Back to the life forms!

Organisms are divided (or classified) into different groupings. Eukaryotes and prokaryotes are further subdivided down into kingdoms, phyla (singular is phylum) classes, orders, families, genera (singular = genus) and species along with sub super and infer groups ad infinitum ad nasuseum!. Among the animals there are perhaps 20 or more phyla of animals ranging from "Porifera" (the sponges) to the "Chordates" (animals with a stiff rod running down their backs). The chordate phylum includes the sub phylum "vertebrata" (vertebrates) – animals with backbones. The vertebrates includes the fish, amphibians, reptiles, birds and mammals. Sometimes people talk about vertebrates as opposed to invertebrates, in effect setting up an opposition between a sub phylum with the rest of the animal kingdom!

Another phylum is the Cnidaria which include most the jellyfish and corals. Others of interest to us this term are Mollusks (clams, mussels, squid, octopus), Arthropods (joint legged creatures – insects, crabs, spiders and so on) Echinoderms (starfish, sea urchins, sea cucumbers) and a number of other phyla contain a variety of worms (flatworms, round worms, segmented worms). We will talk about some of these later.

There are also a number of phyla within the other kingdoms, some of which have thousands of species within them.

There are certain groups we are going to be more interested in than others, although the others are not less important. But if you want to know more about them, the biology department gives a course in zoology which you can take. We will talk largely about certain phyla and only mention some of the others in passing.

You should be aware of the two groups in the prokaryotes – Archaea and Bacteria and what the cyanobacteria do.

Among the animals, you should be aware that sponges and corals, are animals and not made out of plastic or rock! Two of the other major phyla to be aware of are the arthropods and the mollusks. The arthropods are the joint legged animals like crabs, lobsters, insects and spiders; the mollusks contain the "shell fish" and include the squid and the octopus.

The echinoderms are yet another phylum which contains the star fish, sea urchins, and sea cucumbers.

Finally there is the chordate phylum which contains (in the Linnaean system, but not the cladistics one) the class known as the fish, amphibians, reptiles, mammals and birds.

A few other terms to remember (some of which we have mentioned before)

(a) Plankton (zooplankton (heterotrophic) and phytoplankton (autotrophic) unable to swim

(b) Nekton: can swim against a current

(c) Algae: autotrophic (photosynthetic) one celled organisms and some multicellular plants that lack true roots, flowers and the like (sea weeds, kelp)

(d) Sea weeds: macroscopic, multicellular, marine algae

(e) Kelp: a kind of sea weed which can grow 30 to 80 meters in length (100 feet to over 260 feet).

Plankton refers to organisms that are unable to swim against a current. These include phytoplankton which are photosynthetic and zooplankton which includes larvae and small animals like krill.

Nekton refers to animals that can move against a current.

Algae is not a taxonomic classification, (nor are plankton or nekton). It refers to photosynthetic organisms, usually small, like phytoplankton, but some are quite large like the seaweeds, including kelp. It refers to simple nonflowering plants of a large group that includes the seaweeds and many single-celled forms. Algae contain chlorophyll but lack true stems, roots, leaves, and vascular tissue. Many algae are brown, red or other colors, but all have chlorophyll – their color results from other pigments in the cells.

Seaweed is not a technical term but refers to a number of macroscopic algae! One of the seaweeds is "kelp" which often grown into a kind of "forest"

LIFE IN THE OCEAN

SINCE WE HAVE SOME IDEA OF THE WAYS IN WHICH ANIMALS ADAPT TO SPECIFIC ENVIRONMENTS WE NEED TO LOOK AT SOME OF THE OCEANIC ENVIRONMENTS

We have looked at the ones going out from the shore – littoral, neritic and pelagic as well as the ones dealing with different depths – epipelagic (euphotic), mesopelagic (dysphotic), bathypelagic (aphotic) and hadalpelagic (also aphotic).

We have noted that some animals can swim in the water column as are called nekton while others, called plankton cannot. Some organisms live at the bottom of the water column on the land below. Those are called "benthic". Some benthic animals live right on the surface of the ocean bottom (epifauna) while others burrow into the ground (infauna).
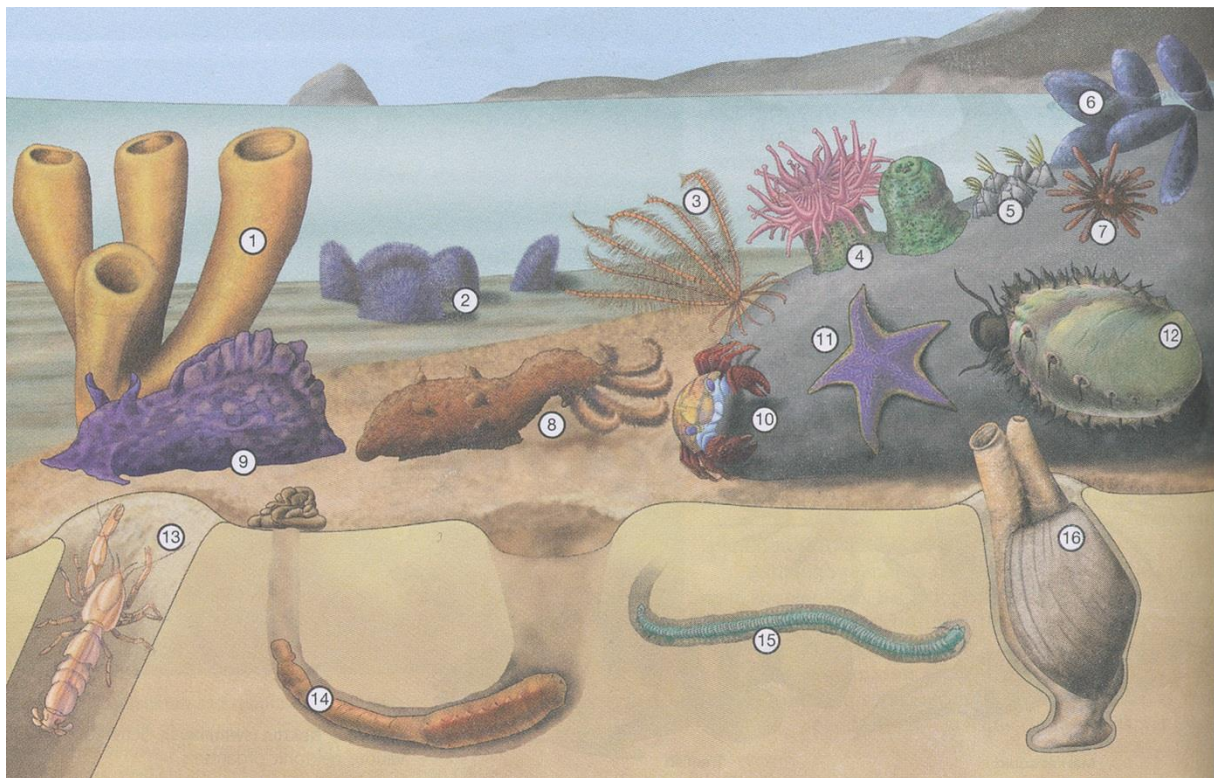
1. Sponge (porifera) 2. Sand dollars (echinoderms) 3. Crinoid (echinoderms) 4. Sea anemones - open and closed (Cnidarians) 5. Barnacles (arthropods crustaceans) 6. Mussels (mollusk bivalve) 7. Sea urchin (echinoderm) 8. Sea cucumber (echinoderm) 9. Sea hare

(mollusk gastropod) 10. Shore crab (arthropod crustacean) 11. Sea star or star fish (echinoderm) 12. Abalone (mollusk gastropod) 13. Ghost crab (arthropod crustacean) 14. Lug worm (annelid polychaetes) 15. Annelid worm 16. Clam (mollusk bivalve)

Animals (as well as plants) are most often thought of as a source of food, but many have other uses for humans as well. Shown here are "invertebrates" – animals without a backbone. We will mention several of these as well as some vertebrates during the term which you should have some familiarity with

SPONGES (PHYLUM PORIFERA)

Among the invertebrates the first are the sponges – the simplest perhaps of all animals. There are several thousand species but only about a dozen are used commercially. These are "picked" and known for their ability to clean. Now-a-days most sponges are not the animal, but rather made from cellulose which is derived from wood pulp, sodium sulphate and hemp fiber.

CNIDARIA

Cnidaria includes jellyfish, corals and sea anemones. They are equipped with stinging cells called nematocysts. Some jellies, like the box jelly are extremely dangerous and can be lethal to humans in less than a minute.

Some are very small and some (Nomura) measure as much as 4-6 feet across. These have had a huge impact on the fishing industry in Japan and are dangerous to the water cooling system of atomic reactors since they can block the intakes.

NOMURA JELLY FISH VIDEO

Some people eat jellyfish but they need to be prepared carefully. Sea turtles also eat them alive Some jellies, like the box jelly are extremely dangerous and can be lethal to humans in less than a minute.

This is a 45 minute video on jelly fish

https://www.youtube.com/watch?v=6HP0_7_RRwg&t=9s

In the picture you can see a clown fish swimming among anemones to which they have immunity. The clown fish develops an immunity toward the anemones, and is able to hide in the tentacles for protection. The clownfish also eats the dead tentacles of the anemone keeping the area clean around it.

The clown fish in return, lures fish to the sessile anemone and helps it to get food.

This process wherein 2 organisms help one another is often called symbiosis or mutualism. The terms are often used interchangeably. Technically, **mutualism** is an ecological interaction between at least two species (=partners) where both partners benefit from the relationship.

Symbiosis on the other hand is defined as an ecological interaction between at least two species (=partners) where there is persistent contact between the partners.

Coral is an extremely important habitat. Coral is an animal which has a dinoflagellate living in it called Zooxanthellae
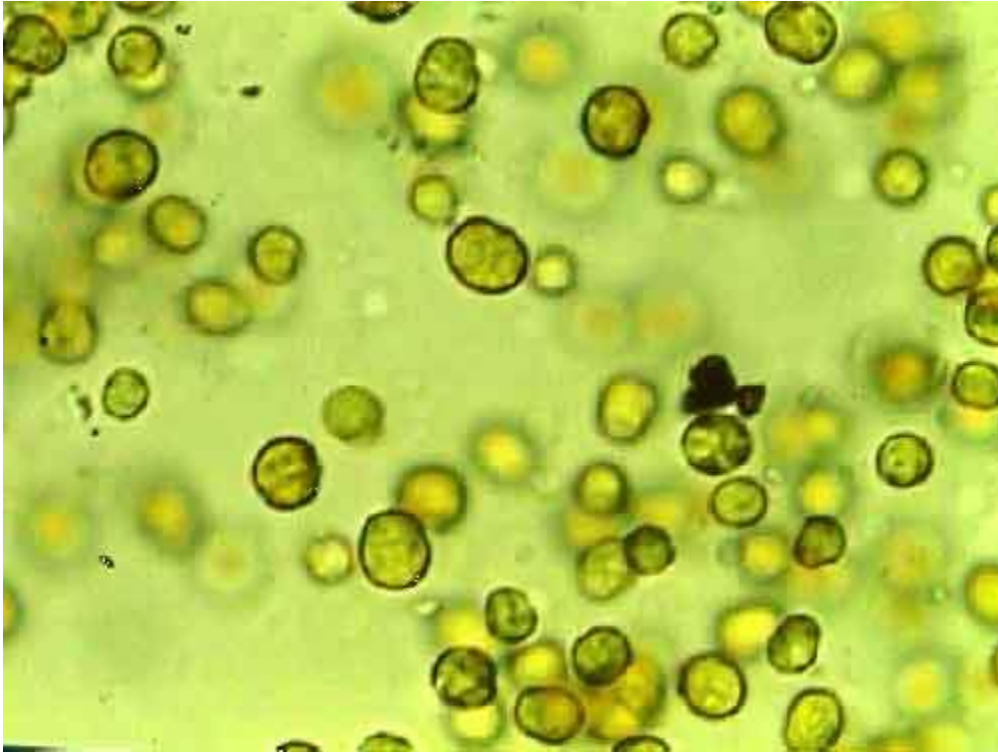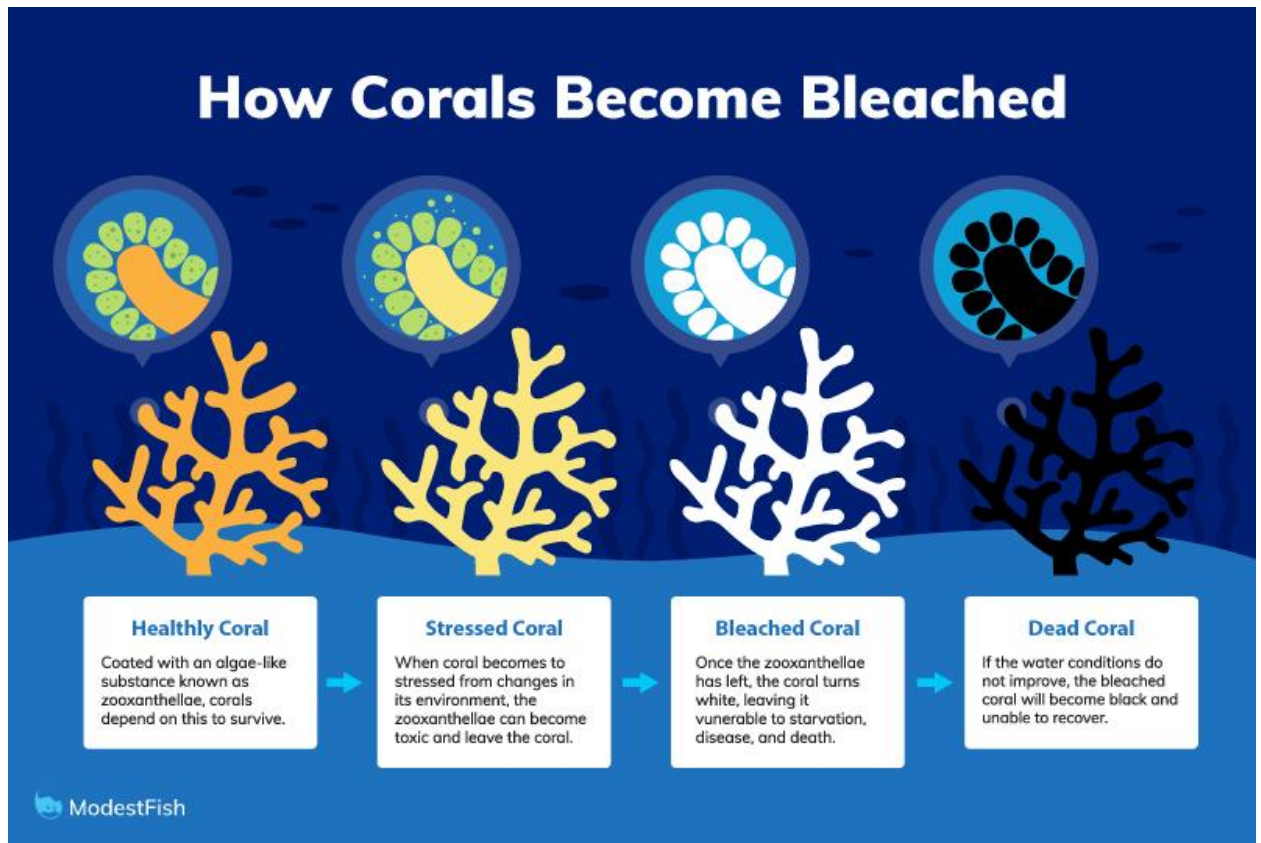

You can see where the Zooxanthellae live in the coral and these provide oxygen to the coral which provides protection to the Zooxanthellae

CORAL ANATOMY

Mesogloea

Nematocyst

Tentacles

Mouth

Zooxanthellae

Pharynx

Septum

CaCO₃ skeleton
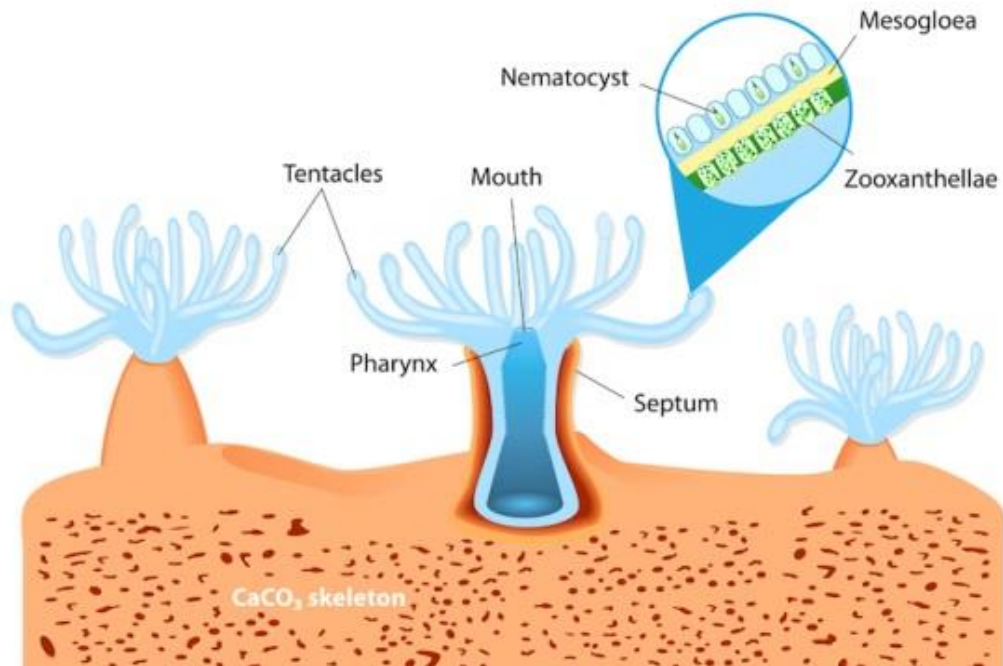
If the coral is stressed, the Zooxanthellae leave the coral and the coral becomes "bleached" and may die if the Zooxanthellae do not return.

How Corals Become Bleached

Healthly Coral
Coated with an algae-like substance known as zooxanthellae, corals depend on this to survive.

Stressed Coral
When coral becomes to stressed from changes in its environment, the zooxanthellae can become toxic and leave the coral.

Bleached Coral
Once the zooxanthellae has left, the coral turns white, leaving it vunerable to starvation, disease, and death.

Dead Coral
If the water conditions do not improve, the bleached coral will become black and unable to recover.

ModestFish

Fish have evolved so that the coral provides them with a kind of "background" against which they become harder for predators to see them

WORMS

Several different phyla Nematodes, Platyhelminthes, annelids etc) .

Some people do eat worms but several kinds are parasitic and there are dangers in doing this. Many marine animals will eat worms.

ECHINODERMS

Some examples: Star fish, sea cucumbers, crinoids
Possible to eat, but not much meat! More likely eaten by other animals. Interesting regenerative powers.

ARTHROPODS (joint legged animals)

Some examples: Crabs, lobsters and so on. Some are edible. Insects are arthropods and many people in the world eat them. Horseshoe

crabs, are here too but are more closely related to the spiders than to the crabs proper.

Lobster

crab

Barnacles

Horseshoe crab

MOLLUSKS
Examples: Clams, mussels , snails
Clams and other mollusks are regularly eaten around the world.
Oysters produce pearls as well.

Sea hare

Abalone

Oyster with pearl

Clams

VERBRATES

Fish

Anchovies

Salmon

Haddock

Shark

Alaskan pollok

Chondrichthyes: Sharks, rays, etc. – cartilaginous. Very old. Edible. Often just the fin is used. Bear young alive but without placental connection (ovoviviparous). The eggs are held in the

mother's body. Over 300 species some dangerous to humans others not. Some, like the largest shark, the whale shark, are filter feeders.

Bull shark

Tiger shark

Among the fish, perhaps the one most feared in the shark. There are many species of shark (more than 400) with some found rather recently. Only 3 or 4 are generally involved with attacks on humans.

It is difficult to know which is the most dangerous of the sharks, in part because there isn't always enough information from the bite to identify the species.

Among the fish, perhaps the one most feared in the shark. There are many species of shark (more than 400) with some found rather recently. Only 3 or 4 are generally involved with attacks on humans. Some list the first 5 of the following as the most dangerous:

The Great While (estimated attacks 400+ attacks 74 fatalities)
Bull Shark (104 attacks 24 fatalities)
Tiger Shark (155 attacks 29 fatalities)
Ocean White tip (unknown # of attacks many fatalities)
Shortfin Mako (45 attacks 3 fatalities)
Bronze Whaler Shark (35 attacks 2) fatalities

Blue (32 attacks 4 fatalities)
Sand Tiger (64 attacks 2) fatalities

Researchers now distinguish between provoked and unprovoked attacks

(1) The White Shark (also known as "The Great White Shark")

White Shark

The White Shark, more commonly referred to as the "Great White," has been reported to be involved in more attacks on humans than any other shark.

Fossil remains suggest the Great White dates back to the early Eocene eras, which lasted from about 56 to 34 million years ago.

Mature males reach an average size of 10.5 feet while females can average 14 feet. Active during daytime hours, Great Whites feed on marine animals - they don't like sea birds or sea otters particularly. It's thought that they attack humans when they mistake diver and surfer silhouettes in the water during approaching from below the surface of the water. An alternative theory has also been suggested that Great Whites attack unfamiliar objects to test their potential as food. If true, that would help explain their involvement over the years in myriad hit-and-run attacks near beaches.

Not very much is known about the size of the great white's total population. Described as a slow-growing animal with low fertility rates, the Great White is considered at risk of overfishing.

(5) Bull shark

Bull Shark

Great Whites get most of the headlines but Bull Sharks may be the most dangerous shark of them all. It has been recorded in 69 unprovoked attacks on humans but researchers believe the numbers may be higher because of the lack of easily identifiable markings. And unlike most other sharks, it is also known to swim in freshwater. Perhaps the most famous incident occurred in 1916 when four people were killed in shark attacks over two weeks - three of the attacks took place in a tidal river called the Matawan Creek.

CREDIT: *Wikipedia*

(2) The Tiger Shark

Tiger Shark

According to the International Shark Attack File, the Tiger shark ranks No. 2 behind the white shark in the number of reported attacks on humans. The shark-monitoring group notes that the animal's "large size and voraciousness" qualify it as a formidable ocean predator. Surfers and swimmers need to know that Tiger sharks tend to be both curious and aggressive when they spot humans in the water.

(4) Oceanic White Tip

Oceanic Whitetip Shark

The Oceanic Whitetip has earned a reputation for being first to arrive on the scene when ocean ships run afoul - especially during war time. The shark was blamed for many of the fatalities related to the sinking of the steamship Nova Scotia off the coast of South Africa during World War 2. Only 192 of the nearly 1,000 men on board survived. Eyewitness accounts from the survivors recounted a "feeding frenzy" as sharks attacked men waiting in the water for rescue. The shark is described as > opportunistic, bold and unpredictable around divers and thus should be "treated with extreme caution."

(5) Bull shark

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(3) Short fin Mako

Shortfin Mako

Powerful, fast and aggressive, the Shortfin Mako has been blamed for many reported shark attacks on humans. In more than a few cases, also blame human error as fisherman have been known to get injured after dragging hooked makos into their boats.

The most famous episode of shark attack was the sinking of the USS Indianapolis by the Japanese on July 30 1945. Of the 1196 crew aabout 300 went down with the ship. The roughly 900 faced exposure, dehydration, saltwater poisoning, and shark attacks while floating with few lifeboats and almost no food or water. The Navy learned of the sinking when survivors were spotted four days later by the crew of a PV-1 Ventura on routine patrol. Only 317 survived.

Of the 880 men who survived the sinking of the USS Indianapolis only 317 survived (4 of the 321 who were pulled from the water died after rescue)

There have been occasional "serial attacks" such as the Jersey shore shark attacks of 1916 which occurred between July 1 and 12. Five people were attacked - 4 bled to death and 1 survived.

This is the event which has the highest number of shark attacks in history. It is though that it was White tipped and Tiger sharks responsible for the attack. Most of the deaths on Indianapolis to exposure, salt poisoning and thirst, with the dead being dragged off by sharks.

Sharks have been prized in some parts of the world for their fins which are used in "shark fin soup". Many sharks are hunted and "finned" with the shark itself being trhown back into the ocean where it dies and the rest of the shark meat going to waste.

Such waste is also commonin "by catches" - fish which are caught up in fishing apparatus intended for other kinds of fish. By catches are those fish that are thrown back, dead. It represents a loss of protein for human polulations.

The estimate given for the number of sharks killed a year by people is somewhere between 50 and 100 million. The number of people killed by sharks is considerably less. In 2015 the number of attacks on humans was given as 164 by the International Shark Attack File

The same organization reports:

US- has highest number of attacks (59 in US 7 of which were in Hawaii) 1 fatality in Hawaii)

Multiple unprovoked attacks occurred in Australia [18], South Africa [8], and Reunion [4], the Canary [2] and Galapagos [2] islands, with single incidents reported from the Bahama Islands, Brazil, Egypt, New Caledonia, and Thailand.

The increased number of attacks is probably caused by there being more use of the waters and hence a higher number of encounters. The number of attacks relative to the number of hours people spend world wide in the water is remarkably low.

The higher survival rate in the US is probably caused by better medical treatment arriving faster.

It was reported that in 2015 more people were killed taking "selfies" than were killed by sharks

The Great While (estimated attacks 400+ attacks 74 fatalities)

Great White with mouth open – Look at all those teeth

Very large Great white off Hawaii – compare with diver

Great White – Smiley Face?

Bull Shark (104 attacks 24 fatalities)

Tiger Shark (155 attacks 29 fatalities)

Ocean White tip (unknown # of attacks many fatalities)

Shortfin Mako (45 attacks 3 fatalities)

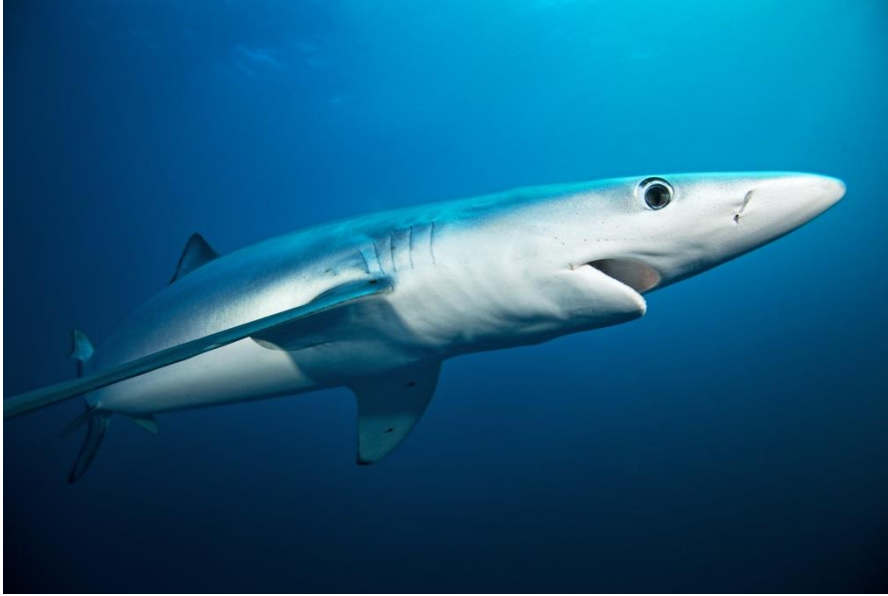Bronze Whaler Shark (35 attacks 2) fatalities

© Hennie Otto/SharkWatchSA.com

© Hennie Otto/SharkWatchSA.com

Blue (32 attacks 4 fatalities)

Sand Tiger (64 attacks 2) fatalities (the only shark known to surface and gulp air)

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