CHAPTER 34

The Pacific Islands: Adapting to Life Surrounded by Ocean

34.1 Introduction

It is almost impossible to imagine how big the Pacific Ocean is. Its vast size has fascinated travelers for centuries. In 1835, a British scientist named Charles Darwin sailed across the Pacific from Tahiti to New Zealand. Darwin was shocked at the ocean's expanse. The maps he had been using, Darwin wrote, failed to give an accurate sense of the size of the Pacific Ocean. The water seemed to go on forever. As for land, there was far less of it than he had imagined.

The Pacific Ocean covers one third of Earth's surface. That is an area of about 64 million square miles. It is more than twice the size of the Atlantic Ocean. Tens of thousands of islands are scattered across its vast blue waters. These islands were formed in different ways. Volcanoes rising up from the ocean floor created **volcanic islands**. Rings of small islands called **atolls** were formed by coral reefs. **Continental islands** are chunks of land that were once part of a continent.

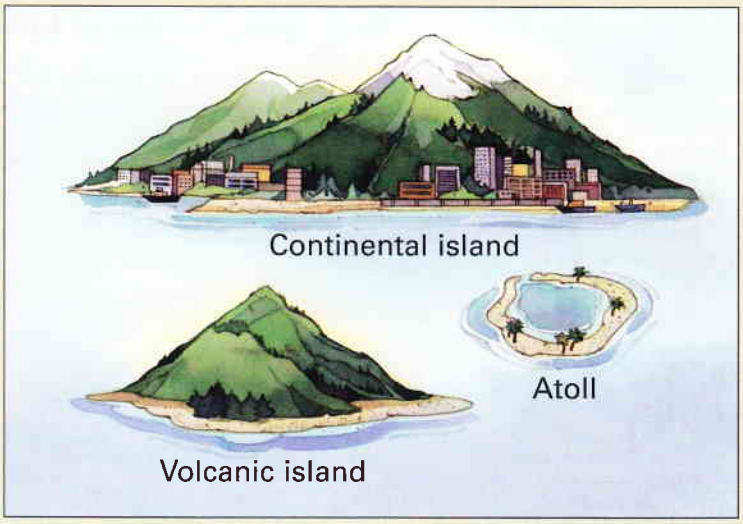
In this chapter, you will read about the **physical features** of all three island types. You will see how winds, water, and ocean resources shape life in this vast region. And you will read how the people who make their home on Pacific islands have adapted to a life surrounded by ocean.

Essential Question

How do people adapt to life in an island region?

This illustration shows the relative size and shape of three types of islands. All three are found in the Pacific Ocean. The largest are continental islands. The second largest are volcanic islands. Atolls are usually quite small. People adapt differently to life on each type of island. Keep this illustration in mind as you try to answer the Essential Question.

Graphic Organizer



◀ Satellite image of the Pacific Ocean and its islands

Travel Across the Pacific
Vast distances separate the Pacific islands. And yet, in time, most islands large enough to support people were settled. The first settlers may have used rafts or oceangoing canoes like this one to go from island to island.

34.2 The Geographic Setting

Thousands of islands dot the central and southern waters of the Pacific Ocean. There may be 20,000 or even 30,000. No one knows for sure. But if you put them all together, they would add up to very little land.

As you read in the introduction to this unit, geographers divide these islands into three groups. They are called Melanesia (black islands), Micronesia (tiny islands), and Polynesia (many islands). You can see a map of the three groups at the bottom of this page. Within these island groups lie 14 countries and many territories.

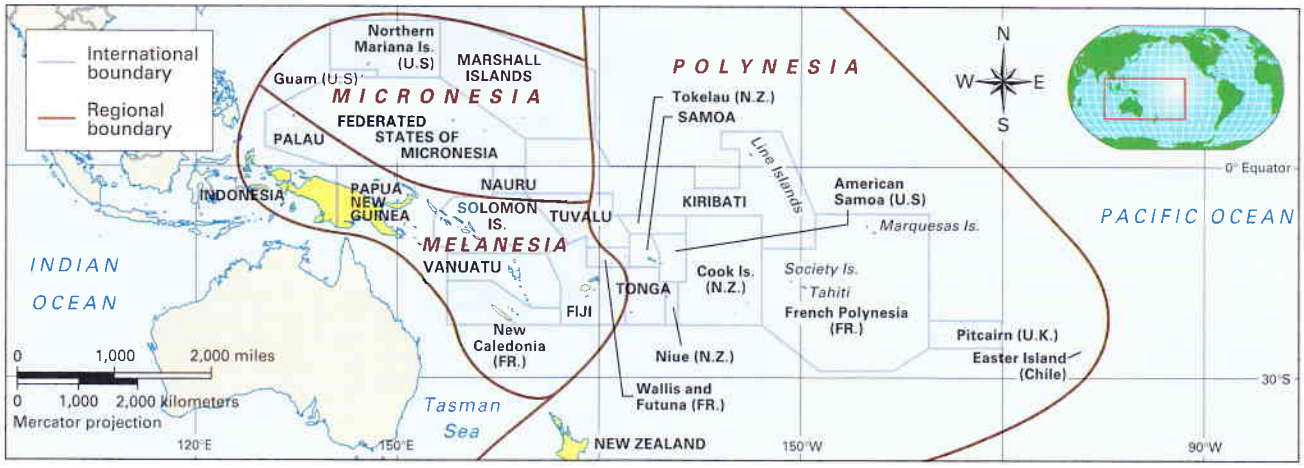
A Mix of Island Types The largest islands in this expanse of ocean are continental islands. These islands were once connected to a continent by a bridge of land. Some were separated from the larger **landmass** after the last ice age. As **glaciers** melted, sea levels rose until the land bridge was covered by water. Others were cut off when ocean waves washed away the land connecting them to a continent.

The movement of **tectonic plates** formed still other continental islands. New Zealand is an example. It was once part of a huge landmass. The movement of plates broke this landmass apart to form Antarctica, Australia, and several continental islands.

Volcanic islands begin when a volcano erupts on the ocean floor. **Lava** and ash slowly build up on the seabed. When enough material builds up, the island rises above sea level. Most volcanic islands are cone shaped with steep slopes rising to a high peak. Fiji, Samoa, and the Hawaiian Islands are all examples of this type of island.

An atoll is a ring of coral islands and reefs surrounding a shallow body of water called a **lagoon**. Atolls begin as coral reefs grow around a volcanic island. Over time, the island sinks beneath the sea. Some islands sink due to the movement of tectonic plates. Others are covered by water when sea levels rise. Still others erode away over time. The area above the sunken volcano becomes a lagoon ringed by coral reefs. Over time, ocean waves break away parts of the reefs. The bits of broken coral pile up to form flat, sandy islands around the lagoon. The Marshall Islands and most of the Tuvalu Islands are atolls.

The Pacific Islands



Geoterms

atoll a ring of coral islands and reefs surrounding a shallow body of ocean water

continental island an island that was once part of a continent

lagoon a body of shallow water partly cut off from the ocean by low-lying rock, sand, or coral reefs

volcanic island an island formed when an underwater volcano builds up enough lava and ash to rise above sea level

Atolls

An atoll forms when a volcanic island surrounded by a coral reef sinks beneath the sea. The coral reef remains. But it surrounds a lagoon, not land. Atolls are common in the Indian and Pacific oceans.

Continental Islands

Continental islands were once part of a continent. Some islands are separated when sea levels rise. Some are cut off from a continent by erosion. Others break away when tectonic plates move.

Volcanic Islands

Volcanic islands form when a volcano erupts far beneath the sea. When these volcanoes rise above the ocean's surface, they form islands. Volcanic islands are steep with high peaks.

34.3 The Ocean Shapes Life in the Pacific

Visitors describe many islands in the Pacific as "paradise." Tourists travel there to relax on sunny beaches and swim in warm ocean water. But the ocean isn't always peaceful. In fact, sometimes it's dangerous.

In 2004, a very powerful earthquake shook the floor of the Indian Ocean. The quake triggered a huge wave called a **tsunami**. The tsunami flooded coastal areas from Asia to Africa. More than 200,000 people died, and many more were left homeless. For better or worse, the ocean affects every aspect of life in the Pacific.

Winds and Currents Warm the Islands Winds and ocean currents shape the **climate** of most Pacific islands. As you read in Chapter 11, winds move around Earth in circular patterns. One group of winds, called **trade winds,** blows toward the equator from both the north and south. As trade winds move toward the equator, they shift westward. This shifting is caused by the rotation of Earth.

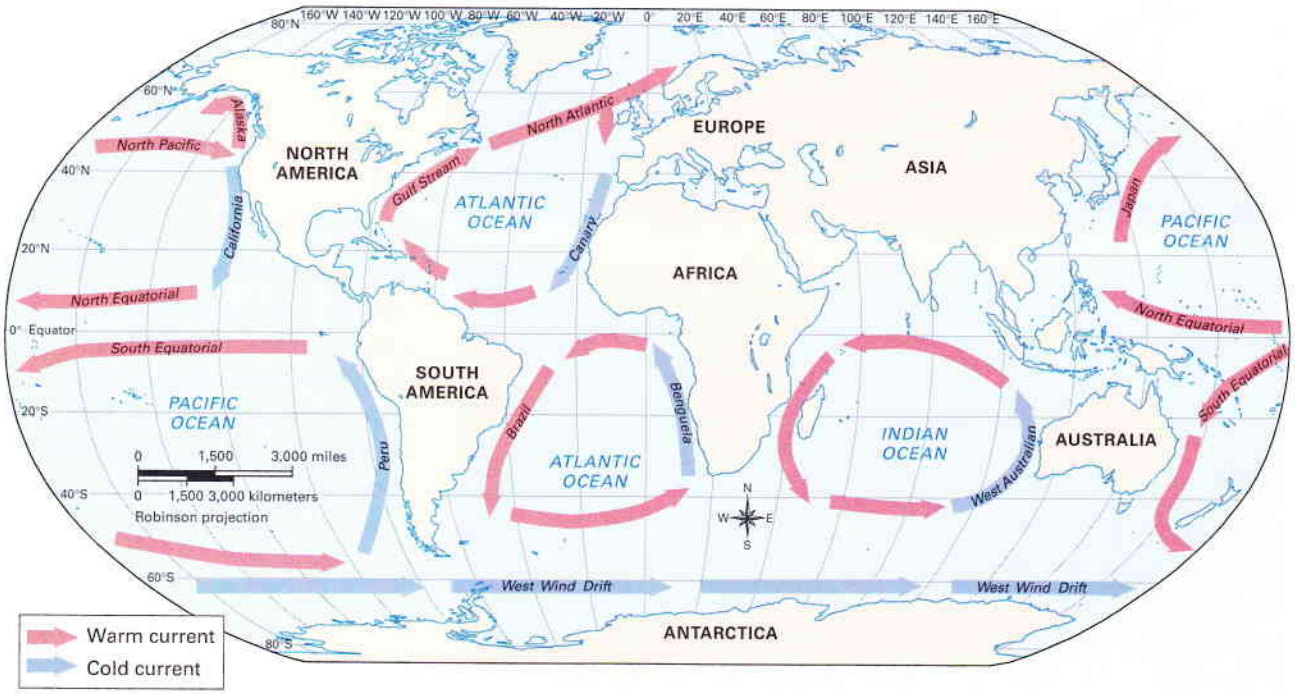
When winds blow across the ocean, they move water on the ocean's surface. This moving surface water forms ocean currents. Like winds, ocean currents move in circular patterns. Near the equator, currents move westward with the trade winds. As these currents move along the equator, the sun warms the water.

Once these warm ocean currents hit land, they have to turn. In the Northern Hemisphere, the currents turn to the north. In the Southern Hemisphere, they turn to the south. As these currents move away from the equator, they act as heating systems. They warm the air in coastal areas and on islands that might otherwise be cooler.

Heating and Cooling Earth

Ocean currents affect the world's climate. Warm currents can heat places far from the equator that would otherwise be cold. The warm Gulf Stream, for example, brings mild winter weather to the British Isles. Cold currents can cool places near the equator that would otherwise be hot.

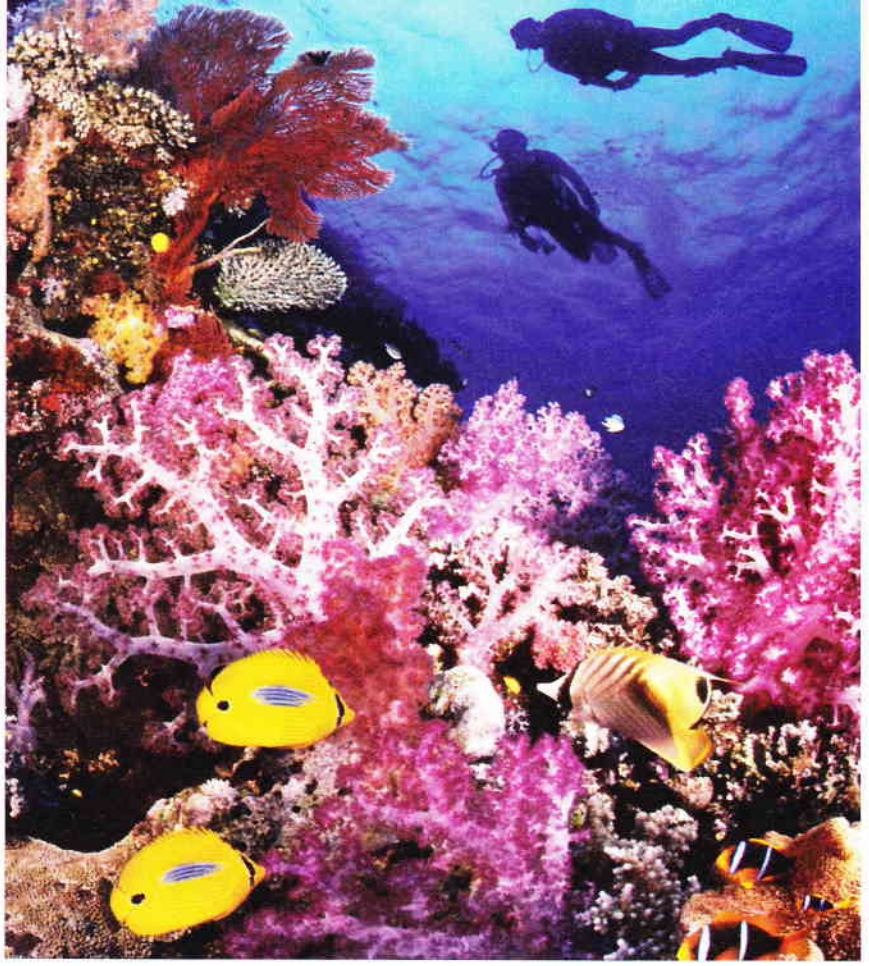
Ocean Surface Currents



Warm Air and Water Bring Wet Weather

As you learned in Chapter 11, warm air and warm water combine to create wet weather. Warm air can hold a lot of moisture. At the same time, warm ocean water evaporates easily to provide that moisture. As the wet, warm air rises, it forms rain clouds. Not surprisingly, Pacific islands in warm equatorial waters have **tropical wet** climates. Some get rain every day. Islands farther from the equator are both cooler and drier.

Warm ocean temperatures also cause **typhoons**. Typhoons are **tropical cyclones** that begin over the Pacific Ocean. Similar storms that begin over the Atlantic are called **hurricanes**. These huge storms have winds of at least 74 miles per hour. They drop large amounts of rain. They also cause **storm surges** that can flood coastal areas. For people on Pacific islands, typhoons, not tsunamis, are the most frequent **natural disaster**.



A Great Variety of Fish
Hundreds of species of fish live in the lagoons and coral reefs of the Pacific. Tourists come to Pacific islands to see this marine life. They use snorkels and scuba diving gear to get a good look at life beneath the waves.

The Ocean Is Rich in Resources

Pacific islanders have always looked to the sea for much of their food—and for good reason. There is great **biodiversity** in the oceans. Many more kinds of plants and animals can be found in the sea than on land. About 13,000 species of fish live in the oceans.

For centuries, islanders have harvested some of these fish for their own use. Today they have been joined in the Pacific by commercial fishing fleets from many countries. About 60 percent of all fish eaten by humans today comes from the Pacific Ocean.

Scientists are now looking to the sea for new medicines. One drug developed from a sea sponge is already being used to treat cancer. Another developed from a marine, or sea, snail may be used to treat severe pain. William Speck, a doctor and director of the Marine Biological Laboratory in Woods Hole, Massachusetts, sees great promise in medicines from the sea. "I believe marine organisms can be used to eliminate disease and human suffering," said Speck in a 2001 newspaper interview.

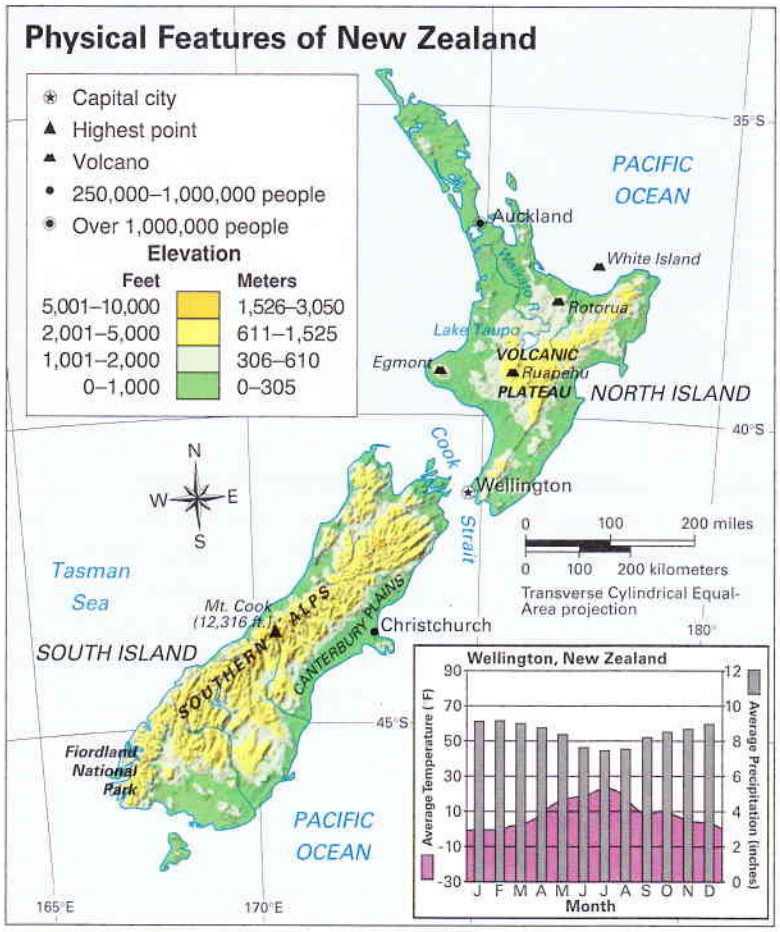
Other resources are also found in the Pacific. Pearls from shellfish called *oysters* are prized for jewelry. Vast expanses of the ocean floor in the central Pacific are rich in metal **ores**. Some areas of the sea have deposits of oil and natural gas.

The jobs of Pacific islanders are often related to the ocean and its resources. Many local people work in the tourist industry. **Tourism** is now the biggest moneymaker on many islands. Others work in the fishing industry.

34.4 Life on a Continental Island: New Zealand

New Zealand is an island country in the South Pacific. It is also one of the world's most isolated countries. It is separated from its nearest neighbor, Australia, by more than 1,000 miles of ocean.

The first people to settle New Zealand knew from experience just how far it was from other places. According to legend, they were at sea for a very long time. Finally, one of them saw a long white cloud in the distance. That meant that they were near land. The settlers named their new home Aotearoa. In their language this meant "Land of the Long White Cloud."



A Varied Landscape

New Zealand boasts a great variety of physical features. The North Island is a land of volcanoes, some of which are still active. The South Island's Southern Alps are still growing at the rate of about two fifths of an inch a year.

Physical Features New Zealand is made up of two large continental islands and many smaller islands. The two large islands are called the North Island and the South Island. Together they measure about 1,000 miles from north to south and 280 miles from east to west. That's roughly the size of the state of California.

Mountains dominate both large islands. Many of these mountains are volcanoes. Some of them, such as Mount Ruapehu, still erupt sometimes. The mountains of the North Island feature many rivers, lakes, hot springs, and steam-spouting **geysers**. On the South Island, the Southern Alps are high enough to be covered by snow all year. They are also steep enough to challenge mountain climbers.

The rocky west coast of the South Island is indented with fjords. A fjord is a narrow inlet between two steep cliffs. Long ago, these inlets were carved out of the coastline by glaciers.

Climate and Economy New Zealand has a **marine west coast** climate. Temperatures are moderate all year, with few extremes of hot and cold. Most days are sunny. But the islands receive regular rainfall from the warm, moist winds that blow from west to east across the Pacific Ocean.

The rain falls unevenly around New Zealand. Heavy rains drench the west side of the South Island. The western slopes of its mountains receive more than an inch of rain a day. By the time clouds cross the eastern side of the mountains, they have lost most of their moisture. The result is a rain shadow east of the mountains. This area gets only 25 inches of rain a year.

Unlike many island countries, New Zealand is blessed with large expanses of fertile land. Farming and raising livestock form the foundation of the country's economy. New Zealand farmers raise enough meat and dairy products to feed their own country and millions more people worldwide. Sheep are the most important farm animals. They are raised both for their meat and their wool. Sheep outnumber people in New Zealand by more than 12 to 1. No other country has so many farm animals compared to its population.

Because New Zealand is surrounded by water, it's not surprising that fishing is a major part of its economy. Tuna, marlin, and snapper thrive in the ocean waters. The sea life also attracts tourists. People from around the world come to see dolphins, seals, and whales.

Human Adaptations By 2005, around 4 million people lived in New Zealand. The great majority make their home on the North Island. Most New Zealanders live in a few large cities.

Although New Zealand doesn't have extreme temperatures, it does have four distinct seasons. In the summer, New Zealanders might never need to wear more than a light jacket. In the winter, they put on warm clothing to go outdoors.

New Zealand's varied **landscape** provides many opportunities for outdoor recreation. People ski and hike on the snowcapped mountains. They surf, sail, swim, and fish along the coasts. Rivers provide opportunities for kayaking and white-water rafting. Hot springs attract people who want to relax.

New Zealand is fairly large compared with many Pacific islands. To get around, people travel by car, train, or bus. Air travel links New Zealanders to the world beyond their island home.

Living in Auckland

Auckland is New Zealand's largest city. More than 1.3 million people make their home in the city and its suburbs. This is about a third of the country's population. Homes in Auckland are similar to houses you would find in an American city.

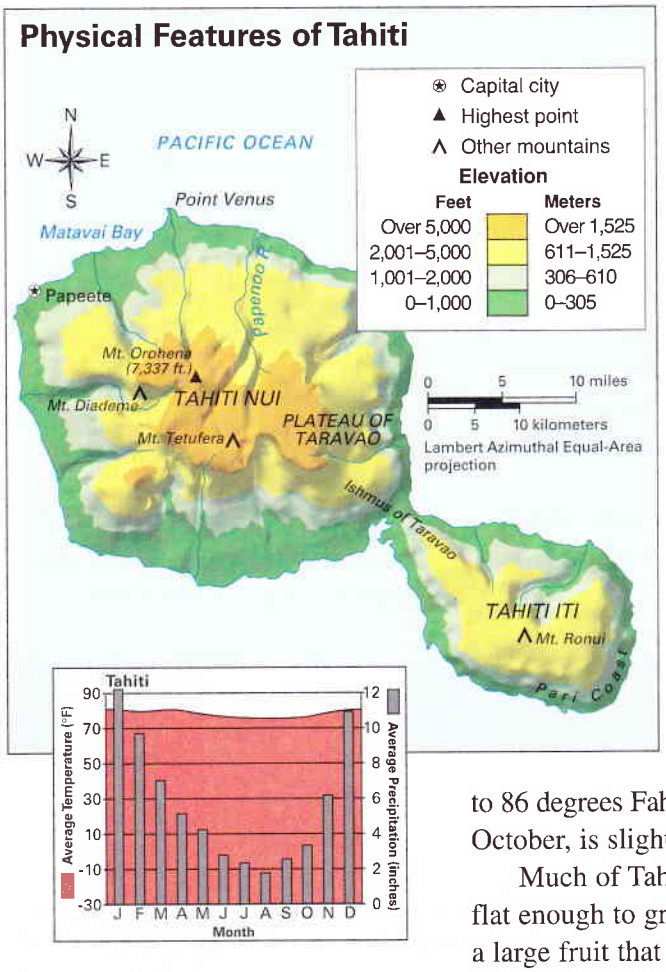
34.5 Life on a Volcanic Island: Tahiti

Tahiti is a land of beautiful beaches and sweet-smelling flowers. Tourists from around the world travel to this island to relax. Many share the opinions of the first Europeans who arrived in Tahiti hundreds of years ago. They think Tahiti is just about perfect.

Getting to Tahiti takes a long time, even by airplane. Like other Pacific islands, Tahiti is very far from its neighbors. It is more than 3,000 miles from Australia and almost 6,000 miles from Japan. It's part of the island group called French Polynesia. Tahiti was once a French colony. Now it is a French territory with its own government.

Steep Volcanoes

This map shows why Tahiti is sometimes called a two-part island. Tahiti Iti and Tahiti Nui are inactive volcanoes. Waterfalls tumble down steep mountain slopes. Sunlight often creates rainbows in the spray. Natives call their island "Tahiti of the many-colored waters."



Physical Features Tahiti is the largest island in French Polynesia, but it's only 402 square miles in area. That makes it one third the size of the tiny state of Rhode Island. From above, the island looks a bit like a hand mirror with a fat handle. The part shaped like a round mirror is called Tahiti Nui (Big Tahiti). The fat handle is Tahiti Iti (Small Tahiti). These two parts are joined together by a narrow **isthmus**.

Both Tahiti Nui and Tahiti Iti were once active volcanoes. The land in both parts of the island rises steeply from the coast. The slopes surround **craters** that once were the volcanoes' centers. The dramatic landscape also features waterfalls and cliffs. The Te Pari cliffs of Tahiti Iti are so steep that they are nearly vertical.

Climate and Economy There are two seasons in Tahiti. The wet season lasts from November to April. During that time, Tahiti gets three fourths of its annual rainfall. Temperatures range from 80 to 86 degrees Fahrenheit. The dry season, which lasts from May to October, is slightly cooler.

Much of Tahiti is too steep for farming. Only the coastal plain is flat enough to grow crops. Tahiti is known for its breadfruit. This is a large fruit that takes on the texture of bread when baked or roasted. Coconut palms, citrus fruits, and orchids also grow in Tahiti. In the past, Tahiti's farms produced enough food to support its people. But as the population has grown, much of the island's food is imported.

Tahiti's economy depends on ocean resources in many ways. Its sunny beaches, coral reefs, colorful fish, and sea turtles attract large numbers of tourists. They are a major source of income for the island.

The next most important income source is black pearls. Pearls come from oysters. When a foreign object, such as a bit of sand, gets inside an oyster's shell, the oyster coats it with a substance called *mother of pearl*. Sometimes the result is a lustrous pearl. Pearls can be white, gold, pink, or dark gray—the color of black pearls.

To encourage oysters to make pearls, Tahitians plant a small bead inside their shells. Ideally a large, dark gray pearl will take shape around the bead over the next two years. But that doesn't happen often. In reality, only 3 oysters out of 100 make a perfect pearl.

The waters off Tahiti are full of sea life. Many Tahitian natives still fish for tuna, marlin, and shark the old-fashioned way. They use poles and lines to catch no more than they will be able to eat.

Commercial fishing is an important part of Tahiti's economy. Fishing fleets from Japan, Korea, and the United States pay Tahiti for permission to fish in its waters. These fleets use electronic equipment to find fish and huge nets to haul their catch out of the sea.

Human Adaptations More than half the population of French Polynesia lives on Tahiti. Most live on the island's north coast. That is also the location of Pepeete, French Polynesia's capital. Pepeete is a crowded modern city. Other parts of Tahiti are less built up, and people live in more traditional villages.

Beginning in the 1700s, outsiders introduced new ways to Tahiti. For example, men and women traditionally wore a wrapped garment called a *pareu*. Today most wear casual clothes like jeans and T-shirts.

Housing has also changed. Traditional one-room houses were made of coconut trunks and pandanus leaves. Today houses are larger and made of more durable materials. Wealthy Tahitians live in large concrete houses. People who are less well-off live in one- or two-story wooden homes. Houses in the country may have thatched roofs.

Tahiti offers many recreation opportunities. Residents and visitors scuba dive, snorkel, and surf in the water. They hike or ride horses on the volcanic slopes. Some go hang gliding off cliffs. Local people may also participate in traditional dancing and sports.

A modern airport in Papeete brings visitors to Tahiti. Cars and buses provide local transportation. The bus service is called *le truck*. It uses trucks converted into open-air buses to take people around the island.

Bright Colors Everywhere
Traditional Tahitian clothing is made of brightly colored cloth. Both men and woman wore a wraparound garment called a *pareu*.

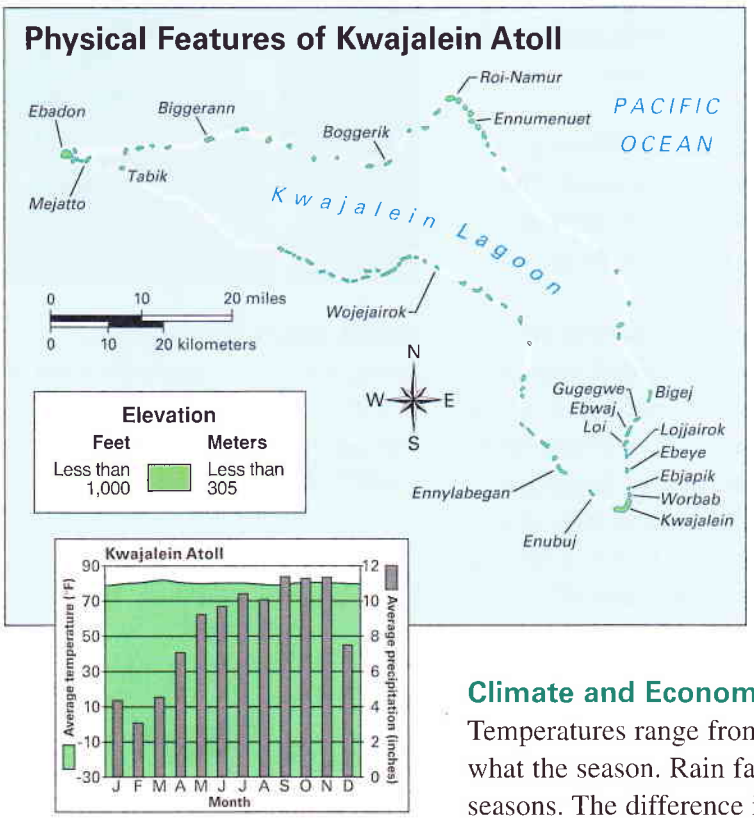
Tahiti Attracts Artists
Artists from around the world have been coming to Tahiti ever since Europeans came to the island. Paul Gauguin was one of the most famous. He was a French painter during the 1800s. His home, shown here, is a traditional Tahitian house.

34.6 Life on an Atoll: Kwajalein Island

A String of Small Islands

Kwajalein Atoll is part of the Marshall Islands. Kwajalein is also the name of one of the islands in the atoll. Kwajalein Island is $\frac{1}{2}$ mile wide and $2\frac{1}{2}$ miles long.

Imagine living on an island that's about the size of a small town. That's what it's like for the people who live on Kwajalein Island. Kwajalein is one of the islands that make up the Kwajalein Atoll. The atoll is located just north of the equator in Micronesia. Kwajalein is part of the Republic of the Marshall Islands. It is also home to a United States Army base.



Physical Features Kwajalein Atoll is the largest coral atoll in the world. Even so, its 97 islands total an area of only 6.5 square miles. The atoll surrounds a lagoon that covers more than 600 square miles. There's a lot more ocean than land in Kwajalein Atoll.

The highest points on Kwajalein Atoll are only 12 to 15 feet above sea level. Because atolls are so low, they flood easily in storms. Also, there are no rivers or springs to provide fresh water. In the past, islanders caught rainwater for drinking. Today **desalinization plants** help some islanders meet their water needs. These plants remove salt from seawater to make it suitable for human use.

Climate and Economy Kwajalein has a tropical wet climate. Temperatures range from about 80 to 88 degrees Fahrenheit no matter what the season. Rain falls daily during both the wet and the "dry" seasons. The difference is that showers don't last as long during the drier months. Tropical storms sometimes blow across Kwajalein, but typhoons are not common. Coral reefs protect the islands from storm surges. They are also home to sea turtles, sea sponges, and shellfish.

Few crops grow in the atoll's sandy soil. Islanders raise coconut palms, breadfruit, and a starchy root called *arrowroot*. Copra, or dried coconut meat, is one of Kwajalein's main products. Because farming is limited, islanders depend on fish for much of their food.

Today, however, the economy of Kwajalein is based on its importance as a U.S. military base in the Pacific. Tourism is also growing among scuba divers who like to explore old shipwrecks.

Human Adaptations People live on 14 of Kwajalein Atoll's 97 islands. About 13,500 are citizens of the Marshall Islands. Approximately 3,000 are Americans. Only people who work for the U.S. Army, and their families, are allowed on Kwajalein Island.

Living on Kwajalein Island can be challenging. Because of the constant rain and dampness, everything made of iron rusts. Outdoor barbecues and metal furniture do not last long in this climate.

Damaged Coral Reefs
The coral reefs of Kwajalein Atoll were once used as building material by people living on the islands. In this photograph, you can still see large areas where coral has been removed.

Travel around Kwajalein can be tricky. The only cars belong to the U.S. Army. Residents use bicycles to get around. But the dampness can rust a bike in days if it isn't cared for. A person who has a bike for three years has been very careful or very lucky. Ferries and planes link the island with the rest of the atoll and the outside world.

The U.S. Army owns all housing on Kwajalein Island. People live in a mix of trailers, older concrete houses, and newer wooden houses. The most unusual houses are dome homes. They look like white plastic bowls turned upside down. The dome homes are made of materials that resist weather damage and conserve energy.

People on Kwajalein dress like most other Americans, only more casually. Many wear shorts and light shirts to beat the heat.

For those who like sports, there is a lot to do on Kwajalein. Scuba divers enjoy exploring the coral reefs with their colorful fish. Water sports such as sailing and windsurfing are popular on the lagoon. Sports fishing is popular as well. Tuna, marlin, and skipjack are popular game fish. People also enjoy team sports such as volleyball and softball. Indoor activities range from bowling to movies.

34.7 Beginning to Think Globally

In this chapter, you learned that the ocean affects every aspect of life in the Pacific Islands. You also learned about life on three kinds of islands. Continental islands are the largest, with the most usable land. On volcanic islands, people live mostly along the coasts, where the land is flat and fertile. Atolls, in contrast, are difficult places to live. They have very little land and lack fresh water. Oceans are important to Pacific islanders. They provide food and attract tourism.

Oceans are important to the rest of the world as well. One out of every five people worldwide relies on fish for protein. As the world's population grows, the demand for fish will increase. Think about this as you look at the map of regulated fishing zones around the world in the next section.

Oceans Provide Resources
Oceans are important to people around the world. Worldwide, 35 million people earn a living by catching or raising fish for food.

34.8 Global Connections

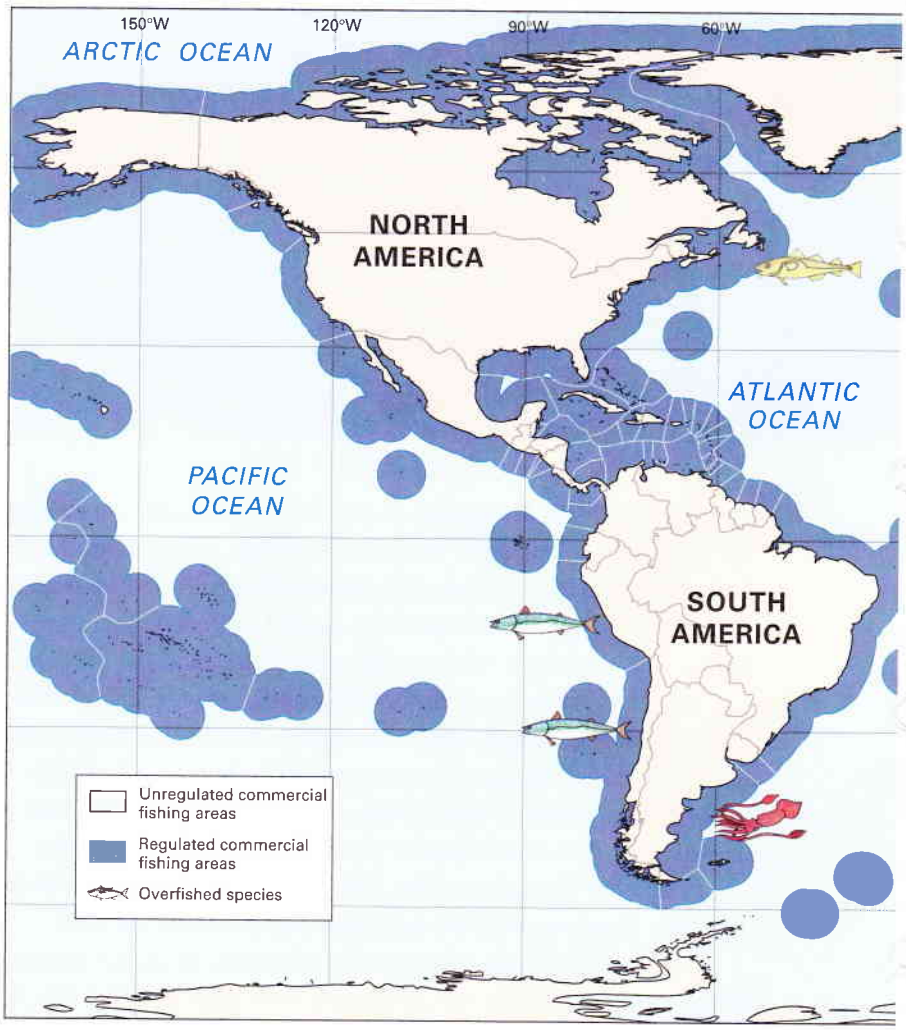
This map shows regulated fishing areas around the world. Each country that borders an ocean has the power to regulate, or control, fishing off its coast. The area it can control extends 200 nautical miles (230 miles) out to sea. These regulated areas are colored dark blue. The light blue areas are unregulated waters. Anyone can fish there. The map also shows where some sea species are in danger of dying out due to **overfishing**.

What is happening to the world's fish supply and why? The supply of many species of fish is declining. Pollution and changes in climate may have contributed to the decline. But the most important cause is overfishing. So many fish are being caught that they cannot replace themselves. Overfishing is driven by a rising demand for fish. It is also the result of better technology. This **technology** helps fishing crews to catch more fish in less time.

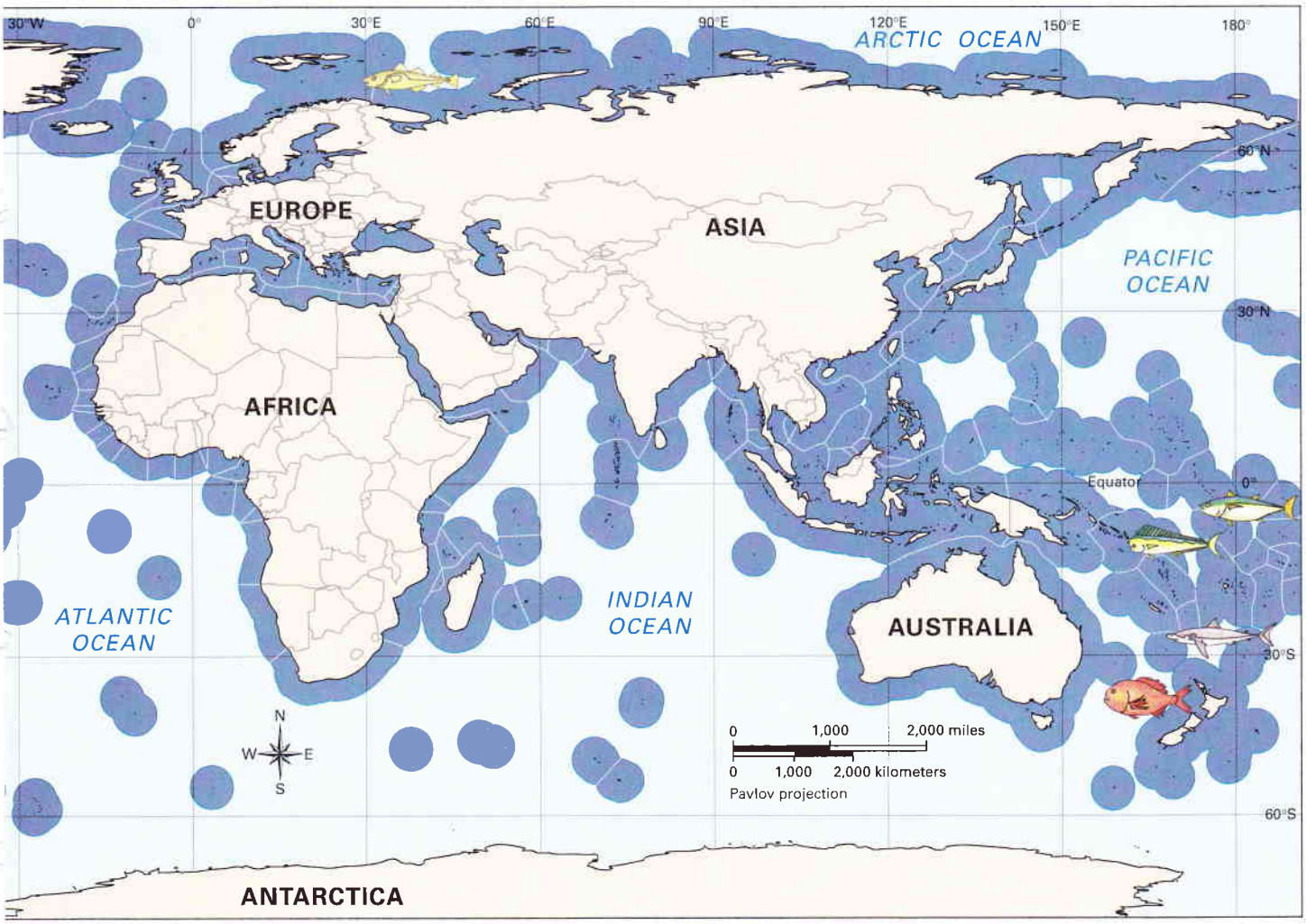
What problems might overfishing cause? Overfishing damages ocean **ecosystems**. The **food web** in oceans changes when a species disappears. Overfishing also threatens a food source on which many people rely.

What can be done to prevent overfishing? Countries can try to reduce overfishing in the waters they control. One way is to outlaw fishing methods that catch too many fish. Another is to ban the catch of endangered species. But countries can only regulate limited areas. The rest of the seas are unprotected. To stop overfishing, countries must work together to protect the oceans and their resources.

Regulated Fishing Areas Around the World



Salmon fishing in Ketchikan, Alaska




Cod: Second only to herring in tons caught each year. Used mainly for food.


Orange roughy: Sold fresh or frozen for food. Its oil is used in cosmetics.


Squid: Appears as "calamari" on menus. Used as bait on fishing boats.


Mackerel: Eaten for their meat. Prized by sports fishers for their fighting ability.


Tuna: A popular food for people and pets. Sold canned, fresh, and frozen.


Mahimahi: Enjoyed as a steak fish. The name means "strong-strong" in Hawaiian.


Shark: Caught for their hides, fins, and meat. The hide makes an excellent leather.