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1.0 General Information

This booklet is a **pre-dive briefing pack** for the **North America - Atlantic Coast - Sub-polar** eco-region. Please feel free to print it and take it with you as an 'aide memoir' for your dive. It contains all the information you need to contribute to the **EARTHDIVE** Global Dive Log.

1.1 Introduction

The **EARTHDIVE Global Dive Log** is a pioneering methodology that has been developed in partnership with **UNEP-WCMC** and marine scientists from around the world. These marine scientists helped establish thirty **EARTHDIVE** eco-regions - areas of water that share a relatively similar climate and contain a common assembly of natural habitats and species. They then identified key indicator species for each region - an important set of marine animals whose numbers and changing population can tell us a lot about the changing state of our oceans.

You can help observe and record sightings of these marine animals during a dive or snorkel trip and enter observations into the **Global Dive Log**. You can also record evidence of key anthropogenic pressures - changes in the marine environment brought about by human activity such as pollution and overfishing. Any data you enter onto the **EARTHDIVE** website can be viewed by you and other visitors.

The **EARTHDIVE** eco-regions span all of the world's oceans - not just those areas with warm water and coral reefs. Whether you are diving in Scotland or Saint Lucia, Connecticut or Cocos, Denmark or Dominica, your data collection is equally valid and valuable. So you don't have to wait for the next exotic dive trip - home waters are just as important!

Each eco-region also has its own types of megafauna, from dolphins to whale sharks, from whales to polar bears (if you like really cold water) and provision is also made in the Global Dive Log to record sightings of these exciting animals.

Collecting this valuable information for **EARTHDIVE** helps create a **Global Dive Log** - a valuable research tool.

This briefing pack lists the indicator species and anthropogenic pressures for the **Mediterranean** eco-region.

Thank you for recording scientific information for **EARTHDIVE**.

1.2 How to record your observations into the Global Dive Log

When recording scientific information for **EARTHDIVE**, divers are recommended to follow our 7 Point Plan. You will find the use of a slate or some other method of taking notes underwater, such as a laminated fish identification card, invaluable. Always try to transfer your data to the **EARTHDIVE** website as soon as possible following your dive. Let dive buddies and dive leaders know what you are measuring, as they may be able to help with some post-dive questions on identification.

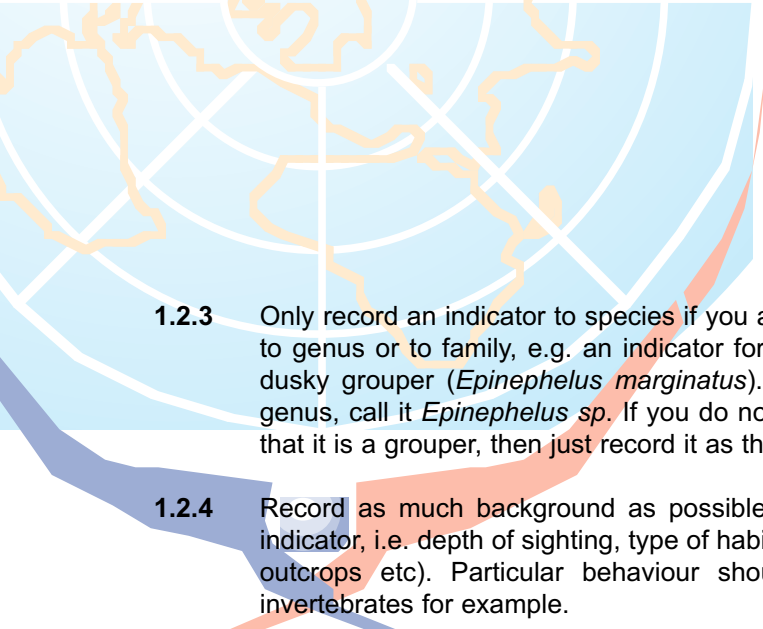
1.2.1 Try and ensure that the time of the underwater recording session is accurately noted. The length of the session can be all of the dive or just a period during the dive e.g. 10 minutes. You may even spend periods of time recording different indicators. For example there may be a dense aggregation of drums, which you count for 10 or 15 minutes. On the other hand you may look for other species such as groupers for most of the dive. Whatever your choice, the data is important so try to add the recording time in the notes for each indicator.

1.2.2 When possible always record **actual** counts of indicator species. If this is too difficult on the dive then enter your data into the abundance scale in the Global Dive Log as an estimate.



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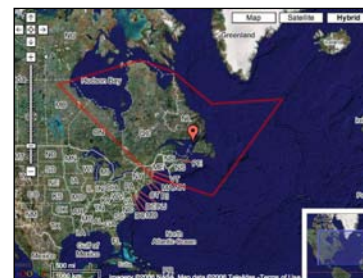
- 
- 1.2.3 Only record an indicator to species if you are 100% certain that it is that species. Otherwise record to genus or to family, e.g. an indicator for the sub-tropical Atlantic Coast of South America is the dusky grouper (*Epinephelus marginatus*). If you are uncertain of the species but recognise the genus, call it *Epinephelus sp.* If you do not have time to recognise it, or do not know it apart from that it is a grouper, then just record it as that - it's just as important!
 - 1.2.4 Record as much background as possible in the notes section of the Global Dive Log for each indicator, i.e. depth of sighting, type of habitat (lower reef slope, kelp bed, sand with scattered rocky outcrops etc). Particular behaviour should also be noted - spawning behaviour in fish or invertebrates for example.
 - 1.2.5 When recording always fin slowly and evenly with minimal sudden movements. Moving rapidly will disturb resident fish causing them to hide from view more quickly. By moving slowly and evenly you have more chance of seeing indicator species and recording their presence/absence more accurately. Always look carefully for particular indicators such as lobsters, which are often under overhangs or in crevices.
 - 1.2.6 On your way to and from your dive site, record any observations you have made regarding the listed anthropogenic pressures for this eco-region.
 - 1.2.7 Following your dive, make notes from your slate or memory and keep them in a safe place. Add any further comments within 24 hours before you lose some of the detail from your memory.

Thank you

2.0 The North America - Atlantic Coast - Sub-polar Eco-Region

This eco-region comprises the coastal waters of the Canadian provinces of Manitoba, New Brunswick, Newfoundland, Nova Scotia, Ontario, Prince Edward Island, and Quebec. The U.S. state of Maine is also included, as are the eight small islands in the St. Pierre and Miquelon group.

The dramatic coastline contained in the eco-region is characterized by fjords, cliffs, and bald rock created by advancing and retreating glaciers during the last Ice Age. There are numerous islands along the coasts. Offshore, the continental shelf extends to a distance of about 150 kilometres, with water depths from 200 to 300 metres.



The Northwest Atlantic forms a natural transition between the cold northern waters and the more temperate southern waters. Major ocean currents flow through it - cold arctic waters carried south by the Labrador Current merge near the Grand Banks with the warmer flow of the Gulf Stream. Average temperatures differ by more than 20°C between the arctic waters and the Gulf Stream.

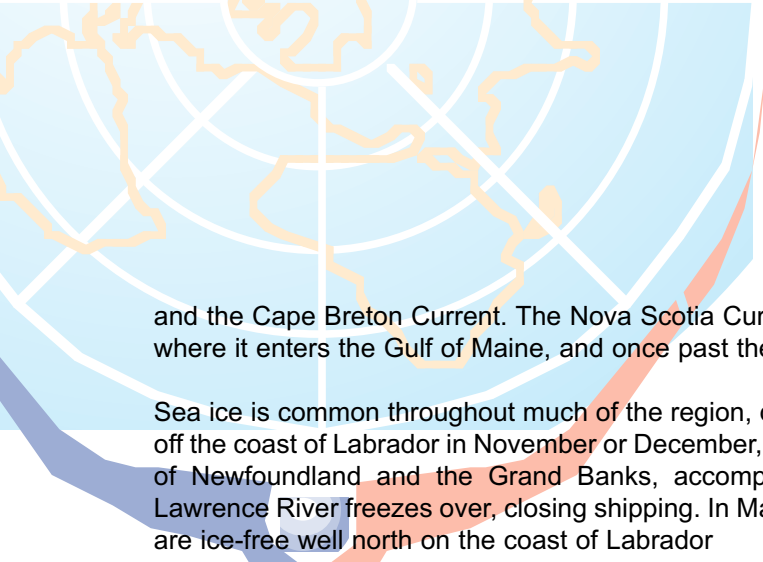
The Newfoundland-Labrador continental shelf extends to quite a distance off the eastern coast of Canada, encompassing the areas of the Labrador Current and the Grand Banks. The Scotian Shelf surrounds the Canadian province of Nova Scotia, and extends to the shelf break, more than 200 nautical miles (nm) from the coast at some points. To the north the Laurentian Channel separates it from the Newfoundland Labrador shelf.

The Nova Scotia Current hugs the coastline in a southwestwardly direction and enters the Gulf of Maine through the Northeast Channel. As the current flows over the shelf, it mixes with offshore waters as well as water from the Labrador Current



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and the Cape Breton Current. The Nova Scotia Current then passes around the southern tip of Nova Scotia where it enters the Gulf of Maine, and once past the Gulf, it flows southward as the Coastal Current.

Sea ice is common throughout much of the region, depending on the season and latitude. Ice begins to form off the coast of Labrador in November or December, and by February or March, it reaches the northeast coast of Newfoundland and the Grand Banks, accompanied by thousands of icebergs. Most years, the St. Lawrence River freezes over, closing shipping. In May or June, the ice begins to clear and, by July, the coasts are ice-free well north on the coast of Labrador

The Grand Banks are one of the world's largest and richest resource areas, renowned for both its valuable fish stocks and (sadly, from a conservation standpoint) petroleum reserves. Situated off the southeast coast of the Island, the Grand Banks are actually a series of raised submarine plateaus with a water depth ranging between 36.5 and 185 metres. The relative shallowness of the water allows extensive marine animal and plant life to flourish on the bottom. As well, the warm waters of the Gulf Stream pass over the southern portion of the Banks in winter but cover almost all of the Grand Banks in summer.

Despite the conservation measures in place for fisheries on the Grand Banks, several species have declined drastically in recent years. By 1995, all major cod and flounder fisheries on the Grand Banks were closed and many other fish species such as turbot and ocean perch have had their catch levels sharply restricted. These fisheries are slowly recovering due to a concerted effort by both Canada and other nations to enforce existing conservation regulations on Grand Banks fish stocks

The Chesapeake Bay and Delaware Bay complex is one of the largest estuaries on Earth. The region is fantastically productive, with huge and commercially vital fisheries, particularly for blue crab and oysters. It is one of the world's most productive temperate estuarine complexes.

Diving in the region is a cool but rewarding experience. Local dive operators recommend that divers should plan a visit to the region between June and September when temperatures and water conditions are ideal. Dry suits are a must all year round!

3.0 Indicator Species

What to look for and record in the **North America - Atlantic Coast - Sub-polar Eco-Region:**

American Lobster (*Homarus americanus*)
Low numbers are indicators of overfishing.



Green Sea Fingers (*Codium fragile sub species tomentosoides*)
Invasive alien.



Tunicate or Sea Squirt (*didemnum sp*)
Invasive alien.



Sea Stars (*Astroidea*, but not *A. vulgaris* or *A. forbsii*)
Their absence is indicative of climate change.



The International Union for Conservation of Nature and Natural Resources (IUCN) provides a listing of species that are at risk of global extinction. The 'IUCN Red List Categories and Criteria' are intended to be an easily and widely understood system and can be found at <http://www.redlist.org> The general aim of the system is to provide an explicit, objective framework for the classification of the broadest range of species according to their extinction risk. If any of the indicator species for this Eco-Region have been classified as Critically Endangered, Endangered or Vulnerable on the list, then we have included that information below.



3.1 American Lobster (*Homarus americanus*)

Because they belong to the invertebrate phylum *Arthropoda* (see our Help pages for an explanation of taxonomic classification), lobsters are actually closely related to insects. This relationship arises because of two main characteristics that they share: they all have an exoskeleton (outer skeleton) and they all have joint appendages. Lobsters are further categorized into the class *Crustacea*, along with other marine organisms like crabs and shrimp. These crustaceans are distinguishable from other Arthropods with hard exoskeletons, like mussels and clams, because their shell is softer and more flexible. As lobsters have ten legs they also belong to the order *Decapoda* (derived from the Latin word, ten feet).



The American lobster (*Homarus americanus*), also known as the Northern or Maine lobster, belongs to the family *Nephropidae*. Another kind of edible lobster found in the order *Decapoda* is the spiny or rock lobsters of the family *Palinuridae*. They differ from the American lobster in that they lack large claws, have spines all over their bodies, and are found in warmer subtropical and tropical waters..

The American lobster is found in the northwest Atlantic from Labrador to Cape Hatteras, North Carolina, from the inter-tidal to 480 metres, but is most common from four to fifty metres. Lobsters prefer to make their homes in rocky areas where they can hide in the crevices from predators. The biggest predator of the American lobster is man, followed by ground fish such as flounder and cod, sculpins, eels, rock gunnels, crabs, and seals.



Lobsters are not fussy eaters. Although they prefer fresh food they will eat basically anything that they can get their claws on, even if it's dead. (Which is why lobster traps are so effective). The main diet of a lobster is crab, mussels, clams, starfish, sea urchins and various marine worms. They are also known to catch fast moving animals like shrimp, amphipods (also known as "sand fleas") and even small fish. Lobsters eat mostly animals, but if these resources become scarce, as they sometimes can be in the spring, they might feed on plants, or sponges to get energy. In the Northumberland Strait, an area making up a great part of the southern Gulf of St. Lawrence, a main dish for a lobster in the winter (fall) is a newly settled crab. Lobsters in this area can get up to half of their energy requirements from crabs.

3.2 Green Sea Fingers (*Codium fragile subspecies Tomentosoides*)

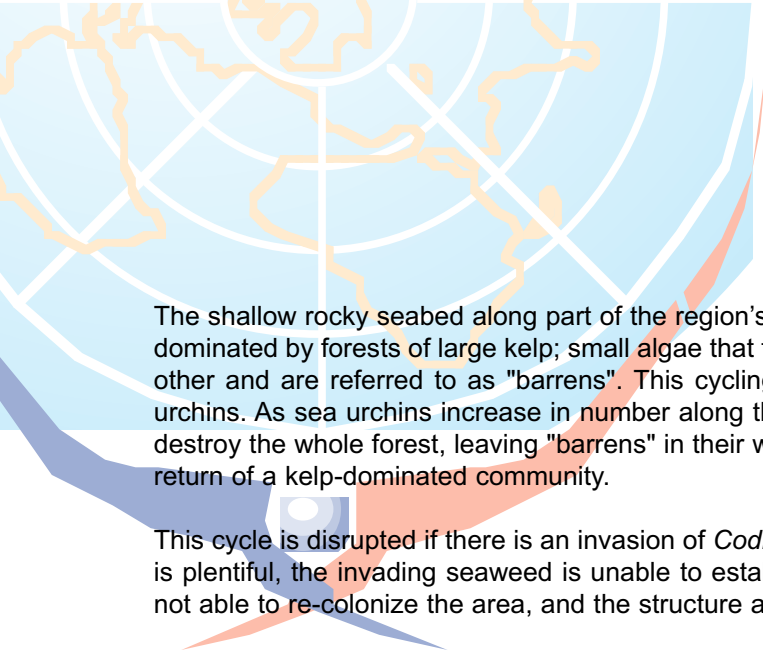
Green sea fingers (*Codium fragile*) is a pale to dark green algal plant with very bush-like appearance. The branches are 5 – 10 mm in diameter, and rise from a disk shaped pad, known as a holdfast. The holdfast is responsible for keeping the plant securely fastened to rocks on the seabed. As the plant grows, the branches sub-divide into two new branches. It is an annual plant and reproduces during the summer.



Believed to be native to Japan, the sub-species *tomentosoides* is known locally as dead man's fingers and is one of the most invasive seaweeds in the world. It is principally sub-tidal in the waters of the region to depths of 15m, but can be found in the inter-tidal zone. Adult plants can grow up to 90 cm in height and when fully established at depth, can develop into bushy 'meadows'. It is found on hard bottoms, often in the shade of marine walls.

When submerged, the branches feel soft and "fuzzy" to the touch due to the presence of numerous long hairs on the surface of each frond.





The shallow rocky seabed along part of the region's coast cycles between two types of communities. One is dominated by forests of large kelp; small algae that form as crusts and thin mats over bare rock dominate the other and are referred to as "barrens". This cycling is controlled by the number and concentration of sea urchins. As sea urchins increase in number along the edges of a kelp bed they graze so intensely that they destroy the whole forest, leaving "barrens" in their wake. A decrease in sea urchin density sets in motion the return of a kelp-dominated community.

This cycle is disrupted if there is an invasion of *Codium fragile* after a decrease in urchin density. Where kelp is plentiful, the invading seaweed is unable to establish itself, but once it does become established, kelp is not able to re-colonize the area, and the structure and composition of the community changes.

Although this indicator can develop into large aggregations, it would be valuable if you can record the number of individual plants.

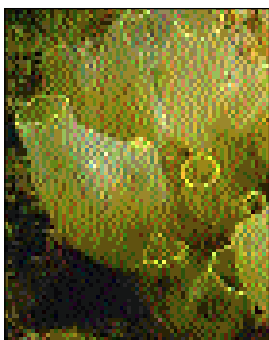
3.3 Tunicate or Sea Squirt (*didemnum sp*)

Tunicates are a group of marine animals that spend most of their short lives attached to docks, rocks or the undersides of boats. To most people they look like small, coloured plant-like growth. It often comes as a surprise to learn that they are actually more closely related to vertebrates like ourselves, than to most other invertebrate animals.

Nothing can be seen of a vertebrate relationship in the adult animals, but the tadpole-like larva has a notochord, (a stiff rod) in its tail. After hatching, this little creature, rarely more than 5mm long, swims for a few hours to find a spot somewhere on a solid surface. It attaches itself to the surface with its head, and within minutes resorption of the larva tail commences and the sea squirt will stay on that same spot for all its life.



A tunicate is built like a barrel, and is so named because the outer layer of the body wall is a tough "tunic", made of a substance that is almost identical with cellulose. They live by passing seawater through their bodies. In essence the animal consists of a double sac with two siphons. Seawater is pumped slowly through one siphon, sieved through the inner sac for plankton and organic detritus, and the filtered seawater is pumped out again through the second siphon, the atrium. When removed from the water, they continue to expel water through the atrium, hence the common name "sea squirt". The class name Ascidiacea, comes from the Greek word askidion, a leather wine flask with a tough outer casing around its body. Sea squirts vary greatly in form, from simple sac-like creatures on the underside of rocks, to complex brightly coloured colonial species with hundreds of minute individuals.



Given the tunicate's preference for living on artificial structures and its fouling and smothering capabilities, its main claim to fame, or rather notoriety is as a pest. Mussel growers, for example, are concerned about the ability of the indicator to establish itself in mussel farming areas.

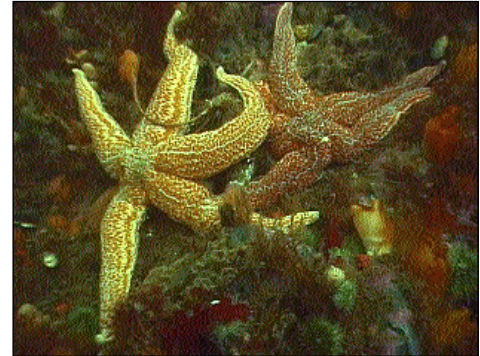
The *Didemnum* species of ascidians are an encrusting colonial species with a sponge-like appearance with a sponge-like appearance. They vary in colour but are commonly creams to yellow/brown. Overall, colonies may reach 30-46 cm long (12-18 inches). In essence they are single year organisms, developing the first year, then breeding and dying the following year.



3.4 Sea Stars (Asteroidea, but not *A. vulgaris* or *A. forbsii*)

Sea stars (group name *Stelleroidea*) are sometimes called starfish, though lacking both vertebrae and fins, they are not real fish. There are two sub-types of sea stars: *Asteroideas* are the true sea stars and sun stars, whereas *Ophiuroideas* are brittle stars and basket stars.

Ophiuroid means 'snake-like', referring to the form and motion of the arms. The arms of brittle stars are easily broken off, but will regenerate in a few days to weeks. Sea stars can also regenerate arms that are broken off, but for most species, the central region of the body must remain intact



Not this one! - *Asterias vulgaris*

Class Asteroidea, the true sea stars, contains about 1700 living species of these echinoderms. Unlike the superficially similar brittle stars, true starfish have no sharp demarcation between arms and central body, and they move using tube feet, or podia, rather than wriggling movements of the whole arms. Each arm, or ray has a light sensitive organ called an eyespot, enabling it to detect light and general direction.

Most starfish are predators, feeding on sessile or slow-moving prey such as molluscs and barnacles. A few species, such as the spiny star of the North Atlantic, eat other sea stars! Many, but not all, starfish are able to turn a portion of their stomachs out through the mouth (called eversion), and thus digest food outside of the body.

This star-shaped carnivorous animal is usually a dull yellow or orange, but can also be brightly coloured. As a natural defence mechanism, the starfish is able to change its body color to hide or escape from predators. Starfish vary greatly in size from a few centimetres over one metre. The arms of the starfish are used for movement, catching prey and digestion. Unlike other animals, the starfish is able to grow a new arm if one is lost. Many starfish have five arms, but there are some deep-water species that carry more than fifty.

The Northern Sea Star (*asterias vulgaris*) and the similar but slightly smaller Forbes Sea Star (*asterias forbsii*) are relatively common in these waters and we would ask you to exclude them from any surveys that you undertake for the Global Dive Log, although of course you are very welcome to include them in your on-line dive log.

4.0 Anthropogenic Pressures

EARTHDIVE is recording five different types of anthropogenic pressures (effects resulting from the actions of humans). Collection of this data enables us to establish an ever-evolving **Global Snapshot** of our oceans.


The types of anthropogenic pressures are the same for each region and are:

- Surface Pressures paper, wood, plastic and any other man-made debris
- Boat Activity pleasure, fishing, commercial
- Subsurface Pressures litter, sediment, physical damage
- Evidence of Fishing pots, traps, discarded nets, blast damage, cyanide damage, other etc
- Coastal Development resorts, villages, towns, distance from the dive sites etc



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Please note any information you feel is relevant and record the data in the notes section for each impact in the Global Dive Log.

Thank you.

5.0 eCORD

EARTHDIVE asks all scuba divers to subscribe to the principles of **eCORD** - the **EARTHDIVE** Code of Responsible Diving - and to encourage others to practice them. **eCORD** is a straightforward 7 Point Plan which will help divers to limit the anthropogenic impact of recreational diving - while at the same time making their diving experiences more rewarding and enjoyable. Be sure to incorporate the 7 points in your dive planning!

1. Know your limits.

Every dive is different and every diver is different. Always ensure that you dive within the limits of your training and experience, whilst taking due account of the prevailing conditions. Take the opportunity to advance and extend your skills whenever that opportunity arises. In particular, buoyancy skills can become a little rusty after any prolonged absence from the water. If you can't get pool or confined water practice before your trip, get your buoyancy control checked out by a qualified instructor on your first dive! There are many national and international dive training organisations which offer a comprehensive range of courses and instructional material beyond basic skills level. Take advantage of them!

2. Be aware of the marine environment and dive with care.

Not surprisingly, many dive sites are located where the reefs and walls play host to the most beautiful corals, sponges and fish - fragile aquatic ecosystems! Starting with your point of entry, be aware of your surroundings: never enter the water where there are living corals, water plants or reeds. Once underwater, it only takes one unguarded moment - a careless kick with a fin, an outstretched hand, a dragging gauge or octopus - to destroy part of this fragile ecosystem. Even fin kicks too close to the reef or sand can have an adverse effect - so dive with the utmost care. Photographers in particular need to take greater care as they strive for that best-yet shot! Don't let your dive become an adverse anthropogenic impact! And remember that these rules apply just as much to 'hard' dive sites - such as wrecks, which have become the home of diverse marine life - as well as fresh-water and other sites.

3. Understand and respect marine flora and fauna.

A large part of the joy of diving is in learning more about the plants and animals who live in this unique underwater environment. In order to survive and thrive, many living creatures disguise themselves to look like plants and inanimate objects, or develop defence mechanisms such as stings. Some even do both! (Have you seen a stonefish lately?) The **EARTHDIVE** briefing packs (available by download only) provide information about indicator species for the region in which you are planning to dive. In addition, dive training organisations run marine naturalist and identification courses. The more that you learn, the more that you will see, the more that you will derive pleasure from your underwater experience - and the safer you will be for yourself, other divers and the marine environment!

4. Don't interfere.

First and foremost, be an observer in the underwater environment. As a general rule, look don't touch. Remember that polyps can be destroyed by even the gentlest contact. Never stand on coral even if it looks solid and robust.

Always resist the temptation to feed fish and discourage others from doing so. You may interfere with their normal feeding habits, damage their health and encourage aggressive behaviour. Leave only your bubbles!

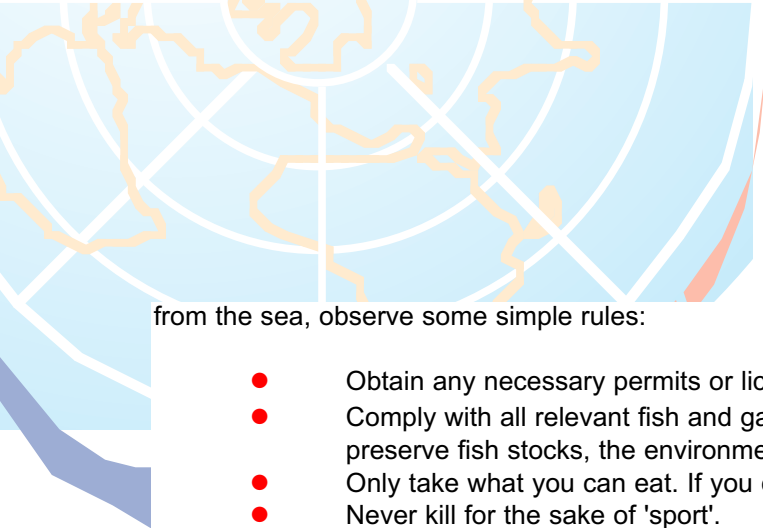
5. Take only what you need.

The marine environment is a valuable source of food for mankind and it is important that it remains so into the future. If you are among those divers who enjoy taking food



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from the sea, observe some simple rules:

- Obtain any necessary permits or licenses.
- Comply with all relevant fish and game regulations. These are designed to protect and preserve fish stocks, the environment and other users.
- Only take what you can eat. If you catch it and can't eat it, put it back.
- Never kill for the sake of 'sport'.
- Avoid spear fishing in areas populated by other divers or visitors to the area, or where you might cause collateral damage.

Don't be tempted to collect shells, corals or other mementos of your dive. If you want a souvenir, take a photograph!

6. Observe and report.

As an **EARTHDIVE** member, you will be in a unique position to monitor and report on the health, biodiversity and any obvious damage to dive sites using the **EARTHDIVE** Global Dive Log. In addition, we would encourage you to report anything unusual to the appropriate local marine and environmental authorities, or if this is difficult, get your dive centre to do it for you. They have a vested interest in a healthy marine environment, and will normally be more than willing to help. Always be on the lookout for physical damage, fish stock depletion, pollution and other environmental disturbances. If the dive operation itself is causing damage -say by anchoring to the reef - then let them know how you feel in no uncertain terms!

7. Get involved.

No matter where you are diving or snorkelling, be it at home or abroad, there will be at least one (and often many more) marine conservation bodies who are active in the area. Don't be afraid to approach them for information, to offer help, or just to find out what they have to offer. You will receive an enthusiastic welcome! They will provide you with lots of opportunities to contribute to marine conservation.



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Green Sea Fingers (*Codium fragile subspecies Tomentosoides*)

How many individual plants did you see? (tick box and/or record actual number)

0 1 - 5 6 - 20 20 - 50 51 - 250 >250

Actual Number (write actual number)

How long were you looking for this indicator? (minutes)

Add your additional information here. In what type of habitat did you see this indicator? What was it doing? At what depth did you see it/them?

Additional Information:



Tunicate or Sea Squirt (*didemnum sp*)

How many individual colonies did you see? (tick box and/or record actual number)

0 1 - 5 6 - 20 20 - 50 51 - 250 >250

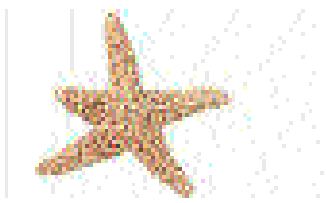
Actual Number (write actual number)

How long were you looking for this indicator? (minutes)

Add your additional information here. In what type of habitat did you see this indicator? What was it doing? At what depth did you see it/them? It would be helpful to note the relative size of the colonies.

Additional Information:





Sea Stars (*Asteroidea*, but not *A. vulgaris* or *A. forbesii*)

How many Sea Stars did you see? (tick box and/or record actual number)

0 1 - 5 6 - 20 20 - 50 51 - 250 >250

Actual Number (write actual number)

How long were you looking for this indicator? (minutes)

Add your additional information here. In what type of habitat did you see this indicator? Can you record its species? What was it doing? At what depth did you see it/them?

Additional Information:



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Post Dive Recording Sheet - **Anthropogenic Pressures**



Surface Pressures

Did you see any Surface Litter? (tick box)

Yes No Dont Know

If yes please record any details (plastic, wood, paper, other etc.) Please record quantity and any other relevant information.



Boat Activity

Did you see any Boat Activity? (tick box)

Yes No Dont Know

If yes please record any details (i.e fishing boats, pleasure boats, commercial vessels any other etc)

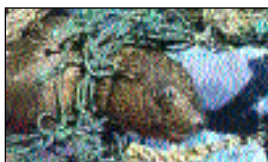


Subsurface Pressures

Did you see any Surface Litter? (tick box)

Yes No Dont Know

If yes please record any details (litter, sediment, physical damage, coral bleaching other etc).

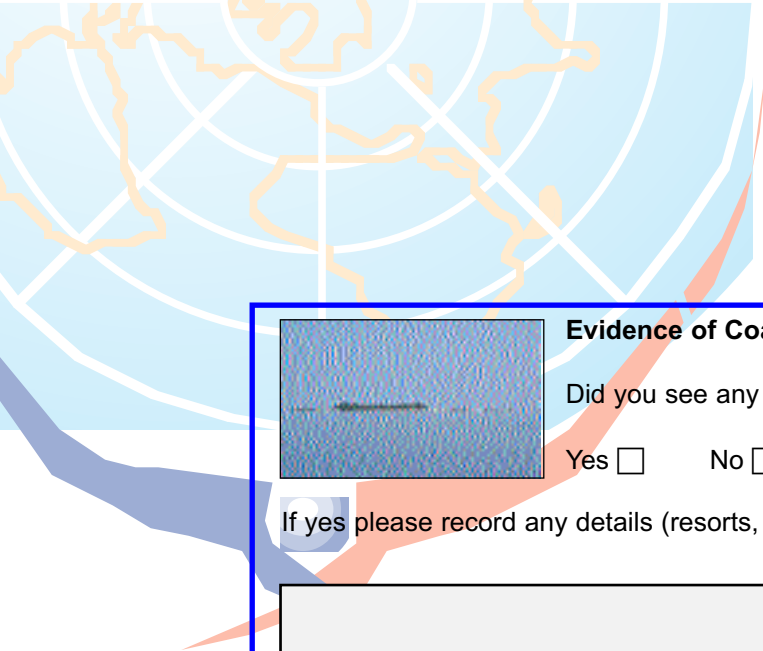


Evidence of Fishing

Did you see any Surface Litter? (tick box)

Yes No Dont Know

If yes please record any details (pots, traps, discarded nets, blast damage, cyanide damage, other etc).



Evidence of Coastal Development

Did you see any evidence of Coastal Development? (tick box)

Yes No Dont Know

If yes please record any details (resorts, villages, towns, distance form the dives site etc).

Evidence of the illegal trade in endangered species

Any observations you make below and record in the Global Dive Log will be passed onto **TRAFFIC**, the world's wildlife trade monitoring network.

TRAFFIC works to ensure that the trade in wild plants and animals is not a threat to the conservation of nature. It has offices covering most parts of the world and works in close co-operation with the Secretariat of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). **TRAFFIC** is a joint programme of WWF and IUCN-The World Conservation Union.

Evidence of the illegal trade in endangered species

Did you find any evidence at any time during your holiday/dive trip of the illegal trade of endangered species. (tick box)

Yes No Dont Know

If yes please record any details (the species, sale location, and any other available information). Please refer to the **TRAFFIC** Guide for more information concerning species identification, local laws, and contact information of **TRAFFIC** to report offences.



© Elizabeth Fleming
Turtle shell ornaments on display

TRAFFIC

