

Cousteau Divers Caribbean Dive Log

Cousteau Divers is worldwide community of divers united to become active agents of the study and preservation of marine life, inspired by Jacques Cousteau and his amazing life achievements. When Cousteau invented scuba diving as we know it today in 1943, he opened the eyes of millions of people to the beauty, and fragility, of the underwater world. With great knowledge comes great responsibility. Today, divers are the only people in the world who witness the state of the oceans on a daily basis. We are uniting to form the front lines of a global movement to help protect them.

In the 70s and 80s, Jacques Cousteau and the crew of Calypso have been many times in the Caribbean Sea: in Belize and the Bahamas (1971) to discover the mysterious blue holes, marine caves that had never been explored. Cousteau divers also dived on the Chinchorro reef; among the most extraordinary creatures in the scene are the giant—more than 1.50 m high with a diameter of more than one meter! Two divers took turns gliding into the creatures few years later, the Cousteau team visited La Martinique where they dived on the largest local shipwreck in the bay of Saint Pierre lying at 55 m down (1979). Calypso then went to Haiti and Cuba in 1986. While Cousteau divers found deserted reef in Haiti which has failed to preserve its natural resources, Cuba closed to foreigners for years was an amazing discovery and provided an example of healthy marine ecosystem.

“Finding our bearings today, finding what remains, in order to save it, becomes an urgent task. We may no longer need a sextant to reach the Caribbean, But the Caribbean is in bad shape. We no longer need to know where the islands, rivers and lakes are, but we need to establish *how* they are.” Jacques-Yves Cousteau, 1986.

The Cousteau Divers program is structured around three major axes: Science, Community and Multimedia. Dive into our program on www.cousteaudivers.org, and share your geo-tagged underwater images with the rest of the world, allowing us all to witness the state of our oceans and to compare them with Cousteau archive images.

Cousteau Divers is establishing diver observation programs in different regions around the world, and you will find dive log methods for the Caribbean, Mediterranean, Red Sea and South-East Asia regions as well.

The following manual will help you understand and complete the Cousteau Dive Log. Your observations could provide valuable information on the status of our coastal seas. The Cousteau Diver program aims to capture this information in a simple and entertaining way, and provide the vehicle through which recreational divers can contribute towards monitoring the health and wealth of the marine life in our oceans.

Cousteau Divers train themselves to record their observations after their dives on the Dive Log and upload them later on the website www.cousteaudivers.org. The Cousteau Divers training is also offered through accredited Cousteau Dive Centers all over the world. The accreditation program for dive centers involves the provision of specialist training for the dive centers to enable them to run the Cousteau Divers training course, as well as the use of training tools to help students progress in reporting their observations.

Cousteau Dive Centers and divemasters serve as permanent observers of their dive sites. They monitor the evolution of additional parameters, such as salinity, pH and oxygen concentrations. Cousteau Dive centers are also encouraged and assisted in having their dive sites declared no-take zones, catering for the natural ecosystem to develop and enrich over the years.

Guide to the Cousteau Divers Log

The Cousteau Divers - Dive Log

The Cousteau Divers - Dive Log allows you to record your personal observations underwater during your dive. Dive operators can also use the Dive Log to record the observations of dive clients by working as team on your dive sites. The observations recorded on the Dive Log can then be entered into the online form on the Cousteau Divers website the next time you have access to the internet.

How do I complete the Cousteau Divers - Dive Log?

The Cousteau Divers - Dive Log is divided into three main sections in which to capture information about the dive, the site and focal species / groups. The guidance notes below explain how to complete each section of the Dive Log. All information is meant to be collected as soon as possible after the dive.

As you will see, you can collect the observations of other people who came on the same dive, gathering as much information as possible on the dive site.

What will happen to the information collected by Cousteau Divers?

The Dive Log data entered into the website is automatically analyzed and a simplified version displayed on the website. The data collected by Cousteau Divers is also made accessible to scientists, local managers of Marine Protected Areas, local authorities and non-governmental organizations (NGOs) working in the region to help with their research and environmental monitoring. Scientists are able to request datasets through an online request form. This allows Cousteau Divers to track where the data is going, who is using the data, and how it is being used. Scientists interested in this data have the opportunity to create a specific profile on the website, and will be kept informed in real-time as the data come in.

About the Dive

On this section of the Cousteau Divers - Dive Log you will record the basic information about the dive (country, geographic location, dive rating, maximum depth, and depth of observation).

- **Photographs:** Tick if you took photographs during the dive / snorkel (see notes below) and will be uploading them on www.cousteaudivers.org
- **Video:** Tick if you recorded video during the dive / snorkel (see notes below) and will be uploading them on www.cousteaudivers.org

How do I prepare images for uploading onto the Cousteau Diver Website?

A photograph (or video) can speak a thousand words! The types of photographs or videos that would be most interesting for scientists would include general shots (e.g. using a standard or wide-angle lens) that capture the characteristics of the site or close-up shots (e.g. using a macro or a standard lens with macro setting on your camera) that capture representative, unique or unusual species. If you spot something that causes you concern you can also submit images of impacts at the site.

When preparing to upload your images (photographs or videos) onto the Cousteau Diver website try be selective. You only need to upload the images that best illustrate the characteristics of the site (e.g. landscapes, habitats) or species of interest (e.g. fish and other marine life). Tag the photographs as accurately as possible, including country, date, location and species identified as you upload them onto the Cousteau Diver website.

- **Dive Site:** Record the name of the dive site or the nearest location if there is no given dive site name.
- **Latitude / Longitude:** It is very important that you locate your observations with as much accuracy as possible. Ideally, record the GPS coordinates yourself or ask your dive center. Record the Latitude / Longitude using the WGS-84 (World Geodetic System-84) in degrees and decimal minutes. For example, the coordinates 37.6732°N and 2.3567°E are in decimal degrees. The coordinates for the same location in degrees and decimal minutes would be 37°40.3920'N and 2°21.4020'E.

If you can't get the exact coordinates for the dive site, ask your dive master to point out the site location on a map AND note the name of the dive site.

- **No. of Divers:** Record the number of divers on the dive that contributed observations to the Dive Log. Don't be shy! And don't hesitate to ask your fellow divers what they saw during the dive.

- **Dive Site Rating:**

- *Landscape:* Rate the underwater landscapes at the site using a scale of 1 to 5, where 1 is a site with an unremarkable landscape and 5 is a site with amazing scenery. If completing the survey with clients ask them to provide you with the rating.
- *Marine life:* Rate the marine life at the site using a scale of 1 to 5, where 1 is a site with poor marine life and 5 is a site with an abundance of marine life. If completing the survey with clients ask them to provide you with the rating.

About the Site

On this section of the Cousteau Divers -Dive Log you will record information on the characteristics of the dive site and the conditions at the site.

- **Site Conditions:** On this sub-section of the Cousteau Divers - Dive Log you will record information about the conditions at the dive site on the day of the dive. This information provides an indication about the type of site. The conditions on the day of the dive can also affect the ability of the Cousteau Diver to record information and may help to explain unusual observations. You can record this information at the start or the end of the dive.

Circle the symbol that best represents the conditions on the day of your dive.

- **Seabed Composition:** On this sub-section of the Cousteau Divers -Dive Log you record information about the physical structure of the seabed in terms of different components: coral reef, solid rock / bedrock, boulders, cobbles, gravel, sand and mud.

During your dive, observe the substrate. Some habitats may be entirely covered by biological organisms so you need to be careful and try to determine what substrate these organisms are growing on (you will record the biological cover on the next part of the form). Try to identify which is the dominant type (i.e. is >50 % of the seabed composed of one type, such as sand or rock). If the main focus of the dive is a wreck then you can indicate the wreck as dominant.

The structure and composition of the seabed provides an indication of both the complexity of the substrate and the stability of the site, both of which are important determinants of the type of marine life. Different types of substrate support different types of animal and plant communities. Substrates such as rock or large boulders provide a stable habitat, as they are rarely moved by wave action or currents, on which diverse communities can develop over a long period of time.

More mobile substrates like muds, sands, gravels and smaller rubble may be subject to more regular disturbances, and this can affect the type of organisms able to colonize the habitat and the

communities that develop over the long term. The structure and composition of the substrate together give an impression of the complexity of the substrate.

Tick the box if the given substrate is present and mark a cross if it is the dominant substrate.

Note: Boulders are >25cm in diameter, Cobbles are 6-25cm, Gravel is 0.2cm-5cm, Sand is smaller than 0.2cm in diameter. For the Mud type, no grains are visible.

- **Seabed Cover:** On this section of the Cousteau Divers - Dive Log you will capture information on the biological organisms living on the seabed (benthic organisms). You will record the presence of the different types of benthic organism found at the site, and indicate which of these provides the dominant cover (e.g. if >50 % of the seabed is covered in seagrass, then this is the dominant cover).

Tick the corresponding box if that substrate is present, and mark a cross if the substrate provides the dominant cover of the dive.

- **Algae:** There is a huge diversity of marine algae. There are three broad categories as described below.

Importance: Algae are primary producers and an important food and energy source for some groups of animals (such as fish and sea urchins). The 'microhabitats' created by turf and erect algae are also important to many small animals such as worms and crustaceans (crabs, shrimp).

Threats: Threats to these communities include physical impacts due to fishing and recreational divers, pollution, and invasive species. Coralline algae are particularly vulnerable because they grow slowly so it takes time for these communities to recover if they are damaged. Climate change poses another threat as warming sea temperatures and ocean acidification may impact calcification rates.

- *Turf algae:* Turf algae is also often known as filamentous algae, and it is typically not much more than 1 cm in length. Turf algae can form dense carpets that may be found growing on other habitats, such as crustacean or mollusk beds, or on algal beds. They can create microhabitats of importance for a wide variety of species, including fish and urchins and other groups that feed off these algae.
- *Frondose algae:* There is a huge variety of different forms of erect or frondose algae. These may include red, green and brown algae such as Sargassum and kelp.
- *Coralline algae:* Coralline algae is the common name for a number of different red algae species from the Corallinaceae family. These algae are usually more of a pinkish-red color and they characteristically have a hard skeleton made from calcium carbonate. Globally, there are many different species and some of these form calcium carbonate constructions, which provide a habitat for a host of other species including polychaetes, cnidarians, mollusks, sponges, bryozoans, foraminiferans and crustaceans. Coralline algae are sensitive to water temperature, nutrients and other environmental conditions.

- **Benthic animals:** This section only refers to non-mobile animals that grow attached to the seabed.

There are numerous different types of benthic animals that might be encountered in different habitats, including sponges, tunicates, anemones, barnacles, mollusks and hard and soft corals (including gorgonians). There are a few of these groups that are bio-constructors and may form biogenic reefs, such as corals, polychaete worms, barnacles and mollusks, amongst others.

Importance: Different groups of benthic animals are important for different reasons. Some are important as food for other organisms while other groups that are capable of creating reef-like structures provide habitats for other organisms and increase diversity.

Threats: These types of organisms may be damaged by physical impacts due to fishing, or other disturbance, pollution and sedimentation from land-run and rivers, and other impacts (including recreational divers). Some groups may also be threatened by climate related threats due to warming sea temperatures and ocean acidification.

- **Hard corals:** Hard corals are animals that are related to sea anemones, with the important difference that they lay down a skeleton of calcium carbonate (limestone) to provide themselves with support. Most true reef building corals contain small single-celled algae (zooxanthellae) that live inside their tissues. These algae create energy from sunlight and this is transferred to the host coral. The algae also contribute towards the corals color. If the coral is exposed to high seawater temperatures or other stressors they may lose their algae. This process is known as 'coral bleaching' because the coral appears 'pale' or white as the calcium carbonate skeleton becomes visible through the animals tissue.

- **Soft corals, sea fans and black corals:** There are numerous different types of soft corals, which grow in a number of very distinctive forms, from branching and tree-like to encrusting, and are often brightly colored yellows, red, oranges and purples, and a wide range of colony shapes. Soft corals are also known as octocorals because they have eight tentacles around their mouths instead of the six found in true hard corals. Soft corals are related to hard corals, and there are a small number of species that do form a hard skeleton. However, most soft corals just have a network of hard calcium carbonate spicules that help to strengthen the body wall instead of a solid skeleton, resulting in a relatively flexible structure, but they are still easily damaged.

- **Sponges:** Sponges are primitive filter-feeding invertebrates that may be found on all types of seabed from the lower shore to great depths. They are composed of a body with a cavity but they lack any major organs. There are many different species of sponge but they are notoriously difficult to identify, not least because they can have different shapes depending the exposure of a site. In exposed locations these animals may form flat or rounded structures, whereas in more sheltered locations they may create larger structures and develop plant-like fronds.

- **Benthic animals (other):** Use this tick box to indicate the presence of other benthic animals that are not hard or soft corals, or sponges.

- *Bare*: Areas where there are no visible organisms growing on the seabed would be categorized as bare substrate. Areas of exposed mud, sand, gravel or pebbles may prevent the settlement and survival of organisms due to the mobility of the substrate. While these bare areas of substrate may appear devoid of life they can often accommodate different types of organisms that can burrow into the sediment.

- **Human Impacts**: On this section of the Dive Log you will record the presence of human activities and impacts. The evidence of human impacts may include rubbish, fishing equipment, lost dive equipment or other visible impacts. Record the presence of the impact if one or two items are seen, or record the impact as abundant if more than two examples are seen at the site.

Focal Species – CARIBBEAN AND GULF OF MEXICO

On this section of the Cousteau Divers - Dive Log, you will record the species that you observe during the dive. There are four parts: fish, invertebrates, algae and other species. The species listed are characteristic of the region, and may include endemic species, exotic (non-native) species, flagship species, keystones, targets, vulnerable and bio-indicators of climate change or other impacts. The fifth section on this part of the form is for recording other observations from the surface.

Tick the box if present or mark a cross if abundant.

Fish**Warsaw Grouper (*Epinephelus nigritus*)**

The Warsaw Grouper (*Epinephelus nigritus*), is a solitary species found on rocky seabeds although juveniles may be found around jetties and on shallow reefs. Adults can reach 230 cm in length and feed on crustaceans (crabs, shrimps and lobsters) and fishes. This is an important game fish, targeted by spearfishers, and it is overfished. It is listed as critically endangered on the IUCN Red List.

Goliath Grouper (*Epinephelus itajara*)

The Goliath Grouper (*Epinephelus itajara*) is a solitary territorial species found in shallow, inshore areas, on rock, coral, or mud. Juveniles may be observed in mangroves and estuaries. Adults can reach 250 cm in length. Goliath groupers feeds on crustaceans, spiny lobsters, turtles, and fishes, including stingrays. Larger individuals have been reported to stalk divers. This is an important game fish, often targeted by spearfishers. It is overfished and now listed as critically endangered on the IUCN Red List.

Other Groupers

Groupers are predatory fish that feed on other fish, and invertebrates such as crabs and octopus. There are approximately 9 species in the Gulf and Caribbean, which range in size as adults from less than 16 inches to over 8 feet. They are found in all habitats, but many species prefer rocky habitats. Young groupers may inhabit shallower depths, whereas older individuals may be found in deeper water, often near cliffs, caves and overhangs. Grouper are favoured food fish in many countries bordering the Gulf of Mexico and Caribbean. The most popular and heavily exploited species are from the genera *Epinephelus*, including the Goliath Grouper (*Epinephelus itajara*) and Warsaw Grouper (*Epinephelus nigritus*) (see below), which are listed as critically endangered on the IUCN Red List.

Jacks

Jacks are generally fast-swimming schooling fishes found in the open water. Due to their large sizes, they are a popular big game fish and targeted by both commercial and recreational fishermen. The

largest species of Jack is the Greater amberjack (*Seriola dumerili*), which is a powerful hunter and feeds on other fish and invertebrates.

Atlantic Spadefish (*Chaetodipterus faber*)

The Atlantic Spadefish (*Chaetodipterus faber*) is a medium-sized school fish found in shallow waters off the coast of the Gulf of Mexico and Caribbean. They are a distinctive silvery fish with bold, black vertical bars on its body. People often mistakenly call it an angelfish due to its appearance. It is a bottom feeder, eating crustaceans, mollusks, and sponges. Due to its large size and the effort needed to catch it, it is a popular target of recreational fishermen. Although its status has not been evaluated by the IUCN, it is suspected that this species could be vulnerable to overfishing.

Hogfish (*Lachnolaimus maximus*)

Hogfish vary in color, from pearl white to reddish brown. These medium to large-sized fish use their long snouts to find invertebrates buried in the substrate, giving them the name hogfish. Although they are a type of wrasse, their large size and three, long dorsal fin spines distinguish them from other species. They are often found in small groups along the edge of the reefs. Due to their large size, hogfish are commonly targeted by spear and recreational fishermen. The hogfish is currently listed as "Vulnerable" with the World Conservation Union (IUCN).

Snappers (*Family Lutjanidae*)

Snappers are moderately sized fish with a long triangular face and a pointed snout. Their enlarged canine teeth earned them the name "snappers". The red snapper (*Lutjanus campechanus*) is the target of major commercial and recreational fisheries in the Gulf and has been historically overfished. The Cubera Snapper (*Lutjanus cyanopterus*) is commercially important throughout the Caribbean, however its population is overfished and is declining in many areas. The species is considered "vulnerable" by the IUCN Red List.

Parrotfish (*Family Scaridae*)

Named for their "beak-like" mouth, Parrotfish are important herbivores that feed on algae, which prevents coral reefs from becoming overgrown with algae. Parrotfish also eat coral, which helps break down old, dead coral and produce and distribute coral sand. Parrotfish are medium to large sized fish found in coral reefs throughout the Caribbean and even in parts of the Gulf of Mexico and the Atlantic coast of Florida.

Angelfish

Angelfish are found in shallow reefs throughout the Caribbean and Gulf of Mexico. Ranging from small to large in size, their vibrant colors and shape set them apart from other fishes on the reef. They can also be distinguished by the large spine found on their gill covers. Angelfish feed on sponges, tunicates, jellyfish, coral, and algae, making them important members of the reef community. They also set up "cleaning stations" where they act as "cleaners" by feeding on the parasites of larger fish. Smaller

angelfish are often collected and sold in the aquarium trade while others are sometimes the target of local reef fisheries.

Butterflyfish

Butterflyfish are small sized reef fish characterized by their bright colors, 'eyespot' on their body, and a dark band across their eyes. This gives them an appearance similar to the wings of a butterfly. Their small, pointed mouth allows them to "nip" off pieces of small coral. Many feed exclusively on live coral, which makes them good indicators of coral health and climate change. If reefs are unhealthy, it is suspected that butterflyfish will leave the reef in search of a healthier one.

Lionfish (*Pterois volitans*)

Lionfish are an invasive species in the Gulf of Mexico and Caribbean. They have long, venomous spines and are solitary animals found in or near reefs. Originally from the Indo-Pacific, these fish feed on other small fish and invertebrates. They are aggressive predators that outcompete other reef predators for food. Their varied diet and uncontrolled population growth has disrupted food chains throughout coral reef habitats. Despite their venomous spines, their meat is good to eat and becoming a common dish in many Caribbean and Gulf coast cities.

Flounder

Flounder are a type of flatfish species, characterized by their flat appearance with both eyes on one side of the head. Flounders are found on the sea bottom in sandy or silty substrate, perfectly camouflaged in their environment. Flounders are a popular seafood dish and the target of large commercial fisheries. In the Gulf of Mexico and the Caribbean, species such as the Gulf flounder (*Paralichthys albigutta*) are vulnerable to overfishing.

Barracuda (*Sphyraena barracuda*)

The most common species is the Great barracuda (*Sphyraena barracuda*) are voracious predators, feeding mainly on other fish and less frequently on cephalopods and crustaceans. It has an elongated body shape, pointed head, prominent sharp teeth, and they often grow to 24 – 39 inches but can reach lengths up to 4.9 feet. The species is pelagic, found in open coastal and offshore locations.

Moray Eels (*Gymnothorax moringa* and *Gymnothorax funebris*)

The Spotted moray (*Gymnothorax moringa*) and Green moray (*Gymnothorax funebris*) are two common species of moray eels found in the Gulf of Mexico and Caribbean. Eels are solitary animals often found in crevices and holes of rocky habitats and reefs. Divers should be careful as these animals may bite! They feed on a varied diet of reef fish and mollusks. The Spotted Moray is a medium-sized snake-like fish covered in black and white spots. The Green moray is large in size and ranges in color from dark green to brown.

Sharks

There are an estimated 49 species of shark found in the Gulf of Mexico. Most of the sharks in the Gulf of Mexico and Caribbean are important top predatory species, including: the Great hammerhead shark (*Sphyrna mokarran*), Bull shark (*Carcharinus leucus*) Sand tiger shark (*Carcharias taurus*), and Sandbar shark (*Carcharhinus plumbeus*). The largest fish in the world, the Whale shark (*Rhincodon typus*) is also found in this region. Unlike the other sharks, the Whale Shark is a filter feeder that feeds on plankton and other microscopic organisms. Sharks in this region are threatened by overfishing and by becoming entangled in fishing gear or caught alongside other fish, as bycatch.

Rays

The largest species of rays in the world, the Giant Oceanic Manta Rays (*Manta birostris*), is found in this region. It is a filter feeder that eats plankton and other tiny organisms. The spotted eagle ray (*Aetobatus narinari*) and cownose ray (*Rhinoptera bonasus*) are two types of eagle rays that typically feed on mollusks and crustaceans. The Southern Stingray (*Dasyatis americana*) is commonly observed in sandy areas on the seafloor.

Pelagic rays are prone to bycatch because they must swim constantly in the water column and may become entangled in fishing line or nets. There is also growing demand for Manta ray gill rakers in Asian markets, resulting in targeted fisheries for these species worldwide. Manta rays are classified as Vulnerable by the IUCN.

Other Species

There is space on this part of the form record the scientific names of the other species of fish that you observe, if you are confident of their identification.

Invertebrates

Slipper lobster (*Scyllarides astori*)

There are two commonly found species of slipper lobster in the Tropical Atlantic (*Scyllarides aequinoctialis* and *Parribacus antarcticus*). These decapod crustaceans typically have 10 pairs of legs and characteristically have shield-shaped structures either side of the head, which replace the primary antennae. These species may be found on the seabed on rock, stones and sand. Slipper lobsters are targeted by small scale fisheries as a local food source.

Caribbean Spiny lobster

Caribbean spiny lobsters (*Panulirus argus*) are important, nocturnal scavengers that help maintain a clean and healthy seabed. They are also prey for skates, nurse sharks, octopuses, snappers and roupers.

Florida stone crab (*Menippe mercenaria*)

The Florida Stone Crab (*Menippe mercenaria*) is characterized by having one large crusher claw and one smaller pincer claw. Adult stone crabs can be found in seagrass beds or on rocky substrate. Stone

crabs are harvested for their large claws but are returned alive to the water, where they regrow their crusher claw and continue to live and reproduce. Stone crabs feed on invertebrates such as other crustaceans and mollusks. In turn, horse conch, grouper, sea turtles, cobia, octopi, and humans feed on stone crabs.

Octopus

There are a few species of octopus found in the Caribbean. The most common octopus (*Octopus vulgaris*) is a nocturnal predator, which feeds on molluscs, small invertebrates and fish. The octopus, like other cephalopods, is bilaterally symmetrical, and they have a pair of eyes and four pairs of arms with suckers with two rows of suckers. Unlike other cephalopods, they do not have an internal shell or skeleton, the only hard structure is the mouth (or beak) which is located on the underside at the centre of the arms. This species is usually a greenish brown colour, but they are masters of camouflage, and can change colour depending on the habitat. They are usually found in rocky areas but they can also be found in sandy habitats where they create burrows reinforced by rocks and shells. An octopus burrow is relatively well-camouflaged, but it is possible to spot these by the neat arrangement of stones and shells around the entrance. Octopuses tend to have relatively short life-spans which may be as short as 6-12 months. They breed only once in a lifetime, and both males and females die shortly afterwards. Males die about two months after mating and the females brood the eggs for about 1 month and then dies shortly afterwards. Octopuses are fished throughout the Gulf of Mexico and Caribbean.

Queen conch (*Strombus gigas*)

The queen conch (*Strombus gigas*) is a large, marine snail found throughout seagrass and reef habitats in the Caribbean and Gulf. The snail is an important prey for various fish, sea turtles, and echinoderms. Due to its edible and substantial meat and attractive shell, it is subject to overfishing and at risk throughout its range.

Urchins

There are many different species of sea urchins in the Gulf of Mexico and Caribbean, and they are found from the shore to great depths. Sea urchins are generally spherical, within a chalky shell-like skeleton covered in mobile spines. The mouth of the urchin is on the underside and the anus is located on the apex of the shell. Sea urchins are grazers and they feed by scraping the fine algal film that forms on the surface substrate. As with other grazers, sea urchins help to create clean patches on the seabed, and space for new benthic organisms to settle. They are important for controlling the assemblage of species found on the seabed and the functioning of coral reef ecosystems. Sea urchins are preyed upon mainly by fish. If the fish predators are overfished then sea urchin populations can increase rapidly, resulting in overgrazing, which can be problematic in some habitats (e.g. kelp). Similarly, a lack of sea urchins can also be problematic in certain habitats. The presence of long spined black urchins (*Diadema antillarum*) in particular is an important indicator of reef health.

Starfish

There are many different species of starfish in the Caribbean. Starfish are echinoderms, and they have a flattened body with five or sometimes more radiating arms (or rays). The mouth is on the underside along with the tube-feet, which allow the starfish to move along the seabed. Some starfish are voracious predators and they can have significant impact on benthic community structure. Starfish are

vulnerable to water pollution as they pump water through their body and have little ability to filter the water.

Spotted sea hare (*Aplysia daclomera*)

The spotted sea hare (*Aplysia daclomera*) is a species of sea hare found worldwide. It has two long antennae which resemble rabbit ears. It is often yellow to orange in colour, with irregular back ring markings and can reach up to 40 cm in length. Often found in shallow waters (0-3 m depth), in tide pools and on rock or under rocks, and on sand substrates, including sea grass. Occasionally they have been observed up to 40 m depth. Sea hares have a giant neuron similar to that found in vertebrates and are used primarily in neurological research.

Nudibranch

Nudibranchs are another type of gastropod (snail-like) mollusc, but these lack a shell entirely. These typically small invertebrates range between 2 cm and 6 cm. They have a slug-like body with a pair of tentacles on the head and a ring of feathery gills on the back, and sometimes they have additional appendages along the back. They are usually brightly coloured.

Giant barrel sponge (*Xestospongia muta*)

The Giant Barrel Sponge (*Xestospongia muta*) is a large, cup or barrel shaped sponge with a jagged exterior. Due to their reddish color, large size, and long life spans, Giant Barrel Sponges are often called the “redwood of the reef”. Sponges play an important role in the ecosystem by filtering large volumes of seawater, improving water clarity. However, this also makes them vulnerable to pollutants and other substances in the water. Giant Barrel Sponges also provide important habitat for various fish and invertebrates. Giant Barrel sponges are susceptible to hurricane disturbance, bleaching events, and changes in water quality and temperature.

Other sponges

Species of sponges differ in shape, colour and texture. However, even individuals of the same species can differ in their appearance and this makes identifying them very difficult. There are over 200 different species of sponges in the Caribbean. They include branching, tube, vase, barrel, ball (massive) and encrusting sponges.

Other Species

There is space on this part of the form record the scientific names of the other species of invertebrates that you observe, if you are confident of their identification.

Corals (Caribbean)

On this subsection of the Cousteau Dive Log, you will record the different growth forms of hard and soft corals observed. Record all observations by ticking the relevant check box and mark a cross if the species

is abundant (dominant). You will also record information about the health of the corals. There is series of check boxes to record if the corals are looking pale, particularly on the tops of the colonies, which indicates partial coral bleaching or if the corals are bleached white. There is another check box to record if there is a coral disease (e.g. black band disease) growing on the coral, if there are coral breakages, due to the diver / snorkeller / anchor impacts, or other growth anomalies (e.g. tumours). Tick the boxes for each of the impacts observed and mark a cross if the impact is common (i.e. observed on more than one colony).

Sea fans and Sea whips

Sea fans and sea whips are known as gorgonians. There are a number of different species found in the Caribbean. Sea fans are usually found in shallow waters, whereas sea whips tend to be found below 15-20 m (50-65 feet) depth. Sea fans provide habitats for many species, such as hydrozoa, bryozoa, brittle stars, and basket starfish. The Pygmy seahorse's camouflage allows it to blend perfectly with these corals that it calls home. Sea fans have elongate branches, covered in small polyps. The most common species (*Gorgonia ventalina*) is often called the "purple sea fan" due to its distinctive coloring. They are vulnerable to the physical impacts of fishing and climate change and can act as indicators of the level of habitat disturbance. Sea fans can also be affected by a disease caused by a fungus which causes lesions to form and eventually kills the sea fan.

Elkhorn coral (*Acropora palmata*)

Elkhorn coral (*Acropora palmata*) is a large, branching coral named for its thick antler-like branches. It used to be the dominant species of coral in shallow waters throughout the Caribbean. However, there has been a significant loss of this coral over the past thirty years, likely due to coral bleaching and hurricane damage. This coral is one of the most important reef building corals in the Caribbean and its rapid decline serves as an indicator for climate change and overall reef health. Threats include coral disease and bleaching, hurricane damage, changes in water temperature and salinity, and algae overgrowth. Elkhorn coral is listed as critically endangered by IUCN.

Staghorn coral (*Acropora cervicornis*)

Staghorn coral (*Acropora cervicornis*) is a large, branching coral with branches that can grow to over 6.5 feet in length. The coral resembles male deer antlers, thus the name "stag horn". It is one of the most important corals in the Caribbean as an important reef builder and fishery habitat. Despite being one of the fastest growing corals in the western Atlantic, the population of Staghorn coral has been collapsing since the 1980s. One of its biggest threats is coral disease outbreaks. Other threats include hurricanes, coral bleaching, algae overgrowth, and physical impacts from humans. Staghorn coral is listed as critically endangered by IUCN.

Boulder star coral (*Montastraea annularis*)

Boulder star coral (*Montastraea annularis*) is a common species of coral found throughout the western Atlantic. It plays an important role in reef building by forming the main reef structure. This

species of coral is threatened by coral disease and bleaching, predation by Stoplight Parrotfish, hurricane damage, and algae overgrowth. It is listed as Endangered by IUCN.

Algal Species

***Sargassum* sp.**

The large brown algae *Sargassum* sp. can be used as a bioindicator of water quality, as they do not tolerate polluted waters. It provides an important habitat for fish, young sea turtles, and other marine plants and animals. Although usually found at the surface level, *Sargassum* beds may form near coral reefs or attach to hard substrates.

***Halimeda* sp.**

Halimeda is a genus of green macroalgae. *Halimeda* are important due to their important production of carbonate and sediment as well as reef formation. They form large beds that provide important habitat and substrate in many reef ecosystems.

Green filamentous algae (various species)

Green filamentous algae includes various species of green macroalgae. This algae may overgrow reefs, especially when supplied by nutrient-filled runoff from coastlines or warmer water temperatures. When it dies, it turns white and enters the water column, where divers call it “diver’s snot”.

Surface Observation

Marine mammals

There are 28 species of marine mammals known to occur in the Gulf of Mexico. Of these, commonly encountered species include: Bottlenose dolphin (*Tursiops truncatus*), Atlantic spotted dolphin (*Stenella frontalis*), West Indian Manatee (*Trichechus manatus*), and the Sperm whale (*Physeter macrocephalus*).

Sea turtle

Five of the world’s seven species of sea turtles are found in the Gulf of Mexico: the Kemp’s ridley (*Lepidochelys kempii*), Green (Chelonia mydas), Loggerhead (*Caretta caretta*), Hawksbill (*Eretmochelys imbricata*), and Leatherback (*Dermochelys coriacea*). Each of these is classified as either threatened or endangered. The Kemp’s ridley is a small species of sea turtle found only in the west Atlantic Ocean and Gulf of Mexico. They are listed as critically endangered by the IUCN. Sea turtles in this region are threatened by becoming entangled in fishing nets, especially trawls, pollution such as oil spills, and habitat loss.

Fishing (artisanal / recreational / other)

Fishing activities may include subsistence or traditional fishing using lines, traps and nets which tend to target reef fish or recreational / sport fishing which targets large pelagic species such as swordfish and tuna. It has been shown that in areas with intensive fishing there is a lower abundance of large fish and live coral cover. The level of fishing pressure varies in the Caribbean with Jamaican reefs being very heavily fished, whilst little fishing takes place in Bonaire.

Spearfishing

Spearfishing is carried out using elastic powered spearguns and slings or compressed gas pneumatic-powered spearguns to strike the hunted fish and can be done using snorkelling or SCUBA diving. Spearfishing has been blamed for declines in large enigmatic species such as the Goliath Grouper in Bonaire and the Nassau Grouper in Belize. Spearfishing is highly regulated; it is banned in some areas, in others a licence is required or it may be only allowed when free diving (not with SCUBA).

Jellyfish bloom

Several species of jellyfish occur naturally in the Caribbean. Often these may be seen as individuals and rarely in groups. Globally, over the past 10 years, there has been an increase in the frequency of reports of 'jellyfish blooms', when there are swarms of jellyfish in the water at the same time. Jellyfish blooms can present a nuisance for swimmers, and pose a potential health hazard when certain toxic species are involved. Such blooms also cause problems for fishermen, as they clog nets thereby deterring fish and consume fish larvae. Jellyfish in large numbers can also clog the inlets underwater pipes. The increased frequency of jellyfish blooms, and the synchrony of such events in the Caribbean and Gulf of Mexico indicate a potential phase shift. The cause of these blooms is uncertain and may be linked to overfishing, coastal habitat degradation, contaminated run-off and climate change, or a combination of these factors.

Algal bloom

An 'algal bloom' occurs when there is a large accumulation of small algae (phytoplankton), macroalgae and occasionally heterotrophic protists in the water. There are many species of phytoplankton that can form blooms. Some species can cause the water to change colour, and cause 'red tides', 'brown tides', or 'green tides'. Other species produce toxins that are poisonous to fish (and humans if they consume the fish) and these are called 'harmful algal blooms (HABs)'. Sometimes create a scum or foam on the sea surface, which can also cover beaches. Algal blooms can occur naturally in response to seasonal changes in the availability of nutrients in the water that favour cell. They can also occur as a result of nutrient enriched run-off from the land, with high concentrations of nitrates, phosphates, from human waste water or from agriculture (fertilizers). When the bloom ends, the algae die and sink to the seabed. The decomposition of the algae removes oxygen from the water and can cause 'eutrophication' and result in the death of other organisms living on the seabed or in the water column.

Marine litter

Marine litter is a global problem. Man made synthetic materials whether they float, sink or remain suspended in the sea, not only look unsightly, but can pose a threat to many species of wildlife. It is estimated that 8 million items of marine litter enter the oceans every day, from the land or thrown overboard from ships. Another estimate is that there are over 13,000 pieces of plastic litter floating for every square kilometre of ocean surface. During the period of 1989-2005, a total of 6,781,537 debris items were removed from shoreline areas and underwater sites in 28 countries of the Caribbean region during the International Coastal Cleanup. Shoreline recreational activities contributed the bulk (76 %) of beach litter (plastic bottles, plastic bags, drink cans, glass bottle, cups plates, food wrappers, pull tabs) while the remainder of rubbish items were from ocean and waterway activities (10.9 %), smoking related activities (7.7 %), dumping (3.2 %) and medical and personal hygiene (2.2 %).

Don't forget to upload your divelogs on www.cousteaudivers.org!

Citation

Klaus, R. (eds). (2012). The Cousteau Divers Observation Program: Guide to the Cousteau Divers Log. Cousteau Divers, Paris. 65p.

Acknowledgements

Stephanie Stefanski, Noémie Stroh and Pierre-Yves Cousteau – Cousteau Divers