Marine Life of the Coral Reef

We are going to discuss:

- Marine life that lives on coral reefs that you may observe as a scuba diver
- Invertebrates - animals without a backbone
- Vertebrates - animals with a backbone
- Interactions and reliance between different animals
- Coloration
- Reproduction
- Feeding activity (what, where, and when)
- Where to find them on the reef
- Dangerous Marine Life First Aid is discussed in another unit.

Invertebrates

The Bahamian song “Conch Ain’t Got No Bone” is absolutely correct. Invertebrates are animals without a backbone. Invertebrates are just about every other animal living under the sea except the fishes and mammals (whales and dolphins).

Invertebrates include:

- Corals
- Conch (mollusk)
- Nudibranchs
- Spiny Lobster
- Sponges
- Crabs
- Crinoids
- Sea Cucumbers
- Starfish

Corals – Reef Builders

- Coral reef eco-systems are very complex communities that are “islands in the sand”. The coral formations we observe on our dives are the external skeletons (exoskeletons) for very small animals called coral polyps. Inside each of the stony cups which makes up the coral formation that contains a coral polyp. Polyps are invertebrates, they have no internal skeleton.
- Coral polyps by themselves grow very slowly. Being an animal, they need food to survive as well as oxygen. The polyps alone would be poor reef builders were it not for a very unique relationship with an algae called zooxanthellae (“animal loving plant”). The polyps live in a symbiotic relationship with the zooxanthellae which means that both organisms benefit from the relationship.

Corals – Reef Builders

- These microscopic algae live within the coral polyps. There are several million of these cells in every square inch of coral reef. These algae combined with other pigments give coral about 90% of its color.
- Coral Polyps are basically a large stomach with tentacles attached. The polyps extend outward for nocturnal (night) feeding on small microscopic animals called zooplankton. They kill and trap the zooplankton with stinging cells called nematocysts. These nematocysts have projections that have barbs which contain venom. When the projection enters the zooplankton, the venom is injected and the barbs hold the prey. The prey is then drawn into the stomach for digestion.

Corals – Reef Builders

- The algae help the polyps combine calcium from the water and the carbon dioxide excreted as waste by the polyps to form calcium carbonate. This is used to build the exoskeleton around the polyps. (Reef foundation)
- These algae use the sunlight (photosynthesis) to produce food and oxygen for the polyps. They use the coral waste products to produce more food. This symbiotic relationship drives the coral growth that builds most of the colorful reefs that we love so much. These coral reefs grow “almost from nothing” and thrive in warm, shallow waters usually less than 100 feet deep. The reefs we dive today have built upon older reefs as the water level of the ocean has risen or as older reef structures have been bashed by storms.

Corals – Reef Builders

- Coral have many enemies. There are fish such as parrotfish that chomp off large bites of coral. They then grind it and as it passes through their digestive track polyps and algae are digested. The ground calcium carbonate exoskeleton is pooped out and forms sand. There are many small crabs, snails, fire worms, and a host of other critters feed on coral polyps. On Pacific reefs there is the notorious crown of thorns starfish that can devour very large areas of living reef. Areas where polyps have been eaten or coral chomped off, polyps can bud and regenerate areas of the colony. Dead areas are subject to attack from boring animals such as marine worms and sponges.

Corals – Reef Builders

- Coral reef ecosystems are characterized by a large diversification with smaller numbers . An example would be different species of angelfish sprinkled along a reef, but small numbers of each. Temperate and colder seas are characterized by less diversification and larger numbers of individual species. Examples would be a large school of anchovies or spots.
- Coral reefs provide the vital food and shelter for many colorful reef fishes and invertebrates. These animals in turn provide food for the carnivores that inhabit the reefs, such as trumpetfish and grouper, and the pelagic (deep water) fish such as sharks and tarpon that visit the reefs in search of the smaller fish as food.

Corals – Reef Builders

- Coral is subject to environmental stress. Coral thrives at temperatures between 77 to 84 degrees Fahrenheit. Most do not grow well below 73 degrees. Coral bleaching can occur if the water temperature gets too high. This kills off the zooxanthellae, but may not kill the polyps. There is a theory that this is adaptive bleaching to acquire new zooxanthellae that is more suited for the new water temperature.
- Different coral species have different temperature thresholds, so not all colonies may be affected by a rise in water temperature. Coral is subject to damage from storm wave action and other physical damage. Sedimentation from construction and from flood waters coming down rivers can cover coral colonies and blanket them, shutting out the sunlight vital to the zooxanthellae. Floods can also change the salinity.

Corals – Reef Builders

- Coral polyps also reproduce sexually. During August to the beginning of September, coral reefs in south Florida will release sperm and eggs in a mass event that looks like a smoke screen has enveloped the reef. They are released to flow in the current in hopes that eggs and sperm will unite. Some polyps are asexual (both male and female) and produce both sperm and eggs. They can expel eggs that are covered with a sperm coating. Once fertilization occurs, the fertilized larvae are now zooplankton to be carried by the currents. These larvae can be the foundation builders for new coral outcroppings. If they find a substrate, such as old dead coral, rock, or wreck structure to attach to, they become the foundation for yet another “island in the sand”.
- The exact timing and triggers of the coral spawning are unclear, but it is related to lunar and tidal cycles and 24 hour light cycles. Spawning occurs at night. These spawning events include not only corals but can include worms, sea stars and sponges.

Soft Corals

- The polyps of soft corals such as sea fans and sea whips, do not use calcium carbonate to produce hard exoskeletons. Rather their exoskeletons have a more “leathery” texture. These corals, built by a similar type of polyp that builds hard corals, look like plants. Soft corals, sometimes called gorgonians, can be a rainbow of colorful fans and ribbons attached to the reef that sway in the current and surge. The polyps pump themselves up with water and expand out from the hard structure to feed on microscopic plankton using their tentacles.

Vertebrates

The principal vertebrates we see on a coral reef are fish. These are divided into the bony fish that have skeletons made of bone and cartilaginous fish (sharks) that have skeletons made of cartilage.

Cartilaginous fish have a skeleton made of cartilage and do not have ribs. If large cartilaginous fish are taken from the water, their body mass will crush their internal organs because of this absence of ribs to protect the internal organs. This cartilage skeleton does not have bone marrow. Red blood cells are produced in the spleen.

Vertebrates

Most fish have scales, but a few have smooth skin. Sharks have a complex outer covering made of flexible fibers. This layer actually acts as an outer skeleton to which the swimming muscles are attached. The external surface is called dermal teeth. These dermal teeth are very abrasive when rubbed from the rear. Sharkskin has been used for sandpaper. Water flows very smoothly from the front over this surface giving the shark a great hydrodynamic advantage, reducing turbulence as they swim.

Reproduction

Fish reproduce sexually. The vast majority being oviparous whereby the males and females release sperm and eggs as clouds into the water for fertilization to take place. The fertilized eggs develop into larvae and enter the water column becoming zooplankton in the oceanic blue soup. However some fish deposit their eggs either on the reef in patches or in the sand and watch over the eggs until they hatch.

Reproduction

Some species of fish are viviparous with internal fertilization. The female holds the eggs internally as they develop as embryos. The male uses the rear part of his pelvic fin, two claspers which analogous to a mammal's penis, to inject his sperm into the female during mating. Most sharks are viviparous, producing a few developed live young as verses generating a cloud of thousands of larvae to develop in the water column.

Cleaning Stations

Fish, like man and other animals, have parasites. The removal of parasites is a particularly interesting process for divers to observe. As you dive a coral reef, you may come upon a fish hovering just above a coral head with their mouth open very wide. If you approach slowly you may be able to see small fish or shrimp inside and around the open mouth, eating the parasites and cleaning the teeth of the larger fish. This is referred to as a symbiotic relationship in that it is mutually beneficial to both critters. The larger fish or eel could surely eat the small cleaner, but it does not as it is being relieved of a burden and the small fish, crab, or shrimp is getting a meal.

Cleaning Stations

This basket sponge is a cleaning station. The diver is holding her hand inside the sponge and the cleaning fish are “cleaning” her hand.

Swimming

Fish use various methods to swim. Most fish use muscles on either side of the backbone that they contract alternately in S-shaped curves. Backward force is applied to the water as the curve reaches the cordial area at the back of the fish. This force is applied through the surface area of the body as well as the fins against the water, propelling the fish. Some fish are built for speed (sharks, barracuda) and some move very slowly (seahorses and frogfish). Swimming may be by movement of the whole body with the S-curve as with a shark or just the rippling of a dorsal fin of a seahorse.

Swimming

Most reef dwellers are slow moving and depend upon the protection of the nooks and crevices of the reef. Pelagics such as sharks are designed for speed. Fish may swim as loners or in mate pairs. Fish may congregate in **aggregations** to mate or feed. They may congregate in loosely organized **shoals** where independent fish will feed and forage. **Schools** are tightly organized groups that swim at the same speed and in the same direction. Since body tissue is denser than water, fish must compensate for negative buoyancy.

Swimming

Some fish have swim bladders that they can inflate to different degrees to maintain neutral buoyancy. If you are collecting fish for an aquarium, you must consider this swim bladder and bring fish to the surface very slowly to allow the swim bladder to equalize and not over expand. An ascent that is too fast will kill the fish. Most bony fish can swim forward and backward. Sharks can only swim forward.

Senses

Most fish have well developed sensory organs. They can feel pain and will exhibit fear responses to impending danger. It is believed that diurnal fish have good color vision. Shark research at Walker's Cay in the Bahamas revealed that a shark could be conditioned to tap a disk of a specific color for a food reward. Several months later the colored disk were again set out and several sharks taped the correct disk…. Go figure.

Senses

To a fish, eyes are a very key feature. Some fish such as butterfly fish have spots on their tail region to confuse predators. Predators will key on the eyes and lead the fish for a strike. If the strike behind the tail region, the fish has a better chance of getting away. Some predators such as trumpetfish will “shadow” or swim just above an animal that is not sensed as a predator, such as a stingray. Any small fish watching the stingray would not be fearful of the ray since rays feed on small crustaceans in the sand. The trumpetfish, along for a ride just over the ray might not be noticed and could pounce on unwary prey.

Senses

Most fish use a lateral sensor line that runs the length of their body to detect gentile water movement and vibrations, detecting the motion of a nearby fish. This is how a shark can be attracted to the thrashing of injured prey. Some fish can detect changes in electrical currents and fields that all living animals emit. Highly refined chemoreceptors are used for remarkable taste and smell. Sharks can smell a drop of blood in a million drops of water (1 drop in 25 gallons of water). They can smell blood that is one-quarter mile away!

Territory

Many of the smaller fish on a coral reef are territorial, while larger fish such as groupers will move away if you approach them. It an 800 pound Goliath Grouper was as aggressive as a Dusky Damsel, none of us would venture into the water. It almost seems like a paradox that the smaller fish will show such aggression to divers or other fish that enter their “area” and the larger fish will tend to move away from a diver. Even a barracuda will usually move away if approached, unless you are stupid and are carrying a fish that you have just speared. The area defended can differ with different species.

Territory

The Threespot Damsel will efend a “farm” of algae about 1/10 of a square yard while a Cocoa Damsel will defend a much larger area that may include paths to outlying grazing areas. The whole area can be 7-8 square yards. If an intruder approaches a fishes “area” they will erect their fins, make striking postures, make clicking or popping sounds, and swim parallel to the route of the invader. If this does not deter the invader, an attack will commence which will include butting and biting.

Territory

Fairy Basslets are plankton eaters that are territorial gathers. They will find a plankton rich area of the current on the reef and defend it from other planktivores. They form groups led by the largest dominant fish and will rise above the reef into the plankton currents to feed, never moving very far away from their vertical column of coral that give them protection.

Territory

Not all territory claims are related to food. Some species use this as a safety measure. The Blue Chromos is often seen by divers in what appears to be schools. They feed on plankton sometimes a few feet above the reef where it is more nutrient rich. Each individual fish will head to their own designated hiding place in the reef to bed down at night and hide if threatened.

Pressure Wave

NOTE ON APPROACHING REEF FISH: As you move through the water column, you create a pressure wave in front of you. If you approach a fish too quickly, the sensor lateral line senses this pressure and the fish may sense impending danger and move away. Also as you approach fish, be aware of your eyes. If you are trying to photograph a small fish from a very close position, it is better to hold the camera in front of you to block your eyes from the fish. If you lower the camera and the fish sees your eyes, it may spook the fish.

Angelfish

Angelfish are found swimming close around and through the coral and on wrecks. They primarily feed on sponges, but also feed on jellyfish, coral, and plankton. Juveniles can serve as cleaners on cleaning stations. The juveniles of all angelfish have a very different color pattern from the adults. The juveniles are much harder to find than mature adults. Most angels usually form a monogamous relationship for life. Adults can live for 15 years. The male and female mate by rising in the water column, rubbing bellies, and releasing clouds of sperm and eggs into the water.

Angelfish

Females can release 25-75 thousand eggs. Fertilized eggs develop into larvae that swim (zooplankton) in the water column and feed on other plankton. After 3-4 weeks the larvae develop into 0.6 to 0.8 juveniles that settle to the bottom. Angelfish are principally tropical although angels have been found on offshore wrecks (20-30 miles out) off North Carolina. These angels have been transported north by the Gulf Stream. Juveniles have been seen in the fall in coastal waters of North Carolina when the waters are warmest. These juveniles are destined to die as the water gets colder.

Queen Angelfish

The Queen Angel Fish is one of the most beautiful fish on the coral reef. They have a blue body with yellow and dark blue accents. They also have a blue ringed crown on their head, just above the eyes. Besides the normal feeding habits, Queens are feeders of opportunity as seen in the picture of a Queen sharing a conch with a turtle,

Queen Angelfish

- **Size:** Up to 14 inches
- **Feeding habits:** daytime
- **Feed on:** sponges, jellyfish, coral, and plankton
- **Where to find:** shallow depths, on the reef around coral heads and under ledges during the day.
- **Nocturnal activity:** withdraw into the reef at night
- **Special notes:** Very shy, approach very slowly or wait for them to come closer. Never try to chase a Queen Angelfish. Usually found as individuals as opposed to pairs, even though they seem to mate for life. Queens are sometimes observed swimming deep on coral reefs at depths of 100 feet or more. Their coloration is so vivid that they are easy to spot swimming against the muted blue of the deep reef.

Blue Angelfish

- **Size:** Up to 18 inches
- **Feeding habits:** daytime
- **Feed on:** sponges, jellyfish, coral, and plankton
- **Where to find:** shallow depths, on the reef around coral heads and under ledges during the day.
- **Nocturnal activity:** withdraw into the reef at night
- **Special notes:** Not as shy as Queens. Usually swim as pairs. Blues have been known to approach you if you have food. They have broader bodies than most angelfish. Blue Angels and Queen Angels sometimes hybridize, they mate and produce a hybrid of the two species. Hybridization among reef dwelling fish is extremely rare. This hybridization is a very rare exception. Note that the Blue Angle does not have the defined the “crown”. Usually a bit larger than Queen Angels.

Gray Angelfish

- **Size:** Up to 24 inches
- **Feeding habits:** daytime
- **Feed on:** sponges, jellyfish, coral, and plankton
- **Where to find:** shallow depths, on the reef around coral heads and under ledges during the day.
- **Nocturnal activity:** withdraw into the reef at night
- **Special notes:** Grays tend to be the most social of the angelfish. They have been known to rise up in the water column to greet a diver or pose for a picture. They eagerly respond to hand feeding.

French Angelfish

- **Size:** Up to 20 inches
- **Feeding habits**: daytime
- **Feed on:** sponges, jellyfish, coral, and plankton
- **Where to find:** shallow depths, on the reef around coral heads and under ledges during the day.
- **Nocturnal activity:** withdraw into the reef at night
- **Special notes:** French Angels tend to be almost as shy as Queen Angels. They stay close to the reef and usually swim as pairs.

Rock Beauty

- **Size:** Up to 8 inches
- **Feeding habits:** daytime
- **Feed on:** sponges, jellyfish, coral, and plankton
- **Where to find:** shallow depths, on the reef around coral heads and under ledges during the day.
- **Nocturnal activity:** withdraw into the reef at night
- **Special notes:** The Rock Beauty is as shy as the Queen Angel. They are usually found swimming alone, close to the reef and are difficult to approach. The juvenile looks almost like a Threespot Damsel.

Atlantic Spadefish

- **Size:** Up to 36 inches
- **Feeding habits:** daytime
- **Feed on:** benthic invertebrates (off the bottom), plankton, jellyfish tentacles
- **Where to find:** swimming above and around the reef and pilings during the day..
- **Nocturnal activity:** withdraw to the open ocean
- **Special notes:** They are pelagic (open ocean) swimmers, but come to the reef to feed. Spawn in pelagic aggregations. Sometimes called White Angelfish.

Barracuda

- **Size:** Up to 6 feet
- **Feeding habits:** daytime
- **Feed on:** reef fish, squid
- **Where to find:** swimming above and around the reef and pilings during the day, hanging below your dive boat
- **Nocturnal activity:** usually withdraw to the open ocean
- **Special notes:** They are pelagic swimmers, but come to the reef to feed. Very inquisitive fish and are drawn to bright shinny objects. They have no fear and will swim right towards and by you. Hazard notes in the dangerous marine life section. Have a mouth full of canine teeth. A 6 foot barracuda was once described as 5 feet of mouth with a 1 foot tail!

Sharks

- **Size:** Up to 6 feet
- **Feeding habits:** daytime
- **Feed on:** reef fish, squid
- **Where to find:** swimming above and around the reef and pilings during the day, hanging below your dive boat
- **Nocturnal activity:** withdraw to the open ocean
- **Special notes:** They are pelagic swimmers, but come to the reef to feed. Very inquisitive fish and are drawn to bright shinny objects. Have no fear and will swim right towards and by you. Hazard notes in the dangerous marine life section. Have a mouth full of canine teeth. A 6 foot barracuda was once described as 5 feet of mouth with a 1 foot tail!

Fairy Basslet

- **Size:** 2 to 4 inches in length
- **Feeding habits:** daytime
- **Feed on:** small crustaceans, sometimes parasites at cleaning stations
- **Where to find:** among sea fans, on top of the coral, nestled in the coral, under ledges
- **Nocturnal activity:** withdraw into their burrow
- **Special notes:** Fairy basslets are small, vibrantly colored fish with purple fronts and yellow tails. They are known to swim upside-down under ledges and along cave ceilings. They live in colonies and defend their territory from other species and even other fairy basslets. Male fairy basslets guard and care for the eggs and the nest

Butterflyfish

- **Size:** 4 to 9 inches in length
- **Feeding habits:** daytime
- **Feed on:** Omnivore (feed on plants and animals)
- **Where to find:** Swimming over the reef, in and around coral and sea fans.
- **Nocturnal activity:** Settle into dark crevices
- **Special notes:** There are about 114 species of butterflyfish. They have thin, disk-shaped bodies that closely resemble their equally recognizable cousins, the angelfish. Their brilliant colors and markings fade to blend with the reef background. Some butterflyfish species travel in small schools, although many are solitary until they find a partner, with whom they may mate for life. They spend their days pecking at coral and rock formations with their long, thin snouts for coral polyps, worms, and small invertebrates.

Spotted Moray Eels

- **Size:** 6” to 3 feet
- **Feeding habits:** dusk and night
- **Feed on:** fish, molluscs (such as octopuses), , crustaceans (crabs and lobsters)
- **Where to find:** In holes and under ledges of the reef
- **Nocturnal activity:** Can be seen swimming over the reef at night while feeding.
- **Special notes:** Care should be taken while putting your hand in holes in the reef as they may be inhabited by a moray eel. Green Moral eels have a docile reputation, but Spotted Morays can be aggressive. Be careful! Do not try to hand feed.

Green Moray Eels

- **Size:** 1 to 6 feet
- **Feeding habits:** dusk and night
- **Feed on:** fish, molluscs (such as octopuses), crustaceans (crabs and lobsters)
- **Where to find:** In holes and under ledges of the reef
- **Nocturnal activity:** Can be seen swimming over the reef at night while feeding.
- **Special notes:** Care should be taken while putting your hand in holes in the reef as they may be inhabited by a moray eel. Green Moral eels have a docile reputation, but you should still treat them with extreme respect. Be careful! Do not try to hand feed. They have few natural preditors.