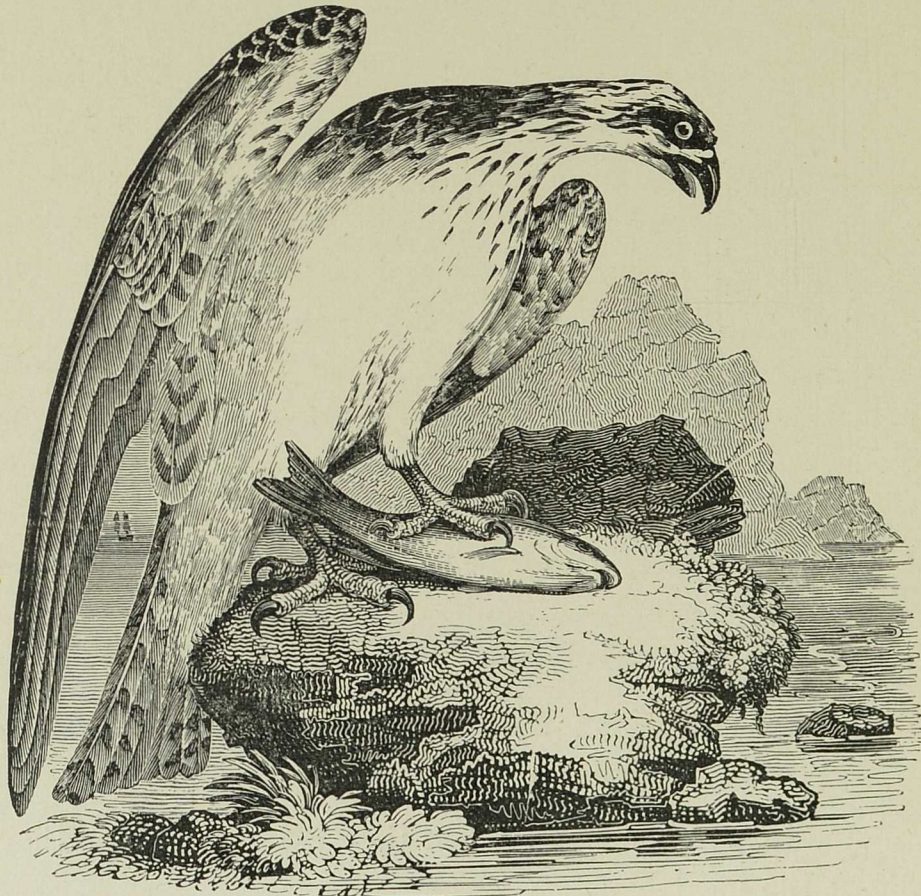
One pouch full of fish is enough for half-a-dozen persons.

## THE EAGLE OF THE SEA.

THERE is a fierce bird of prey called the fish-hawk.

His proper name is the osprey.

He is always hovering about to see what fish he can get.



THE OSPREY.

He pounces on the fish, as the rest of the sea-birds do.

First he wheels round, then he poises himself in the air, and then he drops, swift as an arrow.

In a few seconds he appears again, the water dripping from his plumage. He carries a fish in his mouth, which is still alive and struggling.

But none of these birds seem sure of their prey, even when they have snatched it from the waves.

It often happens that the great sea-eagle is close at hand.

The eagle loves the lonely shore, and the steep, wild rocks. He has been perched on some tree or crag, watching to see what the fish-hawk was about.

Now the time has come for action.

He stretches his wings, bends his white head, and swoops like a thunder-bolt on the fish-hawk.

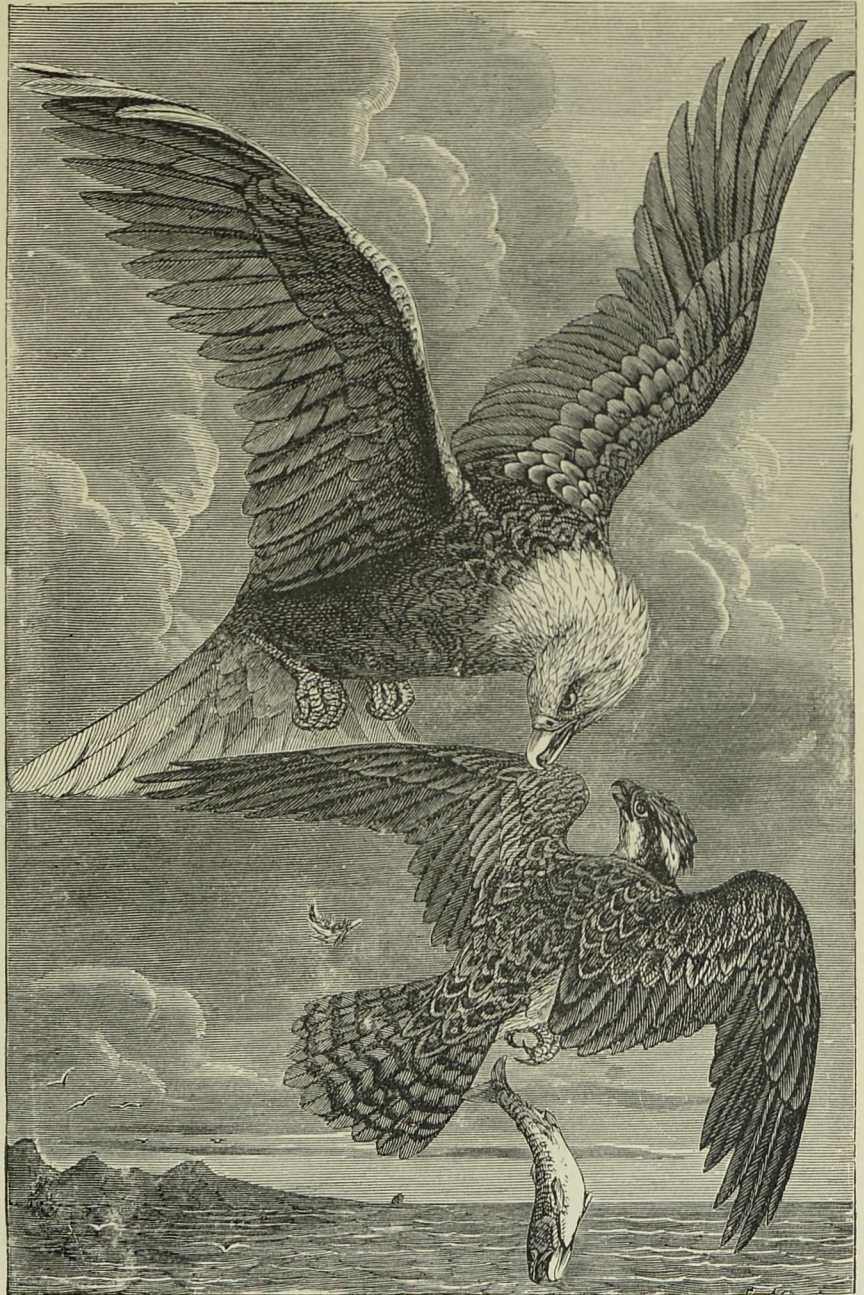
The fish-hawk, in his fright, drops his prey, which is snatched up in a moment, and carried off by the eagle.

The sea-eagle lives chiefly on fish, and has his nest by the sea. He drops with such

violence on his prey that the Italians compare it to the falling of a piece of lead. They call him the leaden eagle.

The sea-eagle is dreaded very much by the people who live near the coast.

He will carry off lambs from the flock, and all the smaller animals he can get ; and he will even attack the cattle.



THE EAGLE AND THE FISH-HAWK.

No one who has not seen the manner of attack would believe it possible.

First, the eagle dashes into the sea and wets his plumage; next, he rolls himself on the beach until he is covered with sand.

After that, he rises up into the air and hovers over an unfortunate ox. The ox goes on quietly feeding, until, all at once, a shower of sand comes into its eyes.

The eagle has flung the sand, and now he begins to clap his wings and fling more sand, and startle and terrify the poor ox as much as he can.

He even strikes it with blows from his great strong pinions.

The ox is half-blinded, and so frightened that it almost loses its senses. It runs headlong hither and thither, until at length it either drops down from fatigue, or rushes over the cliff.

Now and then the eagle meets with his match.

He comes swooping down upon the dolphin.

The dolphin is a sea animal, a little like a whale, only not so large. It will be, however, the destruction of the eagle.

The claws of the eagle are entangled in the skin of the dolphin. He cannot get them free, and as the dolphin dives to the bottom of the sea, it carries the eagle with it, and he is drowned.

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## PLANTS THAT LIVE IN THE SEA.

THE sea is full of plants, that float about in the water, or else are attached to some rock at the bottom of the ocean.

These plants are called sea-weeds.

For a long time, nobody cared about the sea-weeds, or took the trouble to examine them.

But now, they are as carefully studied as the plants that grow on the land.

Many of the sea-weeds are very beautiful indeed.



They make gardens at the bottom of the ocean. Their colours are red, and green, and yellow, and purple.

All manner of living creatures dart about among them. The scene is as varied and as gay as if it were on land.

Indeed, it is almost like fairy-land.

When night comes, millions of tiny creatures shine and sparkle like the glow-worm or the fire-fly. The depth of the ocean is full of beauty by night and by day.

Should you like to know something about the sea-weeds?

They are quite different from land plants, though they have leaves and a root.

The root holds the sea-weed to its place on the rock. But it does not suck up the moisture as the root of the land plant does.

There are no little cells in the leaf of the sea-weed to carry the moisture all over it.

It must be plunged entirely in water, if it is wanted to live.

Its leaves are called fronds, and they are of a substance different from the green leaf of the plant that grows on land.

Sometimes they are hard and horny, and sometimes they bend about as if they were made of india-rubber.

The fronds of some sea-weeds have little bladders or air-vessels on them. These help to float the plant in the water.

The sea-weeds belong to an order of plants called *Cryptogamia*. Their mode of flowering is unknown.

A number of tiny spores or globules are inclosed in a case or capsule. They are so small that you could not see them without a microscope.

But small as they are, they are supposed to be of two kinds, and to answer to the pistil and anther of a flower.

The tiny spores come out of the case or capsule in which they are shut up, and drop into the water.

A number of hairs, or cilia, help them to whirl round and round.

The whirling does not last long.

By-and-by they give over moving, and begin to sink.

They soon fix themselves to a rock or some convenient place. Tiny rootlets shoot from the spore, and hold it fast.

After that it begins to grow, and becomes a sea-weed.

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### THE SEA-WEED THAT IS USED FOR FOOD.

THERE is a sea-weed of a beautiful crimson colour, and that grows in the shape of a hand.

It is called dulse.

If you lived in Scotland, you would hear it cried about in the streets, as water-cresses are with us. People buy dulse and eat it. They say it has a taste of oysters.

The Icelfander has not many dainties in his barren country. But he is very fond of dulse, and has a nice dish made of it.

The dulse is washed and allowed to dry. Then a white powder comes out all over it.

The powder is packed in casks like flour, and is eaten with fish and butter.

Or else it is boiled in milk, and mixed with rye flour.

Cows and sheep are very fond of dulse. When they are kept in pastures near the sea, they will go roaming in search of it.

A sheep will go so far on the beach when the tide is out, and stay so long hunting for dulse, that it cannot get home in time. The tide will come in and wash the poor sheep away.

The sea-weed is often called sheeps' dulse on this account.

The peasants in Ireland make a dainty dish of a sea-weed.

They call it Irish moss; but it grows all round the coasts of England, Scotland, and Ireland. Its frond is cut up into branches that curl like a frill.

People boil it, and then strain off the water.

They boil the water over again, and put into it milk, and sugar, and spice.

When it is done, they pour it into a shape; and as it cools it gets hard like *blanc-mange*. It is thought to be very strengthening for people who are delicate.

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## SODA FROM THE SEA.

WE have seen what a vast amount of matter the molluscs draw out of the sea-water to make their shells.

Now we shall see that the sea-weed can also draw useful material from the sea, and treasure it up in its fronds.

There is a substance which is used in the manufacture of glass, and also of soap. It is called kelp.

Kelp is obtained from a sea-weed.

There was a time when kelp was very valuable indeed. From the coasts of Scotland twenty thousand tons used to be gathered every year, and each ton was worth ten or even twenty pounds.

In the autumn, when the rough winds begin to blow, the sea-weeds are thrown up by the waves, and lie in heaps upon the beach.

Then, in the palmy days of the kelp manufacture, people used to be very busy indeed.

They hurried to the beach to collect the sea-weeds which lay there.

The farmers used some of the weeds to scatter on their fields for manure. But by far the greater part was burned in the kelp-kiln.

The kelp-kiln is a pit dug in the sand, and a few stones put round it.

The sea-weed is first allowed to get dry, and then it is thrown into the pit and set on fire.

After a time, the pit becomes full of a melted substance, which is well raked together, so that it forms one compact mass. When it is cool enough it is taken out, and is really the substance called kelp.

It can be broken to pieces, and sent to market.

What makes the kelp so valuable?

The alkali, or common soda, it contains; and that we use for washing and other cleansing purposes.

It has been found out that soda can be obtained from common salt.

This is done in manufactories in different parts of England, and in other countries.

A great many processes are gone through, by means of fire and of various acids.

The salt is made to lose its saltiness and become soda.

This discovery was made in France.

The price of soda rose so very high in the time of Napoleon, when England and France were at war, that it could scarcely be procured.

The soda manufactories depended a great deal on our sea-weeds for kelp. But when soda began to be made from salt, kelp was not so much wanted. Its price went down in the market.

And the Highlander did not find his kelp harvest so profitable.

I might just say, that the sea-weeds torn up from the deepest part of the sea, and thrown upon the Irish coasts, yield the most soda.

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## MEDICINE THAT COMES FROM THE SEA.

THE fresh sea breeze brings health to the sick and strength to the weak.

But this is not the medicine I mean.

The medicine I mean is called iodine.

There are a great many complaints that iodine will cure.

The worst of all is the goitre.

When a person has a goitre, his neck will swell in a very terrible manner.

In Switzerland, among the great mountains, there are some wretched villages. Almost every man, woman, and child in the village will have the goitre.

In our own country, among the hills of Derbyshire, people suffer from this complaint.

If the iodine cannot always cure the goitre, it will do a great deal of good.

In South America little sticks, called goitre sticks, were sold in the shops. People used to chew them.

That was a long time ago, before anything was known about iodine.

The sticks were nothing but the stems of a sea-weed. And the reason they did good was because they had iodine in them.

What is the name of the sea-weed?

It is called the tangle.

I dare say you have seen it. It has a long ribbon-like frond slit up into a kind of fringe.

It grows in deep water, but it is often cast on shore by the tide.

When a heap of sea-weed lies on the beach, there is more tangle than anything else.

The Scotch people eat the young leaves and stalks when they have been well boiled.

So the tangle is a very useful sea-weed indeed.

But the most valuable part of it is the store of iodine which it yields.

Its great woody stems are collected and made into a heap. Then people set fire to them. They are reduced to ashes, and a blue vapour rises from them.

This is iodine.

The chemist knows how to condense it, and make it pass from a vapour to a real body. The doctors use it for a medicine.

There is another use for the iodine.

People who take likenesses by means of the sun want the vapour of iodine to use in the process.

We call them, as you know, *cartes des visites*.

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## THE WEED THAT LOOKED LIKE A SERPENT.

ONCE upon a time people were very fond of talking about the great sea-serpent.

Now and then, the sailors would declare that they had seen it, and

would give wonderful accounts of what it was like. They would talk of its great head, and the mane which hung from its neck, and the wonderful length of its body, as it lay upon the waves.

But nobody ever came near enough to catch it;—and few people believe that there is a sea-serpent at all.

I am going to tell you a little story about the sea-serpent.

One day a vessel was sailing along the ocean. It was calm weather, and the captain was looking out on the waves. All at once, he felt sure he saw the wonderful sea-serpent.

Its vast body kept moving up and down on the waves, and looked yards on yards in length.

Its huge head was clearly to be seen, and the lion's mane, that people had talked so much about, covered its neck.

It was a strange-looking creature, to be sure, and in a few minutes all the people on board were looking at it.

Yes, it must be the sea-serpent; there was no doubt about it.

The captain was resolved to make sure of the monster, and not to let it slip as other captains had done.

He sent a party of his men in a boat, with a piece of rope to tie to it, and some guns to shoot it if it should resist.

Did the sailors catch the sea-serpent?

They rowed on, and on, and at last came close up to its head.

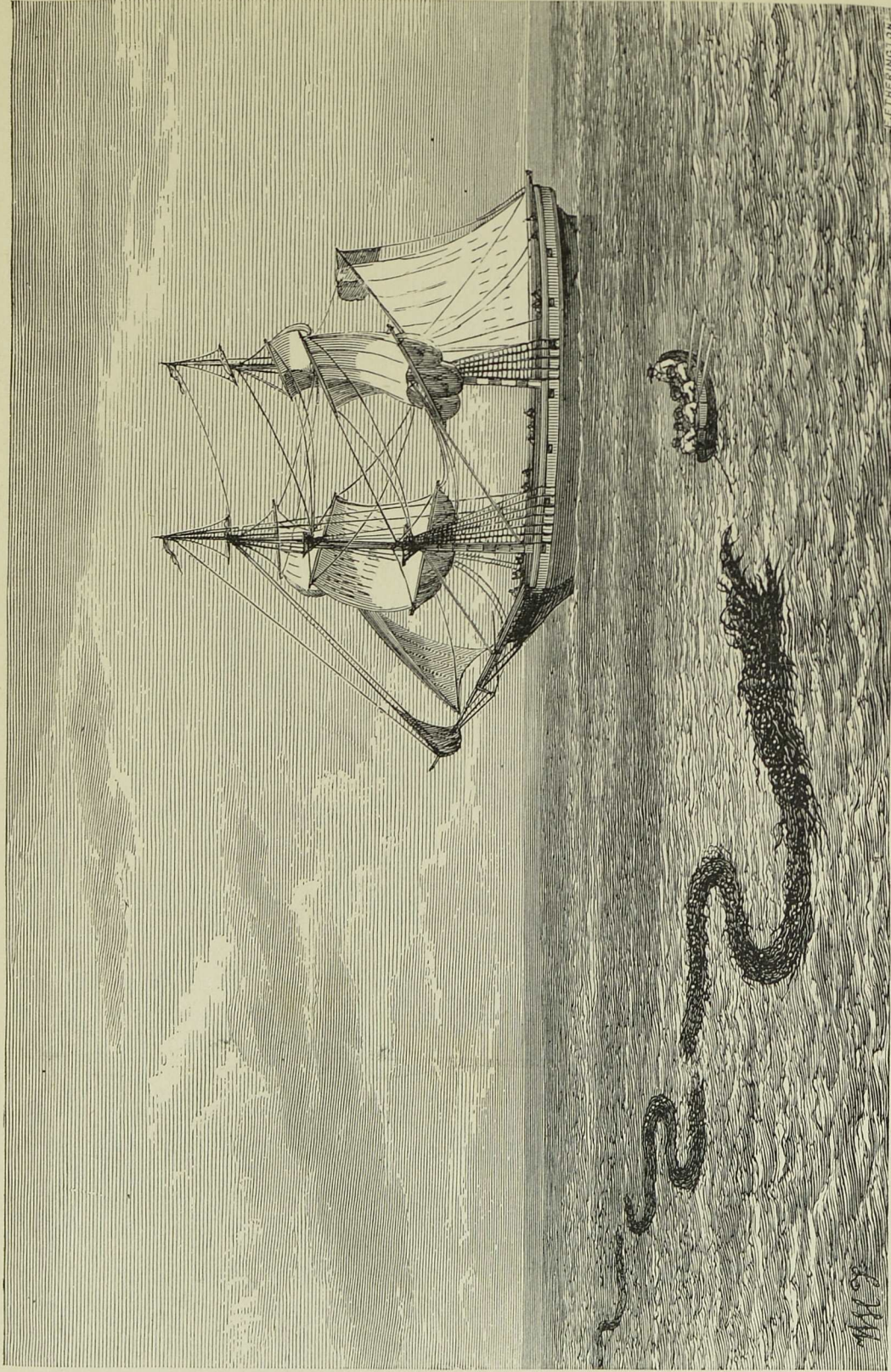
There was the huge monster, bobbing up and down on the waves.

The people in the ship were all the time watching. They saw the sailors unroll the rope, and begin to fasten it to the creature's head. Then the boat set off back again, dragging the wonderful sea-serpent after it.

In the picture you see the boat returning to the ship with the creature behind it.

It was so covered with shells and other marine animals, that at first it was no easy matter to make out what it was.

But, after a time, the captain discovered that it was nothing more than a monstrous piece of sea-weed, a hundred feet long, and four feet in width!



MONSTROUS SEA-WEED





Its root was the head ; and as it moved up and down on the waves it looked as much like a serpent as could be.

Did the captain bring it home to England ?

He tried to do so ; but it had such a disagreeable smell that he was obliged to throw it overboard.

Then it began to look like a serpent again, and to bob up and down just as it had done before.

The captain of another vessel saw it ; and he sent word home that he had really and truly seen the great sea-serpent !

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## ANIMAL HEAT.

PEOPLE speak of animal heat, or caloric.

If you touch your body, you will feel how warm it is.

Now, touch the body of a lizard or a snake, and you shudder a little. For the body of the creature is cold.

It would make the thermometer go down instead of up.

All the warmth the reptile has comes from without.

How the snake and the lizard love to bask in the sun ! No matter how fierce his rays. The hotter the better.

Have you ever seen a snake in its cage at the Zoological Gardens ?

How sluggish, and sleepy, and dull it was !

It can hardly live in our climate though it is wrapped up in a blanket. It has so little heat in its body, and there is no fierce tropical sun to supply the need.

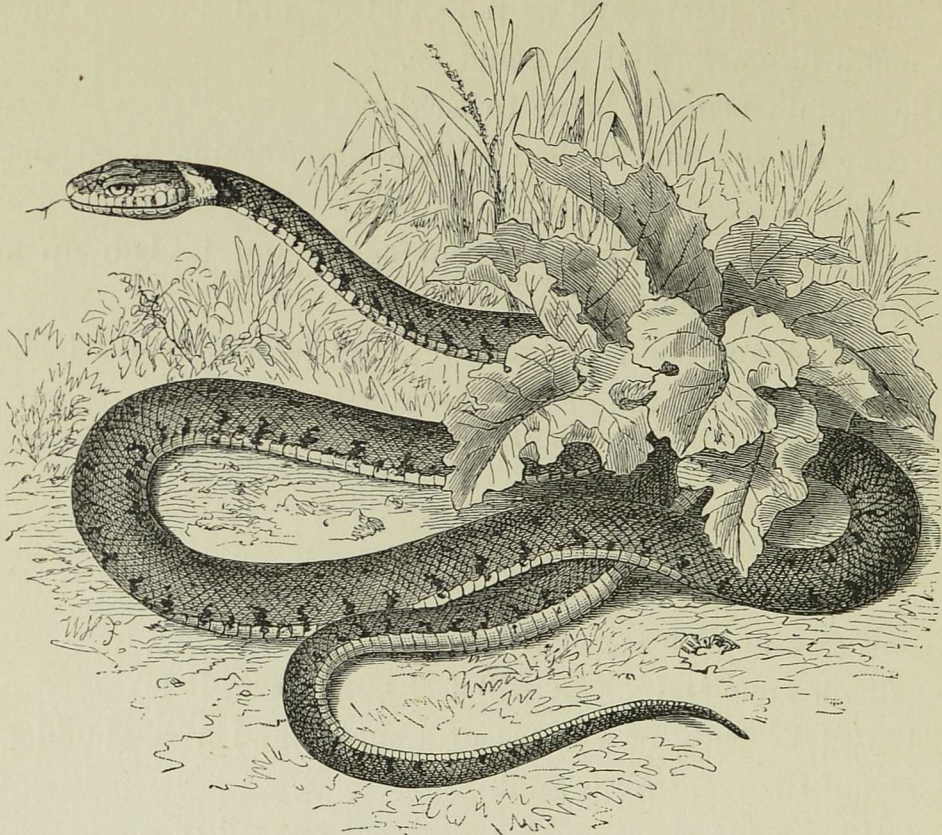
Why has it so little heat ?

Because its blood has so little oxygen. There is a very feeble combustion going on.

It is the difference between a few smouldering ashes and a brisk fire.

When we come to examine the breathing machine of the reptile, we shall know a little more about it.

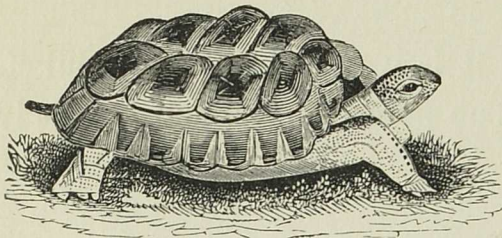
I have only one more thing to tell you at present.



SNAKE.

Nature has made up, in some degree, to the cold-blooded creature for its want of heat.

Life, though it smoulders, lasts a very long time. It does not burn out quickly, as in the case of the animal and the bird.



TORTOISE.

The reptile can live more years than you would believe it possible.

It has even been said that a crocodile cannot die except by a violent death.

And a tortoise can do without food for months and months, and yet be alive.



## CREATURES CALLED REPTILES.

THERE are some parts of the world in which neither birds, nor fishes, nor animals can very well live. Such places, for instance, as the muddy banks of rivers, or tracts of country which are sometimes under water, and then parched up with drought.

Nature does not seem willing to leave these parts of her domain without inhabitants. She has formed a tribe of creatures to live in them—creatures that can exist both in the water and on the land.

We should have had little to do with this extraordinary family if some of them did not live in the sea.

They are called reptiles.

Now the reptile is very strangely made as regards his air food. For we must come again to our old friend oxygen.

Some of the reptiles can breathe in the water and on the land. In fact, they have two breathing machines. They have lungs for the land, and gills for the water.

What a quantity of oxygen they must take in!

Oh, no; far from it. The blood of the reptile has very little oxygen in it; and that makes some of his tribe so sluggish and so slow.

Can anything be more sluggish than a toad!

Toads are reptiles. And a toad has been found shut up in a stone, or in the trunk of a tree.

How long it had been there I am afraid to say.

The lungs of a reptile are not finished off with such care as yours and



TOAD.

mine are. They have large, coarse cells, into which the blood rushes to get a taste of oxygen.

But it does not get half such a taste as in the number of delicate cells that are found in our lungs.

And the lungs of the reptile float loosely, like a bag, and contract and expand in a very imperfect manner.

I will tell you another reason why the lungs work so feebly.

The fault is in the heart.

Your heart and mine have two chambers, so that the two kinds of blood

do not come together. I mean the bright red blood that is full of oxygen, and the dark blood that has none.

But the heart of the reptile has no such division. As in a common room, used by both, the two kinds of blood rush together, and get mixed.

So the blood has not the same vigour; it is only half supplied with oxygen. It cannot go bounding along as ours does.

If it does bound forward for an instant, it soon stops to recover itself.

The quickest pace of the reptile is a series of jerks.

There is a creature which was a great puzzle to naturalists.

They could not decide whether it was a fish or a reptile. It is midway between the two.

It looks like a fish, for it has a long scaly body, that tapers to a point. And it has four little feet or fins, whichever you may like to call them, growing from its body. Two of the fins are in front, and two behind.

It has gills, with a covering to them, just like the fishes; but it has lungs as well. As it grows up, the gills disappear.

It lives so much on land, that Nature seems to think it can do without them. And as the lungs get stronger, they are left to do all the work.

It is called the lepto-siren. It has some other names, but they are so hard and long that I am sure you would not remember them.

It was found in the River Amazon; also in the River Gambia, in Africa.

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## THE GREAT FISH-LIZARD.

AGES and ages ago, the lily stars waved their rosy-coloured arms, and the ammonites lived in the waters.

Creatures that are now extinct, had their home in the ocean.

They were very monstrous creatures indeed.

Perhaps you may have heard of the fish-lizard. Its skeleton, or at least some of its bones, are often to be seen amongst the fossils in a museum.

It is called fish-lizard, because it was like both a fish and a lizard.

Its other name is a very long one; but I must tell it you. It means exactly the same thing, "fish and lizard." It is ichthyosaurus.

It had a huge head, with a pair of enormous eyes as big as a man's head. Its jaws opened so wide, I am afraid to tell you. And it had sharp strong teeth, like those of the crocodile.

Its body was much longer than the crocodile's, and a little like it. For the crocodile is nothing but a great lizard.

The fish-lizard had a strong tail, and it could swim in the water with its fins.

Its fins, or paddles, if you choose to call them so, were a little like those of a whale.

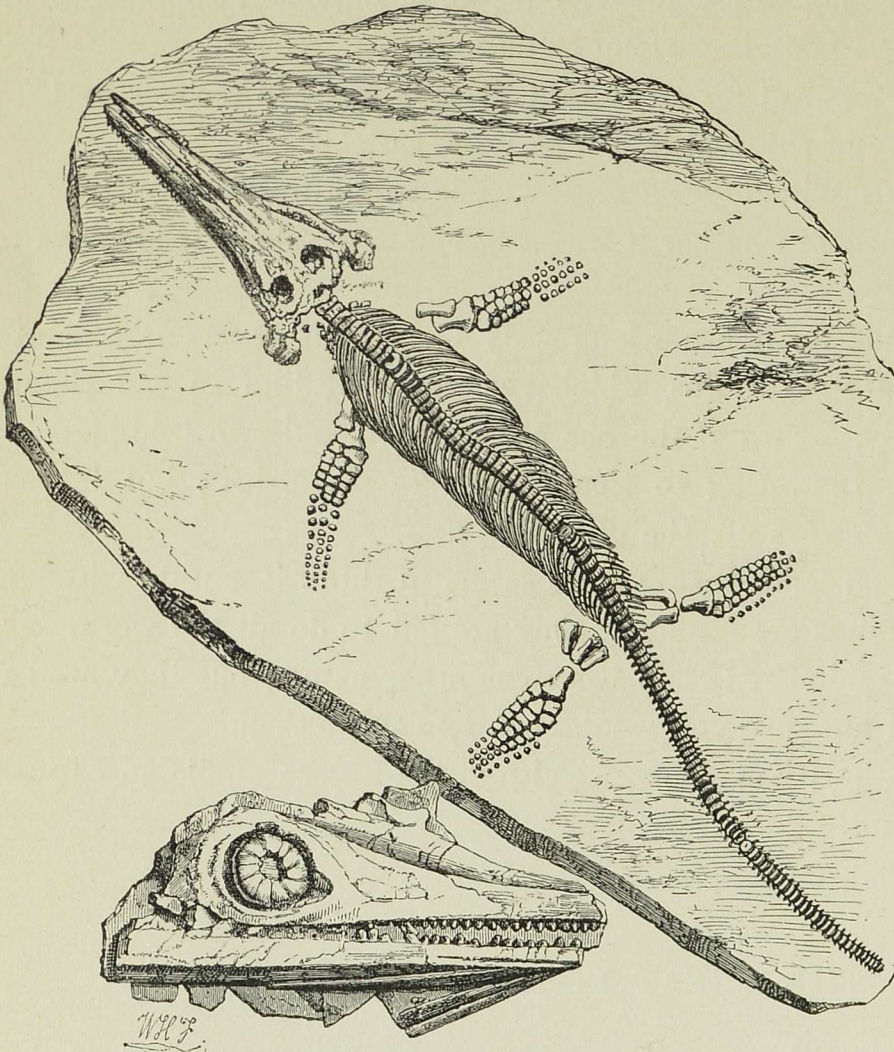
But it was not obliged to keep always in the sea.

It could use its fins for feet, and crawl about on the rocks or the shore.

That is, when it was obliged. It was not much at home on the land.

The fish-lizard lived so long ago, that we cannot know much of its habits.

But we do know just a little.



THE ICHTHYOSAURUS.

It had a good appetite, and used to devour the molluscs that lived in the sea. And it would not spare its own relations if it was hungry.

One fish-lizard would think nothing of devouring another. And it would lie in wait for a creature as big as itself.

I mean the plesiosaurus.

This was a fish-lizard as well.

But it was a gentle creature compared with the other, and had not such a huge head.

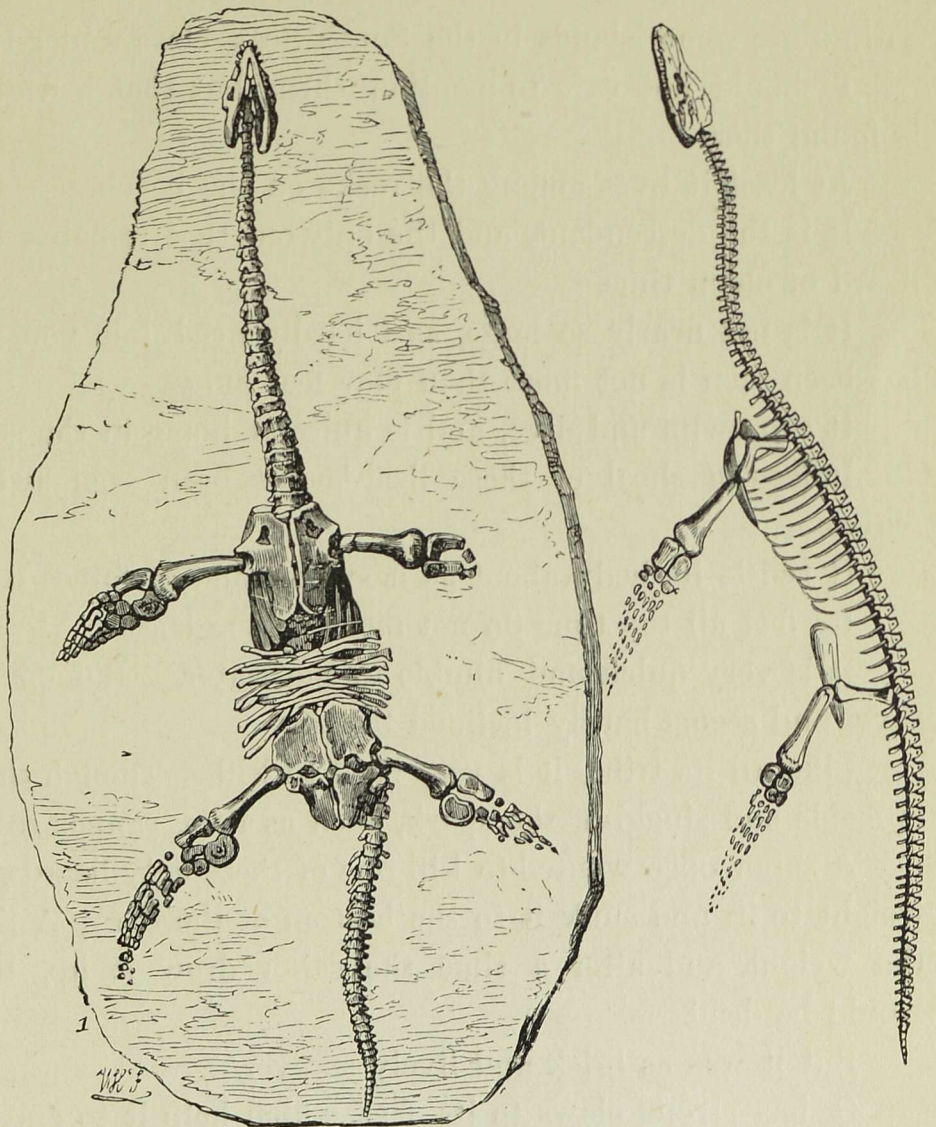
Its neck was very long indeed.

It used to hide itself near the bank, and keep out of the way of its enemy.

How can we be sure that such monsters existed ?

Because their bones have been found embedded in the crust of the earth.

And learned men have been able to tell us, from these very bones a little about their history.



THE PLESIOSAURUS.

## THE LIZARD.

THERE are some islands in the South Seas, close under the Equator.

I should not care to mention them, but that a frightful-looking lizard is found there.

At least it lives among the rocks on the beach.

It is the descendant, and the only one that remains, of the mighty fish-lizard of olden time.

It is not nearly so large, as I hardly need tell you. The largest that has been seen is not more than four feet long.

It can swim and dive, and is quite at home in the sea.

Indeed, a shoal of these lizards has been seen swimming out on the waves.

It twists its body about as it swims, and so forces itself along.

Its feet all the time do not move in the least.

It is very quick and nimble in the water. But on land it is dull and slow, and seems hardly inclined to stir.

Like all its tribe, it is very hard to kill. Though the life of the reptile is feeble and sluggish, the spark, such as it is, cannot easily be put out.

A sailor once wanted to kill one of these ugly lizards. He tied a heavy weight to it, and sunk it to the bottom of the sea. A line was fastened to the weight, and after a time the sailor drew it up, thinking the lizard would be dead.

But it was as brisk and lively as ever.

It has strong claws to its feet, which help it to crawl over the rugged heaps of stones and lava on the coast.

For the islands are volcanic; that is, they have been pushed up from the ocean by the action of fire.

On the wild and rocky shore, a group of these hideous black lizards may be seen, basking in the sun.

They eat sea-weed, though one captain of a ship, who saw them swimming in the water, declares they devour fish, and go out to catch it.



Naturalists dispute this fact. I mean the fact of eating the fish. At any rate, the stomach of the creature has been found to be filled with a sea-weed that grows near the coast.

And who shall decide when doctors disagree?

There is one very curious thing about the lizard.

It can swim like a fish, and seems, as I told you, quite at home in the water.

But still it cannot always be made to go into the sea. And, oddly enough, it likes the land the best.

A naturalist who was watching it to find out its habits, says that he did all he could to force it into the water.

He drove it to a sharp point of the rock, where it could get neither forwards nor backwards.

He thought, of course, it would jump off into the sea, and swim away in safety.

And the lizard was very much alarmed, and in great straits. But still it would not seek refuge in the water. It would rather be caught.

And the same naturalist threw it again and again into a pool left by the tide on the shore. It could swim in this pool as well as possible. But it would not stay there. It crawled out as soon as it could, and began to make its way among the rocks.

Some people think it is afraid of the sharks, and that it fancies the land is the safest place.

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## T H E T U R T L E .

THERE is a creature whose soft body would be the prey of almost every inhabitant of the sea.

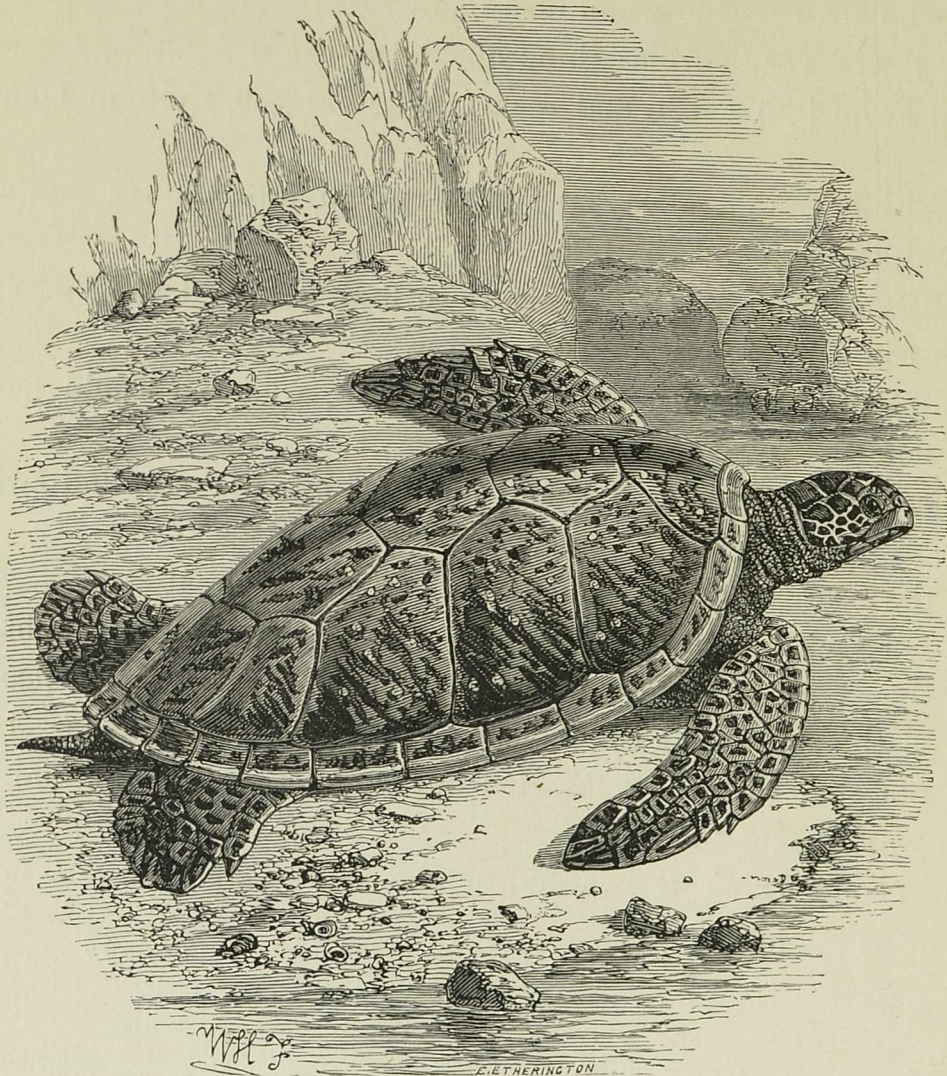
It is helpless in itself, and without any means of protection.

Nature has therefore given it a thick, strong shield, which screens and defends it from its enemies.

Except, indeed, its greatest enemy, man.

Man has, long ago, found out that the flesh of some kinds of turtles is very nice indeed.

And the sailor, who is tired of his salt beef and ship's diet, is glad



THE TURTLE.

when he lands at a coast where turtles are likely to come ashore to lay their eggs.

For this is the only time he has any chance of catching them.

The turtle lives in the sea.

And it likes the warm seas of the Tropics, and keeps there when it can.

Now and then, very rough gales will drive it away from its home, and keep chasing it on, and on, till it gets hundreds of miles away.

A turtle was once washed on shore in our own county of Cornwall. It was a monstrous creature, six feet long.

I must tell you a little about that great heavy shield, that the turtle carries on its back.

The back-bone, the ribs, and the breast-bone of the turtle, are all compactly joined together. They make a complete covering of bone. A harness, if you like to call it so.

A skin goes all over the harness ; and on the skin are great scales or shining plates.

In some species of turtle the shell or covering is used for ornamental work. It is called tortoise-shell.

Indeed, the Romans were so fond of tortoise-shell, that they used it to inlay their doors, and to ornament their houses.

They did not care to eat the flesh of the turtle, as we do.

Now, what is found inside this covering or harness ?

The soft parts of the animal. Its muscles and its flesh.

Its head, and its tail, and its feet can be seen. For it puts out its head to look about.

There is a land tortoise that can draw head, and feet, and tail, under its shield, so that nothing can be seen.

And if it is frightened, it will keep them hidden almost any length of time. At least till its enemy is tired of waiting.

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## ENEMIES OF THE TURTLE.

How does the turtle manage to breathe under the shell ?

I will tell you.

Breathing goes on very slowly in the turtle. It does not need to breathe so often as we do.

It gulps down air through its mouth, and so by degrees fills its lungs.

Its lungs, as I told you before, have large, coarse cells to them, and they do not fill with air very easily. And its blood gets mixed, if you remember, so that the current is slow and not brisk. And there is no heat

in its body. So that life does not go on very fast, and requires less supply of air food.

The life of the turtle is more like a dream or a sleep, compared to that of a bird, or a warm-blooded animal.

The most active period of its existence is when it wants to lay its eggs.

Then it must come on shore, and find a bed of soft, loose sand in which to lay them.

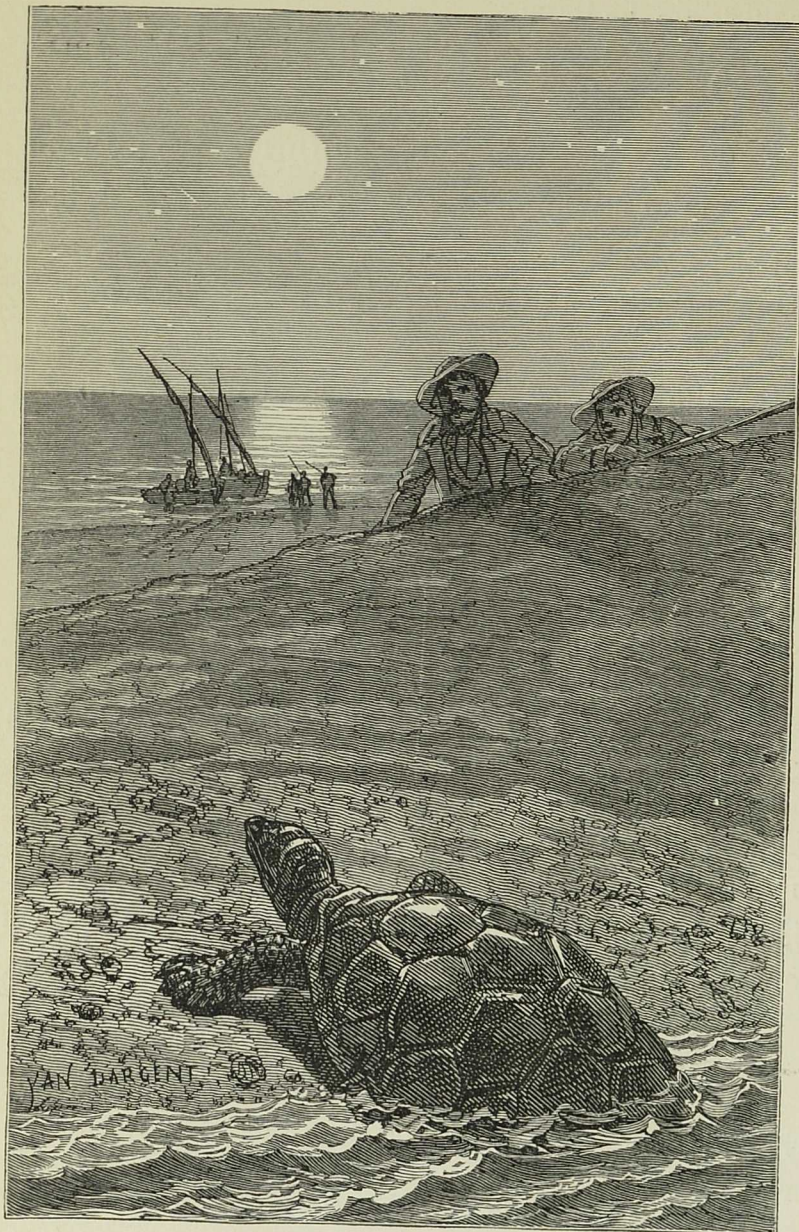
Now, this is just the time when some sailors or turtle-hunters, or perhaps both, are sure to be on the watch.

A ship has touched at that very coast on purpose to carry away the turtles.

But man is not the only enemy on the watch.

The wild dog, and even the tiger, often attack the poor turtle.

If it can be turned on its back, it falls an easy prey. And the dogs will all push together in order to turn it over.



TURTLE COMING TO LAY HER EGGS.

Now and then, however, a turtle escapes and gets back to the sea. For it is soon alarmed, and the slightest sound will cause it to hurry off as fast as it can.

The men who are watching never make the least noise. They hide themselves behind a rock or stone, and wait patiently, till they see some dark objects crawling slowly along.

These are the turtles. It will often take four men to turn a turtle on its back.

Then the poor creature cannot help itself in the least.

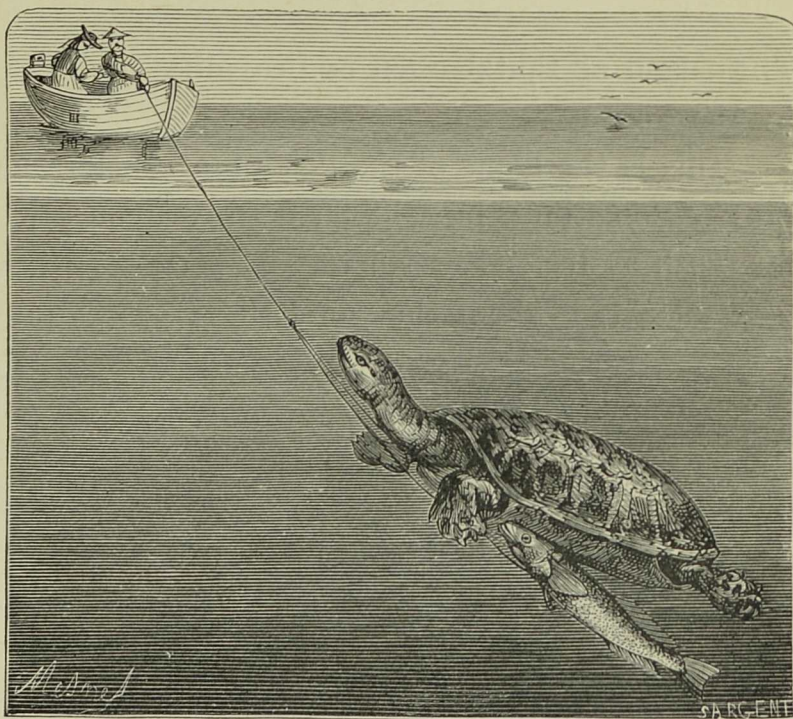
The little turtles, when they come out of the egg, have a great many enemies.

The sea-birds stoop down upon them, and the wild beasts devour them without mercy. And when they get into the sea, there are sharks and other fierce fishes waiting for them.

Happily, the turtle lays several hundreds of eggs in the course of the summer. Or else turtle soup would not be so easy to procure as it is.

I told you that the sucking-fish was sometimes used to catch the turtle.

The men in the boat have let it down by a rope. It has fixed itself on the under side of the turtle, and the hunter is drawing them both up together.



TURTLE-HUNTING.

## THE POLAR BEAR.

THE island of Spitzbergen is, in reality, a cluster of islands joined together by the solid ice.

This is the home of the Polar bear. Here he prowls about in search of prey. Sometimes he will float away upon a block of ice, until he gets as far south as Iceland or Norway.

But this is about the worst thing he can do.



SAILORS ATTACKED BY POLAR BEARS.

People have no liking for bears as visitors. They no sooner hear that one has landed, than they hurry down to the beach with sticks, and all sorts of weapons, and kill him.

He had better have kept at home, in the far north.

The bear can live on the sea, as well as on the land. He can swim like a fish, and dive, and paddle about, and be quite at his ease.

His feet are half-webbed—that is, the toes are partly joined together. And this makes him able to swim so well.

On land, he can run very fast indeed. The soles of his feet have a lining, if I may call it so, of soft fleece, so that he can tread firmly on the ice, and is never in danger of slipping.

He raises himself on his hind legs, and runs along, looking very formidable indeed.

It is not always possible to see the bear until you are close to him.

He has a soft and beautiful coat of yellowish white fur. It is very much like the ice, and can hardly be distinguished from it.

The bear's coat is rather in his favour when he wants to catch his prey. And he is very cunning. He steals along on the ice without making a sound. Or he will lie coiled up, his sharp eyes open, though he pretends to be asleep.



HUNTER AND BEAR.

He will watch and wait for hours, till he finds a chance of springing on his victim.

There are several animals that serve him for food

The pretty blue foxes come in the summer, and so do the reindeer. And there are seals and walruses in the water, and plenty of fishes.

So the bear gets enough to eat, for one part of the year at least.

When a man is taken by surprise, and finds himself at the mercy of the bear, it is not easy to escape.

The man in the picture is a hunter. You see he has his weapons with him. He is lying on the ground, as if he were dead. But, in reality, he is trying to deceive the bear.

The bear will take it for granted that his prey is dead, and he will snuff about him in a very leisurely manner.

The hunter is all the time on the watch, and presently, when he sees the bear in a favourable position, he will jump up, and run his weapon through him.

This is the only chance the hunter has for his life. And very likely he has practised the same trick before.

The sailors call the bear the "Man in the White Cloak."

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## THE BEAR AND HER CUBS.

I HAVE a little more to tell you about the bear.

He roams about all the winter on the ice. But this kind of life would not suit his partner, the mother bear

She has her little cubs to bring up, and there must be some kind of shelter found for them.

All round is ice and snow. Where, then, can she find a shelter?

She makes one herself; for Instinct, as we have seen all along, is a wonderful guide.

She goes to some rock, and scoops out a hole in the snow, close by the side of the rock; here the little cubs are born.

It is just large enough to hold her and the cubs. The snow falling from above makes a kind of roof. And as she breathes, the warmth of



her breath keeps a little thawed space in the snow. A breathing hole, one might call it.

In this small, cramped space, the bear and her young ones pass the winter. As the young ones grow larger, the warmth of their bodies increases the hole, so that they contrive to have room enough.



POLAR BEARS.

When spring comes, their mother takes them out, and lets them have their liberty.

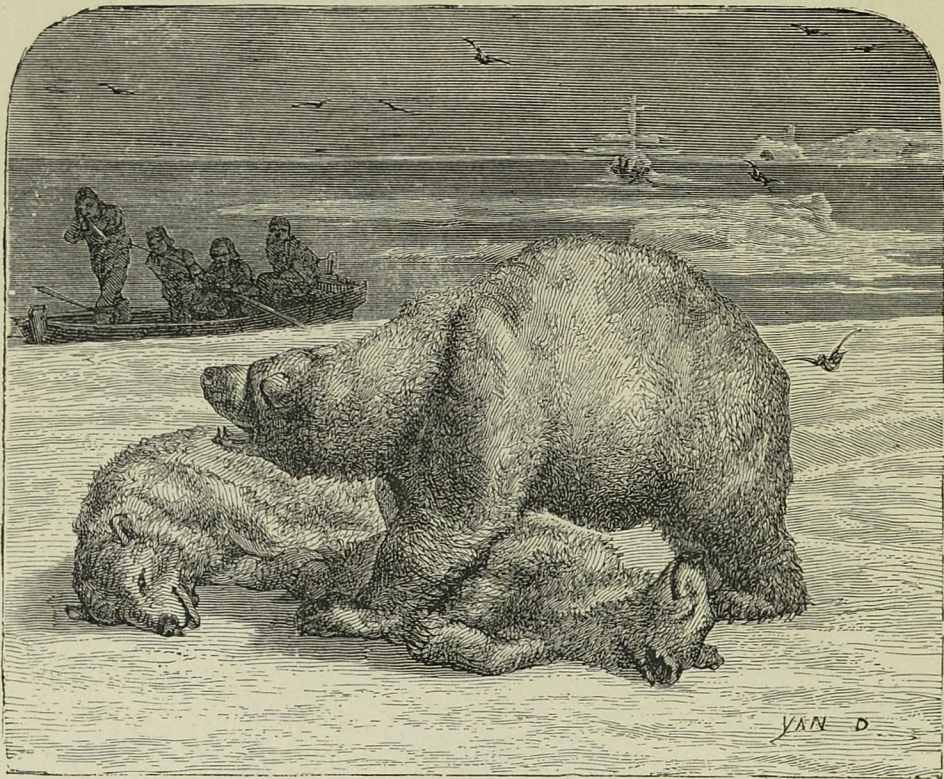
But how does the mother bear obtain food?

She does not eat in the winter, strange as it may seem.

In the autumn she ate enormously, and chose the most fattening diet.

She became as fat as possible, and laid in a store of food to last during the months of seclusion in her snow cave.

Of course, when she emerges, she is thin and hungry enough. And it is not at all pleasant to meet with her and her cubs.



BEAR MOURNING OVER HER CUBS.

She is ready to attack anything or anybody.

Her love for her cubs is very strong indeed.

In the picture, you see that the poor little cubs have been shot, and the mother is mourning over them.

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## THE SEAL.

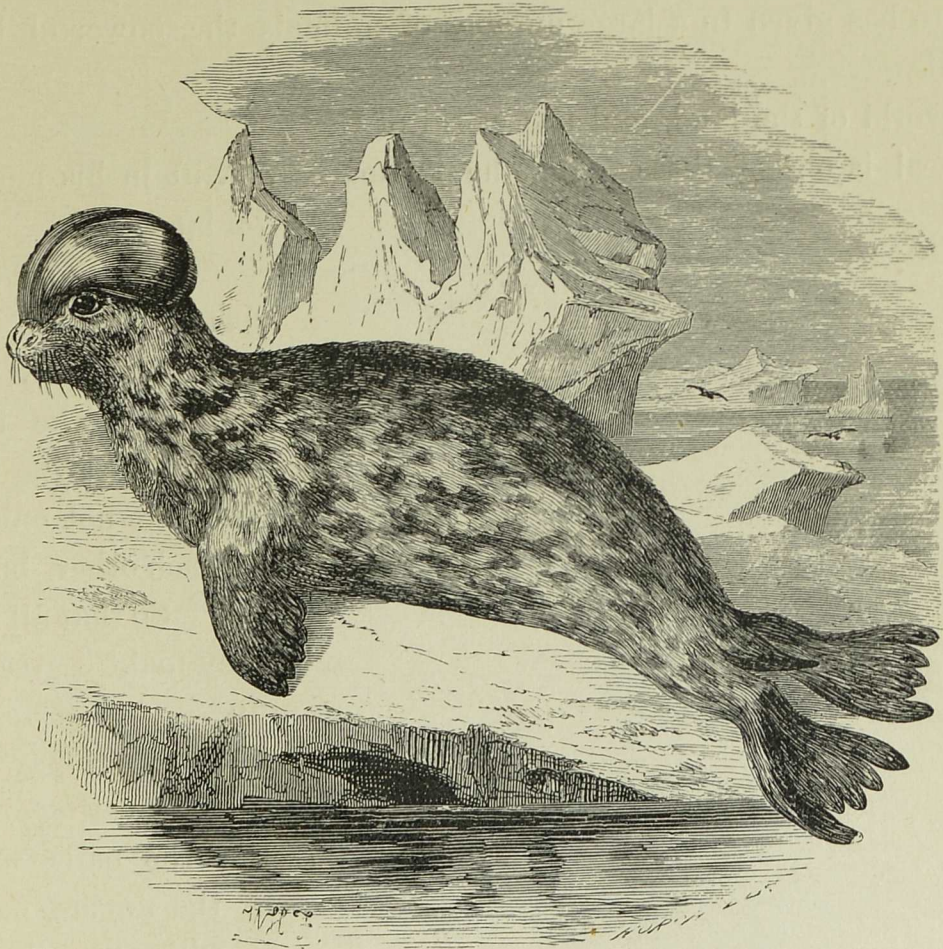
THE seal is another animal found in the icy seas.

The poor, half-starved inhabitants of those dreary regions regard him as their greatest blessing.

He affords them both food and light.

In the huts of the Esquimaux and the Greenlander there are numbers of oil lamps. All through the long dark winter, these lamps give light and warmth.

They are as simple as possible. A few wicks floating in a vessel of oil. That is the lamp.



THE CRESTED SEAL.

The oil comes from the seal. When no seals have been caught, the stock of oil gets very low. Then there is danger of a famine. It is as if the harvest were to fail in England.

But one happy morning there is an outcry on the beach. The women and children run down to see. A great seal is being dragged along in triumph.

What rejoicings there are ! The creature is a huge size. His large fat body affords abundance of food. The oil soon fills the lamps, and makes them burn merrily.

In fact, all is feasting and content.

We have no great fancy for seal's flesh. It is not to our taste. But we have beef and mutton. The poor Greenlander and the Esquimaux have neither.

Nature has given to a large number of animals the power of living in two worlds.

The world of the land, and the world of the sea.

The seal is one of these. But he is not very swift in his movements on land.

He has four paws, or feet — two in the fore part of his body, and two behind. The hind-feet have a covering of skin. They are not only joined to each other, but to the tail. So that all together they make a great strong fin.

The fore-paws have a skin covering as well. But the nails, and part of the fingers, or toes, if you like to call them so, are seen.



A MAN WATCHING FOR THE SEAL.

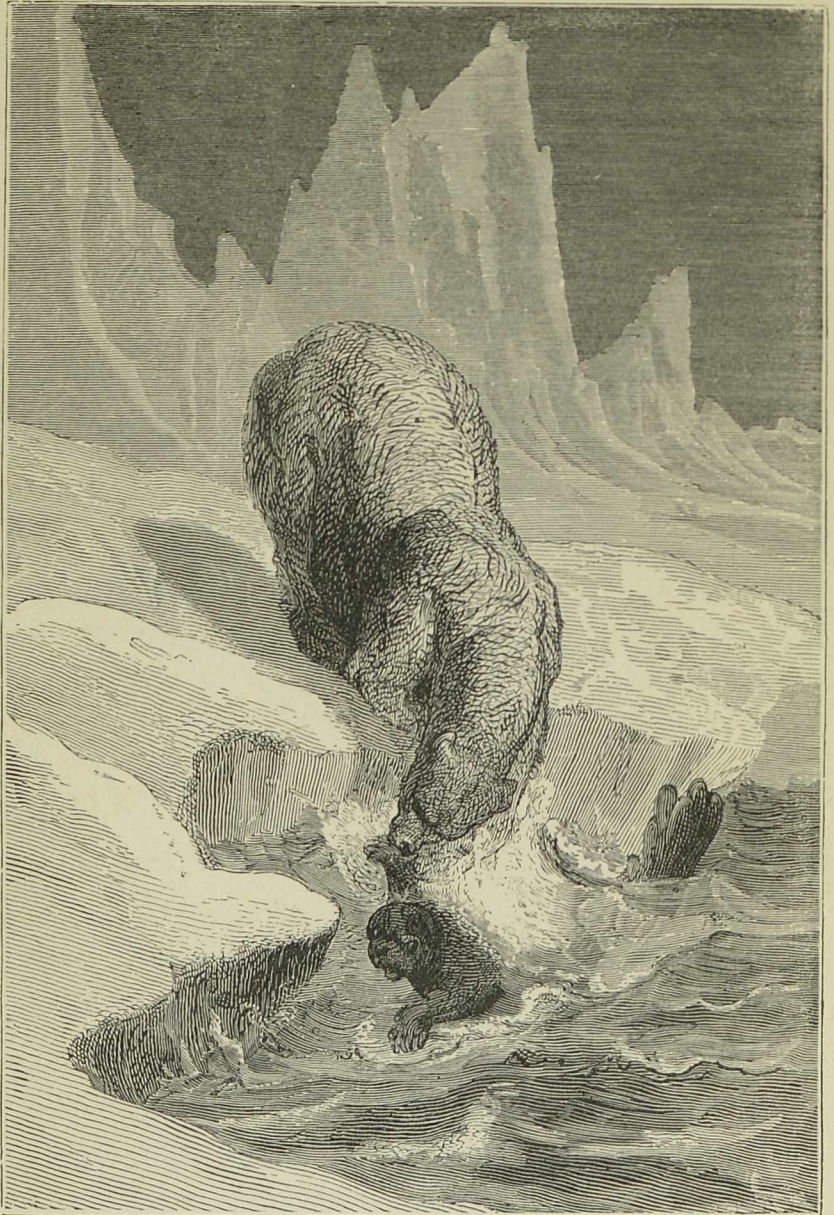
It is not very easy for the seal to waddle along on his fin-like feet. When he is in the water he can swim about nimbly enough. But he has to get his air food from the atmosphere. So that he makes little holes in the ice, and breathes through them. But this habit often costs him his life.

A man, muffled up in furs, has been sitting hour after hour on the ice, watching for him. He has a long sharp spear; and when the seal has made his hole, and has only one thin layer of ice to break through, down comes the spear into his body.

If the man had made the least sound, the seal would have heard him, and would have gone away.

But the man knew better. He knew that the lamps at home were going out for want of oil; and that his wife had no seal's flesh in her larder.

A great deal depended on his catching the seal.



A SEAL CAUGHT BY A POLAR BEAR.

The poor seal has another enemy to contend with besides the hunter.

The Polar bear is always prowling about looking for seals. He will watch at their holes, as the hunter did, or else try to surprise them when they lie asleep on the ice.

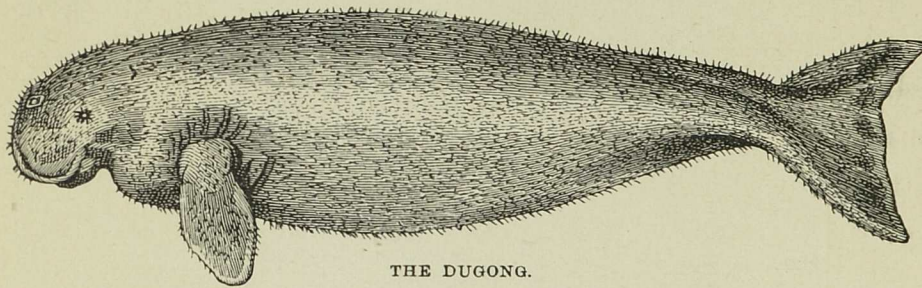
The seal in the picture was fast asleep, and without any fear of danger The bear came stealthily up; and though the poor seal plunged at once

into the sea, he was too late to save his life. The bear, as you see, has seized him by one of his paws, and will drag him out, and make a meal of him.

### MORE ABOUT SEALS.

THERE was a time when many strange stories were told of mermaids and mermen.

The sailors declared that they saw a creature, now and then, appearing above the sea. It had a head like a woman, and a body like a fish.



THE DUGONG.

This wonderful creature was really nothing but a relation of the seal.

He is called a dugong, and very

few of his family are left. Indeed, the race is becoming extinct.

The dugong lives in the warm Tropical seas, and is more than twenty feet long.

The people, on the coasts where he is found, think his flesh very good to eat, and say that it tastes like ham.

Indeed, travellers declare that no better meat is to be had.

Besides the flesh, you may think what a quantity of oil must come from such a vast body. And the oil is used both for lamps and for cookery.

The mother dugong carries her young one between her fore-paws. She clasps it to her breast; and as her round head appears above the water, she looks in the distance a little like a woman.

And, no doubt, it was a dugong with her little one that the sailors saw, and mistook for a mermaid.

The dugong, I must tell you, forms a link between the seals and the whales.

There is a huge kind of seal, called the elephant seal, that is found in the dreary regions of the South Pole.

Vessels go out to hunt these great creatures for the sake of the oil and the skin.

The elephant seal is so gentle that he will let the sailors actually knock him down.

The only fierceness ever shown is when the mother seal has her little one taken away.

Then she has been known to come behind a sailor, get his head into her mouth, and bite him with her sharp teeth till she had nearly killed him.

The elephant seal is so fat and loaded with blubber that he can hardly walk on land.

He is obliged to rest every few minutes, so that he seldom ventures far from the sea. If the sun is hot, he is very much distressed, and tries to scoop up the sand and throw it over his body, till he has made a kind of covering.

The skin has no fur upon it, so that it can only be used as leather for harness. But the oil is very excellent indeed, and burns without any disagreeable smell.

The seal-skin, so much used for cloaks and jackets, comes from the South Seas. There are some islands, called the South Shetland Islands, where the fur seal lives.

He has long gray hair, that has to be all pulled out. Under the hair, there is a thick soft fur of a fine yellow-brown, and so valuable that it costs the poor seal his life.

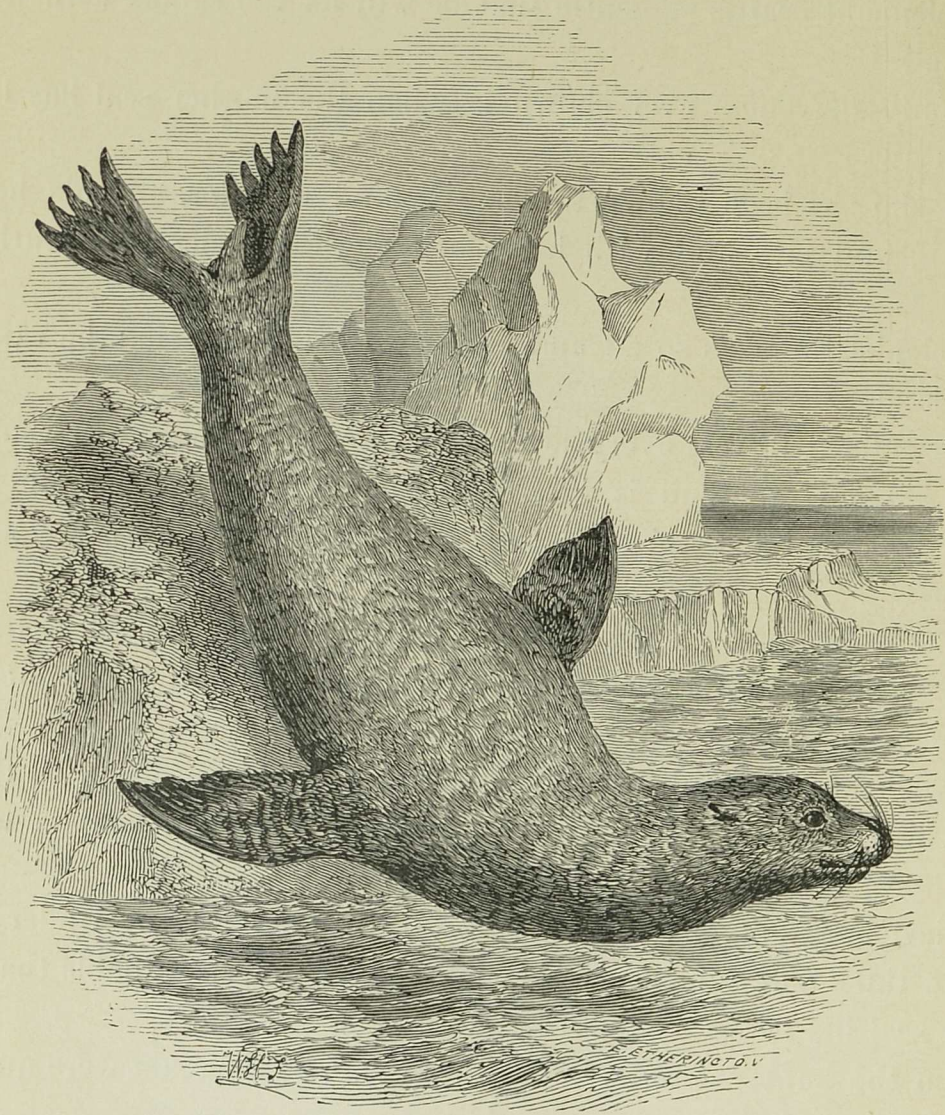
When the hunters first went to these islands, the seals were quite tame, and never attempted to get out of the way.

They would even look on, while their companions were being killed. But now they have learned a little wisdom, and take care to climb to the top of a rock or steep place, where they can throw themselves into the sea.

The hunters have been foolish enough to kill so many seals that the

number is thinned. The moment the seals came in sight they were killed, for the sake of their skins. And the poor little ones, being left without their mothers, often died as well.

The proper name of the fur seal is the otary.



THE OTARY, OR FUR SEAL.

The otary has an external ear, which distinguishes him from the rest of the seals.

The whole tribe can, however, hear perfectly well both above and under the water.



There is another species of seal called the sea-lion. He has long shaggy hair falling down his neck, a little like the mane of a lion.



THE SEA-LION.

The sea-lions are met with both in the Northern and in the Southern Seas.

They live in great hordes, and are formidable-looking creatures, but as harmless as the other seals.

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## THE WALRUS.

THE walrus is another relation of the seal. He is an immense size, and is very clumsy and awkward in his movements. That is, when he gets on land. In the sea, he can swim readily enough.

Do you notice his two large tusks?

He can use them when he wants to dig up the shell-fish, or the roots



WALRUSES.

of some plant that grows near the sea. And he can use them to drag his unwieldy body up the rocks, or up some block of ice.

And he can fight with them against the fierce Polar bear.

In spite of this, the bear sometimes gets the mastery, and kills the walrus by giving him one of his bear's hugs.

Sometimes the dead body of a walrus is cast ashore, and then there is great excitement among the sea-birds and animals.

The sea-birds come whirling round and scream with delight. The foxes and the bears scent it from afar; but the foxes dare not approach until the bears are satisfied. So they stand round barking with impatience.

If man were present, he would dispute the prize. For the walrus is a treasure to the dwellers on those desolate shores. His flesh forms an article of food, and is keenly relished. His skin is used for leather, and the ivory of the tusks is invaluable.

In spite of his great size and fierce tusks the walrus can be tamed, and is very affectionate.

A Russian lady tamed a young walrus, and made a pet of it. The creature followed her about, and was never so happy as when it lay with its head in her lap.



A BEAR HUGGING A WALRUS.

## HOW THE WHALE BREATHES.

THERE is one huge animal in the Arctic Seas that draws numbers of ships thither in search of him.

I mean the whale.

There are several kinds of whales, and some are found in the Southern as well as in the Northern Seas. But the whale I am speaking of is the Greenland whale, and lives up in the cold and ice of the Frozen Zone.

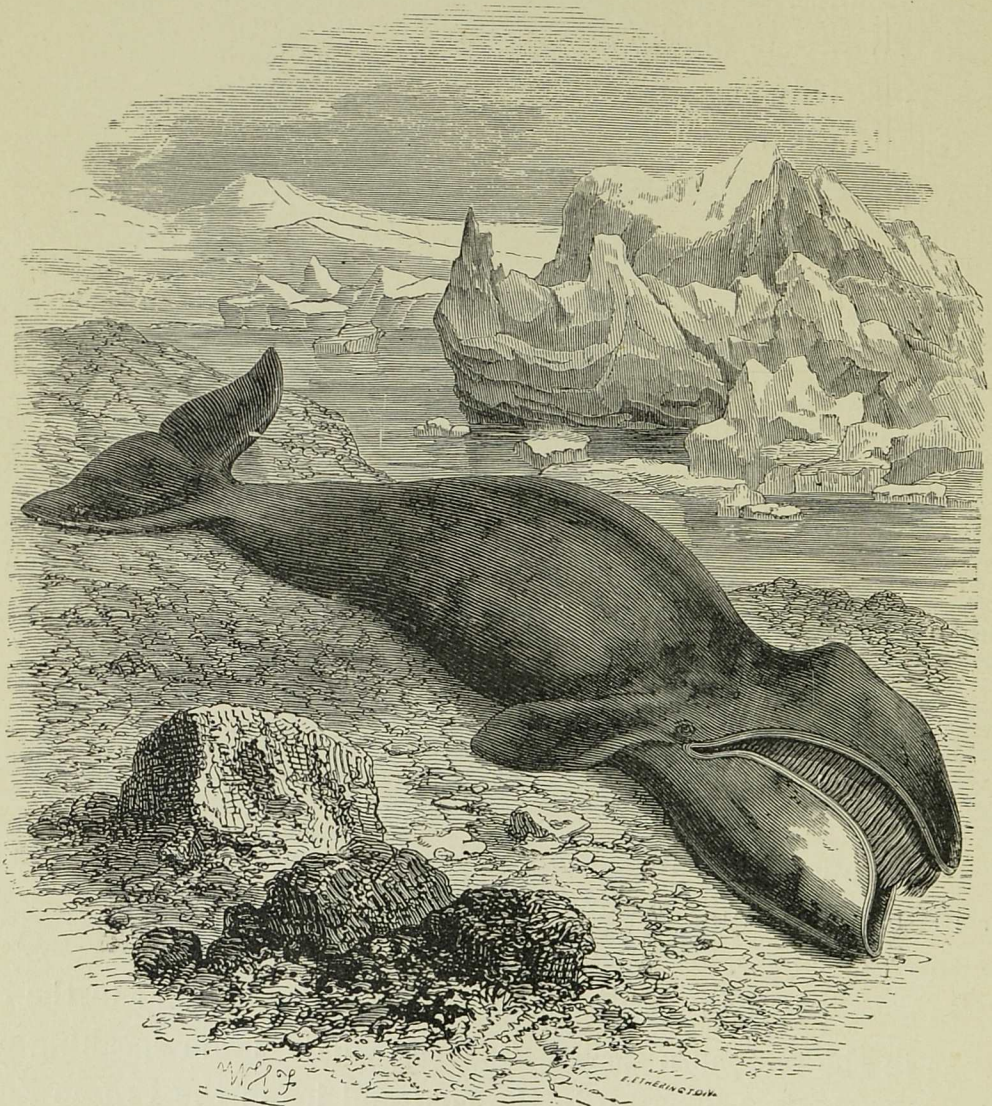
His body is of value because of the quantity of oil which can be obtained from it. And though the whale-fishery is a most dangerous undertaking, many persons are found willing to engage in it.

The whale lives in the sea, and to all appearance has the habits of a fish.

## HOW THE WHALE BREATHES.

Let us examine him rather more closely.

He has warm blood, as you and I have. The mother whale gives suck to her young one. And both of them breathe air from the atmosphere. Therefore the whale takes a place amongst the animals.



THE GREENLAND WHALE.

Now, here is a curious fact at the very beginning. The whale can keep under water for an hour at a time, or even two hours.

But this is not his usual practice.

Every ten minutes, or quarter of an hour, he comes up to breathe. He comes up, in fact, to get oxygen into his blood.

What keeps the whale alive during the time he is under water?

I will tell you.

He has a reservoir of blood which has had its share of oxygen, and is kept ready for use.

This reservoir, if I may call it so, consists of a number of arteries, or vessels, which contain the blood that has been mixed with oxygen.

They spread over the inside of the chest, and also of the ribs and the spine. They are found even within the skull.

When the whale is a long time under water, and cannot get any oxygen from the atmosphere, he falls back on this store within.

The blood can thus continue its course without becoming exhausted.

When he does rise to the surface, which he is obliged to do at last, then the whole of the blood receives a supply.

Part goes its way through the body, and the rest is received into the reservoir to be ready for use.

Can any arrangement be more suited to the case!

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## MORE ABOUT THE WHALE.

I HAVE another fact to tell you about the whale's breathing.

The tube called the windpipe is not placed as our windpipe is. It does not open into the mouth. It opens at the top of the head.

There is a lump where it opens. And the whale can keep his whole body under water except just this lump.

And there is a kind of valve or stopper to the opening of the windpipe, which exactly fits it, and can keep out the water, and also resist the greatest pressure. Indeed, the more pressure there is upon it, the tighter it fits.

The whale begins to breathe before he quite reaches the surface of the water. The air rushing from the windpipe, and the water together, are blown up into a column. Then the whale is said to "spout."

When the whale is struck by the harpoon, he is in a great hurry and fright. He dives down to the bottom of the sea with the utmost speed, and even strikes the ground with his head. Indeed, it is no uncommon



WHALE DIVING WHEN STRUCK.

thing for him to fracture his skull.

The whale, as you know, lives among the ice and cold of the north.

How can the heat of his body be kept up?

He is quite protected from the cold by his skin.

This skin is really a thick layer of fat, which the sailors call blubber. It is a dark motley colour to look at, and is full of fibres, as our skin is.

The whole skin is full of oil. This is indeed the true riches of the whale, and the reason why he is hunted.

As far as the whale himself is concerned, the oily skin is useful for two reasons.

It is very warm, and keeps up the heat of the body. And the oil being lighter than the water, helps him to swim.

I have not finished with the whale.

I must tell you of another beautiful contrivance.

The whale, large as he is, does not feed on creatures of any size.

His throat is so narrow, that a herring could not get down it.

He lives on jelly-fishes and minute animals.

He opens his huge mouth and takes them in.

But does he swallow the mouthful of water, as well as the creatures in it?

If he did, his stomach would soon be filled with water, and have very little food to sustain it. There would be more water than food.

There is a contrivance to prevent this.

The whale has no teeth. He is a very harmless creature, in spite of his size.

His mouth is the most curious part of him.

From the upper jaw there are a number of plates of a horny substance. They stand side by side, and the edges have a fringe of hair.

The middle plate is the largest, and the plates keep getting smaller on each side, the last being the smallest.

The lower jaw has no plates; but it is in the shape of a great spoon, so that the plates can go into it when the mouth is shut.

Now, when the great mouthful of water is taken in by the whale, it runs out again through the plates. But the fringes of hair keep in the tiny living creatures which are to serve as food.

They are, in fact, a kind of filter, for they reject the bad, and only receive the good.

The plates I have been speaking about are the true whalebone, and as valuable in their way as the oil is in its way.

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## THE ENEMIES OF THE WHALE.

THE whale is, as we have said, a very harmless creature. If it were not so, the mischief he might do would be great indeed.

He has, however, enemies both in the sea and on the land.

There are some fishes that belong to the fierce and cruel family of the shark.

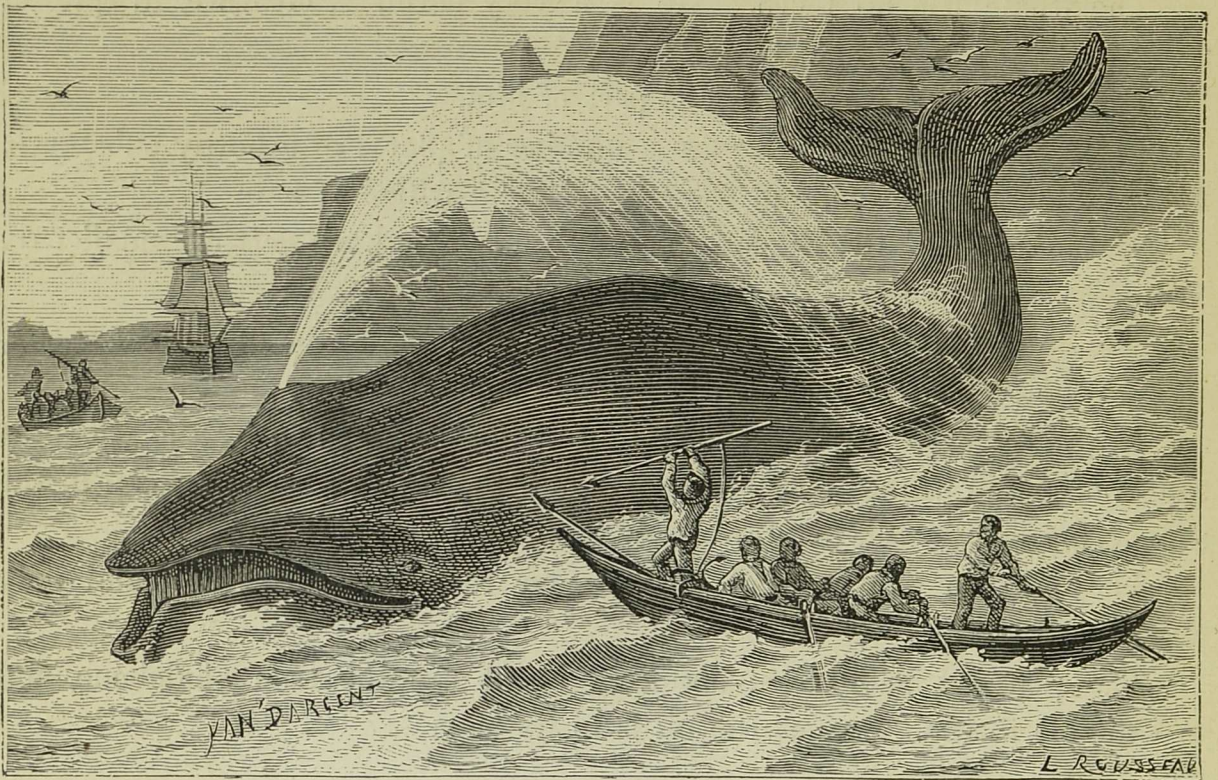
One of these fishes is very apt to make an attack on the poor whale, and feed upon his huge body, until its hunger has abated.

Another shark has a long tail, nearly half as long as its body. It seems to take a delight in giving the whale great slaps with its tail, that sound like the report of a gun.

Then there is a worse enemy still—the sword-fish.

It comes with its sharp sword, and stabs the whale without mercy.

A whale attacked by a number of sword-fishes, and of sharks as well,



HARPOONING THE WHALE, AND WHALE SPOUTING.

has been seen by the captain of a vessel. He declares that the water all round was dyed with blood.

Thus the huge size of the whale does not protect him.

Indeed, his only resource is to dive down to the bottom of the sea where his enemies cannot follow him.

But the worst foe the whale has is man.

In spite of the dangers of the icy sea, and the hazard there is in attacking a creature of such vast size, man is constantly warring against the whale.

The supply of oil and of whalebone are a rich reward for all the risk and trouble.

And when I tell you the whale-fishery will produce, in one year, seven hundred thousand pounds, you will better understand how it is that men are found willing to undertake it.

The ships that go out whale-hunting are made very strong indeed.



And they set out in the spring, as the summer is the only season when there is a chance of sailing in those icy seas.

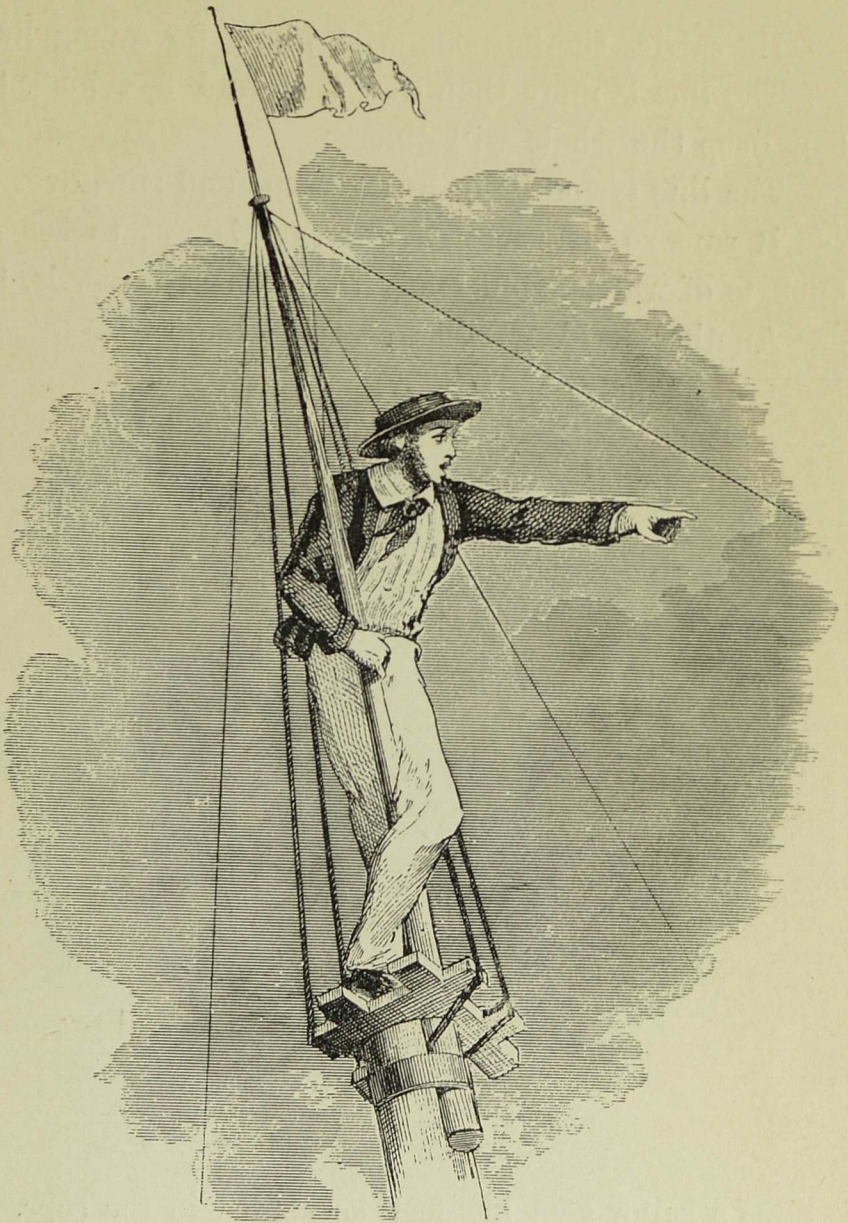
When they reach the spot where whales are likely to be found, a man keeps on the watch, to spy one out.

The moment he sees one he calls out, "There she spouts!" Then the boats are let down in pursuit. This is done directly, for the boats are kept ready to start.

The weapon used to attack the whale is called a harpoon.

It is made of iron, and is a little in the shape of an anchor, but with a sharp point to it.

Very swiftly, and without making any noise, the boat glides towards the whale. He does not even see it until he feels a sharp weapon sticking in his body.



ON THE WATCH—"THERE SHE SPOUTS!"



HARPOON OF THE WHALER.

This is the harpoon, which has been thrown by the harpooner. The whale now dives into the very depths of the ocean.

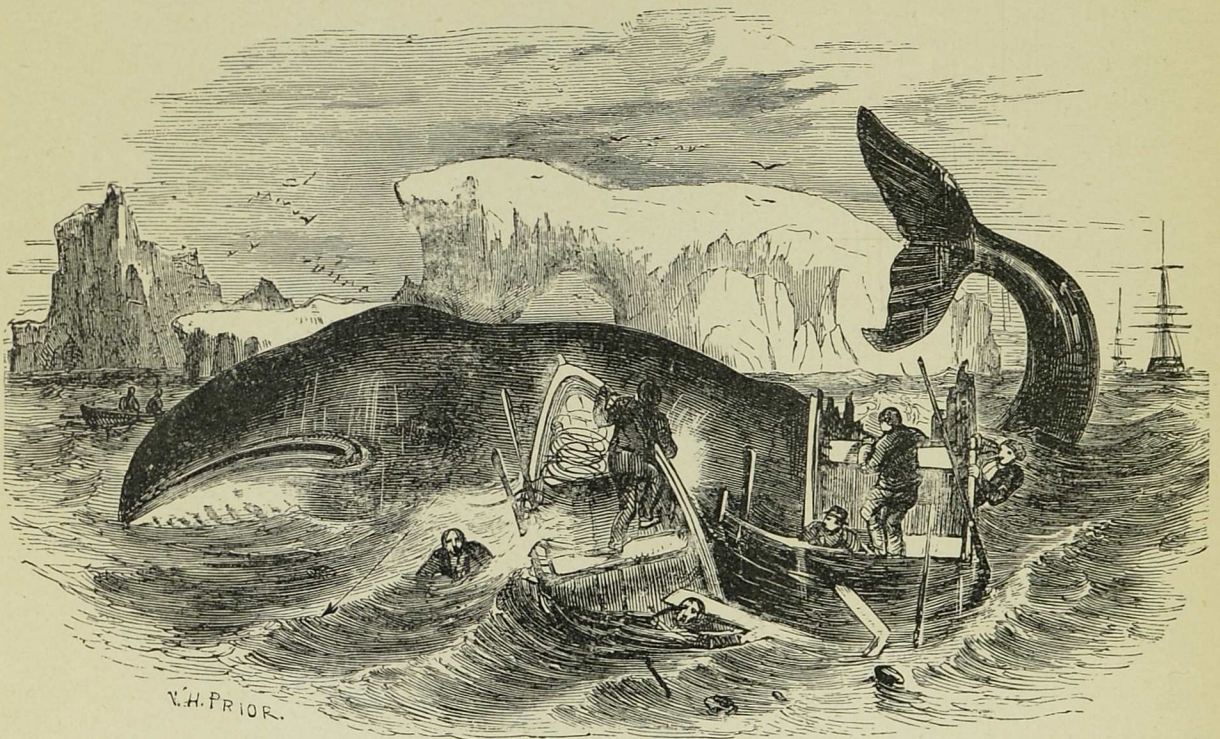
He carries the harpoon with him ; for a long line is fastened to it.

The line is more than four thousand feet long, for there is no knowing how deep the whale will dive.

The line is coiled up in the boat, and runs over a pulley or windlass.

It runs so fast, that the friction is apt to set the boat on fire. And buckets of water stand ready to be dashed over it, to prevent the mischief.

Another accident will sometimes happen.



ACCIDENT TO THE BOATS.

If a sailor gets his feet entangled in the rope, it will be impossible for him to get them free.

His feet will be cut off ; or he will be dragged overboard, and never seen again.

Often, too, the whale will give such a violent blow with his tail, that the boat will be thrown up into the air, and the sailors tossed into the water.

Such accidents are constantly taking place.

After the whale has been under water for some time, he is obliged to come up for air.

As soon as he appears the boats are ready with fresh harpoons and lances. He will dive again, but this time he cannot stay under water so long. He gets exhausted by repeated wounds, and after a great many struggles he dies. Then the men hoist a flag, and give three cheers.

The danger is over.

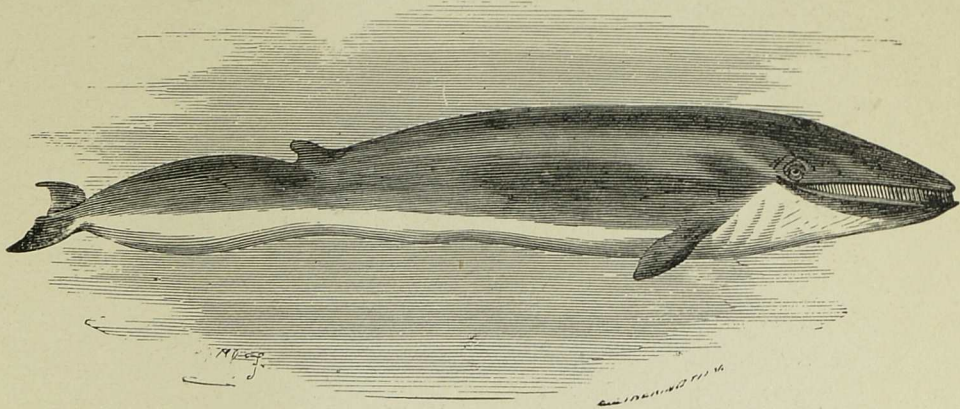
But a great deal has yet to be done.

The vast body of the whale is brought near the vessel, and the men get upon it. They have iron spikes in their shoes, or else they could not help slipping.

They have knives and spades to cut off the thick coating of blubber.

They cut it off in long strips, which are carried on board and cut up into pieces. The pieces are put into casks.

When the whalebone has been taken out of the mouth, the huge mass is turned adrift. Man has no further use for it; but the sea-birds, and the sharks, and the white bears have quite a feast. Sometimes, however, the body of the whale sinks to the bottom the moment it is turned adrift.



THE RORQUAL.

I must tell you that there is a whale much larger than the one I have described.

Its body is sometimes more than a hundred feet long.

It lives in the same seas as the Greenland whale, but the whaling vessels do not often attack it.

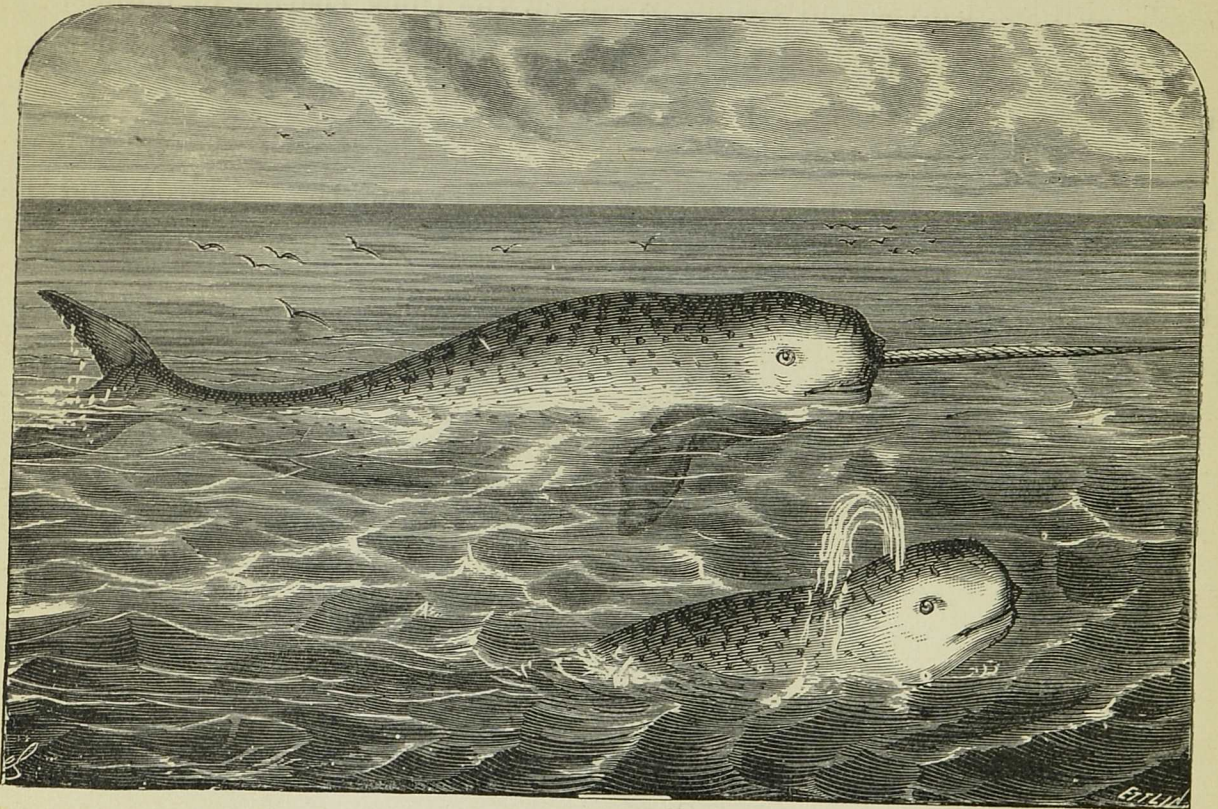
It is very swift, and strong, and dangerous. And also it has much less blubber, and very little whalebone. It is called the rorqual.

## THE NARWHAL.

THERE is a very beautiful creature that is related to the whale, but is not nearly so large, or so clumsy. Indeed, it is graceful as well as handsome.

It is called the sea-unicorn, or, more properly, the narwhal.

Its skin is of a gray colour, mottled with black. But the most curious thing about it is its horn. This horn is of pure ivory, and projects from the head in a straight line.



THE NARWHAL—MALE AND FEMALE.

It is really nothing but a tooth. The tooth is in a spiral form, or twisted round and round, as you perceive.

There is a fellow tooth within the jaw, but it does not grow out, and lies snugly hidden.

People have been very much puzzled to find out what use the narwhal makes of its horn.

Some suppose that it is useful to rake about in the mud at the bottom of the sea, or to break through the ice, in order to breathe.

Other people think the narwhal uses it to pierce its prey.

At any rate, the long twisted horn of the narwhal is of use to man.

It is of hard ivory, better even than that of the elephant.

Many years ago the horn was worth more money than it is now.

People fancied that it was the horn of the unicorn, and believed it could work any amount of wonders.

The unicorn is, as you know, a fabulous creature, as much so as the phoenix.

In these days the horn is much valued for its ivory ; and the sailors in a whaling vessel are very glad when they happen to meet with a narwhal. They attack it with harpoons, as they do the whale.

But the narwhal is not at all easy to catch. It swims so fast, and is so cautious and shy, that it is very seldom a boat can get near enough to do it any harm.

Though it looks so fierce, with its long spike of a horn, it is really very gentle indeed.

It plays about in the water with its companions, and they amuse themselves with crossing their horns.

But sometimes the horn is the means of the poor narwhal's destruction.

When the fisherman succeeds in getting near to a shoal of these beautiful creatures, they might perhaps escape by the rapidity of their flight. But their horns get entangled, and so embarrass them, that some are sure to be caught.

I must tell you that the narwhal keeps to the Northern Seas, and rarely ventures out of them.

Now and then it strays into the milder waters, and comes near our coasts ; but this very seldom happens.

## THE LIGHTHOUSE.

THERE are many unseen dangers in the paths of the sea.

Besides the storm and the tempest, there are other perils to be dreaded.

Near the shore, often within sight of home, there will lurk rocks and quicksands.

If the ship approach too near she will be lost.

Round every coast these dangers have to be encountered ; and from earliest times the mariner has, in some rude way, been warned of their existence.

We have heard of beacon fires which blazed every night on some head or promontory. And we know that the ancient Egyptians had their strip of coast studded with towers.

The towers were landmarks by day, and served as beacons by night.

A noble task has the lighthouse to perform, as it stands on some lonely rock or dangerous shore.

When darkness hides everything else from view, its flashing light falls upon the waves, and is seen at a great distance.

The birds of the sea are attracted towards it, and come in a flock.

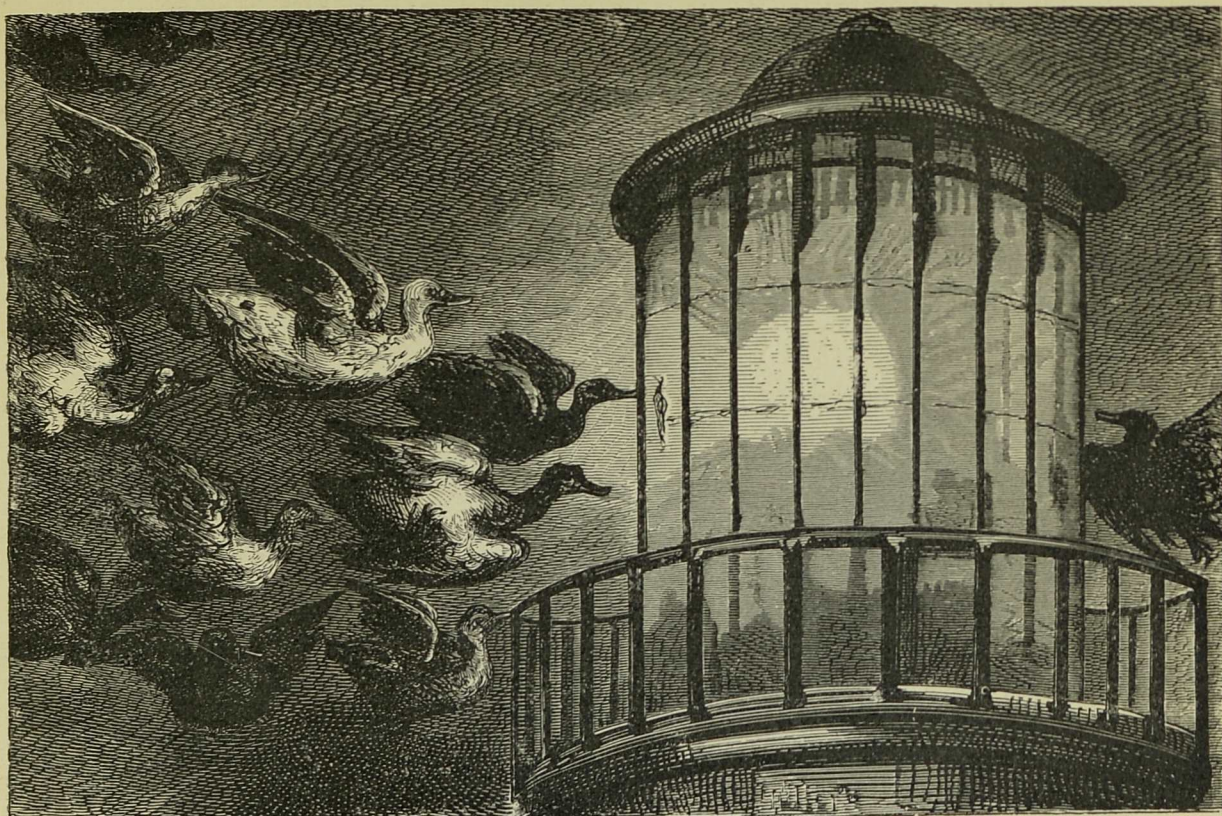
They will even dash against the glass and break it, in their eagerness to get nearer.

To prevent accidents of this sort, it is usual now to put a guard of wire outside the glass. This defends the glass, and keeps the birds at a respectful distance.

You will be amused to hear that at one of these lonely lighthouses the birds are in great favour. Instead of doing harm, they act as signals.

Numbers of gulls perch on the lighthouse walls, and make a loud screaming. Their harsh voices can be heard by the sailors in some not far distant vessel.

When the sailors hear the gulls they know that dangers are at hand, and they take care to guide the ship safely past the treacherous coast.



SEA-BIRDS ATTRACTED BY THE LIGHT FROM A LIGHTHOUSE.

In fact, there is no need to use the guns and the cannon as warnings. The voices of the sea-birds answer quite as well.

So the cannon has lain idle for years, and the guns are never loaded.

The men in the lighthouse pet the sea-birds, and treat them with every indulgence. So that when off duty the gulls walk about the little solitary islet where the lighthouse stands, and are as tame as if they were pigeons.

The most important of our English lighthouses is Eddystone.

It is off the coast of Plymouth, where a number of dangerous rocks lie hidden under water.

When the tide is out they can be seen clearly. At other times only the whirling and eddying of the waves tell us where they are.

The lighthouse is built on the highest of the rocks, and gives warning to the vessels that go up and down the channel.

There is a sad story connected with Eddystone.

A lighthouse was built upon the rock by a rich but rather whimsical gentleman.

His friends found fault with its construction, and warned him that it was not safe.

He laughed at their fears, and wished a furious gale might come and prove how secure his lighthouse was. Nay, he wished to sleep in the tower himself in just such a gale.

His presumptuous wish was granted.

Soon after there came a fearful storm, and all night the waves thundered against the lighthouse. It was a night long to be remembered on that part of the coast.

With the first streak of dawn people hurried to the beach and gazed anxiously in the direction of the lighthouse.

Alas! it was not to be seen! The furious waves had overthrown it, and the architect had perished with it!

A lighthouse on a safer plan is now constructed at Eddystone, and night after night its friendly lantern throws a radiance on the waters.

But the fate of poor Winstanley and his ill-omened tower will not be soon forgotten.

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## THE LIFE-BOAT.

IN spite of the beacon fire and the friendly lighthouse, terrible disasters will occur around the coast,

The wintry winds will rise higher and higher, until there blows a furious gale.

If the gale comes from the sea direct towards the land, havoc will be made among the shipping.

Vessels will be driven into the very dangers they have been striving to avoid.

They will be driven on shore, or on some treacherous bar of sand; or the bottom of the ship will grate upon some rock, and the cry of "All is lost!" will come upon the gale.





THE WRECK AND THE LIFE-BOAT



“They that go down to the sea in ships, that do business in great waters; these see the works of the Lord, and his wonders in the deep. For he commandeth, and raiseth the stormy wind, which lifteth up the waves thereof. They mount up to the heaven, they go down again to the depths; their soul is melted because of trouble. They reel to and fro, and stagger like a drunken man, and are at their wit’s end.”

The sailors on the beach view from afar the struggling and doomed vessel.

Amid the tumult and noise of the waves, with the sea running mountains high and the gale shrieking wildly, they hasten to succour those in distress.

They bring out their life-boat.

It is not constructed like any other craft that sails on the waters. It has been built for one single purpose—to save life.

And this is why it is called the life-boat.

Any other boat could not live a moment in a sea like this. But the life-boat can ride over the surging billows.

It is so contrived that it cannot be upset. It is a friend in need—one of the most successful attempts of human skill and benevolence.

In the picture, a distressing scene is taking place.

The poor ship is reeling and tossing in the grasp of the storm. She has struck upon a rock, and very soon will be broken to pieces.

The wretched crew have been driven from one refuge to another. The hold of the vessel is full of water. The waves wash over the deck and sweep everything away.

The men are clinging to the masts and to the shrouds, and finding what frail shelter they can. Their cries of anguish pierce the skies. They feel as if their last hour were come.

Some of them are even struggling in the waves.

It is a frightful picture. There is but one gleam of brightness in it.

Do you see the life-boat gallantly ploughing its way towards the doomed vessel?

The brave sailors pull at the oars with all their might. They

encourage each other. They hold out their hands to the struggling, drowning crew.

Very soon, they will have snatched some of them from the jaws of death.

The men are exhausted, and almost dying with cold and fatigue. But they will be carried back to land, and placed in safety. Then once more the life-boat will make its perilous way to the ship.

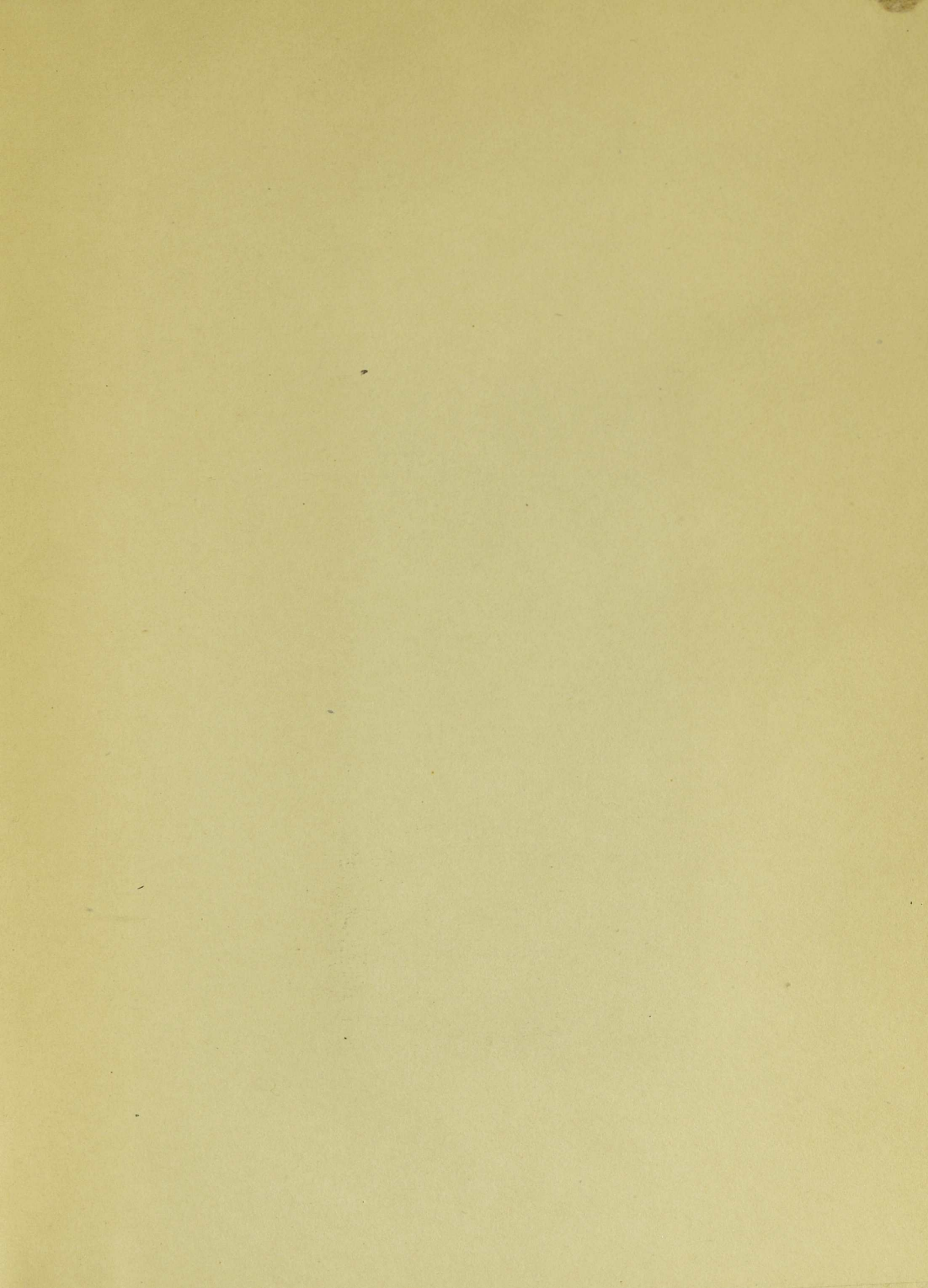
While there is one of the crew remaining—ere the ship settles down in the waters and is no more seen—the sailors will ply their task of mercy. The life-boat will go out to the rescue.

How full of hardships and of dangers is the life of the mariner!

It is well that, in our public worship, we do not forget to pray for those at sea.

“O Christ, whose voice the waters heard,  
And hushed their raging at thy word,  
Who walkedst on the foaming deep,  
And calm amidst its rage didst sleep,  
Oh, hear us when we cry to thee  
For those in peril on the sea!”







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