Cousteau Divers South-East Asia 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.

Captain Cousteau took Calypso to the 13, 677 islands scattered over more than 5,000 kilometers that comprise the Indonesian archipelago several times from 1988 to 1991. The Cousteau team climbed rumbling volcanoes, talked with convicts who extract sulphur from the earth and visited villages devastated by eruptions. Off Sumatra, they met one of the last hunter-gatherer peoples of the world, the Mentawi of Siberut Island. The team felt that they were visiting 20 countries, so different were the cultures. This diversity existed in the sulphuric waters of the ocean, too. Colonies of sponges grew in the most bizarre shapes. Some individual sponges were so big that a diver could hide in them. The rare spectacle of sponges spawning was shared with millions of television viewers.

During this great expedition in South Asia, the Calypso also visited nearby islands and countries. In 1989, Calypso sailed on the Celebes Sea, to explore the small island of Sipadan. Cousteau divers met green turtles, which seem to get out of a secret geological fault, a green turtle sanctuary. In Thailand they witnessed a memorable seen, squid mating. Cousteau divers also dove in the water of the Andaman Islands where they found a rich and peaceful marine biodiversity, with elephants swimming above them to reach a nearby island. The Cousteau team continued its journey in the heart of Philippines to visit Palawan and its uneven coasts (1991). Unlike in Andaman; the natural resources here became scares and young Filipinos risked their live using cyanide and dynamites to caught fishes.

The Cousteau team also explored freshwater system. In 1992, Captain Cousteau organized a great expedition to the Mekong: Calypso patrolled the lower section of the river that irrigates four countries, while a small team aboard two wooden vessels explored the section above the falls that block the river at the border between Laos and Cambodia, a challenging adventure in a troubled region short of modern infrastructures.

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 Geodectic 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.

- **Seagrass**: Seagrasses are the only completely marine flowering plants. Seagrass meadows are highly productive habitats created by special salt tolerant flowering plants.

Importance: Seagrass provides food and habitats for many other species. Seagrass meadows produce biomass and oxygen and help protect and stabilise shorelines. The root system (rhizomes) binds sediments, and the blades slow the movement of water and increase the settlement of sediments, thereby helping improve water quality. Their roots and rhizomes are an important carbon sink, but they also change the composition of the seawater chemistry, and can help to locally reduce the effects of ocean acidification.

Threats: Various human activities threaten seagrass including anchoring on the meadows, and mobile fishing gear such as bottom trawling, both of which cause physical damage. Non-native invasive species can threaten some species of seagrass, as they can overgrow the blades of seagrass, reducing growth rates and eventually causing the plants to die. Run-off from the land that is enriched with nutrients can result in small algae growing on the surface of the seagrass blade (epiphytic algae), which can eventually kill the seagrass.

- **Algae**: There is a huge diversity of marine algae found in the SE Asia region. 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, foraminferans 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. There are approximately 32 reef-building coral species in the SE Asia region as well as many different solitary hard coral species.

- *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 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 – SOUTH EAST ASIA

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 (South East Asia)

Groupers (*Family Serranidae*)

Groupers are predatory fish that feed on other fish, and invertebrates such as crabs and octopus. There are approximately 20 species in SE Asia, which range in size as adults from less than 30cm to over 100cm. They are found in all habitats, and are a key part of coral reef fish communities. Groupers are a favoured food fish in many countries, and as such are often heavily exploited. N.B. In some areas the *Anthias* is very abundant but, although these are members of the grouper family they are not included in this survey.

Butterflyfishes (*Family Chaetodontidae*)

The Butterflyfishes are one of the archetypal families of coral reef fishes, being conspicuous and brightly coloured. There are over a hundred species worldwide, with more than 50 occurring in the SE Asia region (although a maximum of 20 to 25 species are likely to occur at any one site). Butterflyfishes are used as indicator species for studies of coral reef health and diversity because they occupy a diversity of different ecological niches. For example, their feeding habits vary from corallivores (can only eat live coral) through to generalists (feeding on anything from small worms to algae) and planktivores (feeding on plankton). You will record the abundance of four obligate corallivores. The species of coral feeding butterflyfish included in the survey are all very distinctive. These are species which decline in abundance if the health and abundance of hard corals declines. Abundance of all other butterflyfishes is also recorded.

- **Redfin Butterflyfish** (*Chaetodon trifasciatus & C. lunulatus*)

There are two species of Redfin butterflyfish: the Redfin (Chaetodon lunulatus) in the eastern and Pacific parts of SE Asia (also known as the Oval or Pinstripe butterflyfish), and the Indian Ocean Redfin (Chaetodon trifasciatus) in the western / Indian Ocean parts of SE Asia (also known as the Melon butterflyfish). These two species only overlap in the Sumatra / western Java area. They are very similar to each other in appearance, and are very closely related. Usually seen in pairs, these species may be very abundant in coral-rich areas. On the Dive Log, these are lumped together for recording under the single heading of Redfin Butterflyfish.

- **Triangular butterflyfish** (C. triangulum and C. baronessa)

Like the Redfin Butterflyfish, the Triangular Butterflyfish consists of two very similar species, one from the eastern / Pacific part of SE Asia (the Eastern Triangular Butterflyfish, Chaetodon baronessa), and one from the western, Indian Ocean, part of SE Asia (Chaetodon triangulum). Usually seen in pairs, these species may be very abundant in coral-rich areas, especially where Acropora corals are present. On the Dive Log, these two are lumped together for recording under the single heading of Triangular Butterflyfish.

- **Chevron butterflyfish** (Chaetodon trifascialis).

The Chevron butterflyfish (Chaetodon trifascialis) is often solitary, occupying a territory on and around branching or tabular corals (which form its main source of food). Sometimes several fish will be seen around a single coral, especially if some of those fish are juveniles, which the adult fish often seem to tolerate within territories where they would chase away other adults.

- **Other butterflyfish**.

There is a great variety of butterflyfish found in the region. If you are certain of the species identification, you can tick this box and record the scientific names at the bottom of the sheet.

- **Emperors** (Famiy Lethrinidae)

Emperors (family Lethrinidae) are an important fisheries group of around 20 species in the SE Asia region. All species grow quite large, with a minimum adult size of 30cm, and at least one species (Lethrinus elongatus) reaches up to a metre in length. They are carnivores, being important consumers of invertebrate animals such as crustaceans and starfish (including young of the coral-eating Crown of Thorns starfish). Most Emperors have a very distinctive sloping profile to the face, with eyes placed high on the sides of the head.

Snappers (*Family Lutjanidae*)

Snappers (family Lutjanidae) are another important fisheries group throughout the SE Asia region. A total of around 20 species occur in the region, although not all are both common and widespread. Size of adult fishes varies between species, from as little as 30cm to over 1m (in the case the Twinspot snapper *Lutjanus bohar*). Snappers are a common cause of ciguatera poisoning, and for this reason the sale of several species (including the Red Snapper, *Lutjanus bohar*, and the Paddletail snapper, *Lutjanus gibbus*) is banned in Australia.

Parrotfish (*Family Scaridae*)

Parrotfish (Family Scaridae) (excluding the bumphead parrotfish, Bolbometopon muricatum) are both common and widespread throughout shallow tropical seas. They are named parrotfish because of

their bright colours, and the beak-like fused teeth that are a prominent feature. Parrotfish change sex from female to male during the course of their lives, with the smaller, younger females (called the 'initial phase') generally being quite drab in colour, and the older (or 'terminal phase') males being vividly coloured. The colour differences between the sexes are so pronounced that inexperienced divers may easily think they are two separate species. There are many hundreds of species in the SE Asia. Parrotfish are grazers, scraping rocky and coral surfaces with their fused teeth to remove algae, and in some cases large adults will leave very pronounced scrape marks on living corals, or even bite off small pieces of coral.

Banded Sweetlips (*Plectorynchus diagrammus*)

The Banded Sweetlips family is a conspicuous fish commonly seen on reefs from northern Australia throughout SE Asia to southern Japan (although it does not occur on the Indian Ocean side of Indonesia or Malaysia), and is often caught in reef fisheries.

Bumphead Parrotfish (*Bolbometopon muricatum*)

The Bumphead Parrotfish (*Bolbometopon muricatum*), also known as the Green Humphead Parrotfish, or Double-headed Parrotfish, is the largest species in the parrotfish family, reaching up to 120 cm in length. They are generally seen in groups of anything from three or four individuals up to several dozen, and tend to both feed and sleep in groups. They are threatened throughout their range (throughout most of the Indo-west Pacific).

Napoleon wrasse (*Cheilinus undulatus*)

The Napoleon wrasse (*Cheilinus undulatus*) is always a favourite with divers, is the largest member of the wrasse family, growing to over 200 m in length, and over 190 kg in weight. Fully grown fish have a prominent hump on the forehead, but this is absent on smaller fish, gradually appearing and increasing in size as the fish grown larger. The Napoleon wrasse is heavily in demand in the live fish trade in Asia, and is globally endangered, having been very heavily exploited throughout its range in the Pacific and Indian Oceans.

Moray, Snake and Garden Eels

There is a wide range of different species of moray, snake and garden eels found in SE Asia. Moray 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 molluscs. Garden eels occur in colonies in sand where they live individually in burrows from which they protrude to feed. Snake eels are not usually seen as they spend most of their time buried in the sand where they hunt small fishes and crustaceans.

Requiem Sharks *(Family Carcharhinidae)*

Although there are dozens of species of sharks recorded from the inshore and coral reef waters of SE Asia, there are probably fewer than a dozen species that divers are likely to encounter. These include

the 'classic' reef-associated species such as the Blacktip reef Shark (Carcharinus melanopterus) and the Whitetip Reef Shark (Triaenodon obesus), as well as much more spectacular species such as the Tiger Shark (Galeocerdo cuvier). Rare sightings may be made, when diving at offshore reefs and pinnacles in deep water, of open water species such as the Oceanic White Tip (Carcharinus longimanus). Sharks are top predators, playing a key role in marine ecosystems worldwide. However, shark populations globally have been under extreme pressure from fishing for many years, both as by-catch and, more significantly, as deliberately targeted species. Fishing pressure on sharks is severe throughout the SE Asia region. The great popularity of sharks for divers, and their importance for the tourism industry, is likely to be an important factor in encouraging the conservation of shark populations.

Grey reef shark (*Carcharhinus amblyrhynchos)*

The grey reef shark (*Carcharhinus amblyrhynchos*) is often observed schooling close to reefs near to deep water. They can reach up to 260 cm long and feed mainly on fish, squid, crabs and shrimps. They are listed as 'Near-threatened' on the IUCN Red List.

Blacktip reef shark (*Carcharinus melanopterus)*

The Blacktip reef shark (*Carcharinus melanopterus)* has black tips on all fins, which may be highlighted by white band below. The underbelly is white while the upper surface is grey, and there is a white flash along the side. These are relatively small sharks, which reach a maximum size of 200 cm. They feed on reef fish, cephalopods and shrimp and are typically found near reefs, from shallow to deep water drop offs. They are listed as 'Near-threatened' on the IUCN Red List.

Whitetip reef shark (*Triaenodon obesus*)

The Whitetip reef shark (*Triaenodon obesus*) has distinctive white tips on the dorsal and tail fin. This relatively small shark can reach a maximum size of 210 cm. Found in clear shallow water, usually near coral reefs, where it hunts for reef fish, lobster, and crabs mainly at night. May be observed resting in caves or on the seabed during the day. Whitetips are listed as 'Near-threatened' on the IUCN Red List.

Silvertip Shark (*Carcharhinus albimarginatus*)

Silvertip Shark (*Carcharhinus albimarginatus)* has a characteristic white flash along the edge of the fins, which is particularly noticeable on the dorsal, pectoral and tail fins. This shark can reach up to 300 cm and is found from shallow to deep offshore water. It feeds on sharks, rays, tuna, and cephalopods. They are listed as 'Data Deficient' on the IUCN Red List.

Tiger shark (*Galeocerdo cuvier)*

Tiger shark (*Galeocerdo cuvier*), as suggested by the name, has distinctive dark vertical bars similar to tiger stripes. Found in coastal and offshore locations, this species is thought to migrate over long distances between temperate and tropical seas. It feeds on fish, shark, turtles, seabirds and can grow to 5500 cm. Tiger sharks are listed as 'Near-threatened' on the IUCN Red List.

Silky shark (*Carcharhinus falciformIs*)

The Silky shark (*Carcharhinus falciformIs*) may be observed from reef edge to deeper slopes. They can reach up to 330 cm long and feed mainly on large pelagic fish, such as tuna, squid, octopus, and some crustacean. They are listed as 'Data Deficient' on the IUCN Red List.

Oceanic White Tip (*Carcharinus longimanus)*

The Oceanic White Tip (*Carcharinus longimanus)* has white tips on the tail and on the characteristically rounded dorsal and pectoral fins. They can reach up to 400 cm long and are typically solitary found swimming over deep water. Oceanic White Tip sharks feed on fishes, seabirds, turtle, lobsters, crabs and shrimps. They are listed as 'Near-threatened' on the IUCN Red List.

Hammerhead sharks

The Scalloped Hammerhead (*Sphyrna lewinii)* is a coastal-pelagic species found close to shelf edges near deep water, to over 512 m depth. This is a migratory species although resident populations also exist. Adults may be observed as individuals, pairs or in schools. Hammerheads feed mainly on fishes and cephalopods, but also lobsters, shrimps, crabs, other sharks and rays. Considered potentially dangerous to divers but often not aggressive. This is a fisheries target species in some regions and is listed as Endangered on the IUCN Red List.

Manta Rays

There are two species of manta ray, the large oceanic species *Manta birostris* and the smaller coastal species *M. alfredi,* which tends to form aggregations. It is not easy to distinguish between these species so record the presence of manta rays. Giant Manta rays are thought to be more migratory and wide ranging. Population numbers of both species are poorly known but are thought to be declining in many regions. Mantas are targeted for their gill rakers in some regions, but they are also vulnerable to accidental capture given their large size. Both species are listed as Vulnerable on the IUCN Red List.

Eagle Rays *(Family Myliobatidae)*

Eagle rays (Myliobatidae) are coastal species, found to depths of 100 m; there are at least two species in the region. The most common is the Spotted Eagle ray (Aetobatus narinari). These rays are semipelagic and found inshore and in deep water, in bays and lagoons and offshore banks; there is one species in the region.

Stingrays *(Family Dasyatidae)*

Stingrays (Dasyatidae) are mostly demersal and found in coastal waters to depths of 480m; there are several species in the region. The most common species are the Blue spotted Ribbontail Stingray (*Taeniura lymma*), Black spotted Ribbontail Stingray (*T. melanospilos*) and the Honeycomb Stingray (*Himantura uarnak*).

Sawfish (*Pristis microdon*)

The Largetooth sawfish has a long snout with 17 to 22 large teeth. May be observed in shallow water lagoons and around reefs. Occasionally caught in net and trawl fisheries. Maybe extinct in parts of the Indo-Pacific. Used for its fins and meat (both of very high value), skin and cartilage. The saws are often sold as tourist souvenirs. Listed as Critically Endangered on the IUCN Red List.

Other Species

In this section of the form record the names of the species of fish that you observe during your dive, if you are confident of their identification.

Invertebrates (South East Asia)

Spiny lobster

Several species of spiny lobster that are likely to be seen by divers in the SE Asia region, including the Common Spiny Lobster *Palinurus penicillatus,* the Painted Spiny Lobster *P. versicolor,* and theScalloped Spiny Lobster *P. homarus*, amongst others. All are fished for food, with over-exploitation being a problem in many areas throughout the region.

Sea cucumbers

Sea cucumbers are echinoderms, the group that also includes sea urchins and starfish. Sea cucumbers are elongated and soft-bodied, without any projecting arms. They feed by using tentacles around the mouth, at one end of the long body, to collect food particles from the substrate, or which are floating in the water. Colour of the different species varies from very dark brown or black through pale brown to cream. Some species are very abundant in shallow sandy areas, such as reef flats, while others may be seen at much greater depths. There are numerous sea cucumber species in the region, many of which are heavily exploited because they are regarded as a delicacy in parts of Asia. In many areas edible species have been over-exploited almost to the point of extinction.

Crown of Thorns starfish (*Acanthaster plancii)*

The Crown of Thorns starfish is an unmistakable animal, being large bodied with up to 30 short arms, both the central body and the arms being covered with long sharp spines. They grow up to 70cm in total diameter. As adults these animals feed on living corals. They may occur in very high numbers, and when this happens they can be responsible for the death of corals over very large areas. Outbreaks have been responsible for the devastation of large areas of coral reefs throughout the Indo-Pacific region over the past 40 years, including parts of SE Asia.

Other starfish.

For the purposes of the Cousteau Divers surveys this only includes true sea stars (Stellaroidea), and does not include the brittle stars (Ophiuroidea). Numerous species of starfish are likely to be encountered by divers in SE Asia, including 'ordinary' star-shaped sea stars such as *Linckia* and *Pentaceraster*, as well as more unusual types such as cushion stars (*Culcita*). The majority will have five arms, but some species may have seven or more, and it is also quite common to see animals with four or fewer arms, having lost one or more to predators. Although sea stars commonly occur on coral reefs, they will also be encountered in areas of sand, gravel, and coral rubble.

Cuttlefish.

Cuttlefish of the family Sepioidea (*Sepia*) are unmistakable animals with a large body with paired fins which run along the sides from the head to the tail. There are 8 arms and 2 tentacles, surrounding the mouth and adjoining the head with large eyes. They eat small molluscs, crabs, and shrimps, and in turn are preyed on by sharks and other fish. There is an internal shell which is the cuttlebone that is frequently seen washed ashore. They live for 2 years, and can reach up to 45cm. They move by jet propulsion, and can eject ink when scared to mask their escape.

Needle spined sea urchin (*Diadema spp*)

Sea urchins are generally spherical, within a chalky shell-like skeleton covered in mobile spines. The mouth 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 space for new benthic organisms to settle, including corals. *Diadema* urchins are unmistakable, having small central bodies and large numbers of very long black spines (which may be many times longer than the diameter of the body). They may at times be very abundant, congregating in groups of dozens or hundreds of individuals at depths ranging from less than a metre to, on rare occasions, 20 metres or more.

Other sea urchins

There are many different species of sea urchins in the SE Asia region in addition to *Diadema*. Sea urchins are preyed upon mainly by fish. If the fish predators are overfished then sea urchin populations can increase dramatically resulting in overgrazing, which can be problematic in some habitats. Similarly, a lack of sea urchins can also be problematic in certain habitats.

Clams (*Tridacna*)

There are five species of clams of the genus Tridacna found in the SE Asia region: *T. crocea*, *T. squamosa*, *T. maxima, T. derasa* and *T. gigas*. The largest of these, the Indo-Pacific Giant Clam *T. gigas*, may grown to over a meter across and 200kg in weight. The others are all smaller, the largest of which (*T. maxima*) rarely grows bigger than 50cm across the shell. These species are all confined to relatively shallow water, generally less than 10m. They are common on reef tops and reef edges, where bright sunlight can be utilised by symbiotic algae in the tissues of the clam to provide nutrition to the clam. The

symbiotic algae are responsible for the bright blue and green mantle tissue often visible inside the shells of these animals. The shells are often sold to tourists as part of the curio trade. Do not collect or buy this or any other shell if offered.

Murex (*Murex*)

Murex are large gastropod molluscs, the broad main shell has elongated projection, both of which are often covered with fine elaborate spines. This genera has been commercially exploited for centuries and used to extract a dye used to colour clothes. The shells are often sold to tourists as part of the curio trade. Do not collect or buy this or any other shell if offered.

Corals (South East Asia)

On this subsection of the Cousteau Dive Log, you will record the different growth forms of hard 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 the status of the corals: If there are corals that look pale, particularly on the tops of the colonies, this indicates partial coral bleaching. If the corals are bright white this indicates more severe coral bleaching. There are other check boxes 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).

Acropora branching hard coral

There are several different coral genera which have a branching growth form, where there separate branches. This is a variable growth-form, as some branching coral colonies are very tight and compact, and others may have open appearances. Although there are many different types of corals that branch, the majority of corals with this growth form will be from the highly diverse genera *Acropora*. The *Acropora* corals typically have corallites along the entire edge of the branches, but also the tip of each branch is often made up of one corallite, known as the apical corallite. Other branching corals typically do not have these apical corallites (and can be recorded as 'Other branching' see below).

Acropora tabular hard coral

Corals with closely packed branches that grow outwards to create a flat table-like surface, a few centimetres thick. These tables often arise from a thickened stem or trunk-like attachment to the substrate, which may or may not be visible underneath the table. In some colonies there may be several of these tables stacked almost on top of each other. All tabular corals are from the genus *Acropora.*

Other branching hard corals

This category refers to bushy corals that have separate elongated branches, and where the branches do not fuse to form flat table-like structures (see below). This is a variable growth-form, as some branching coral colonies are very tight and compact, and others may have open appearances. The majority of branching corals will be from the highly diverse genera *Acropora* (see above). Other coral genera that branch includes: *Stylophora, Seriatopora, Porites* spp. These corals may have more than one corallite on the branch tip, unlike *Acropora,* which typically has one apical corallite on the branch tip.

Massive hard coral

This refers to the shape, NOT to the size of the coral. 'Massive' in this case means 'in a mass'. These corals are rock or boulder-like in shape, and may be small (only a few cm in diameter) or may grow to several metres in height and width. This growth-form includes the *Porites* corals which can grow to enormous sizes, as well as the brain corals (e.g. *Platygyra*), and other species with larger rounded polyps (e.g. *Favia* and *Favites*).

Encrusting hard coral

Encrusting corals grow as layer over the substrate. They may have ridges and folds, or 'fingers' up to several centimetres in height on their top surfaces. They will also often have a 'skirt' at their outer edge, where there is a gap between the coral and the substrate. They may be strongly textured in appearance, with large corallites.

Foliose hard coral (Leafy or Vase-shaped corals)

Corals which grow in thin leaf-like plates, which may appear like large cabbages or vases (e.g. some *Turbinaria* or *Montipora* corals).

Mushroom corals

Mushroom corals are free-living corals that grow unattached from the substrate. There are several different genera of mushroom corals that may be found in the SE Asia (e.g. *Fungia* sp. and *Herpolitha* sp.). The shape of mushroom corals range from round flat disks, to hill-shaped mounds, and more elongate oblong shape. Mushroom corals may be observed alone or in clusters.

Other hard corals

Any type that does not fall inside the categories above (e.g. *Pavona*), and any growth form.

Algae (South East Asia)

Sargassum sp.

The large brown algae *Sargassum* sp. can be used as a bioindicator of water quality, as they tend not to tolerate polluted waters. It provides an important habitat for fish, young sea turtles, and other marine plants and animals. *Sargassum* beds may form near coral reefs, attached 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.

Other

Use this space to record the scientific name of other algae you may observe if you are confident of the identification.

Surface Observation (South East Asia)

Dolphins and porpoises

There are over 30 species of cetacean resident in the SE Asia region with, for example, 29 different species recorded in Indonesian waters alone (eleven dolphins and 18 whales including beaked whales and Orcas). Divers may encounter a number of the resident species including the Indo-Pacific Humpbacked Dolphin (*Sousa chinensis*), the Longbeaked Common Dolphin (*Delphinus capensis*), the Spotted Dolphin (*Stenella attenuata*), the Spinner Dolphin (*Stenella longirostris*) and the Bottlenose Dolphin (*Tursiops truncatus*). Sightings are most likely to occur while travelling by boat to or from a dive site, with only rare sightings by divers in the water (although it is very common to hear dolphins while diving).

Dugong

On very rare occasions the sea cow or dugong (*Dugong dugon*) may be encountered in clear waters outside reefs, but they are more usually confined to shallow lagoons and channels where they can find abundant supplies of the seagrasses which are their main source of food.

Sea turtle

Six of the world's seven species of sea turtles are found in the SE Asia region: Green (*Chelonia mydas*), Loggerhead (*Caretta caretta*), Hawksbill (*Eretmochelys imbricata*), Olive Ridley (*Lepidochelys olivacea*), Leatherback (*Dermochelys coriacea*) and Flatback (*Natator depressus*) and all of these except for the Flatback nest in the region. Each of these is classified as either vulnerable, endangered or critically

endangered apart from the flatback which is data deficient. Sea turtles in this region are threatened by becoming entangled in fishing nets, especially trawls, pollution such as oil spills, and habitat loss.

Other

There are several species listed on Dive Log that may also be observed from the surface. These include the Mantas and the Whale Shark (*Rhincodon typus*), which is a large filter feeding shark and the largest non-cetacean animal in the world.

Fishing activities

Fishing activities may include subsistence or traditional fishing using lines, traps and nets as well as destructive fishing techniques (poison and blast fishing) which tend to target reef fish and invertebrates (shells and sea cucumbers) or sport fishing which targets large pelagic species such as swordfish and tuna. Coastal fisheries are extremely important in the region, however many species are now overfished.

Spearfishing

Spearfishing in SE Asia is both a traditional fishing technique and in many locations a technique recently adopted because of low gear costs. Spearfishing may be carried out with wooden spear guns and sharpened metal rods powered by large rubber strips and can be done by freediving or using SCUBA.

Jellyfish bloom

Several species of jellyfish occur naturally in the SE Asia region. 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 SE Asia region 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 (fertililzers). 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. The problem of marine litter is likely to be particularly severe in the SE Asia region however very little is known about the extent and nature of the problem. During the International Coastal Cleanup conducted in 9 countries in the East Asia region during 2007, shoreline recreational activities contributed the bulk (48.1 %) of beach litter (plastic bottles, plastic bags, glass bottles, straws, food wrappers) while the remainder of rubbish items were from smoking related activities (17.5 %) and ocean and waterway activities (8.9 %)

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