ESP on Assignment: Field Guide/Scientific Research

Overarching Theme: Sustainability

1. Research ESP Location (ESP on JIS Net):
   ● Use Google Earth and other sources to find your ESP location/s.
   ● Add screenshots of your location/s (satellite images and maps).

2. Research what you likely will encounter at your ESP location:
   ● Choose ONE ECOSYSTEM to focus your field guide on, one that you will likely spend a good deal of time at.
   ● Identify the key abiotic factors in that ecosystem.
   ● Identify and create a “field guide” to the flora (plants) and fauna (animals) of that ecosystem.
   ● Identify a keystone species in the ecosystem (an organism that when taken away will affect the entire ecosystem)
   ● Include details such as: taxonomy, photos, characteristics, behavior, habitat, diet, range, protection status/endangered, etc.

3. Identify relationships within your ecosystem:
   ● Commensalism
   ● Mutualism
   ● Parasitism
   ● Competition
   ● Predator-Prey

4. Produce a food web diagram of the ecosystem that includes: trophic levels, predator, prey, producers, consumers, and decomposers.
Complete this table before starting your research:

<table>
<thead>
<tr>
<th>Your Name</th>
<th>Mansi</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name of Your ESP Trip</td>
<td>Coastal Environments</td>
</tr>
<tr>
<td>Ecosystems you likely will encounter on your trip</td>
<td>Coral reefs</td>
</tr>
<tr>
<td>Ecosystem Focus for ESP on Assignment Project</td>
<td>Gili Nanggu</td>
</tr>
</tbody>
</table>
Maps
Satellite Images
Abiotic factors:

- Ocean water/salt water
- Sunlight
- Climate
- Temperature (pH levels)
- Moisture
- Wind
- Water currents
- Soil type
- Nutrient availability
- Minerals
- Rocks
- Dead coral
- Shells
- Carbon Dioxide
- Oxygen

Biotic Factors:

- Algae
- Fungi
- Plants
- Marine Animals (mammals, fish, whales, sharks, dolphins, jellyfish, shrimp, starfish, squids, etc)
- Bacteria
- Corals (brain, staghorn, branching, shelf, solitary, soft, fan, etc)/jellyfish/anemone
- Invertebrates (arthropod, mollusc, etc)
- Echinoderms (starfish, urchins)
- Arthropods (insects, crustaceans)
- Mollusks (cephalopod, gastropod, bivalve)
- Plankton (phytoplankton, zooplankton)
- Reptiles/Amphibians
- Birds
<table>
<thead>
<tr>
<th>Species</th>
<th>Photos</th>
<th>Information</th>
<th>Sources</th>
</tr>
</thead>
</table>
| Black-backed butterflyfish | ![Image](https://via.placeholder.com/150) | **Taxonomy**  
Kingdom: Animalia  
Phylum: Chordata  
Class: Actinopterygii  
Order: Perciformes  
Family: Chaetodontidae  
Genus: Chaetodon  
Species: Chaetodon melannotus |  | **wikipedia**  
**walkaboutindonesia**  
**iucnredlist** |
|                         |        | **Range**  
Widespread through the Indo-Pacific from the Red Sea and East Africa to Samoa, to southern Japan and throughout Micronesia. Found around 1-25 meters deep. |  |  |
|                         |        | **Characteristics**  
● Grows to 18 cm long  
● Can live for 20 years  
● Has a white body with black diagonal stripes on the sides  
● The fins are yellow and it has a yellow face with a black eye band |  |  |
|                         |        | **Behavior**  
● When it is found at night or when it’s scared, this fish changes color - the upper side of the animal turns black except for 2 white patches  
● **Secondary consumer** |  |  |
|                         |        | **Habitat**  
This species inhabits areas of lagoons, seaweed reefs and reef flats that are abundant in coral. |  |  |
|                         |        | **Diet** |  |  |
Parrot Fish

**Taxonomy**
- Kingdom: Animalia
- Phylum: Chordata
- Class: Actinopterygii
- Order: Perciformes
- Family: Scaridae
- Genus: Scarus
- Species: Scaridae

**Range**
Found in shallow tropical and subtropical oceans around the world, mostly in the Indo-Pacific. They are found in coral reefs, rocky coasts, and seagrass beds and have an important role in bioerosion (removal of a calcium carbonate substance/layer by biological things). Found 1-30m deep.

**Characteristics**
- Parrot fish are known for their particular condition of arrangements of their teeth
- Their teeth are arranged tightly in a mosaic on the outside surface of their jaw bones which forms a parrot-like beak which they use to scrape algae from coral and rocky substances/layers - helps in the bioerosion process
- Maximum size: 30-50 cm
- Parrotfish are usually herbivores while others eat many tiny reef organisms
- On the Caribbean coral reefs, parrotfish are

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**Protection**
Is found in marine protected areas.

**Status**
It is not endangered at the moment.
<table>
<thead>
<tr>
<th>Behavior</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>- Some parrotfish species produce/discharge a mucus cocoon usually at night to hide its smell from predators, acts as an early warming system which tells the fish that predators are disturbing the membrane, and the skin itself is surrounded in a mucus substance which has properties of an antioxidant which helps and protects the body from things</td>
<td></td>
</tr>
<tr>
<td>- Their feeding is crucial for the production and distribution of coral sands in the reef biome, and maintains the algae growth of the structure of the reef</td>
<td></td>
</tr>
<tr>
<td>- Their feeding activity is kind of like that of an owl’s when they regurgitate owl pellets because they only digest the edible parts and excrete it as sand creating small islands and the sandy beaches of the Caribbean</td>
<td></td>
</tr>
<tr>
<td>- The effect of parrotfish grazing on sponges is the protection of reef-building corals that could be overgrown by fast-growing sponge species, otherwise</td>
<td></td>
</tr>
<tr>
<td>- Parrotfish release many microscopic, floating eggs into the water which become a portion of the plankton - floats freely, settling into the coral until it hatches</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Habitat</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Common in the Indo-Pacific, Great Barrier Reef and</td>
<td></td>
</tr>
</tbody>
</table>
the Caribbean sea because the parrotfish is important to saving Caribbean coral reefs from being overgrown with seaweed and sponges, and it is also important for the health of the Great Barrier reef because it is the only one of the thousand of fish species that continuously performs the task of scraping and cleaning coral reefs.

**Diet**
Algae living on the reefs and coral polyps

**Protection**
People are trying to catch parrotfish but also trying to find a way of how to save the corals when the parrotfish are taken away.

**Status**
They may not be endangered because the main source of income for the locals in the Indo-Pacific rely on the corals which is only maintained from the help of the parrotfish. But people may stop thinking about this and cause unsustainability.

## Hawksbill Sea Turtle

<table>
<thead>
<tr>
<th>Taxonomy</th>
<th>nationalgeographic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kingdom: Animalia</td>
<td></td>
</tr>
<tr>
<td>Phylum: Chordata</td>
<td></td>
</tr>
<tr>
<td>Class: Reptilia</td>
<td></td>
</tr>
<tr>
<td>Order: Testudines</td>
<td></td>
</tr>
<tr>
<td>Family: Cheloniidae</td>
<td></td>
</tr>
<tr>
<td>Genus: Eretmochelys</td>
<td></td>
</tr>
<tr>
<td>Species: Eretmochelys Imbricata</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Range</th>
<th>nationalgeographic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Found throughout the tropical waters of the Atlantic, Pacific and Indian oceans.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>nationalgeographic</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Maximum shell length: 45 inches</td>
<td></td>
</tr>
</tbody>
</table>
- Maximum weight: 150 pounds
- They have a pair of claws on each flipper
- You can tell the difference between the male and the female because male hawksbills have longer claws, thicker tails, and brighter coloring
- Hawksbill Sea Turtles have heads that end in a sharp point looking like a bird’s beak
- Their hard shells protect them from predators
- Their preys include large fish, sharks, crocodiles, octopuses and humans

**Behavior**
The move from places to places from feeding grounds to nesting grounds usually on tropical beaches. Mating takes place in shallow waters close to the shore and occurs every 2 or 3 years. It is a secondary consumer.

**Habitat**
Found in reefs that have lots of sponges for them to feed on

**Diet**
They are omnivores, and also eat molluscs, algae, crustaceans, sea urchins, fish and jellyfish

**Protection**
Sanctuaries have been built for places that have endangered hawksbill sea turtles.

**Status**
Hawksbills are endangered because of us humans and because of artificial selection. Their eggs are eaten globally and are usually killed for their flesh and shells, which costs a lot too. The sea turtles are also threatened by getting captured in fishing nets.
<table>
<thead>
<tr>
<th>Taxonomy</th>
<th></th>
<th></th>
<th>wikipedia</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kingdom: Animalia</td>
<td>Phylum: Arthropoda</td>
<td>Class: Malacostraca</td>
<td>Order: Decapoda</td>
</tr>
<tr>
<td>Family: Diogenidae</td>
<td>Genus: Dardanus</td>
<td>Species: Dardanus Calidus</td>
<td></td>
</tr>
</tbody>
</table>

| Range | Worldwide in distribution. Found in sandy or muddy marine waters and sometimes on land and trees. |
| Characteristics | | | |
| ● Nocturnal | ● Hermit crabs have long, spirally curved abdomens which are soft | ● The vulnerable abdomen is protected from predators by an empty seashell that rescues the crab from loss at sea in which its entire body can pull in | ● Hermit crabs use the shells of sea snails |
| ● The tip of the hermit crab's abdomen is adapted to hold on strongly onto the small bone of the snail shell | ● Some hermit crabs are only a few mm long, other can live from 12-70 years, and some can be a size of a coconut |

| Behavior | | | |
| ● When they grow, they need bigger shells | ● Gastropod shells are usually a limited source, so the crabs compete for shells | ● Hermit crabs with shells that are too small cannot grow as fast as those with the ones with the shells that fit perfectly and have higher chances to be eaten if they can’t |
completely cover themselves into the shell
- As the crabs grow, the look for larger shells, so when the previous shell is abandoned, the crabs for a vacancy chain to exchange shells showing symbiotic relationships
- Hermit crab's larvae hatch at the 3rd stage
- In this larval stage, the crab has many long spines, a narrow abdomen, and a large antennae
- **Primary consumer**

**Habitat**
There are two types of hermit crabs, one that spends most of its life in the water and the other, on land. The marine hermit crabs live in different depths of saltwater. As pets, many marine species of hermit crabs are common in the marine aquarium trade kept in reef fish tanks. They breathe through gills but they don’t have to carry around their water to do so. As long as their gills are damp, they can survive for a short while out of the water. Most of this species inhabit immobile structures left my worms, gastropods, corals and sponges. The land hermit crabs are a terrestrial species that live in tropical areas, and they have access to freshwater and saltwater to keep their gills damp to survive and to reproduce.

**Diet**
Terrestrial: fresh fruits, vegetables, meat, fish, nuts, seeds, etc. They are omnivores so they eat practically anything.
Marine: Their feeding activity varies in their size. Smaller crabs-algae, plants, uneaten fish food. Larger crabs-crab pellets, lettuce, dried seaweed, poultry pieces, etc.
### Protection
There has been sanctuaries made worldwide called the Happy Hermit Crab Sanctuary that is for rescuing unwanted or needy hermit crabs that are good for the crabs and good for the owners in that area.

### Status
People think that the hermit crab is endangered but actually, if they keep getting locked up in captivity then they can get endangered or extinct. Hermit crabs can only have babies in the ocean or on the ocean shore, but if they are kept in captivities, they can’t have babies, therefore preventing them from interbreeding with other species, and ruining the cycle. So there may be an unfortunate chance.

### Bubble Coral (keystone species)

#### Taxonomy
- **Kingdom:** Animalia
- **Phylum:** Cnidaria
- **Class:** Anthozoa
- **Order:** Scleractinia
- **Family:** Caryophylliidae
- **Genus:** Plerogyra
- **Species:** Plerogyra Sinuosa

#### Range
Found in the Indian and Pacific Oceans, from the Red Sea, Gulf of Aden and southwest Indian Ocean, across the northern Indian Ocean to Southeast Asia, Japan and the East China Sea, and into the West and Central Pacific Ocean.

#### Characteristics
- It has bubbles the size of a grape which increases their surface area according to the amount of light accessable
- They are larger during the day but smaller during the night when tentacles reach out to
grab food

- It needs low light and a gentle water flow
- The septa isn’t arranged properly which gives the colony a messy look
- The costae on young colonies form lobes which grow spines which then lengthens and forms new polyps; this process is called the budding method
- This coral has vesicles looking like bubbles up to 2.5 cm in diameter
- During the day, this gets larger but the retract to a particular limit when night comes, to show the polyps and their tentacles

**Behavior**

- Bubble coral is a zooxanthellate (organisms that are able to live in a symbiosis relationship with marine invertebrates like jellyfish, other coral and sea anemones)
- It gets most of its food from the nutrients that live inside the soft tissues including the walls of the vesicles
- These organisms are photosynthetic, and they provide the coral with organic carbon and nitrogen, sometimes they provide 90% of their host’s energy needs for metabolism and growth
- The other needs are met when the polyps catch the planktonic organisms (organisms that live in the water column and can’t swim through the current)
- Each polyp produces a hard skeleton, called a corallite which contributes to the formation of a coral reef
- The coral skeleton then forms the bulk of the colony
- **Primary consumer**
| **Habitat** | Found in shallow reef environments. Found on protected reefs in lagoons in which it grows on vertical faces or under overhangs. The large colonies are usually found on flat surfaces in thick waters. It is found between depth of 3 and 35 meters. |
| **Diet** | Bubble coral ingests food through squirting it to them. You would use either a turkey baster, an eyedropper or a pipette. But bubble corals can produce their own food like algae and zooplankton since it is a photosynthetic organism that obtain 70% of its nutrient requirement from the zooxanthellae. |
| **Protection** | According to the UNEP World Conservation Monitoring Centre, the bubble coral is also found in a number of Marine Protected areas. |
| **Status** | The bubble coral is classified as Near Threatened on the IUCN Red List because of the human population growth therefore increasing pressure on coastal resources, the increase in domestic and agricultural waste in the oceans, bad land-use practices that cause an increase in sediment running onto the reefs, overfishing, rising carbon dioxide levels may make the ocean’s acidity increase, global climate change, with the rise in ocean temperatures increasing risks of coral bleaching which can lead to the death of the coral because it expels its zooxanthellae. |
**Taxonomy**
Kingdom: Animalia
Phylum: Chordata
Class: Actinopterygii
Order: Scorpaeniformes
Family: Scorpaenidae
Genus: Pterois
Species: Pterois volitans

**Range**
Native to the western Pacific Ocean, throughout Indonesia, especially. Sometimes the lionfish is considered an invasive species, inhabiting the waters off the eastern coast of the US. Also found in the Caribbean.

**Characteristics**
- The lionfish has warning coloration with red, white, creamy, black bands, pectoral fins, and venomous spiky fan-like fins
- The elongated pectoral and dorsal fins of the lionfish are transparent and covered in rows of dark spots
- The pelvic fins are black with white spots
- Fleshy tabs around the face and spines on the head differ in shape and size, but are long on juveniles and leaf-like on the adult
- The larva of a lionfish has a large head with a long, triangular snout and long head spines
- 38 cm in length

**Behavior**
- It hunts at night, stalking and ambushing its prey by spreading the pectoral fins out wide and corralling its prey into a corner before immediately swallowing it at once
- During mating season, the male circles,
- The female lionfish releases 2 egg clusters with each containing 2,000 to 15,000 eggs which are fertilized externally by the male
- After a few days, the mucus dissolves releasing the eggs into the water, allowing them to float as planktonic larvae
- A lionfish has venom glands located at the base of most spines
- The 18 spines they have are used for protecting themselves from predators and to aid prey captures
- The spines are covered in a sheath with 2 grooves that have venom-secreting tissues' so when the spines enter the skin of another organism, the sheath around the spines is released and the tissue releases venom into the wound
- The venom contains a neurotoxin which reduces the transmission chemical signals to the muscles, also affecting the cardiovascular system

**Secondary consumer**

### Habitat
Found in depths of 50 meters. Found in lagoons, thick inshore areas, coral or rocky reeds. Sometimes also found in bays, estuaries and harbours. During the day, the lionfish will be found in places where it's not technically seen like under ledges or in caves/crevices.

### Diet
Lionfish feed on small fish, shrimps and crabs.
## Protection
No conservation measures are in place to protect this species since it is a very common one. In its range where it’s considered an invasive species, the lionfish is the reason why there are control efforts to prevent it from spreading further so that native species wouldn’t be out-competed for food and habitat.

## Status
The lionfish hasn’t been assessed by the IUCN but with everything being said, I don’t think they are endangered, they are still a widespread species. Additionally, there are now threats towards the lionfish.

## Lace Coral
![Image of Lace Coral](https://arkive.org/media/lace-coral/G047C120.jpg)

### Taxonomy
Kingdom: Animalia  
Phylum: Cnidaria  
Class: Hydrozoa  
Order: Stylasterina  
Family: Stylasteridae  
Genus: Stylaster  
Species: Stylaster californicus

### Range
Found throughout the Indo-Pacific and Atlantic Oceans.

### Characteristics
- They form tree like structures with the branches growing in one plane
- The colors that make the beauty of this coral, is deposited inside the limestone skeleton and stays after the animal tissue is gone
- Clusters of small pores, gastropods and dactylo pores can be seen on alternating sides of the branches
<table>
<thead>
<tr>
<th>Behavior</th>
</tr>
</thead>
<tbody>
<tr>
<td>● Lace corals are azooxanthellate; not dependant on light, can live where the reef-building corals</td>
</tr>
<tr>
<td>● Lace corals are hydrozoans, have different type of polyps - the polyps of hydrozoans are tiny and are imbedded in the skeleton connected by a network of minute canals</td>
</tr>
<tr>
<td>● Seen on the smooth surface are pores of 2 sizes; gastropores surrounded by dactylopores</td>
</tr>
<tr>
<td>● Dactylopores house long fine hairs that extends above the surface from the skeleton; the hairs possess clusters of stinging cells, these hairs capture prey which is encompassed by gastrozooids or feeding polyps, found inside the gastropores</td>
</tr>
<tr>
<td>● The polyps reproduce asexually producing jellyfish-like medusae which are released into the water from ampullae</td>
</tr>
<tr>
<td>● The medusae contains the reproductive organs, which releases eggs and sperm into the water</td>
</tr>
<tr>
<td>● Fertilized eggs grow into larvae that will then settle on the substrate and form new colonies</td>
</tr>
<tr>
<td>● Lace corals also have the potential to reproduce asexually by fragmentation</td>
</tr>
<tr>
<td>● <strong>Primary consumer</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Habitat</th>
</tr>
</thead>
<tbody>
<tr>
<td>Found in mild as well as tropical latitudes, and also occur at 3,000 to 6,000 meters deep. Found in caves where it may occur as clumps and under overhangs in shallow reef environments.</td>
</tr>
</tbody>
</table>

<p>| Diet |</p>
<table>
<thead>
<tr>
<th><strong>Blue Sea Star</strong></th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th><strong>Taxonomy</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Kingdom:</strong> Animalia</td>
</tr>
<tr>
<td><strong>Phylum:</strong> Echinodermata</td>
</tr>
<tr>
<td><strong>Class:</strong> Asteroidea</td>
</tr>
<tr>
<td><strong>Order:</strong> Valvatida</td>
</tr>
<tr>
<td><strong>Family:</strong> Ophidiasteridae</td>
</tr>
<tr>
<td><strong>Genus:</strong> Linckia</td>
</tr>
<tr>
<td><strong>Species:</strong> Linckia laevigata</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Range</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Found in the tropical waters of the Indian and Pacific Oceans, from the Western Indian Ocean to southeastern Polynesia.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Characteristics</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>● Identified by 5 cylindrical arms</td>
</tr>
<tr>
<td>● Can grow up to 30-40 cm across</td>
</tr>
<tr>
<td>● They get their color from a blue pigment called linckiacyanin and some yellow carotenoids</td>
</tr>
</tbody>
</table>

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One of the three main polyps, functions to provide nutrition for the coral, and that polyp is called the gastrozooids. They also feed on passing food particles and micorplanktons.

**Protection**
Lace Corals are listed on the Appendix II of the Convention on International Trade in Endangered species meaning that trade in this species should be carefully regulated. Indonesia and Fiji have quota systems for corals including lace corals. Lace coral is being conserved in many marine protected areas.

**Status**
Lace corals are threatened by the global coral trade for use in aquariums or for jewellery and ornaments, which is why it is listed on Appendix II of CITES.

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eol - encyclopedia of life
● These colors change depending on the amount and combination of pigments in each starfish
● Can weigh from 11-16 grams
● About 30 cm in length
● It has other physical features like
  - Ectothermic: An animal whose regulation of body temperature depends on sources outside like sunlight or a heated rock surface; cold blooded animals
  - Heterothermic: Animals that are both poikilothermic (organisms whose inner temperature changes considerably) and homeothermic (thermoregulation that stabilizes organism's' internal body temperature despite outside influences)
  - Radial Symmetry: Symmetry around a central axis, a starfish or a tulip flower
● It’s hard
● Usually have short, yellowish tube feet
● They have calcified skin which means that it hardens by deposition of, or turning into calcium carbonate/insoluble calcium compounds, that is bony and which protects them from predators
● Some starfish have distinct colors that camouflage them which also scares away the predators

**Behavior**
● They don’t have brains hence no sensory network
● They are sensitive to the water that surrounds them, touch, light and orientation/adaptation
● The pedicellariae (defensive organ) of the starfish help in the touch sense as they work
<table>
<thead>
<tr>
<th>Sea Cucumber</th>
<th>to get sediments away from the organism</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>● The tube feet function as chemoreceptors (a sensory cell or organ responsive to chemical stimuli) and helps the sea star in looking for food</td>
</tr>
<tr>
<td></td>
<td>● These sea stars are nocturnal</td>
</tr>
<tr>
<td></td>
<td>● <strong>Primary consumer</strong></td>
</tr>
<tr>
<td><strong>Habitat</strong></td>
<td>Lives in coral reefs and seagrass beds, commonly found in thinly distributed/scattered density</td>
</tr>
<tr>
<td><strong>Diet</strong></td>
<td>It is a carnivore. They usually eat Open clams, oysters, dead animals, small/marine invertebrates, detritus, algae.</td>
</tr>
<tr>
<td><strong>Protection</strong></td>
<td>No conservation organizations have been established but sanctuaries have been made in regions that have endangered blue sea stars.</td>
</tr>
<tr>
<td><strong>Status</strong></td>
<td>The blue sea star has been part of the sea shell trade which includes marketing dried sea star skeleton for decoration. Regions have seen severe population declines because of the continuous harvesting from the tourism industries.</td>
</tr>
<tr>
<td><strong>Taxonomy</strong></td>
<td>Kingdom: Animalia</td>
</tr>
<tr>
<td></td>
<td>Phylum: Echinodermata</td>
</tr>
<tr>
<td></td>
<td>Class: Holothuroidea</td>
</tr>
<tr>
<td></td>
<td>Order: Aspidochirotida</td>
</tr>
<tr>
<td></td>
<td>Family: Holothuriidae</td>
</tr>
<tr>
<td></td>
<td>Genus: Holothuria</td>
</tr>
<tr>
<td></td>
<td>Species: Holothuria Scabra</td>
</tr>
</tbody>
</table>

[iucnredlist]
| **Range** | Found throughout the Indo-Pacific, from South Africa to the Red Sea, India, China and Japan to Australia, and to the northeast of Micronesia and the southeast of Tonga. In Madagascar, you can see the sea cucumber in the west coast from the south of Toliara. |
| **Characteristics** | ● Has leathery skin and a long body with one gonad (testis/ovary)  
● Greyish-black on the top, paler dark colored wrinkled on the bottom  
● Grows up to 40 cm in length  
● It is broader than it is high  
● Has flexible/bendable skin |
| **Behavior** | ● When they are somewhat threatened, some sea cucumbers discharge sticky threads to capture their enemies  
● They have a water vascular system that works by hydrostatic pressure allowing them to move around with their tube feet (suckers)  
● They collect food in with 8-30 tube feet surrounding their mouths  
● These organisms break down the particles to even smaller pieces and then it gets recycled back into the ocean  
● **Primary consumer** |
<p>| <strong>Habitat</strong> | They usually permanently live in the shallows. Sometimes they go under and bury themselves under the ocean floor. They would be more partial to seagrass beds close to mangroves, but they are also found in inner reef flats and lagoons. This species allures muddy ecosystems. |</p>
<table>
<thead>
<tr>
<th>Diet</th>
<th>Protection</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sea cucumbers are omnivores and they feed on tiny particles like algae, minute aquatic animals or waste materials, sometimes small invertebrates too.</td>
<td>Fishers throughout Asia (Fiji, India and Papua New Guinea) are banned for farming sea cucumbers, but only temporarily. Illegal trade is still occurring and is causing the biggest defect in the sea cucumber population.</td>
<td>This species is found in many commercials for its high cost to supply the Asian consumers. This species is endangered as it has had a 50% decline in its population over the past 30-50 years. The sea cucumbers have been eaten by man for more than 1,000 years. Due to their fast reproductivity, this species could increase in population if fishing pressures decreased.</td>
</tr>
</tbody>
</table>

**Titan Triggerfish**

**Taxonomy**
- Kingdom: Animalia
- Phylum: Chordata
- Class: Actinopterygii
- Order: Tetraodontiformes
- Family: Balistidae
- Genus: Balistoides
- Species: Balistoides viridescens

**Range**
Found in the Indian Ocean and central Pacific. They can be found at depths of 10 to 30 meters.

**Characteristics**
- Their upper jaw is unable to extend beyond
or above the surface, but they have hard teeth that are specialized for cracking the shells of hard-shelled invertebrates
- Its entire body is scaled and it is usually green in color, with yellow/green fins with black tips, and a dark grey/purple colored lower jaw
- Their eyes rotate themselves and their pelvic fins are joined into a spine
- They grow from 40-60 cm in length
- They have dark spots above their mouth
- They also have black spots on the edge of their fins

**Behavior**
- It feeds in odd ways like turning over rocks, stirring up sand and biting off pieces from coral
- Smaller fish are found around the Titan triggerfish because they feed on the smaller organisms that are stirred up
- The nests of these fish is found in a flat sandy area amongst corals, which they will defend profusely since they get very hostile when other fish enter their territory
- When it's mating season, they get even more belligerent on their territory in which their teeth can leave severe injuries on the invaders
- Titan Triggerfish often isolate themselves
- They are diurnal
- Their territory is in the shape of a cone

**Secondary consumers**

**Habitat**
Found in tropical and subtropical oceans around the world, mostly in the Indo-Pacific. Found in lagoons
and reefs.

**Diet**
They eat sea urchins, molluscs, crustaceans, tube worms and coral. These fish usually have smaller fish around eating the leftovers from whatever the titan triggerfish has eaten and scraps removed by their heavy defeat, showing mutualism because otherwise the triggerfish could potentially trigger death because of the trails they leave.

**Protection**
No sanctuaries have been established but their population could significantly decrease, given the condition of their destructed habitats in some regions.

**Status**
This species is currently not endangered.

---

**Green Sea Turtle**

**Taxonomy**
Kingdom: Animalia  
Phylum: Chordata  
Class: Reptilia  
Order: Testudines  
Family: Cheloniidae  
Genus: Chelonia  
Species: Chelonia Mydas

**Range**
Found in tropical and subtropical coastal waters, worldwide. The Atlantic green turtle, found off the shores of Europe and North America, and the Eastern Pacific green turtle, found in coastal waters from Alaska to Chile.

**Characteristics**

[nationalgeographic](https://nationalgeographic.com)
- Large, heavy, smooth carapace (hard upper shell of a tortoise)
- The color of the shell is usually brown or olive depending on its habitat
- The green sea turtles can’t pull its head into its shell
- Weight: up to 317.5 kg
- Size: up to 1.5 meters
- Average life span in the wild: 80 years
- Green sea turtles have flippers which are like paddles that allow them to swim smoothly

**Behavior**
- Green sea turtles aren’t the same as usual turtles, they warm themselves by basking in the sun on land
- Mating occurs every 2 to 4 years and takes place in shallow waters close to shore
- Females leave the sea and choose a specific area to nest and often lay their eggs the same place their mothers did
- They leave 100 to 200 eggs under the sand to allow them to hatch after about 2 months
- The most dangerous time of this turtle’s life is when it is just hatched because lots of predators come to strike

- **Secondary consumer**

**Habitat**
Their migrations are from feeding grounds, to nesting sites, but are usually found in sandy beaches.

**Diet**
Green sea turtles are herbivores that feed of sea grasses and algae. But juvenile green turtles also feed on invertebrates like crabs, jellyfish and sponges.
### Protection
Not protected but should be given the current standards over the ocean.

### Status
Green sea turtles are endangered but they are still killed for their meat and eggs. But other threats include boat propeller accidents, fishnet-caused drowning, and the destruction of their nesting ground by human intrusion.

<table>
<thead>
<tr>
<th>Leatherback Turtle</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="https://example.com/leatherback_turtle.jpg" alt="Leatherback Turtle" /></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Taxonomy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kingdom: Animalia</td>
</tr>
<tr>
<td>Phylum: Chordata</td>
</tr>
<tr>
<td>Class: Reptilia</td>
</tr>
<tr>
<td>Order: Testudines</td>
</tr>
<tr>
<td>Family: Dermochelyidae</td>
</tr>
<tr>
<td>Genus: Dermochelys</td>
</tr>
<tr>
<td>Species: Dermochelys coriacea</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Leatherback sea turtles are found throughout the world's ocean as far north as Alaska and as far south as South Africa. These turtles swim long migrations from feeding grounds in mild waters and nesting beaches in the tropics with about 7000 km in a span of a couple of months.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>● Doesn't have common bony plates on its carapace</td>
</tr>
<tr>
<td>● But its shell is flexible and covered in a thin layer of leathery skin</td>
</tr>
<tr>
<td>● It is dark in color with white and pink spots</td>
</tr>
<tr>
<td>● You can see a leatherback turtle by noticing its 7 narrow ridges</td>
</tr>
<tr>
<td>● Leatherbacks are the largest turtles in the arkive</td>
</tr>
<tr>
<td>World</td>
</tr>
<tr>
<td>---</td>
</tr>
<tr>
<td>The length of a carapace of an average female is 1.6 meters weighing from 300-600 kg</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Secondary consumer</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Habitat</th>
</tr>
</thead>
<tbody>
<tr>
<td>Found in open seas. Females are found in sandy beaches close to the deep water or occasionally shallow beaches. Although juvenile leatherback turtles are found in concentrated waters off western Africa.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Diet</th>
</tr>
</thead>
<tbody>
<tr>
<td>They mainly eat jellyfish and other soft-bodied species.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Protection</th>
</tr>
</thead>
<tbody>
<tr>
<td>The leatherback turtle is protected nearly everywhere it is found. The international trade of these turtles have been banned by the Appendix I of the CITES. Conservation projects have also been established for the nesting beaches with specificity on the management restrictions, since it’s been most</td>
</tr>
</tbody>
</table>
There are now Turtle Excluding Devices attached to fishing nets to prevent accidental captures and the US government has set up conservation areas in the north Pacific that cannot withhold fisheries during particular times of the year.

**Status**
The leatherback turtle is currently Critically Endangered according to the IUCN Red List. A few threats to the leatherback turtle include the global climate change, habitat loss and loss of prey. Ocean levels have also been rising which increased beach erosion and degradation which could potentially wash away the nesting habitat.

---

### Seagrass

**Taxonomy**

<table>
<thead>
<tr>
<th>Kingdom</th>
<th>Plantae</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phylum</td>
<td>Tracheophyta</td>
</tr>
<tr>
<td>Class</td>
<td>Liliopsida</td>
</tr>
<tr>
<td>Order</td>
<td>Najadales</td>
</tr>
<tr>
<td>Family</td>
<td>Zosteraceae</td>
</tr>
<tr>
<td>Genus</td>
<td>Zostera</td>
</tr>
<tr>
<td>Species</td>
<td>Zostera marina</td>
</tr>
</tbody>
</table>

**Range**

Found in all the coasts in every continent apart from Antarctica, obviously. But the Coral Triangle is the center of biodiversity for seagrasses.

**Characteristics**

- They constitute an important global carbon sink with 15% of total carbon storage in the oceans
- The seagrass root mat adds stability to the coastal zone and the leaves decreases the effect of wave energy in the shoreline
- When dead seagrass breaks down, it
becomes part of the marine food web, supporting fish, snails, shrimp and other primary consumers
  - Contains lots of protein

**Behavior**
  - Underwater plants that pollinate
  - Provide nursery habitat, shelter, and food for a variety of important species
  - They filter tides from the currents and coastal waters of nutrients, contaminants, and sediments
  - **Producer**

**Habitat**
You can find them in vast meadows at depths of 50 meters.

**Diet**
Seagrasses provide their own nutrients for themselves and they are the primary good for both dugongs and sea turtles.

**Protection**
No sanctuaries or conservation sites have been developed but now since they are declining and hundreds of hectares are lost annually, some should be appearing right about now, to not only save their species but the entire marine food web too because it would impact the trophic levels and energy flow between organisms.

**Status**
Along developed coastlines and in areas of aquaculture, the seagrass population is decreasing. They are one of the fastest declining marine habitats worldwide and the resource must be conserved and
<table>
<thead>
<tr>
<th>Black Mangrove</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Taxonomy</strong></td>
</tr>
<tr>
<td>Kingdom: Plantae</td>
</tr>
<tr>
<td>Phylum: Tracheophyta</td>
</tr>
<tr>
<td>Class: Magnoliopsida</td>
</tr>
<tr>
<td>Order: Lamiales</td>
</tr>
<tr>
<td>Family: Acanthaceae</td>
</tr>
<tr>
<td>Genus: Avicennia</td>
</tr>
<tr>
<td>Species: Avicennia germinans</td>
</tr>
</tbody>
</table>

**Range**
Found in tropical and subtropical regions of the Americas, on both the Atlantic and Pacific coasts and on the Atlantic coast of tropical Africa. Common through coastal areas of the Indo-Pacific and Texas and Florida as far north as southern Louisiana and coastal Georgia in the US.

**Characteristics**
- The leaves appear whitish from the salt excreted at night and on cloudy days
- White mangroves grow inland from black mangroves which themselves grow inland from red mangroves
- The three species work together to stabilize the shoreline, provide buffers from storm surges, trap debris and detritus (waste or debris of any kind) brought in from the tides, and provide feeding, breeding and nursery grounds for a variety of wildlife
- It can reach up to 10-15 meters in height
- The heartwood is dark brown to black in color while the sapwood is yellowish brown
- The sapwood sinks in the water while the heartwood floats

---

[protected within the Coral Triangle the most to maintain ocean health and productivity.]

[iucnredlist](https://www.iucnredlist.org)

[wikipedia](https://en.wikipedia.org/wiki/Avicennia_germinans)
The wood is strong, heavy and hard but it is difficult to work because its interlocked grain and for its oily texture.
- Includes posts, pilings, charcoal and fuel
- The dry wood is subject to attack by marine borers and termites
- It contains tannin in the bark and has been used to tan leather products

**Behavior**
- Reproduces vivipary (producing seeds that germinate before coming detached from the parent plant)
- Seeds are covered in fruit which shows the germinated seedling when it falls into the water
- It doesn’t grow on pop roots but possesses pneumatophores (an aerial root specialized for gaseous exchange) allowing the roots to breathe even when it is submerged
- Expels absorbed salt from its leathery leaves

**Habitat**
Grows just above the high tide in coastal lagoons in brackish water where the tide meets the stream. It is less tolerant of highly saline conditions than other species that occur in mangrove ecosystems.

**Diet**
It doesn’t feed on other organisms but other organisms feed on them. They are the **producers**.

**Protection**
No conservation sites have been established.

**Status**
Not currently endangered.
| Psychedelic Frogfish | **Taxonomy**  
Kingdom: Animalia  
Phylum: Chordata  
Class: Actinopterygii  
Order: Lophiiformes  
Family: Antennariidae  
Genus: Histiophryne  
Species: Histiophryne psychedelica  

**Range**  
Found in the Ambon Islands and Bali and other islands in the Indonesian archipelago.

**Characteristics**  
- Has stripes of bluish green, white and yellowish orange  
- Has forward facing eyes on its flattened face  
- Its broad face has an expanded, fleshy chin and cheeks  
- It has a large, wide open mouth  
- Its body has thick skin with many folds and its tail is slightly off centre  
- The pectoral fins on each side has evolved to be more like legs than fins  
- Has three spines along its back  
- Length: 8 cm

**Behavior**  
- The fish looks like it's hopping while using the fins to push off and expelling water from the gill openings  
- The tail is curled to one side which takes the fish to random and different directions  
- Its coloring does not change which shows in its behaviour because it tends to shy away and isolates itself

[arKive](https://arkive.org)
<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Habitat</strong></td>
<td>Found in coral reefs at depths of 5 to 7 meters and within 100 meters of a commercial pier. Frogfish hide around coral debris covered with algae, sponges and ascidian (a sea squirt) species. But recently, they have moved to deeper water but scientists aren’t sure why, yet.</td>
<td></td>
</tr>
<tr>
<td><strong>Diet</strong></td>
<td>Consists of shrimp and small fish.</td>
<td></td>
</tr>
<tr>
<td><strong>Protection</strong></td>
<td>Until this present day, there hasn’t been any conservation measures for the frogfish.</td>
<td></td>
</tr>
<tr>
<td><strong>Status</strong></td>
<td>Not yet classified on the IUCN Red List.</td>
<td></td>
</tr>
</tbody>
</table>
## Boxer crab

<table>
<thead>
<tr>
<th>Taxonomy</th>
<th><a href="https://en.wikipedia.org/wiki/Boxer_crab">wikipedia</a></th>
</tr>
</thead>
<tbody>
<tr>
<td>Kingdom: Animalia</td>
<td>Phylum: Arthropoda</td>
</tr>
<tr>
<td>Phylum: Arthropoda</td>
<td>Class: Malacostraca</td>
</tr>
<tr>
<td>Class: Malacostraca</td>
<td>Order: Decapoda</td>
</tr>
<tr>
<td>Order: Decapoda</td>
<td>Family: Xanthidae</td>
</tr>
<tr>
<td>Family: Xanthidae</td>
<td>Genus: Lybia</td>
</tr>
<tr>
<td>Genus: Lybia</td>
<td>Species: <em>Lybia</em> tessellata</td>
</tr>
</tbody>
</table>

### Range
Found in the shallow areas of the tropical Indo-Pacific ocean. From the red sea and the East African coast to Indonesia and New Guinea.

### Characteristics
- It has a habit of carrying a sea anemone (invertebrate) around each of its claws.
- Their claw look like pom-poms or boxing gloves.
- Grows to a width of about 2.5 cm.
- Its carapace is shaped in a trapezoid and the margin has a tooth shaped projection on both sides, behind the short-stalked eye.
- The surface of the carapace is marked into different colored geometric parts with dark lines making it look like stained glass.
- They have slim, long and thin claws with each fine finger have 8 or 9 spines.
- The front pair of its walking legs is smaller than the other 3 pairs.
- The legs have dark lines intervening, with white spots.

### Behavior
- If it's being attacked by a predator, it will threaten that organism with an anemone, the
<p>| <strong>Habitat</strong> | Found on sandy and gravelly seabeds where it is well camouflaged and on live corals where it clings with its long and thin legs. |
| <strong>Diet</strong> | It is an omnivore. It carries a small sea anemone in each chela holding its chelifeds out horizontally while moving around to protect itself and to potentially consume some nutrients. |
| <strong>Protection</strong> | Lots of boxer crabs are being kept in reef aquariums where it may be attacked by predators and mistreated by humans. It is a shy species and easier to find at night when the tank lights are off. So there are no conservation sites at the moment because they are being captured for people to be appealed by their beauty in aquariums. |
| <strong>Status</strong> | Not endangered at the moment but could be, because of the aquarium trade and their cryptic behaviors that interests humans. |</p>
<table>
<thead>
<tr>
<th>Oriental Sweetlips fish</th>
<th><strong>Taxonomy</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Kingdom: Animalia</td>
<td>Kingdom: Animalia</td>
</tr>
<tr>
<td>Phylum: Chordata</td>
<td>Phylum: Chordata</td>
</tr>
<tr>
<td>Class: Actinopterygii</td>
<td>Class: Actinopterygii</td>
</tr>
<tr>
<td>Order: Perciformes</td>
<td>Order: Perciformes</td>
</tr>
<tr>
<td>Family: Haemulidae</td>
<td>Family: Haemulidae</td>
</tr>
<tr>
<td>Genus: Plectorhinchus</td>
<td>Genus: Plectorhinchus</td>
</tr>
<tr>
<td>Species: Plectorhinchus vittatus</td>
<td>Species: Plectorhinchus vittatus</td>
</tr>
</tbody>
</table>

**Range**
Native to the Indian ocean and the western Pacific Ocean. Can be found at depths from 2 to 25 meters.

**Characteristics**
- Reaches up to 82 cm
- They are striped black
- As they grow older, the stripes in the tail are replaced by black dots on a yellow background and its body turns more white with thin, black horizontal striping across its body
- Has a body pattern and coloration that has white, brown and yellow

**Behavior**
- These fish produce a type of mucus or slime from their skin providing protection against parasites and infections and helps the fish move through the water faster
- Gills allow the fish to breathe which consists of thin sheets of tissue containing blood vessels
- As water passes over the gills, oxygen is absorbed into the bloodstream, CO2 passes out into the water
- The gills are protected by a large bony plate called an operculum
<table>
<thead>
<tr>
<th><strong>Queen Angelfish</strong></th>
<th><strong>Secondary consumer</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Habitat</strong> Can be found in reef dwellers on both coral and rocky reefs.</td>
<td></td>
</tr>
<tr>
<td><strong>Diet</strong> Small crustaceans, invertebrates, shrimp, black worms</td>
<td></td>
</tr>
<tr>
<td><strong>Protection</strong> They are also part of the aquarium trade but they don’t fit as a good organism in the aquarium because this specimen is hard to sustain to maturity and its tank busting maximum size will be an issue because they can grow to great lengths.</td>
<td></td>
</tr>
<tr>
<td><strong>Status</strong> Currently not endangered.</td>
<td></td>
</tr>
</tbody>
</table>

**Taxonomy**
- **Kingdom:** Animalia
- **Phylum:** Chordata
- **Class:** Actinopterygii
- **Order:** Perciformes
- **Family:** Pomacanthidae
- **Genus:** Holacanthus
- **Species:** Holacanthus ciliaris

**Range**
- Found near the reefs of the western and warmer section of the Atlantic Ocean. Ranges as far as the Coral Triangle and are common near Florida.

**Characteristics**
- Their pectoral and ventral fins are yellow but their lips and the edges of their dorsal fins and anal fins are dark blue in color.
- Known to have blue spots around each gill
- Colors of the juvenile fish help them to blend in with the reefs
- Can live up to 15 years in the wild
- Can reach up to 45 cm in length
- About 3.5 pounds

**Behavior**
- Adult angelfish are found in pairs throughout the year showing how high their commitment levels are
- The pairs reproduce by rising up in the water bringing their bellies close together and releasing bunches of sperm and eggs
- The female can release 25 to 75 thousand eggs and 10 million eggs during each spawning cycle
- The eggs are transparent and able to float
- They hatch after 15 to 20 hours into larvae that lack in effective eyes, fins or guts
- The large yolk sac is absorbed after 48 hours, in which the larvae develops normal characteristics of swimming feeding on plankton
- They are an aggressive species harassing other angelfishes similar to them

**Secondary consumer**

**Habitat**
You can find them inhabiting reefs.

**Diet**
Primarily, they feed on sponges, tunicates, jellyfish, corals, plankton and algae. Juveniles clean and feed on the parasites of larger fish at cleaning stations. But in aquariums, they are fed meaty and algae based foods.
<table>
<thead>
<tr>
<th>Common Bottlenose Dolphin</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Protection</strong></td>
</tr>
<tr>
<td>There have not been any conservation measures yet but they are part of the aquarium trade. They have been considered to be hard to keep in captivity and they need a large aquarium to fit in from 150 on up to 180 gallons. It should be the last fish added to any system. It is not a reef safe fish, and the larger angelfish may nip at corals, specifically on stony and softer ones and invertebrates.</td>
</tr>
<tr>
<td><strong>Status</strong></td>
</tr>
<tr>
<td>Currently not endangered and not yet classified on the IUCN Red List.</td>
</tr>
<tr>
<td><strong>Taxonomy</strong></td>
</tr>
<tr>
<td>Kingdom: Animalia</td>
</tr>
<tr>
<td>Phylum: Chordata</td>
</tr>
<tr>
<td>Class: Mammalia</td>
</tr>
<tr>
<td>Order: Artiodactyla</td>
</tr>
<tr>
<td>Family: Delphinidae</td>
</tr>
<tr>
<td>Genus: Tursiops</td>
</tr>
<tr>
<td>Species: Tursiops truncatus</td>
</tr>
<tr>
<td><strong>Range</strong></td>
</tr>
<tr>
<td>Found in coastal and continental waters in tropical and temperate zones. In the Indo-Pacific, Black Sea, Mediterranean Sea.</td>
</tr>
<tr>
<td><strong>Characteristics</strong></td>
</tr>
<tr>
<td>● They are very smart, adaptable predators that are able to problem solve, use tools efficiently, and don’t mind consuming any types of prey (variety)</td>
</tr>
<tr>
<td>● It is a large dolphin</td>
</tr>
<tr>
<td>● Its color is usually dark grey sometimes blue or brownish grey, dark dorsal cape, pale lower sides with delicate eye-flipper stripes and a lighter colored belly</td>
</tr>
</tbody>
</table>
● It has a short and thick beak, set off from the melon (a waxy mass in the head of dolphins that focuses on hearing signals) by a crease, a high hooked dorsal fin, long and thin pointed flippers, and pointed flukes
● Maximum lengths: Male - 3.8 meters, Female-3.7 meters, Calf - 1.3 meters
● Maximum weight: Male - 650 kg

Behavior
● They are curious, active, good at socializing either with humans or other dolphins
● They can be seen lobtailing (to beat the surface of the water with the flukes), breaching (rise and break through the surface of the water), spyhopping (vertically poking their heads out of the water), bow riding on ships and large whales and playing with fish, seaweed or marine debris
● They can be found in small groups with other species of dolphins, whales, sharks and sea turtles
● They are known to communicating with fishermen, driving fish towards shore into nets
● Tertiary consumer

Habitat
Found in many seas, rivers, lagoons and shallow bays.

Diet
Fish including sciaenids, scombrids and mugilidae, squid, shrimp and other crustaceans.

Protection
| **Rock Beauty** | **Taxonomy**
Kingdom: Animalia  
Phylum: Chordata  
Class: Actinopterygii  
Order: Perciformes  
Family: Pomacanthidae  
Genus: Holacanthus  
Species: Holacanthus tricolor  

**Range**
Found in Southeast Asia, Florida, Texas. Can be found at depths between 3 and 92 meters.

**Characteristics**
- It has a flat, deep body
- Its overall body color is yellow in the facial region of the body with blue towards the tail of the end of the fish
- Their pectoral and ventral fins are also yellow but their lips and the edges of their dorsal fins and anal fins are dark blue
- Can measure up to 25 cm |

|  | Sadly, bottlenose dolphins have high mortality rates from accidental bycatch. Threats to this species includes hunting, chemical and noise pollution and habitat degradation. In some countries they are being captured live and exported for public display. Many inshore bottlenose dolphins exist in small, isolated population which are most vulnerable to human activities.  

**Status**
The IUCN classifies the common bottlenose dolphin as of Least Concern worldwide. In the North Sea and the black sea, the common bottlenose dolphin is classified as endangered. | enature  
animal-world |
| **Can live for 20 years or more in captivity with good care** |
| **It is a shy species** |

**Behavior**
- Their looks enable them to blend in with the reefs
- They stay extremely close to the reef structure for their entire lives and become territorial
- When these animals are picking at other fish, it means they are nipping the slime that the fish are secreting which is more of a nutritional need than a desire to win a competition
- They are a diurnal species
- They spend most of their time hiding in cracks and crevices
- These angelfish are all born female
- The male angelfish will have harems (a group of female animals sharing a single mate) defending a territory with 2 or 4 resident female
- If the male dies, one of the largest females will turn male and the smaller female will then assume a role in the harem as a spawning (release or deposit eggs) female
- **Secondary consumer**

**Habitat**
Found in ocean of bay shallows, estuaries, tidal flats and salt marshes, tide pools, aquariums.

**Diet**
It is an omnivore. They have a specialized diet that needs to include sponge material. They also have
invertebrates, gorgonians, tunicates, zoantharians, algae, and sea squirts.

**Protection**
No conservation sites have been established but this species is difficult to treat as it is part of the aquarium trade. It doesn’t act well with small invertebrates/organisms because it usually tend to nip their mucous, so they need to be first put into the bigger tanks with bigger animals.

**Status**
This species is on the IUCN Red List as Least Concern as it has a large population with a wide distribution and no threats are currently identified.

---

**Yellow Tang**

---

**Taxonomy**
Kingdom: Animalia  
Phylum: Chordata  
Class: Actinopterygii  
Order: Perciformes  
Family: Acanthuridae  
Genus: Zebrasoma  
Species: Zebrasoma flavescens

**Range**
Found in marine environments close to the reefs in depths between 2 to 46 meters. Widely distributed in the Pacific Ocean in Ryukyu, Mariana, Marshall, Marcus, Wake and Hawaiian Islands. Has recently been found off the coast in the Western Central Atlantic. Quite a variety in the Indo-Pacific as well.

**Characteristics**
- They have a total of 5 dorsal fins
- They have a total of 23 to 26 dorsal soft rays
- 3 anal spines
- 19-22 Anal soft rays
- There are bright yellow in color
- They have sheath of peduncular spine white (a stalk-like part by which an organ is attached to an animal's body)
- Its body is very deep with its snout slightly protruding
- It has a small mouth, a broad and rounded end set of teeth, finely toothed
- 18 upper and 22 lower teeth in an average adult yellow tang

**Behavior**
- They migrate alone or in loose groups
- Group spawning and pair spawning by territorial mates that passing females were identified
- Spawning occurs around the full moon showing lunar periodicity
- Because adults lose venom glands, it cannot be determined despite the presence of distinct anterolateral grooves
- **Secondary consumer**

**Habitat**
They inhabit coral rich areas of lagoon and seaward reefs from below the surge zone to about 46 meters. But its natural habitat is actually widespread throughout Indonesia and the Great Barrier Reef.

**Diet**
They are herbivores that primarily feed on filamentous algae.

**Protection**
No conservation measures have been developed. But it is also part of the aquarium trade.
<table>
<thead>
<tr>
<th>Ocean Surgeonfish</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>This species is on the IUCN Red List and CITES as Least Concern.</td>
<td></td>
</tr>
</tbody>
</table>

**Taxonomy**
- Kingdom: Animalia
- Phylum: Chordata
- Class: Actinopterygii
- Order: Perciformes
- Family: Acanthuridae
- Genus: Acanthurus
- Species: Acanthurus bahianus

**Range**
- Found in the Western Atlantic Ocean south to the Gulf of Mexico and Brazil. It is very rare to find in the Indo-Pacific.

**Characteristics**
- It is an oval-shaped tropical reef fish which is deep and compressed
- It has a sharp spine hidden in the caudal peduncle (narrow area just before the tail) that fits into a horizontal groove
- It’s mouth is small and low on the head, well adapted for scraping algae from rocks and coral
- It has a long dorsal fin that extends continuously
- The caudal fin is moderately to deeply fitting into a somewhat border
- The scales are small and has many tiny projections on the edge
- The stomach is gizzard-like
- It’s color is yellowing to grayish brown with pale greenish gray to pale blue vertical lines on the body
There are short yellow lines radiating from the further back margin of the eye within a narrow blue area.

- The dorsal fin has a blue margin and alternating bands of orange and bluish green.
- The anal fin is similarly colored but with fewer less visible bands.
- The caudal fin is olive to brown changing suddenly to white or paler at the base with a bluish white further back margin.
- There is a small violent or blue region at the socket of the caudal spine.
- Can measure up to 30.5 cm long.
- Has 14 teeth in the upper jaw and 16 teeth in the lower jaw.
- Reaches sexual maturity at 9-12 months of age.
- Diurnal.

**Behavior**

- They are vegetarians who play a crucial role on the reefs by eating the algae that can grow over the coral and kill it.
- Color change may take place during spawning as well as intraspecific competition and other communication.
- Dentition (the arrangement or condition of an organism’s teeth) of the ocean surgeon is specially adapted for feeding on filamentous species of algae found in the bottom.
- It has a close-set finely toothed teeth in its small mouth.
- The eggs are spherical in shape with a single oil globule with each measuring 0.17 mm in diameter.
- After hatching, the larvae are kite-shaped with a long snout and a small terminal mouth.
- They use their scalpel-like spine located on each side of the caudal peduncle to defense mechanism against predators in which they have slash motion to prevent serious wounds on the victim
- But during the larval life stage, predation pressures are at its peak
- They have quite a lot of parasites as well; parasitic symbiosis; but they get cleaned up by angelfish juveniles
- **Secondary consumer**

**Habitat**
Found in shallow bottoms over coral and rock formations and typically migrates in groups of 5 or more.

**Diet**
It feeds on green and brown algae, small invertebrates. Their small mouth and specialized teeth pick up lots of coral and sand while eating algal mats along the bottom substrate. It has thin-walled intestines filled with sand and different flora and fauna that helps in the digestion of its algal diet.

**Protection**
No conservation measures have been listed.

**Status**
Currently not endangered.
Sea urchins

**Taxonomy**
- Kingdom: Animalia
- Phylum: Echinodermata
- Class: Echinoidea
- Order: Echinoida
- Family:
- Genus:
- Species:

**Range**
Sea urchins are distributed globally and can be found in all the waters of the world.

**Characteristics**
- The roe, which is the egg mass, in some species is eaten in some cultures and some echinoid species are commercially fished
- Echinoids have a substantial fossil record
- Skeletons of echinoids are made up of tightly interlocking plates that form a rigid structure
- Living echinoids are covered with spines which are movable and anchored in socket in the skeleton
- These spines are long and important
- Usually, the mouths of echinoids have 5 hard teeth that are arranged in a circlet, forming an apparatus

**Behavior**
- Because echinoids have rigid skeletons, they have the ability to fossilize better
- Some echinoids are really strong that there were some that survived in the mass extinction of the Permo-Triassic boundary
- Echinoids started becoming more diverse after this mass extinction
- **Primary consumer**
<table>
<thead>
<tr>
<th>Golden rabbitfish</th>
<th>Habitat</th>
<th>You can find them at depths of around 2 to 50 meters located in the sand where you can find seaweed as well.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Diet</td>
<td>They eat larvae, algae.</td>
</tr>
<tr>
<td></td>
<td>Protection</td>
<td>No conservation measures have been established.</td>
</tr>
<tr>
<td></td>
<td>Status</td>
<td>Currently not endangered.</td>
</tr>
</tbody>
</table>
|   | Taxonomy | Kingdom: Animalia  
Phylum: Chordata  
Class: Actinopterygii  
Order: Perciformes  
Family: Siganidae  
Genus: Siganus  
Species: Siganus guttatus |
|   | Range    | Can be found in the eastern Indian Ocean and western Pacific Oceans. Are mostly found in the Indo-Pacific Ocean and Maldives. Can be found in depths of 3-30 meters. |
|   | Characteristics  |  
- Can grow up to 40 cm  
- Its color form includes blue, orange, tan, white and yellow  
- The golden spots they have reaches until the eye of this fish which helps it in its camouflaging  
- Their cheeks are covered with overlapping scales and have fully-scaled pelvic ridges |

[Image of Golden rabbitfish]
<table>
<thead>
<tr>
<th>Behavior</th>
<th>Secondary consumer</th>
</tr>
</thead>
<tbody>
<tr>
<td>If they aren’t well-fed, it may nip and consume other animals or soft corals.</td>
<td></td>
</tr>
<tr>
<td>They prefer to swim around in large groups.</td>
<td></td>
</tr>
<tr>
<td>Its dorsal spines are venomous which is why predators tend to swim away from it.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Habitat</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mostly found in reefs and marine sites on coral reef slopes or inshore near jetties, mangroves and lagoons.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Diet</th>
</tr>
</thead>
<tbody>
<tr>
<td>It is a herbivore. They get nutrition out of sessile colonial tunicates, monaxonid sponges, and benthic algae. They feed on algae, seagrass and weeds. Their foods also includes krill, raw table shrimp, squid, clam and mussel.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Protection</th>
</tr>
</thead>
<tbody>
<tr>
<td>No conservation sites have been identified</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>It is part of the trade since it is commercially exploited throughout all of its range but it is listed as Least Concern by the IUCN Red List.</td>
</tr>
</tbody>
</table>
### Sergeant Major Fish

<table>
<thead>
<tr>
<th>Taxonomy</th>
<th>seaworld</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kingdom: Animalia</td>
<td></td>
</tr>
<tr>
<td>Phylum: Chordata</td>
<td></td>
</tr>
<tr>
<td>Class: Osteichthyes</td>
<td></td>
</tr>
<tr>
<td>Order: Perciformes</td>
<td></td>
</tr>
<tr>
<td>Family: Pomacentridae</td>
<td></td>
</tr>
<tr>
<td>Genus: Abudefduf</td>
<td></td>
</tr>
<tr>
<td>Species: Abudefduf saxatilis</td>
<td></td>
</tr>
</tbody>
</table>

#### Range
- Found in the Western Atlantic to the Eastern Atlantic, and the Western Pacific. Common in the Great Barrier Reef, and anything that is common there, is also common in the coral triangle.

#### Characteristics
- They have 13 dorsal spines
- 12 to 13 dorsal soft rays
- 2 anal spines
- 10 to 12 anal soft rays
- Their dorsal fins are yellowish gray shading to the white ventral fin and 5 vertical black bars
- The faint sixth bar is located along the caudal peduncle
- Adult male sergeant majors are colored dark blue to dark gray backgrounds during the mating season with the black bars less visible
- They have an average size of 10.2 to 15.2 cm
- The maximum weight is 200 grams

#### Behavior
- They show dioecism which is having the male and female reproductive organs carried by separate individuals of the same species meaning they are sexually distinct
Their fertilization is external and the spawning occurs all year round.
- The species creates nesting sites with male guards.
- Sexual dimorphism is minimal meaning occurring in or representing two distinct forms.
- **Secondary consumer**

**Habitat**
They can be found at depths of 1 to 15 meters in tropical and subtropical marine and/or slightly salty coastal waters.

**Diet**
They feed on algae, invertebrate larvae, small crustaceans and small fish.

**Protection**
There are no conservation sites developed yet.

**Status**
This species has not been classified by IUCN Red List, CITES or USFWS. So it is potentially not endangered at the moment.
<table>
<thead>
<tr>
<th>Branching Fire Coral</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th><strong>Taxonomy</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Kingdom: Animalia</td>
</tr>
<tr>
<td>Phylum: Cnidaria</td>
</tr>
<tr>
<td>Class: Hydrozoa</td>
</tr>
<tr>
<td>Order: Anthomedusae</td>
</tr>
<tr>
<td>Family: Milleporidae</td>
</tr>
<tr>
<td>Genus: Millepora</td>
</tr>
<tr>
<td>Species: Millepora Dichotoma</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Range</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Found in Florida, the Bahamas and the Caribbean. Can also be found in the Indo-Pacific.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Characteristics</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>● Brown to light creamy yellow in color with white branch tips</td>
</tr>
<tr>
<td>● Can reach up to 50 cm</td>
</tr>
<tr>
<td>● Its surface is smooth and covered with minute pores which is where the polyps live</td>
</tr>
<tr>
<td>● When the tiny polyps extend beyond or above the surface, they have something that looks like short, fine hairs</td>
</tr>
<tr>
<td>● The surface of this species is covered in zooids which each has a particular function</td>
</tr>
<tr>
<td>- The gastrozooid is used for feeding which is where the prey is digested into the body</td>
</tr>
<tr>
<td>- The dactylozooids shelter the stinging cells which requires cnidae and the stinging thread which is released from the cnidoblast</td>
</tr>
<tr>
<td>- The cnidae are mainly used for capturing preys and for defense</td>
</tr>
<tr>
<td>● If you are touched by the fire coral or if you touch it, it will cause a burning sensation with a very strong sting</td>
</tr>
<tr>
<td>● These corals have 2 principal forms: the predominant body types is the polyp and the...</td>
</tr>
</tbody>
</table>
other is bell-shaped or could be the shape of a thin disk

**Behavior**
- One way of reproducing is fragmentation
  - A piece of this species can be detached from the parent colony and re-colonize a sufficient underlying layer with a new colony that will be genetically similar to the parent colony
- Fire corals have zooxanthellae algae. Zooxanthellae exchange their photosynthate to the species for use as energy and in return the zooxanthellae have somewhere to live and survive
- This species produce a hard aragonite (a mineral consisting of calcium carbonate) skeleton and help in reef building but inside their structure are canals that shelter all of their polyps and help in food distribution
- The fire corals have the ability to take over other corals
- When these corals are already sexually mature, they don't depend on lunar cycles and will release free swimming medusae (a free swimming sexual form which is kind of like a jellyfish and usually has stinging tentacles around the edge) which only lasts for a few hours
- **Secondary consumer**

**Habitat**
They can be found in all marine environments and is the only coral that can grow deeper than 10 meters. Can be found at depths of 1 to 40 meters. They can also be found in lagoons, sheltered deep water reefs, and places where water movement is calm.

**Diet**
<table>
<thead>
<tr>
<th>Common Sea Fan</th>
<th>They provide their own nutrients from the different zooids.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Protection</strong></td>
<td>No conservation sites have been established.</td>
</tr>
<tr>
<td><strong>Status</strong></td>
<td>Currently not endangered.</td>
</tr>
</tbody>
</table>

**Taxonomy**
Kingdom: Animalia  
Phylum: Cnidaria  
Class: Anthozoa  
Order: Alcyonacea  
Family: Anthothelidae  
Genus: Gorgonia  
Species: Gorgonia ventalina

**Range**
Found in the Western Atlantic ocean and the Caribbean Sea and occasionally in the Indo-Pacific as well.

**Characteristics**
- It is a fan-shaped coral, hence the name, with many main branches and a latticework of linking other smaller branches  
- It is a saltwater invertebrate  
- Its skeleton is made of calcite and gorgonian which is a collagen-like compound  
- The calyces in which the polyps are fixed deeply in are in two rows along the branches  
- Can group up to 1.5 meters tall  
- The main branches are often purple and the fan is oriented at right angles to the current  
- The skeleton of this species contain hard structures which are unpleasant to taste for
Predators and it also contains secondary metabolites

- Sclerite which is the form of structural defense, are in the shape of scaphoids in this species, and it is bent down at the tops and encircled with a series to tubercle belts, these form the surface layer of the sea fan and are in a parallel orientation which can change depending on the tension of the animal
- Sclerites are also defending this species from foreign pathogens which will increase purple sclerites in the area to try to contain it from spreading

**Behavior**

- This species is a filter feeder
- Each polyp stretches its 8 tentacles to catch plankton drifting past on the current
- Its tissues contain a symbiotic dinoflagellate which is photosynthetic and uses sunlight to create organic carbon compounds which are then benefiting the host coral
- This species is symbiotic with zooxanthellae which provides the coral with carbon compounds, increases its growth, reproduction and calcification, conserves nutrients and provides a higher surface area to volume that helps in prey capture and light capture
- Once a polyp is settled on a hard surface, the young polyp creates a horizontal layer of aragonite called the basal disk
- As the polyp starts to grow upward, the base’s margin also turns upward forming a cup called the epitheca which contains daily growth bands
- The septa form the skeletal boundaries around at the bottom of the coral polyps which are left behind as a result of the upward growth of the polyp
- This species reproduces sexually and able to produce asexually by cloning and fragmentation with external fertilisation
- The larvae usually spends days as plankton before settling on a hard surface to begin formation of a colony
- This species doesn’t have a specific lifespan because it continues growing with its smart techniques but their threats include diseases
- **Primary consumer**

**Habitat**
It grows near the shore in shallow waters in areas with strong wave action and on deeper outer reefs with strong currents at depths of about 15 meters.

**Diet**
It is a carnivore and it feeds on zooplankton and also gets nutrients through the zooxanthellae’s photosynthetic activities.

**Protection**
There are no conservation sites at the moment

**Status**
Hasn’t been classified by conservation organizations telling us that there is nothing to worry about since it is not currently endangered.
<table>
<thead>
<tr>
<th>Box Jellyfish</th>
</tr>
</thead>
</table>

**Taxonomy**
- Kingdom: Animalia
- Phylum: Cnidaria
- Class: Cubozoa
- Order: Chirodropida
- Family: Chirodropidae
- Genus: Chironex
- Species: Chironex Fleckeri

**Range**
Largely distributed to the tropical Indo-Pacific region, and can be found in tropical and subtropical oceans like the Atlantic ocean and the east Pacific ocean.

**Characteristics**
- The box jellyfish are cnidarian invertebrates which they ge be their cube-shaped medusae
- Some box jellyfishes produce very dangerous venom and are extremely fatal to humans
- Box jellyfish can move faster than other jellyfish because of its tentacles
- The medusa of a box jellyfish has a squarish, box-like bell and the interior of this bell is called the gastrovascular cavity which is divided into 4 septa's into a central stomach and 4 gastric pockets and there are 8 gonads located on either side of the septa's
- The nervous system of the box jellyfish is very developed having a nerve ring that helps their pulsing movements, they have enhanced retinas, corneas and lenses
- This allows the organism to see particular points of light
- Box jellyfish can weigh up to 2 kg
- Statoliths which are made of calcium sulfate hemihydrate show clear sequential
incremental layers which are laid down on a daily basis

- The maximum age for this species is 88 days by the time it was already 6 inches long

**Behavior**

- This species have about 15 tentacles on each corner and each of these tentacles has 500,000 cnidocytes containing nematocysts which is a microscopic mechanism that injects venom into the prey
- The margins of the septa has small gastric filaments which shelter nematocysts and digestive glands and help to overcome prey
- Each of the 4 septa's is stretch out into a funnel that opens onto the oral surface and helps the flow of fluid into and out of the organism
- This species has a total of 24 eyes, near the clusters of their eyes, are statoliths which detects gravitational pull and helps the animal to situate itself
- **Secondary consumer**

**Habitat**

Can be found near coral reefs throughout its range and can mostly be found in deep waters.

**Diet**

They feed on small fish, invertebrates, prawns, baitfish and small crustaceans too.

**Protection**

There have been no conservation sites established but in fact there are for saving humans from them since their stings can really cause potent injuries.
<table>
<thead>
<tr>
<th><strong>Tree Coral</strong></th>
<th><strong>Status</strong></th>
<th>Currently not endangered.</th>
</tr>
</thead>
</table>
| ![Tree Coral](https://liveaquaria.com/images/corals/nephtheidae/nephthea.png) | **Taxonomy** | Kingdom: Animalia  
Phylum:  
Class:  
Order:  
Family: Nephtheidae  
Genus:  
Species: |
| **Range** | Common in the Maldives, Fiji and Indonesia because of culture and for the commercial fishing. |
| **Characteristics** | ● They are brown branching corals which form covered and hard surface layers  
● In the wild, they are usually found in strong currents  
● They need medium to high lighting combined with medium to strong water movement  
● For good health, they need more of iodine, strontium and other trace elements to the water |
| **Behavior** | ● They are aggressive and can produce toxins so that good enough space can be provided between them and other corals  
● They are moderately hard to maintain in the reef aquarium but they make good corals  
● The symbiotic algae zooxanthellae are hosted within tree corals and provide the majority of their nutritional needs from the light driven process of photosynthesis |
<table>
<thead>
<tr>
<th><strong>Staghorn coral</strong></th>
<th><strong>Habitat</strong></th>
<th>Found in tropical reefs throughout its range.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>Diet</strong></td>
<td>They provide their own nutrients and they also feed on micro-planktons, baby brine shrimps or food designed for filter feeding invertebrates.</td>
</tr>
<tr>
<td></td>
<td><strong>Protection</strong></td>
<td>They are part of the aquarium trade but no conservation sites have been developed yet.</td>
</tr>
<tr>
<td></td>
<td><strong>Status</strong></td>
<td>Currently not endangered.</td>
</tr>
</tbody>
</table>

**Taxonomy**
Kingdom: Animalia  
Phylum: Cnidaria  
Class: Anthozoa  
Order: Scleractinia  
Family: Acroporidae  
Genus: Acropora  
Species: Acropora spp.

**Range**  
It is the most abundant coral of most reefs in the Indo-Pacific and some of them can also be found in the western Atlantic and the Caribbean region.

**Characteristics**
- They are one of the fastest growing corals on reefs and are amazing reef-builders
- Colonies look like antlers/staghorns and can grow up to 2 meters tall
- They have light skeletons that allow them to grow quickly
- The skeleton, or corallites of a new polyp is built by specialised ‘axial’ corallites which...
forms the tips of branches and since all the corallites of a colony are closely interconnected, they can grow in a coordinated manner.

**Behavior**

- This species have a special symbiotic relationship with algae called zooxanthellae which lives inside the tissues of the coral and provides the coral with food through photosynthesis, the coral provides the algae with protection and sunlight availability.
- They can reproduce sexually or asexually.
- Sexual reproduction happens from the release of eggs and sperm into the water.
- Pinkish eggs are released from corallites on the sides of the branches to be fertilized by sperm released from other polyps at the same time.
- The water turns milky because of this and some of the resulting larvae settle quickly on the same reef while others drift around for long periods of time.
- Asexual reproduction happens from fragmentation when a branch breaks off a colony, reattaches to the underlying layer and grows.

**Habitat**

Can be found at depths of 30 meters and can be seen in tropical reef environments. The upper depth limit is from the wave action and the lower limit is determined by light availability and the amount of suspended sediments since staghorn corals needs normal marine salinity (the concentration of dissolved salts in the water).
<table>
<thead>
<tr>
<th><strong>Diet</strong></th>
<th>They provide nutrients for themselves and also get nutrients from food particles floating around.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Protection</strong></td>
<td>Trade in this coral should be carefully regulated and a permit is needed to bring the coral or objects made from them into the countries that have signed the CITES convention. Staghorn corals are part of the marine community in many marine protected areas or in areas where management plans are in place to protect the coral community. Efforts have been made to reattach coral fragments or culture and settle coral larvae. Both success have had limited success and new techniques are being pursued.</td>
</tr>
<tr>
<td><strong>Status</strong></td>
<td>Listed on Appendix II of CITES.</td>
</tr>
</tbody>
</table>
**Knobby Brain coral**

**Taxonomy**
- Kingdom: Animalia
- Phylum: Cnidaria
- Class: Anthozoa
- Order: Scleractinia
- Family: Mussidae
- Genus: Diploria
- Species: Diploria clivosa

**Range**
Can be found in shallow waters in the West Atlantic Ocean and the Caribbean Sea and sometimes it can also be found in the Indo-Pacific.

**Characteristics**
- Forms hemispherical domes or forms plates and covers the seabed with a hard surface layer
- It can grow up to a diameter of 1.3 meters
- It's surface has ridges with valleys in between
- The coral polyps are found along the valley bottoms with each of them found on a stony cup or a corallite
- The sides of these have minute walls that are called septa which come in 4 different sized cycles
- They stretch outside the corallites as costae that join one corallite to another
- The color of the coral is usually some shade of yellowish or greenish brown and is caused by the presence of symbiotic dinoflagellates called zooxanthellae in the coral's tissues

**Behavior**

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*[Link to Encyclopedia of Life*](http://eol.org)
During the day, the polyps of this coral are retracted into the corallites but at night they emerge and stretch their tentacles to feed.

- The zooxanthellae are photosynthetic and up to 50% of their production is transferred into the host while they make use of the coral's nitrogenous waste.
- This coral grows by the budding of new polyps and the deposition of new calcareous material.
- Sexual reproduction happens by the release of gametes into the water column.
- The planula larvae free swims with the currents before settling on the seabed and undergoing metamorphosis into polyps.
- These start to produce their own skeletons and find new colonies.

Primary consumer

Habitat
It is found growing on reefs, in seagrass meadows, in lagoon and sometimes mangroves. It can be found at depths of 40 meters but is more commonly seen in depths of 5 meters.

Diet
This species provides their own nutrients.

Protection
This species is part of the aquarium trade and fisheries management and should be monitored for conservation measures especially in Indonesia.

Status
This species has been classified as Least Concern by the IUCN Red List and is listed on CITES Appendix II.
Mantis Shrimp

<table>
<thead>
<tr>
<th>Taxonomy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kingdom: Animalia</td>
</tr>
<tr>
<td>Phylum: Arthropoda</td>
</tr>
<tr>
<td>Class: Malacostraca</td>
</tr>
<tr>
<td>Order: Stomatopoda</td>
</tr>
<tr>
<td>Family: Bathysquilloidea</td>
</tr>
<tr>
<td>Genus: Odontodactylus</td>
</tr>
<tr>
<td>Species: Odontodactylus scyllarus</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Found in the waters of the Indian and Pacific Oceans.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>These crustaceans are tough and causes fatal deaths</td>
</tr>
<tr>
<td>The carapace of a mantis shrimp covers only the rear part of the head and the first 4 segments of the thorax</td>
</tr>
<tr>
<td>They are only about 4 inches long but are one of the most strongest animals in the world</td>
</tr>
<tr>
<td>To punch their prey, they use clubs which are like elbows with the force of a bullet shot from a 22 caliber gun</td>
</tr>
<tr>
<td>This force accelerates over 50 mph with a force of over 330 pounds</td>
</tr>
<tr>
<td>Their force can easily break the shells of prey like crabs and clams</td>
</tr>
<tr>
<td>To be able to punch that hard, mantis shrimp have a special shock absorbent core that has a molecular structure which is called a bouligand structure which keeps small cracks from becoming a full break</td>
</tr>
<tr>
<td>Their speed is indescribably fast, in the time it takes you to blink, the mantis shrimp could have already punched 500 times</td>
</tr>
<tr>
<td>Behavior</td>
</tr>
<tr>
<td>--------------------------</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
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<tr>
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</tr>
</tbody>
</table>

**Habitat**
They live around the world in shallow, subtropical and tropical marine environments.

**Diet**
They usually feed on invertebrates or crustaceans that have carapaces like crabs and clams. But other than that, they also feed on food particles drifting.
around and sometimes zooxanthellae secreted from corals.

**Protection**
They are usually commercially fished because of cultures. But they don’t belong in any marine protected areas and no conservation measures have been established for this species either.

**Status**
Currently not endangered.

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### Clownfish

**Taxonomy**
- **Kingdom:** Animalia
- **Phylum:** Chordata
- **Class:** Actinopterygii
- **Order:** Perciformes
- **Family:** Pomacentridae
- **Genus:** Amphiprion
- **Species:** Amphiprion ocellaris

**Range**
This species can be found off the coasts of Australia and Southeast Asia and Japan.

**Characteristics**
- Most clownfish are orange with 3 white bands on the head and body and each of the white bands have black outlines
- They can grow up to 3 inches long
- The tail is rounded and the dorsal fin is lined with 11 spines
- Clownfish are hermaphrodites meaning they have both male and female sex organs
- There are all born male but they have the ability to turn themselves into females and once the change is made, they can’t change back to being a male
- This process can be made through mating so when two males become mates, the more dominant fish becomes the female

**Behavior**

- Before spawning, the male clownfish prepares a nest by clearing a spot on bare rock near the anemone
- A few indications of when two clownfish decide to mate is when the male shows its extended fins and bites and chases the female
- The female will then lay 100 to 1000 eggs which are each about 3 to 4 mm long
- Then the male releases sperm to fertilize the eggs and then the female swims off
- The male watches over the eggs, fan them and eat the eggs that are infertile or damaged by fungus
- The eggs then hatches 6 to 8 days later

**Secondary consumer**

**Habitat**

They live in the coral reefs. They are found around certain kinds of anemones which is an organism that leaves itself on the seafloor and uses its tentacles to bring food. The anemone’s tentacles have stinging cells called nematocysts that releases a toxin when a prey or predator touches it. Clownfish aren’t affected by toxins since they touch the tentacles with different parts of their body and because a layer of mucus builds up which causes immunity to the toxin. This forms mutualism since the anemone provides protection and shelter and leftovers for the clownfish while the clownfish brings food to the anemone and removes parasites.
<table>
<thead>
<tr>
<th><strong>Diet</strong></th>
<th>Clownfish are omnivores. They eat plants, algae, zooplankton, worms and small crustaceans.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Protection</strong></td>
<td>This species is part of the aquarium trade. Since the movie, “Finding Nemo,” clownfish sales have tripled and in some areas, they are overfished to meet the expectations for the aquariums since they are needed for their popularness. This species is sometimes also kept as a pet but owners don’t know how to properly take care of them. And children being inspired by the movie stated before, flushed their clownfish down the toilet thinking that he would get more freedom in the ocean like how Nemo was.</td>
</tr>
<tr>
<td><strong>Status</strong></td>
<td>Currently not endangered.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Sea snake</strong></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Taxonomy</strong></td>
<td>Kingdom: Animalia</td>
</tr>
<tr>
<td></td>
<td>Phylum: Chordata</td>
</tr>
<tr>
<td></td>
<td>Class: Reptilia</td>
</tr>
<tr>
<td></td>
<td>Order: Squamata</td>
</tr>
<tr>
<td></td>
<td>Family: Elapidae</td>
</tr>
<tr>
<td></td>
<td>Genus: Pelamis</td>
</tr>
<tr>
<td></td>
<td>Species: Pelamis platura</td>
</tr>
<tr>
<td><strong>Range</strong></td>
<td>They are found in marine environments in warm coastal waters from the Indian Ocean to the Pacific and the venomous ones are found in Australia.</td>
</tr>
<tr>
<td><strong>Characteristics</strong></td>
<td>They have paddle-like tails and they have compressed bodies that make them look like eels</td>
</tr>
</tbody>
</table>

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[iucn]: https://www.iucnredlist.org/
They need to come up to the surface pretty regularly to breathe since they don’t have gills.

They usually grow between 120 to 150 cm.

They have a round pupil and small eyes and they have nostrils seen dorsally.

Their skulls don’t change although the condition and arrangement are like short fangs in which poison is injected and they have 18 smaller teeth behind them on the upper jaw in most vertebrates.

Their nostrils have valves (maintains the flow of the contents in one direction by closing in response to any pressure from reverse flow) that consists of spongy tissues to exclude water and the windpipe can be drawn up to where the short nasal passage opens into the roof of the mouth.

Their lungs are also large but they have been developed to help in floating rather than to exchange gases but it is helping in storing air for dives as well.

Sea Snakes have lots of salt from the water meaning they have to evolve a more effective regulation of salt concentration in their blood.

**Behavior**

- But they can spend 30 minutes to 2 hours before they take another breath since they have long cylindrical lungs that extends through its entire body and they can breath through their skin.
- Sea snakes shed their skin every 2 to 6 weeks and to do this, the snake rubs its lips against coral or other hard substrate to loosen it.
- Then, it catches the skin against something and crawls forward leaving the skin turned inside out behind it
- Skin shedding enables sea snakes to rid themselves of marine organisms such as algae of barnacles
- If they don’t shed their skin, it would affect how the snake swims and could cause disease
- **Secondary consumer**

**Habitat**
Can be found in shallow waters, sheltered waters, estuaries and around islands.

**Diet**
They eat small fish and sometimes young octopodes which is kind of like a mollusc. They sometimes eat sea snake barnacles too which attaches to their skin.

**Protection**
No conservation sites have been developed.

**Status**
Considered vulnerable, and classified as critically endangered according to the IUCN Red List of Threatened Species.
FOOD WEB

Key:
The arrows show which animal eats which plant. Arrows are black for animals that eat plants, blue for animals that eat other animals, and green for animals that eat other animals and plants, showing that they are eating on multiple trophic levels.

Common Bottlenose Dolphin
- Tuna
- Cods
- Jellyfish
- Octopus

Common Eel
- Crabs
- Shrimp
- Snails

Bivalves
- Mussels
- Oysters

Seagrass
- Fish
- Birds
- Insects

Plankton
- Phytoplankton
- Zooplankton

Black Mangrove
- Leaves
- Seeds
- Roots

Algae
- Seaweed
- Kelp

Clamshell
- Clams
- Oysters

Shrimp
- Prawns
- Krill

Amphibians
- Frogs
- Toads
- Salamanders

Snakes
- Boas
- Pythons
- Cobras

Coral Reef
- Fish
- Sharks
- Rays

Information:
- Tuna: A species of fish that is commonly found in the open ocean. It is a highly sought-after fish that is often used in sushi, sashimi, and other dishes.
- Cods: A group of fish that are often caught in the North Atlantic Ocean. They are known for their meaty texture and are used in various dishes.
- Jellyfish: A group of marine animals that belong to the Cnidaria class. They are known for their bell-shaped bodies and tentacles.
- Octopus: A group of marine animals that are known for their intelligence and ability to change color. They are often used in seafood dishes.
- Clams: A group of bivalve mollusks that are commonly found in saltwater habitats. They are often used in soups, stews, and other dishes.
- Oysters: A group of bivalve mollusks that are commonly found in saltwater habitats. They are often used in salads, soups, and other dishes.
- Mussels: A group of bivalve mollusks that are commonly found in saltwater habitats. They are often used in soups, stews, and other dishes.
- Oysters: A group of bivalve mollusks that are commonly found in saltwater habitats. They are often used in salads, soups, and other dishes.
- Leaves: A group of plant parts that are used in various dishes.
- Seeds: A group of plant parts that are used in various dishes.
- Roots: A group of plant parts that are used in various dishes.
- Fish: A group of animals that are commonly found in the ocean. They are often used in seafood dishes.
- Shrimp: A group of crustaceans that are commonly found in the ocean. They are often used in seafood dishes.
- Snails: A group of mollusks that are commonly found in the ocean. They are often used in seafood dishes.
- Bivalves: A group of mollusks that are commonly found in the ocean. They are often used in seafood dishes.
- Leaves: A group of plant parts that are used in various dishes.
- Seeds: A group of plant parts that are used in various dishes.
- Oysters: A group of bivalve mollusks that are commonly found in saltwater habitats. They are often used in soups, stews, and other dishes.
- Clams: A group of bivalve mollusks that are commonly found in saltwater habitats. They are often used in soups, stews, and other dishes.
- Oysters: A group of bivalve mollusks that are commonly found in saltwater habitats. They are often used in soups, stews, and other dishes.
- Fungi: A group of organisms that are known for their ability to break down organic matter. They are often used in various dishes.
- Fish: A group of animals that are commonly found in the ocean. They are often used in seafood dishes.
- Birds: A group of animals that are known for their ability to fly. They are often used in various dishes.
- Insects: A group of animals that are known for their ability to fly. They are often used in various dishes.

By recognizing the food web, you can understand the relationships between different species and how they rely on each other for survival.
<table>
<thead>
<tr>
<th>Highlight for self-assessment</th>
<th>Meeting the goal at a high level.</th>
<th>Meeting the goal at a satisfactory level.</th>
<th>Not meeting the goal.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Learning goal</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I can complete open-ended tasks.</td>
<td>I have completed all 8 parts</td>
<td>I have completed 7 parts.</td>
<td>I have completed 4 or fewer of the parts.</td>
</tr>
<tr>
<td>I can collect and combine information from a number of sources.</td>
<td>I listed 10 or more sources</td>
<td>I listed 6 to 9 sources</td>
<td>I listed 5 or fewer sources</td>
</tr>
<tr>
<td>I can distinguish between relevant and irrelevant information.</td>
<td>I included only information that related to my particular ecosystem. I deliberately did not include some of the info I found because it didn’t relate.</td>
<td>I included only information that related to my particular ecosystem. I did not find any information that did not relate.</td>
<td>I know some of the info is unrelated and doesn’t need to be there.</td>
</tr>
<tr>
<td>I can use a range of sources, including databases, to access information.</td>
<td>I used the Library website to access databases like WebPath express, BrainPop, Gales Science and TWIG. My bibliography includes several different kinds of sources.</td>
<td>I used a couple of sources from the Library site, but not all of them. I probably Googled more than I should have.</td>
<td>I only Googled stuff. Most of my information came from sites like YouTube or Wikipedia.</td>
</tr>
</tbody>
</table>
I can summarise information from written secondary sources. I paraphrased all of the information. I did not copy and paste any of it. If I copied images, then I gave credit for all of them.

I paraphrased most of the information. I copied and pasted a little of it. If I copied images, then I gave credit for some of them.

I copied and pasted most of the information. If I copied images, I gave no credit for them.

Great Research Resources:

Middle School Library Catalogs: Gales, ImageQuest, NatGeoKids, etc.

iNaturalist- Indonesia
Endemics - Indonesia
Animals - Indonesia
Ecology Asia
Reefguide.org
Marine Species
Indonesia Species List
Online Field Guide
Arkive
Project Noah