Name: _____ Date: _____

Cold Water Rising Along a Windy Coast

Circle group

Some coasts have very cold water, even in summer. Many fish, seabirds, and whales live there. The cause is upwelling. In upwelling, deep water rises to take the place of water that has moved away.

Wind starts it. A steady wind blows along the coast and drags the top layer of the sea. Because Earth spins, the water does not move the same way as the wind. Along many coasts, it drifts away from the shore. Water from far below rises to fill the empty space.

The deep water is cold. It is also full of nutrients, such as nitrogen and phosphorus. Tiny living things and bits of dead matter sink down from the surface, and bacteria break them into nutrients. Near the surface, plankton use up nutrients fast, so sunny water often has few of them. Upwelling lifts the nutrients into the light. Then plankton have sunshine and food.

The plankton grow fast. Small fish eat them. Bigger fish, seabirds, and marine mammals follow the small fish. Some of the richest fishing places in the world are near coasts with strong upwelling. Cold water also cools the air above it, so fog often hangs over those coasts.

Questions

1. What is upwelling?

_____

_____

2. What starts upwelling along many coasts?

_____

_____

3. Which nutrients are in the deep water?

_____

_____

4. Why does sunny surface water often have few nutrients?

_____

_____

5. Why do fish, seabirds, and whales gather where upwelling happens?

_____

_____

6. Why does fog often hang over a coast with upwelling?

_____

_____

Words to know

upwelling: deep water rising up toward the surface of the sea
nutrients: substances that living things need in order to grow
plankton: tiny living things that drift in the water
marine: having to do with the sea

Talk together (every group has these)

1. Find one fact that every group read. How did your sheet say it?
2. What did your sheet tell you that you think another group's did not? Ask them.
3. What is one question about this topic that none of the sheets answered?

Name: _____ Date: _____

Cold Water Rising Along a Windy Coast

Triangle group

Along some coasts, the surface of the sea is surprisingly cold, even in summer, and the water teems with fish, seabirds, and whales. The reason is a process called upwelling, in which deep water rises to replace water that has been pushed away.

Upwelling often begins with wind. When a steady wind blows along a coast, it drags the top layer of the ocean with it. Because of Earth's rotation, the moving water does not travel in the same direction as the wind. Along many coasts it drifts away from the shore instead. The water that left cannot simply vanish, so water from far below rises to fill the gap.

That deep water is cold, and it carries something valuable. Over time, tiny organisms and bits of dead matter sink from the sunlit surface, and bacteria break them down into nutrients such as nitrogen and phosphorus. These nutrients pile up in the dark depths. Near the surface, plankton use them up quickly, so sunlit water is often poor in nutrients. When upwelling lifts the deep water into the light, the plankton have everything they need: sunshine from above and nutrients from below.

Plankton multiply rapidly, and small fish feed on them. Larger fish, seabirds, and marine mammals follow the small fish. Several of the richest fishing regions in the world lie off coasts with strong upwelling. The same process also explains why swimmers at some beaches find the water so chilly, and why fog often hangs over those coastlines, since the cold water cools the air above it.

Questions

1. What is upwelling?

_____

_____

2. What starts upwelling along many coasts?

_____

_____

3. Which nutrients build up in the dark depths?

_____

_____

4. Why is sunlit surface water often poor in nutrients?

_____

_____

5. Why do fish, seabirds, and whales gather where upwelling happens?

_____

_____

6. Why might fog often hang over a coast with upwelling?

_____

_____

Words to know

upwelling: deep water rising up toward the surface of the sea
nutrients: substances that living things need in order to grow
plankton: tiny living things that drift in the water
rotation: the spinning of Earth around its axis
marine: having to do with the sea

Talk together (every group has these)

1. Find one fact that every group read. How did your sheet say it?
2. What did your sheet tell you that you think another group's did not? Ask them.
3. What is one question about this topic that none of the sheets answered?

Name: _____ Date: _____

Cold Water Rising Along a Windy Coast

Square group

Along certain coastlines, the surface of the sea remains surprisingly cold even in the middle of summer, and the water is crowded with fish, seabirds, and whales. The explanation is a process known as upwelling, in which deep water climbs toward the surface to replace water that has been driven away.

Upwelling frequently begins with the wind. When a steady wind blows parallel to a coast, it drags the uppermost layer of the ocean along with it. Because of the rotation of the Earth, the moving water does not follow the same direction as the wind. Along many coasts it drifts away from the shore instead. The water that departed cannot simply vanish, so cold water from far below rises to fill the gap it leaves behind.

That deep water is not only cold but also remarkably valuable. Over time, tiny organisms and fragments of dead matter sink from the sunlit surface, and bacteria gradually break them down into nutrients such as nitrogen and phosphorus. These nutrients accumulate in the dark depths. Near the surface, plankton consume them so quickly that sunlit water is often poor in nutrients. When upwelling lifts the deep water into the light, the plankton finally have everything they require: sunshine from above and nutrients from below.

The plankton multiply rapidly, and small fish feed on them in enormous numbers. Larger fish, seabirds, and marine mammals then follow the small fish. Several of the richest fishing regions in the world lie off coasts with strong upwelling. The same process explains why swimmers at some beaches find the water so chilly, and why fog so often hangs over those coastlines, since the cold water cools the air that rests above it.

Questions

1. What is upwelling?

_____

_____

2. What usually starts upwelling along a coast?

_____

_____

3. Which nutrients accumulate in the dark depths?

_____

_____

4. Why is sunlit surface water often poor in nutrients?

_____

_____

5. Why do fish, seabirds, and marine mammals gather where there is strong upwelling?

_____

_____

6. Why might fog often hang over a coastline with upwelling?

_____

_____

Words to know

upwelling: deep water rising up toward the surface of the sea
nutrients: substances that living things need in order to grow
plankton: tiny living things that drift in the water
rotation: the spinning of Earth around its axis
marine: having to do with the sea

Talk together (every group has these)

1. Find one fact that every group read. How did your sheet say it?
2. What did your sheet tell you that you think another group's did not? Ask them.
3. What is one question about this topic that none of the sheets answered?

For the teacher: Cold Water Rising Along a Windy Coast

Each student sheet carries a shape, not a level. The same topic and facts, written three ways.

Circle: Cold Water Rising Along a Windy Coast

Easier · 198 words · Flesch-Kincaid grade 4.2

1. Deep water rising to take the place of water that moved away.
2. A steady wind drags the top layer of water, and it drifts away from the shore.
3. Nitrogen and phosphorus.
4. Plankton use them up fast.
5. Plankton grow fast, small fish eat them, and bigger animals follow the small fish.
6. Cold water cools the air above it.

Triangle: Cold Water Rising Along a Windy Coast

This passage · 258 words · Flesch-Kincaid grade 7.9

1. Deep water rising to replace surface water that has been pushed away.
2. A steady wind along the coast drags the top layer of water, which drifts away from the shore.
3. Nitrogen and phosphorus.
4. Plankton use the nutrients up quickly.
5. Plankton multiply there, small fish eat the plankton, and larger animals follow the small fish.
6. The cold water cools the air above it.

Square: Cold Water Rising Along a Windy Coast

Harder · 284 words · Flesch-Kincaid grade 9.3

1. A process in which deep water rises toward the surface to replace water that has been driven away.
2. A steady wind drags the top layer of water, which then drifts away from the shore.
3. Nitrogen and phosphorus.
4. Plankton consume the nutrients very quickly.
5. Plankton multiply there, small fish feed on them, and larger animals follow the small fish.
6. The cold water cools the air resting above it.