

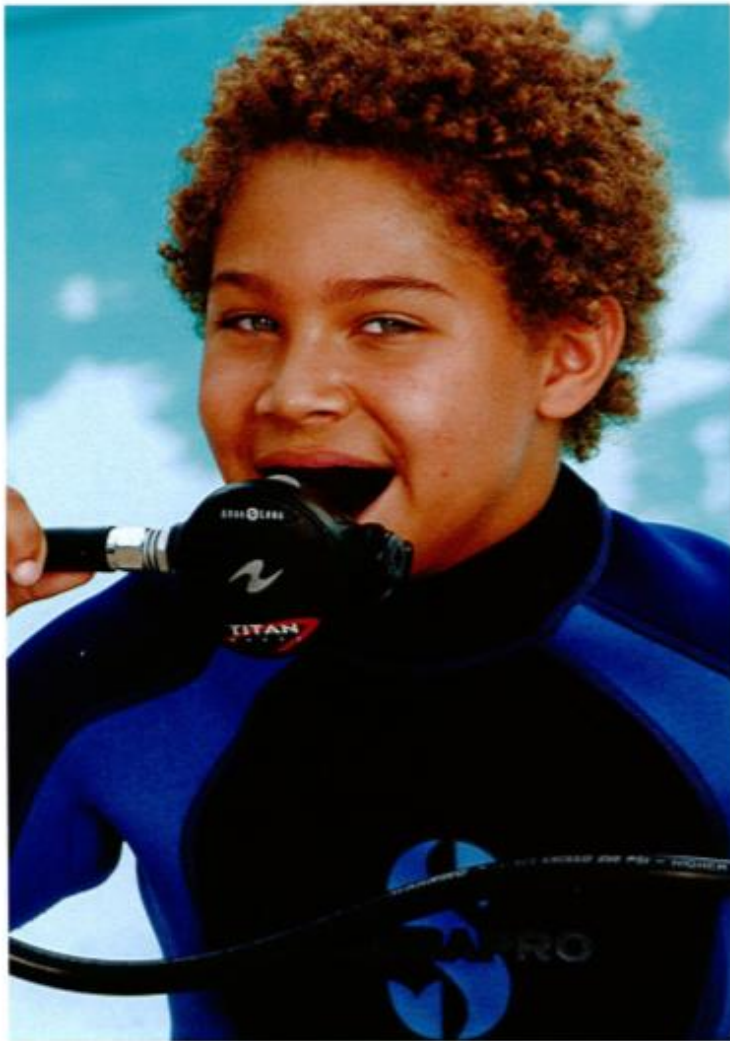
## Hearing Underwater— You Can Listen But You Can't Talk

Sound travels well through water, so you will be able to hear underwater. However, sound travels about four times faster in water than in air. This makes it difficult to tell where a sound is coming from.

You will not be doing much talking underwater. You can attract attention vocally by yelling into a regulator, but you cannot speak clearly, so you will need to use other methods of communication. For example, you can rap your knife on your tank to get your buddy's attention, write on a slate, and use hand signals. Many scuba divers "talk" with their hands through standardized hand signals that most divers recognize.



Hand signals may vary somewhat, so be sure to review the signals you will be using when planning a dive with a new buddy.



## Essential Diving Skills

You will be able to perform the essential diving skills discussed in this chapter after you have successfully completed your skills development sessions in a pool or confined water. *Confined water* refers to a body of water much like a pool, with similar pool-like conditions, such as a clear and shallow pond, a lake, or a ocean lagoon or bay.

After you practice these skills in confined water, you will apply them during open water dives under the supervision of your scuba instructor in order to achieve your dive certification and earn this merit badge. *Open water* refers to a natural, non pool-like aquatic area such as a lake, quarry, or an ocean environment. Open water environments are deeper than confined water areas with natural contours and features.

### Assembling, Inspecting, and Testing Equipment

Before you can use scuba equipment, you have to be able to put together your cylinder, regulator, and buoyancy control device, or BCD. Putting your equipment together carefully allows it to function correctly underwater. In addition, you will learn how to inspect and test your equipment before using it. Inspection and testing help make sure all the pieces of equipment function properly before you venture underwater.



## Proper Weighting

Before putting your equipment on, you will learn how to add or subtract weights

from your weight belt or weight pockets in your BCD (collectively, these two places where you can place lead weight are called a *weight system*). This allows you to adjust your buoyancy so you can descend underwater but not be too heavy on the dive bottom. On the bottom, you may practice achieving neutral buoyancy by doing a *fin pivot*.

A *fin pivot* is a training skill to help you practice attaining neutral buoyancy. If you are properly weighted on the bottom, you will pivot *up* on your fins when you inhale and pivot *down* when you exhale. More often than not, you will want to dive with neutral buoyancy, neither descending nor ascending. Neutral buoyancy keeps you under control and off the bottom so you don't stir up debris or harm aquatic life on the bottom.



Weight belt



Fin pivot

## Entries and Exits

Depending on the dive site where you learn your essential diving skills, you will practice a variety of water entries and exits. Different types of dive sites require different types of entries and exits. In general, the best entry and exit is usually the easiest. If you can wade or lower yourself into the water, that is usually better than a long drop. To exit, if you can use a ladder or simply walk out of the water, that is usually best.



## Emergency Function of the Weight System

In an emergency at the surface, your first reaction should be to inflate your BCD. However, if your BCD does not support you, your next option would be to drop your weights.



## Snorkel/Regulator Exchanges at the Surface

Quite often you will snorkel on the surface directly over the place where you want to dive so that you do not waste cylinder air on the way. When you get there, you will exchange your snorkel for your regulator and then descend. Since there may be waves or chop in the ocean or lake, you might have to do this with your face in the water.



### Mouthpiece Clearing—Snorkel and Regulator

Both snorkels and regulators can get water in them. To clear water from your snorkel or regulator, simply exhale forcefully and sharply into the mouthpiece. This “blasts” the water out of the equipment. Typically, you will need to do this when you surface and switch from your regulator to your snorkel.

### Regulator Recovery and Retrieval

If your regulator should accidentally drop from your mouth, you can recover it by sweeping your arm forward and placing it back into your mouth.



You will want to practice your regulator recovery and retrieval skills.

### Controlled Descents and Ascents

Every diver needs to descend (go down) at the beginning of a dive and then ascend (go up) at the end. In your certification course, you will learn the specific steps for appropriate descents and ascents.

### Descents

The descent has five steps that you will practice in your open water diver course.

1. Signal that you and your buddy are both ready to descend.
2. Orient yourself to something at the surface that will help you find out where you are when you resurface.
3. Switch from your snorkel to your regulator. Do this with your face in the water.
4. Check the time, set your watch bezel (the movable timer dial on the outer area of some traditional dive watches), or start your underwater timer. If you don't have an underwater watch or timer, for practice look at your wrist where you would wear your watch to simulate noting the time.
5. Slowly deflate your BCD and exhale to initiate a head-up descent. Equalize your ears immediately upon submerging and do so frequently during descent. You do not need to be straight up and down, but staying in a generally head-up position helps you stay oriented and makes it easier to equalize.



### Ascents

A proper ascent has five steps that you will learn and practice in your open water diver course.

1. You and your buddy signal each other and agree to ascend.
2. Note the time of your ascent. Again, if you do not have a watch for this dive, simulate checking the time by looking at your wrist.
3. Hold your right hand over your head (so you do not run into anything) and hold up the buoyancy control device hose with exhaust control using your left hand. Air expanding in your BCD during ascent will increase your buoyancy. You need to release air as you rise to keep your ascent under control.
4. Look up and around, slowly rotating to make sure the area above you is clear.
5. Swim up slowly, at a rate no faster than 60 feet (18 meters) per minute (slower is fine), while breathing normally.



### Surface Snorkel Swimming With a Full Scuba System

Quite often you will snorkel on the surface to the place where you want to dive, which means that you won't waste cylinder air on the way. During confined water development, you will practice snorkel swimming on the surface with scuba equipment.



### Underwater Swimming

After you have practiced a few skills, you will be ready to swim around a bit. The standard kick for diving is the flutter kick. If you use the flutter kick appropriately you will save energy, because the flutter kick is quite efficient.



Flutter kick

### Mask Removal, Replacement, and Clearing

Water sometimes leaks into your mask while diving—especially if you smile or laugh. In addition, you may need to take your mask off underwater to adjust it, so it is essential to become comfortable with taking it off and then putting it back on. Once your mask is back on, you will clear the water from it by exhaling through your nose. This pushes the water out of the mask, allowing you to see again.



### Buddy-System Techniques

During your confined water skills development, you will practice the buddy system—always diving with a buddy who stays nearby at all times. Dive buddies help each other with things such as putting on and checking each other's equipment before the dive; reminding each other to check depth, time, and air-supply limits; and providing emergency assistance in the unlikely event it is necessary. Remember, the buddy system is part of Safe Swim Defense training.



### Underwater and Surface Buoyancy Control

Achieving neutral buoyancy underwater is a skill you will use often while diving. During confined water skill development, you will practice hovering above the bottom, demonstrating your ability to maintain neutral buoyancy. You need to maintain neutral buoyancy while diving for the following reasons.

- To avoid inappropriate contact with the bottom that could possibly harm bottom-dwelling animals
- To be able to relax and maneuver easily
- To prevent rapid, uncontrolled ascents and descents



### Underwater Removal and Replacement of Scuba System

There may be times when you need to remove and replace your scuba unit. Underwater, your scuba unit may need adjustment or may be slightly entangled and need to be freed. On the surface, you may put your scuba unit on after entering the water and remove it before exiting.

### Out-of-Air Emergency Alternatives

If you pay attention to your air-supply gauge and plan your dive conservatively, it is unlikely that you will ever run out of air underwater. Even so, you need to be able to handle such an emergency, and you will practice a few responses during your confined water dives.



### Equipment Care and Maintenance

Like all outdoor equipment, diving equipment needs to be cleaned, maintained, and stored after each use. Rinse all equipment with freshwater and allow it to dry in a place that is out of the sun.




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Be sure to follow the manufacturer's directions for the proper cleaning, care, and storage of all your scuba equipment.

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## Dive Equipment for Adventurers

Divers love working with their equipment and trying new devices. Some divers use specialty equipment to get more out of their underwater adventures. This chapter outlines what is possible as you increase your diving experience and skills.

### Diver Propulsion Vehicles

If you want to travel farther, save time, and save air on a dive, diver propulsion vehicles (DPVs, or "scooters") are one answer. DPVs tow (or push in some cases) you through the water, making them excellent tools for a variety of diving situations. It is also thrilling to zoom over a reef or through a kelp forest like you are flying a jet or racing a motorcycle. You might find you love DPVs simply because they are so much fun.



DPVs, or "scooters," can be a valuable tool for explorers who want to cover a lot of territory underwater in a short period of time.

### Boats and Kayaks

Many divers also are boat owners. Boats allow divers to reach underwater destinations beyond a beach or shoreline. How much a boat can extend your dive-location opportunities depends on the size of the boat and how well it is equipped.

Boats allow divers to reach dive destinations beyond a shoreline. Dive kayaking has become a popular, yet inexpensive way to dive offshore.



### Digital Underwater Cameras

Digital photography has revolutionized taking pictures underwater just as much as it has on dry land. Compact, easy-to-use underwater camera systems have become so simple that some people begin taking underwater photos on their very first dive. Professional underwater photographers use expensive cameras in watertight housings to take their photos. As a result, digital underwater photography suits itself to practically all levels of interest, whether you simply want fun snapshots or whether you plan to pursue it as a dedicated artist.

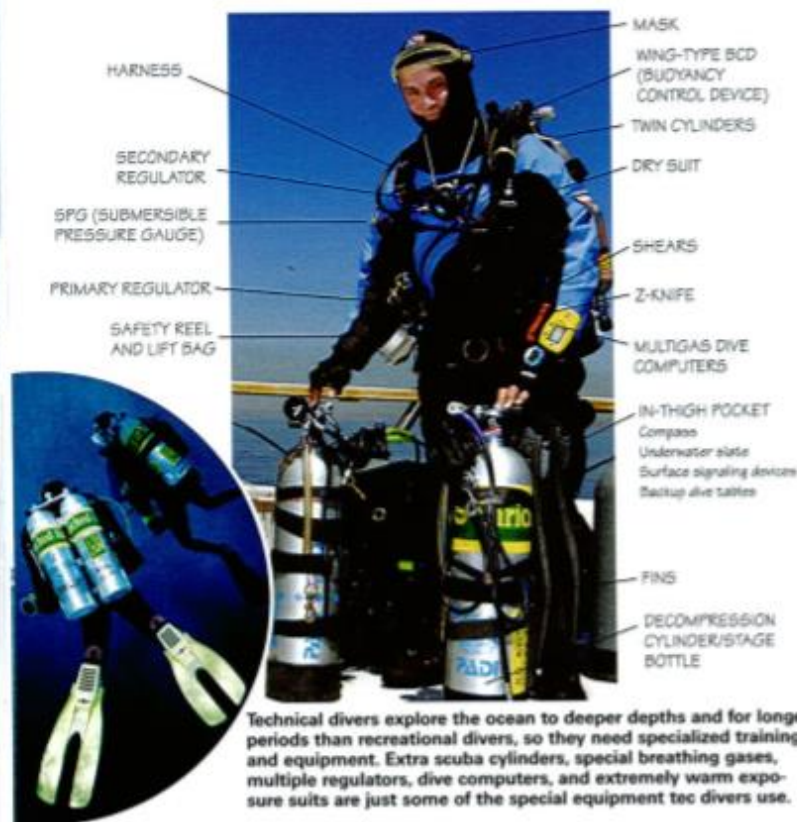
One activity you may want to try once you become a certified diver is underwater photography. You can even take underwater photos of your fellow Scouts.





### Technical Diving Equipment

Technical diving—"tec diving" for short—is a relative newcomer to the world of underwater exploration. Tec diving is a very specialized form of diving that uses extensive equipment and procedures to dive beyond the limits of recreational diving. Tec diving requires more elaborate and intense training, plus ample experience and the willingness to accept the risks. As a Scout, you will have to wait until you are at least 18 to enroll in a technical diving course.



Technical divers explore the ocean to deeper depths and for longer periods than recreational divers, so they need specialized training and equipment. Extra scuba cylinders, special breathing gases, multiple regulators, dive computers, and extremely warm exposure suits are just some of the special equipment tec divers use.

### Look, No Bubbles!

Rebreathers allow divers to stay underwater longer. In addition, they give off few or no bubbles, so divers are much less noticeable. Aquatic animals cannot detect rebreather divers as easily as divers using conventional scuba equipment that release noisy bubbles.



### Closed Circuit Rebreathers (CCRs)

Divers who use conventional scuba equipment breathe in air from a cylinder using a regulator. When a diver exhales using this equipment, bubbles exit the regulator and rise to the surface. The exhaled air contains a higher percentage of carbon dioxide than the air inhaled. However, the exhaled air also contains quite a bit of usable oxygen, but it is not used again with this type of scuba equipment.

Rebreathers are scuba devices that allow divers to breathe their own air over and over again so exhaled oxygen is not wasted. Rebreathers have several advantages over conventional scuba equipment.

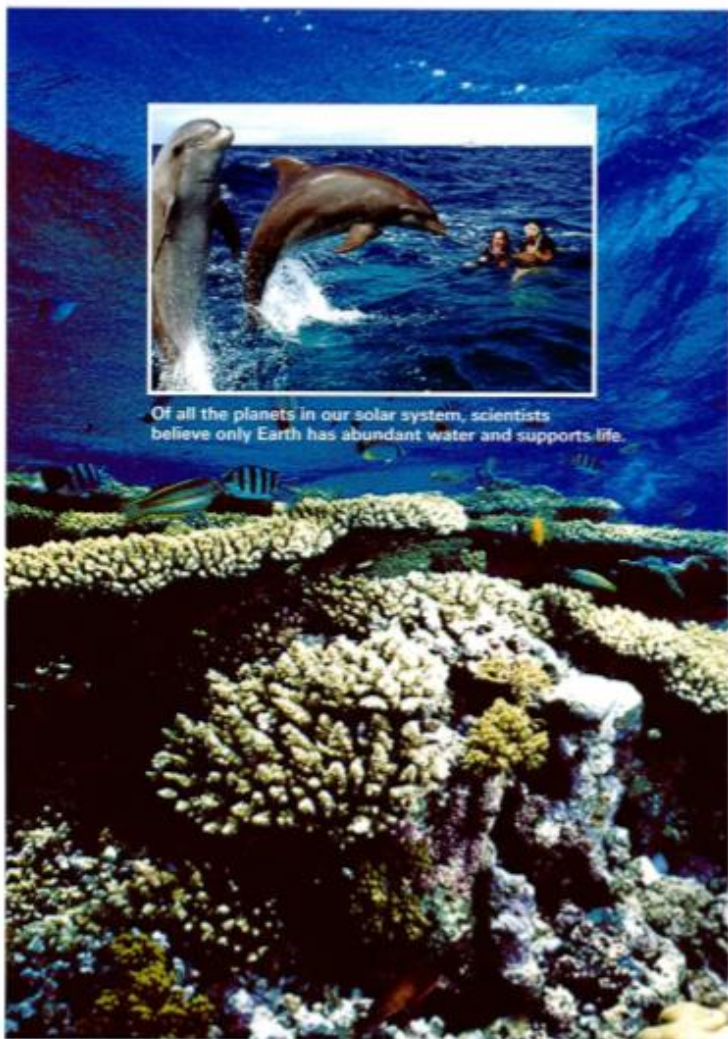
- Rebreathers are silent. They produce few or no bubbles and do not disturb marine life or reveal the diver's presence. Many underwater photographers use rebreathers to get close to marine animals.
- Rebreathers allow divers to spend a longer time underwater than do conventional cylinders.
- Rebreathers are often lighter in weight.
- Rebreathers allow for less decompression time than when diving using a conventional cylinder.

Rebreathers are considered to be advanced scuba equipment and require extra, specialized training. Even so, more and more recreational divers are beginning to use rebreathers.

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Military divers, such as the U.S. Navy SEALs, use rebreathers to keep from being detected underwater.

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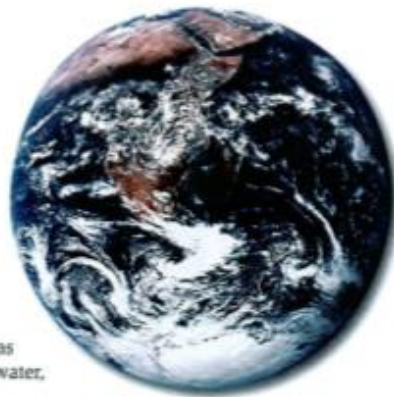
Of all the planets in our solar system, scientists believe only Earth has abundant water and supports life.

## Exploring the Ocean Planet

Imagine a planet where approximately 70 percent of its living space is water and more than half of this area measures deeper than 9,800 feet deep.

This is planet Earth—and is the reason why it is sometimes called the “ocean planet.” Of all the planets in our solar system, Earth is unique. It is the only planet known to have liquid water. Life as we know it depends on water. Without water, life simply cannot exist.

**This NASA photograph shows that we truly live on an “ocean planet.” Water covers more than 70 percent of Earth’s surface. About 97 percent of the water on Earth is saltwater contained in the oceans.**



Marine scientists use scuba and small deep-diving submarines called submersibles to explore the ocean. With this technology they can see firsthand what’s beneath the waves and collect specimens for research. Even with this technology, they’ve been able to explore less than 5 percent of the ocean.




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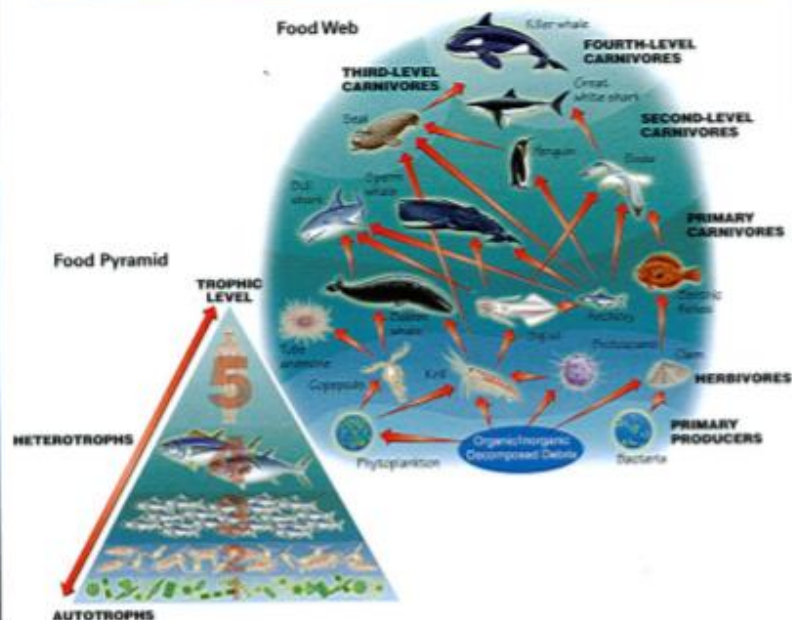
When you focus on our water planet, think exploration. Very little of the underwater world has been explored. In fact, less than 5 percent of the ocean has been explored.

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## Underwater Ecosystems to Explore

The ocean is vast. Throughout the world's oceans, there are many different environments, or *ecosystems*. An *aquatic ecosystem* is a specific underwater environment with a clearly defined physical boundary, distinct physical conditions (temperature of the water, depth, etc.), at least one energy source (such as sunlight), and a community of plants, animals, and other organisms that interact with one another and through which energy is transferred.

Food webs and food pyramids illustrate the flow of energy. For example, algae use energy from sunlight to carry out photosynthesis—a process that converts carbon dioxide into food compounds. The algae are then eaten by other organisms. Nutrients from the algae provide energy to these organisms that in turn are eaten by other organisms. In this way, the sun's energy is passed from organism to organism in the ecosystem.



## Freshwater Ecosystems

Inland, away from the ocean, divers may explore freshwater ecosystems, both natural and human-made bodies of water. These include reservoirs, mountain lakes, flooded rock quarries, springs, caves, and rivers. Visibility can range from a couple of feet to clearer than the clearest ocean water. Such dive places are often very popular.

Although freshwater ecosystems account for only a tiny portion of Earth's aquatic environment, they are vitally important to life on Earth. These ecosystems also can be very diverse, that is, they support a large number of different types of animals and plants. For example, the Amazon River is believed to contain almost as many fish species as found in all the world's coral reefs.



Some inland bodies of water, such as the Great Lakes, are actually freshwater seas that have had the same roles in culture and shipping commerce as large seas. These lakes offer good opportunities for shipwreck diving. Wrecks are often far better preserved in these bodies of water than are wrecks in saltwater. This is because rust forms more slowly in freshwater than in saltwater. In addition, freshwater supports fewer organisms that contribute to the deterioration of the wreck. This is particularly true of wooden-hulled craft, which deteriorate and collapse in only a couple of decades in tropical seas but that can last well over a century in the cold depths of a lake.

Rivers have their own personalities. In many rivers, divers will enter upstream, drift with the current, and exit downstream. Other rivers flow slowly enough that divers can dive them as they would dive a lake, without being overly concerned about currents.

You could scuba dive in a different place, every week for an entire lifetime and there would still be new wonders to see.

## Marine Ecosystems

Marine ecosystems are saltwater ecosystems.

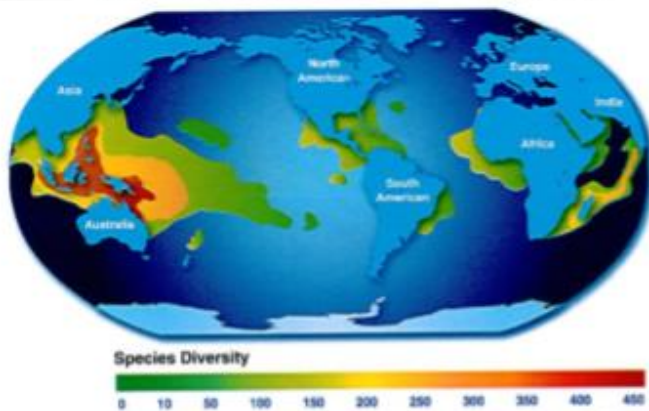
The entire tropical zone receives the sun's rays more directly than areas in higher latitudes, so the average annual temperature of the tropics is higher. Seasonal temperatures vary less than in other places on Earth.

### CORAL REEFS

Of all Earth's ecosystems, few compare to the coral reef. A coral reef consists of the hard outer skeletons of tiny animals called corals. Most scientists believe that coral reefs are the most diverse ecosystems in the ocean. The Central-South Pacific area between Asia and Australia has the world's highest diversity of marine species. In this area, more than 2,000 species of fish are known, with new species discovered every year.

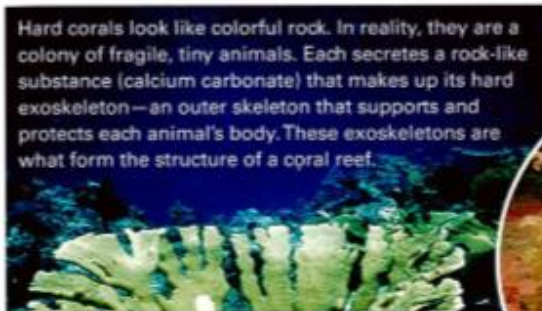
Coral reefs exist in many parts of the world, including coastal areas near southeastern Asia, southeastern Africa, northeastern Australia, eastern Brazil, and near Florida and Hawaii. These are all tropical or subtropical areas. The tropics lie within a narrow band of water and land on each side of the equator. They include all the land and water situated between the Tropic of Cancer and the Tropic of Capricorn.

Coral reef ecosystems are fragile. Scientists, divers, and others familiar with coral are concerned about the health of these ecosystems. The conditions corals require for life are narrow and specific. Corals need a lot of light and clear water that is free of sand and debris that could clog, smother, and kill the corals.



The Central-South Pacific area between Asia and Australia has the world's highest marine species diversity.

Hard corals look like colorful rock. In reality, they are a colony of fragile, tiny animals. Each secretes a rock-like substance (calcium carbonate) that makes up its hard exoskeleton—an outer skeleton that supports and protects each animal's body. These exoskeletons are what form the structure of a coral reef.



Soft corals form colonies but don't secrete a hard, rock-like exoskeleton.



A healthy coral ecosystem requires water that is relatively free of nutrients. This may seem odd. However, coral ecosystems efficiently pass on and preserve organic material. The lack of nutrients in the water actually protects the corals from organisms that need more nutrients (such as species of algae) and that would otherwise compete with the corals for food and other resources.



One of the first things you will notice about tropical coral reef ecosystems is that they are colorful. Many reef creatures are quite delicate as well.

When you scuba dive around corals, never touch them with your fingers, body, or fin tips. Most corals break off easily. Carefully control your buoyancy with your buoyancy control device (BCD) to remain neutral and off the bottom.

### TEMPERATE KELP FORESTS

Temperate marine ecosystems—cooler, but still mild, environments—are wonderful places to dive, but they do require that you wear a warm exposure suit to stay comfortable.

The west coast of the United States and areas along the northeastern coast of North America can be considered temperate.

Of these temperate areas, the kelp forest ecosystem is one of the more unique. Giant kelps, a type of algae, can grow up to 12 inches a day and reach a total length of 80 feet, as long as they are in clear water with ample sunlight and nutrients. Kelp forests provide a safe living environment for a substantial number of temperate fish and reef-dwelling creatures.

**Kelp forests are fascinating ecosystems for divers to explore. The fastest-growing algae is giant kelp. Forests of this algae provide a lush environment for many underwater creatures.**



Kelp is important because it is the foundation for many temperate coastal ecosystems, much as coral is the foundation for many tropical marine ecosystems.

### POLAR ECOSYSTEMS

Because of their nutrient-rich water, the oceans at both the North Pole and the South Pole are home to some of the largest organisms on the planet. Every species of great whale—including humpback and gray whales and many other marine mammals—feed in the polar regions, mainly during the warm, long days of summer. These are the only seas rich enough in nutrients to support large populations of these hungry giants.

While coral reefs are characterized by having lots of different species with relatively small populations, the polar seas are the opposite. They have a low number of types of animals, but large populations. For these reasons, a growing number of divers are visiting polar ecosystems for adventure, thrills, and the chance to see very clear water and large animals.

Ice diving requires special training from experienced instructors. Divers certified as ice divers have the opportunity to dive year-round in clear water and to see unique cold-water creatures.



### Cave Diving

Highly trained cave divers explore underground aquatic ecosystems. In the Mexican Yucatan (south of the city of Cancun), exploratory cave divers have mapped submerged caves with more than 461 miles of passages. The longest single passage has been mapped to 74 miles. More than 20 years since the first serious cave exploration began in the Yucatan, divers are still discovering new caves and unexplored passages.

Specialized cave-diving training is always required before entering underwater caverns (the lighted entrance area of a cave) and actual cave passages. Nevertheless, those well-trained divers who have completed cave-diving courses find the adventure an incredible experience.



Cave diver exploring Mexico's Yucatan Peninsula

### Being a Good Steward of Our Ocean Planet

No matter where you live, you are connected to the ocean. It supplies you with oxygen and freshwater. Most of the oxygen in the atmosphere originally came from the activities of photosynthesizing organisms in the ocean. Much of Earth's freshwater is water that evaporates from the ocean and then condenses and falls as rain.

The ocean also moderates Earth's climate, influences our weather, and affects our health. We get food, medicine, minerals, and energy resources from the ocean. In addition, the ocean serves as a global highway for ships and navies.

#### Helping to Protect the Ocean

Because you depend on the ocean, you need to become a good steward of this largely unexplored portion of our planet. Even if you live miles from the ocean, you can participate in its protection. Here are some general principles to help you become a good steward of any environment.

- **Take responsibility for your actions in all things.** It sounds simple, but being accountable to yourself will help you do what is necessary to become a good steward of the oceans.

The ocean may someday provide you with a career. See the chapter "Diving-Related Career Opportunities" for a discussion of diving professions.

- **Stop to consider the consequences of your actions.** Ask, "If I choose to do this, what will be the result?" Remember the Outdoor Code: "As an American, I will do my best to be clean in my outdoor manners, be careful with fire, be considerate in the outdoors, and be conservation-minded."
- **Lead by example.** If you become a good steward of the ocean, it will inspire your family and friends to act similarly.
- **Remember that one person can make a difference.** Small accomplishments add up faster than you might think.



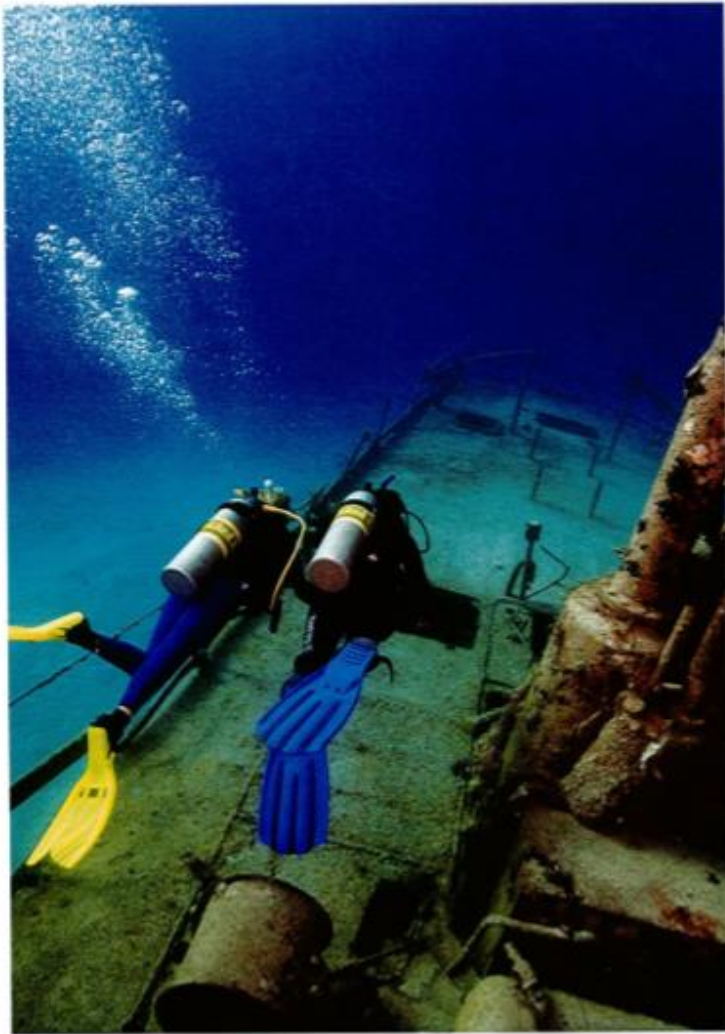
Here are some ideas of what you can do to protect the ocean, regardless of where you live.

- **Learn.** The more you know about the ocean, the better caretaker you will be.
- **Be a voice for the ocean.** Share with your fellow Scouts, parents, other family members, and neighbors what you have learned about protecting our ocean.
- **Become a scuba diver.** Scuba diving allows you to visit and experience the ocean firsthand. Your experiences will provide you with the motivation to protect our ocean. When you do scuba dive, dive responsibly. Keep off the bottom, avoid touching a reef or marine life, and never take souvenirs.



- **Practice the appropriate principles of Leave No Trace while you dive.** In particular, practice the following: (1) Plan ahead and prepare. Watch for hazards and follow all the rules of the park, outdoor facility, marine park, or boat. (2) Leave what you find. (3) Respect wildlife. (4) Be considerate of other visitors. Remember that other divers or visitors may be nearby. (5) Dispose of waste properly. Stash your trash. Do not throw trash into the ocean.
- **Choose your home detergents and cleaning products carefully.** The household chemicals you use may end up in our waterways and be carried to the oceans, so be sure to use naturally derived and biodegradable detergents and cleaning products.
- **Eat only sustainable seafood.** Certain types of seafood sold in markets are endangered and overfished. Being careful about which kinds of seafood you eat is important, both at home and in restaurants. Some species to avoid eating include Chilean sea bass, Atlantic cod, Atlantic flounder, grouper, halibut, rockfish, snapper, imported swordfish, blue-fin tuna, shark, turtle, Caribbean spiny lobster, and conch.
- **Fish responsibly.** If you enjoy recreational fishing, obey regulations and consider catch-and-release style fishing.
- **Be "water-wise" at home.** Have your parents install a water-saving toilet or add a water saver bag or brick to your toilet. Take shorter showers and add water-saving or low-flow showerheads and faucets in your home. Run your dishwasher and washing machine only with a full load. Using less freshwater at home means that less polluted runoff makes its way into streams and rivers that ultimately flow into the ocean.
- **Avoid using harmful pesticides and weed killers around your home.** Some yard chemicals can be harmful to ocean inhabitants. Rain can wash the chemicals off your yard, into rivers, and ultimately into the ocean.
- **Refuse to buy ornaments made from dead marine life.** Coral jewelry and home decorations made from dead marine life cannot compare to their living beauty in the ocean.
- **Refuse to buy wild marine life for home aquariums.** If you keep a saltwater tank, buy only marine life that have been certified as being sustainably caught or reared in captivity.





## Gaining Diving Experience

Once you earn your Scuba Diving merit badge and become a certified diver, go diving with your fellow Scouts. Dive often and build your experience. Dive different locations and explore new areas. There is no need to limit yourself just to swimming around underwater and sightseeing—although that can be a lot of fun. Try new challenges such as underwater digital photography or exploring wrecks. Recognize that scuba diving is more than just a recreational activity, it is a door through which you reach hundreds of underwater pursuits and maybe even a lifelong career.



### Boy Scout Continuing Education

As an activity, scuba diving relates to many Scouting adventures and other merit badge accomplishments. For example, if you are age 14 or older you can go to the Florida Sea Base and continue your diving in the Florida Keys. In fact, you could earn your Scuba Diving merit badge in just one week at the Florida Sea Base. Under the guidance of your merit badge counselor and PADI instructor there, you may earn your Open Water Diver Certification. As a certified Scout diver, you can experience the underwater wilderness as you have never seen it before.

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At the national Scout jamboree, you can try diving and begin your Scuba Diving merit badge adventure. The scuba diving pools at the jamboree are very popular.

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### Diver Continuing Education

Once you become certified, you will be a beginning diver, and you can start expanding your diving knowledge and skills immediately by taking other scuba courses.

First, set your sights on completing an advanced open water diver course. The course title does not mean you have to be advanced to take the course, it simply means you will advance your underwater abilities by taking the course.

Typically, advanced courses include a series of supervised dives taught by a professional instructor. Advanced courses introduce you to the basics of special underwater activities. It is a great way to see what kinds of diving interest you. Advanced dives include training in underwater navigation and deep diving, plus other specialty-oriented dives such as night diving, boat diving, altitude diving, search-and-recovery diving, and wreck diving.

By completing an advanced open water diver course, you may find one specialty activity that really excites you. If that happens you can take an entire course specific to that activity. Specialty diver courses focus on just one underwater activity and refine your knowledge and skills in that area.



If you discover that you are really interested in one particular underwater activity, there is probably a course for it. In diving, these are called specialty courses. Wreck diving and underwater digital photography are two of the most popular courses.

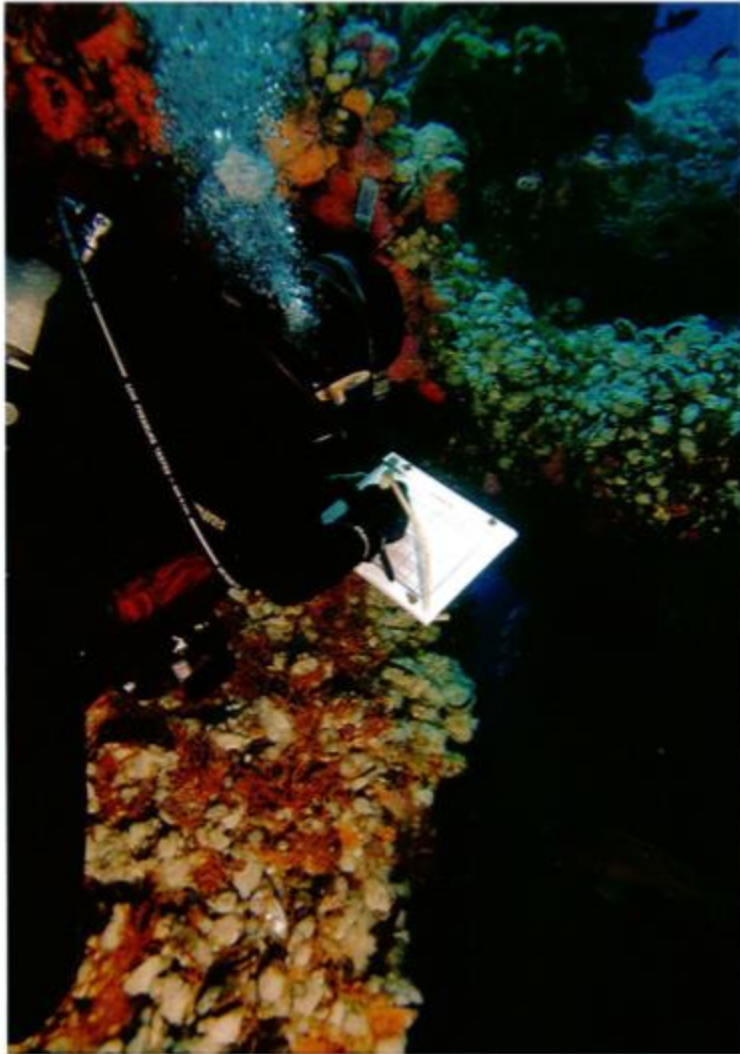
Rescue divers assist other divers in need. As a rescue diver, you will learn how to deal with diving emergencies. You may never need to use these skills, but the challenges of this course will provide you with the confidence to handle many emergencies.

After completing a rescue course, you can either continue your training and become a Master Scuba Diver or a Divemaster. The Master Scuba Diver rating is the highest nonprofessional rating in recreational diving. During a Divemaster-style course you will sharpen your dive skills to demonstration quality, develop a professional-level understanding of dive knowledge, learn to organize and conduct diving activities, and learn how to assist professional scuba instructors while they train beginning divers.

Completing a rescue diver course is a real confidence builder, because you will begin to learn how to assist other divers in need.







## Diving-Related Career Opportunities

As a Scout, you will first visit the underwater world as a recreational scuba diver. If you catch the scuba diving “bug” and become hooked on diving, you may ask yourself, “When I become an adult, can I make diving my career?”

There are thousands of careers that involve underwater exploration and adventure. Some involve many years of college and university training to earn degrees, while some require “trade school” type accomplishments such as learning to weld, repair machinery, become a boat captain and other similar skills.

### Careers to Explore

Here are some diving professions worth exploring.

#### Recreational Scuba Instructor

Imagine a career where you look forward to heading off to work in the morning. As a professional recreational scuba instructor, you might work at a local dive center, at a resort, or on a dive boat. Sailing out into the ocean to dive every day could be the rule, not the exception—especially if you work in a tropical dive destination. Your commute to work could be as easy as a 10-minute boat ride to an exotic reef. One of the best things about being a recreational scuba instructor is that you will get to help others by teaching them a new recreational activity and enriching their lives by helping them experience the adventure of diving.



Regardless of the diving-related career you might train for, most people who have chosen an occupation that makes use of their scuba skills agree that it is a life filled with variety and adventure.

Even though there are other ways to do work underwater (such as using small submersibles and remotely operated vehicles), commercial divers remain the most cost-effective way of accomplishing many tasks down to a depth of approximately 1,000 feet.

Expect to work long days as a recreational scuba instructor, especially if you work at a popular dive resort. It can be demanding work, but this exciting profession can be lots of fun and very rewarding. In addition, becoming a recreational scuba instructor is an excellent starting point for many of the other diving-related occupations you will read about next.

To become a recreational scuba instructor, you will need to become a great diver. To become a great diver, you will need to take more scuba courses and go diving. After you earn your Scuba Diving merit badge and receive your Open Water Diver Certification, you may enroll in the following courses: Advanced Diver, Rescue Diver, and then Divemaster.

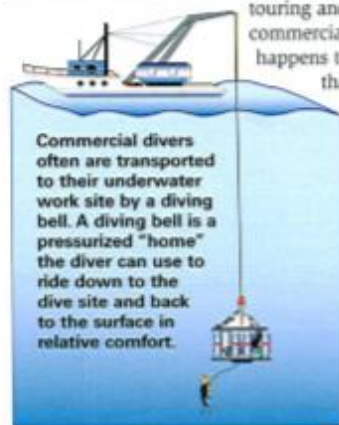
These diver ratings were discussed in the chapter called "Gaining Diving Experience."

Some scuba instructors continue their training to become instructor trainers. This position allows them to train others to become instructors. Other scuba instructors become owners of professional dive stores and dive resorts on tropical islands.

### Commercial Diver

In recreational diving, the emphasis is on the sport—underwater touring and enjoying the aquatic environment. In commercial diving, the emphasis is on work that happens to be underwater. Commercial diving is a trade that includes inspections, repairs, construction, cleaning, and other forms of labor.

To succeed as a commercial diver, you must have good mechanical ability and have been trained in skills such as welding. Commercial divers go where there is work. This rarely means warm, tropical places. More typically, a commercial diver works in a cold harbor with little or no underwater visibility. The offshore oil industry is one of the major sources of work for commercial divers.



HARNES

COMMERCIAL DIVING HELMET

UMBILICAL

DRY SUIT

CYLINDER

BCD (BUOYANCY CONTROL DEVICE)

WEIGHT SYSTEM

WET OR DRY SUIT

Commercial divers often use full helmets, lines that extend to the surface for their air supply, very warm exposure suits, and a variety of backup safety equipment. A commercial diver's equipment is very much like the space suits NASA astronauts wear.

Public safety divers often use equipment similar to commercial divers. However, instead of using air delivered by a hose from the surface, public safety divers often use standard scuba cylinders and full-face masks.



SURFACE MASK

COMPASS

SPG (SUBMERGIBLE PRESSURE GAUGE)

DIVE COMPUTER

CUTTING TOOLS

### Public Safety Diver

Public safety diving is a broad term for professions related to underwater crime and accident investigations or to other community needs, such as inspecting dams or waterways. A public safety diver also is usually a police officer, firefighter, sheriff, paramedic, emergency medical technician (EMT), or some other kind of public service agent. However, in some areas, public safety divers are specialized volunteers who work closely with police and fire services.

As with commercial diving, public safety diving is about the work, not the diving. Accidents occur everywhere—not necessarily where you want to dive. Consequently, public safety diving often takes place in bodies of water that are less than desirable to visit.

### Scientific Diver

Scuba diving has become an important scientific tool. Biologists, oceanographers, archaeologists, geologists, ecologists, and other scientists rely on scientific diving to gather underwater data about their fields. In addition to pure research, scientific scuba diving has become an important tool in applied sciences related to fisheries management, environmental damage assessments, and energy development.

To conduct scientific investigations at any depth and location, scientific diving borrows tools and techniques from virtually every other type of diving. Although most scientific divers use standard recreational scuba gear, some scientific divers also are technical divers or commercial divers. They may use full-face masks and wireless communication devices.

Scientific divers may work for the government, universities, private institutions, or environmental groups. Often, scientific divers have advanced degrees in such fields as marine biology, oceanography, geology, or archaeology.



Diving has become an important part of scientific research. Here we see diving scientists conducting a fish survey underwater, taking underwater measurements, and using a microscope to examine collected specimens.

### Submersible Pilot or ROV Pilot

Diving is a relatively inexpensive, portable, and versatile way to explore and study the underwater world. However, diving does have its limitations, which is where deep-diving submersibles—small submarines—come in. Even using the most sophisticated diving system, humans exposed to pressure cannot (so far) perform much meaningful work deeper than about 1,000 feet. The stresses on the body related to pressure and other factors become overwhelming. Yet, 1,000 feet does not even represent 10 percent of the ocean's average depth. Many deep-diving submersibles and remotely operated vehicles (ROVs), on the other hand, can easily reach depths of 10,000 feet. Their capabilities greatly assist in scientific endeavors and other kinds of ocean exploration.



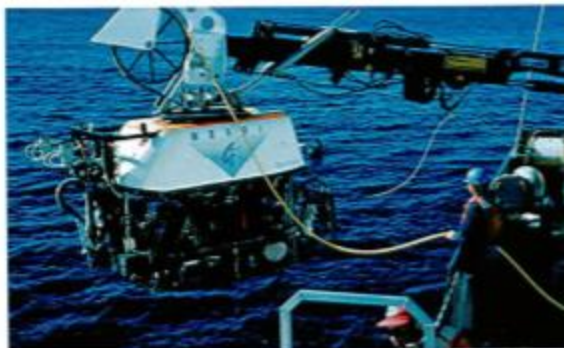
Submersibles are small, very deep-diving submarines that scientists use to explore ocean depths beyond the capabilities of scuba diving. Submersibles require a human pilot to guide them safely underwater.

A submersible pilot is much like an airline pilot, except the submersible pilot goes down, rather than up. Submersible pilots not only "drive" the submersible underwater, but they are often responsible for the care and maintenance of the submersible while at its home base, in the field, or while it is being transported. In addition, most submersible pilots are trained marine biologists or oceanographers. As they pilot the submersible underwater, they often assist other scientists onboard (if the submersible holds more than one person) in doing a survey or study.



A remotely operated vehicle (ROV) combines much of the portability and affordability of diving with the depth and duration capabilities of submersibles. A ROV dives without a human at the helm. ROV pilots work onboard ships, guiding their vehicles underwater by various switches and joy sticks and receiving images from the ROV via a television. In a way, operating a ROV is much like playing a video game!

As a submersible or ROV pilot, you may spend many days and months at sea. However, these expeditions are often filled with wonderful discoveries of new species of animals, deep shipwrecks, and undersea geological formations. You may be the first person to see sights never before seen by another human.



Operating a ROV is much like playing a video game.

### Military Diver

When you think of military diving, you may think of groups such as the U.S. Navy SEALs, stealthily slipping behind enemy lines from underwater. In reality, this is only one type of several diver roles you can experience as a military diver.

In most countries, the majority of military divers have long, distinguished careers and perform valuable—often risky—services for their countries that do not relate directly to combat situations. Military divers may perform the following tasks.

- **Combat swimming.** Many operations fall into the category of combat swimming. These include antiterrorism, hostage/prisoner rescue, raids, reconnaissance, and other incursions into enemy territory.

- **Construction.** Military divers using equipment and procedures similar to those used by commercial divers work in the construction, maintenance, or removal of submerged or partially submerged structures such as piers, docks, and bridges.
- **Rescue.** Military rescue divers and swimmers, such as those in the U.S. Coast Guard, train to aid mariners, trapped submariners, and downed pilots.
- **Search and salvage.** Military salvage divers recover practice weapons and military vessels or aircraft that have sunk.
- **EOD and demolition.** Explosive Ordnance Disposal diving is one of the most hazardous duties in military diving. EOD divers must render harmless enemy mines (explosive devices) or live weapons that have failed to detonate and then dispose of them.
- **Security swims.** These are inspections of vessels and structures for explosives, sabotage, or other signs of tampering. Military divers conducting this task are not necessarily trained to disarm explosives; they may simply locate the explosives.
- **Vessel maintenance, repair, and inspection.** These duties are similar to those carried out in the civilian world by commercial divers and include hull inspections, cleaning, welding, and other maintenance or repair tasks.



DRY SUIT

MIXED GAS OR OXYGEN  
CLOSED-CIRCUIT REBREATHER

COMPASS  
AND GAUGES

This diver is a military combat swimmer. Many types of operations fall into the category of combat swimming. These include antiterrorism, hostage/prisoner rescue, raids, reconnaissance, and other incursions into enemy territory.



## Glossary

**alternate air source.** A piece of diving equipment used in an emergency to give to a buddy who is out of air.

**assistant instructor.** A leadership certification level in diving that can include limited teaching duties. May assist fully certified instructors while preparing for instructor training.

**aquatic ecosystem.** A specific underwater environment with a clearly defined physical boundary, distinct physical conditions (temperature of the water, depth, etc.), at least one energy source (such as sunlight), and a community of plants, animals, and other organisms that interact with one another and through which energy is transferred.

**buddy system.** When two scuba divers assist each other. A set of safety procedures that improve divers' chances of avoiding or surviving accidents underwater.

**buoyancy control device (BCD).** An inflatable vest worn by the diver that can be automatically or orally inflated to help control buoyancy; also known as a buoyancy compensator.

**certification card (C-card).** Proof of completed diver training and evidence of experience.

**closed circuit rebreathers (CCRs).** Breathing equipment that captures, cleanses and re-oxygenates exhaled breath so that it can be re-inhaled.

**commercial diver.** A professional diver doing such tasks as underwater hunting, welding, recovery, inspection, and construction.

**confined water.** Refers to a body of water such as a pool, or an environment with similar pool-like conditions, such as a clear and shallow pond, a lake, or a ocean lagoon or bay.



Buoyancy control device (BCD)

**coral reef.** Consists of the hard outer skeletons of tiny animals called corals.

**cylinder.** The metal container that holds pressurized air for breathing. Also called a scuba tank.

**decompression.** Means "releasing pressure." Any change from one ambient pressure to a lower ambient pressure always results in a reduction of gas pressure within the body.

**decompression illness (DCI).** Refers to both decompression sickness and lung overexpansion injuries as a single condition, resulting in overlapping sets of symptoms.

**depth gauge.** A device that indicates how far a diver is below the surface.

**Divemaster.** A professional level diver who leads a group of less experienced divers underwater. It is also, in some cases, a certification level that denotes a leadership role in diving, on a pathway to becoming a recreational scuba instructor.

**dive computer.** Device that constantly measures depth and time. Using this information and a preprogrammed algorithm, the computer calculates and displays the decompression status of a diver.

**dive flag.** Special flag used by a boat or on a buoy to indicate "divers down."

**dive tables.** Printed tables that provide divers with a way of avoiding decompression sickness by giving the maximum times that can be spent at depth, and by indicating the decompression stops and surface intervals needed for a particular depth and time profile to be carried out safely.

**diver certification.** A general statement meaning an individual is taking formal scuba training from a qualified instructor.

**diver propulsion vehicles (DPVs).** Motorized, underwater vehicle used by divers to cover long distances underwater without having to kick. Also known as a dive "scooter."

**exposure suit.** A specific diving garment used to reduce heat loss and to protect a diver from minor scrapes, stings, and abrasions. Examples are wet suits, dry suits, and rash guards.



Depth gauge

Exposure suits



**ecosystem.** A specific environment with a clearly defined physical boundary, distinct physical conditions (temperature of the water, depth, etc.), at least one energy source (such as sunlight), and a community of plants, animals, and other organisms that interact with one another and through which energy is transferred.

**equalization.** The act of forcing air into an air space (in the body or created by equipment like a dive mask) to offset increasing water pressure.

**face mask.** A skirted glass window constructed to provide an air space between the eyes and nose from the water. Masks permit divers to see underwater and equalize the air space created by the mask.

**fins.** Adjustable-strap or full-foot design that allow a diver's powerful leg muscles to move them through the water.

**fin pivot.** A training skill to help divers practice attaining neutral buoyancy.

**hand signals.** A standardized form of sign system used by scuba divers to communicate underwater.

**military diver.** Divers that venture underwater for the military. May include those that use diving for war, construction, rescue, search and salvage, demolition, security swims, vessel maintenance, repair, and inspection.

**nitrogen narcosis.** A condition caused by breathing nitrogen at high pressure at depth. Causes an anesthetic effect that may result in a diver making poor judgments and decisions.

**open water.** A natural, nonpool-like aquatic area such as a lake, quarry, or an ocean environment.

**Open Water Certification.** A beginning level of recreational diver training. Certification allows the holder to purchase diving equipment and air for scuba cylinders.

**polar ecosystem.** An ecosystem around the north and south poles; in the polar seas.



Face mask

Full-foot fin

Adjustable fin

**public safety diver.** A broad term for professions related to underwater crime and accident investigations or to other community needs, such as inspecting dams or waterways. A public safety diver also is usually a police officer, firefighter, sheriff, paramedic, emergency medical technician (EMT), or some other kind of public service agent.

**recreational scuba diving.** Diving for fun and to prescribed limits, including a depth no greater than 130 fsw, using only compressed air, and never requiring a decompression stop.

**recreational scuba instructor.** An individual that teaches recreational diving to others as a career.

**Recreational Scuba Training Council (RSTC).**

A council of recreational diving certification organizations that regulate the standards of scuba diver training. Member organizations include International Diving Educators Association, Professional Diving Instructors Corporation, Professional Association of Diving Instructors, Scuba Diving International, and Scuba Schools International.

**regulator.** The piece of dive equipment that makes it possible for divers to use the air in their cylinder. It reduces the pressure of the air in the scuba cylinder to match the surrounding water pressure. It delivers air only when a diver wants it.

**ROV pilot.** An individual that guides a remotely operated vehicle (ROV) underwater by various switches and joy sticks, while receiving images from the ROV via a television.

**safety stop.** At the end of each dive, a stop during ascent to the surface at 15 feet for three minutes to allow excess nitrogen to leave a diver's body.

**scientific diver.** Professional divers that use scuba as a scientific tool. Examples are biologists, oceanographers, archaeologists, geologists, ecologists, and other scientists rely on scientific diving to gather underwater data about their fields.

**scuba.** Acronym meaning self-contained underwater breathing apparatus.

**snorkel.** A piece of equipment that allows divers to rest or swim with their face in the water.



Snorkel

**specialized diving.** Diving beyond an entry-level (beginner) that requires more training. Examples include night diving, cavern and cave diving, wreck diving, and deep diving.

**squeezes.** A response by an enclosed air space (sinuses, middle ear, inside a mask) to increasing underwater pressure during descent. A scuba diver may be injured if he or she fails to equalize these air spaces, either while descending or ascending.

**submersible.** Small deep-diving submarines.

**submersible pressure gauge (SPG).** Gauge attached to the regulator, used to monitor pressure (the amount of air) remaining in the scuba cylinder.

**technical diving.** A form of SCUBA diving that exceeds the scope of recreational diving, allowing deeper and longer dives.

**temperate marine ecosystem.** A cooler, but still mild, marine environment. The west coast of the United States and areas along the northeastern coast of North America can be considered temperate.

**timing device.** Dive equipment such as dive watches or special underwater timers that are pressure-activated stopwatches, used to determine dive time at depth.

**visibility.** The vertical distance a diver can see underwater measured in feet.

**weight system.** A piece of diving equipment helps divers to overcome the buoyancy of their body and equipment. May be a weight belt or lead weight integrated into a BCD.



## Scuba Diving Resources

### Scouting Literature

*Archaeology, First Aid, Lifesaving, Oceanography, Swimming, Water Sports, and Weather* merit badge pamphlets

Visit the Boy Scouts of America's official retail Web site (with your parent's permission) at <http://www.scoutstuff.org> for a complete listing of all merit badge pamphlets and other helpful Scouting materials and supplies.

### Books

Shreeves, Karl. *Open Water Diver Manual*. PADI, 2007.

Shreeves, Karl. *Adventures in Diving Manual*. PADI, 2007.

PADI. *Encyclopedia of Recreational Diving* (third edition). PADI, 2005.

Wohlens, Robert. *Life on an Ocean Planet*. Current Publishing, 2010.

### Periodicals

#### *Dive Training*

Web site: <http://www.dtmag.com>

#### *Scuba Diving*

Web site: <http://www.scubadiving.com>

#### *Sport Diver Magazine*

Web site: <http://www.sportdiver.com>

### Organizations and Web Sites

#### Historical Diving Society

Web site: <http://www.hds.org>

#### International Diving Educators Association (IDEA)

Web site: <http://www.ideascuba.com>

#### National Association of Underwater Instructors (NAUI)

Web site: <http://www.naui.org>

#### Professional Association of Diving Instructors (PADI)

Web sites: <http://www.padi.com>  
<http://www.projectaware.org>  
<http://www.currentpublishingcorp.com>  
<http://www.emergencyfirstresponse.com>

#### Professional Diving Instructors Corporation (PDIC)

Web site: <http://www.pdic-intl.com>

#### Scuba Diving International (SDI)

Web site: <http://www.tdisdi.com>

#### Scuba Schools International (SSI)

Web site: <http://www.divessi.com>

#### (World) Recreational Scuba Training Council (RSTC)

Web site: <http://www.wrsc.com>

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