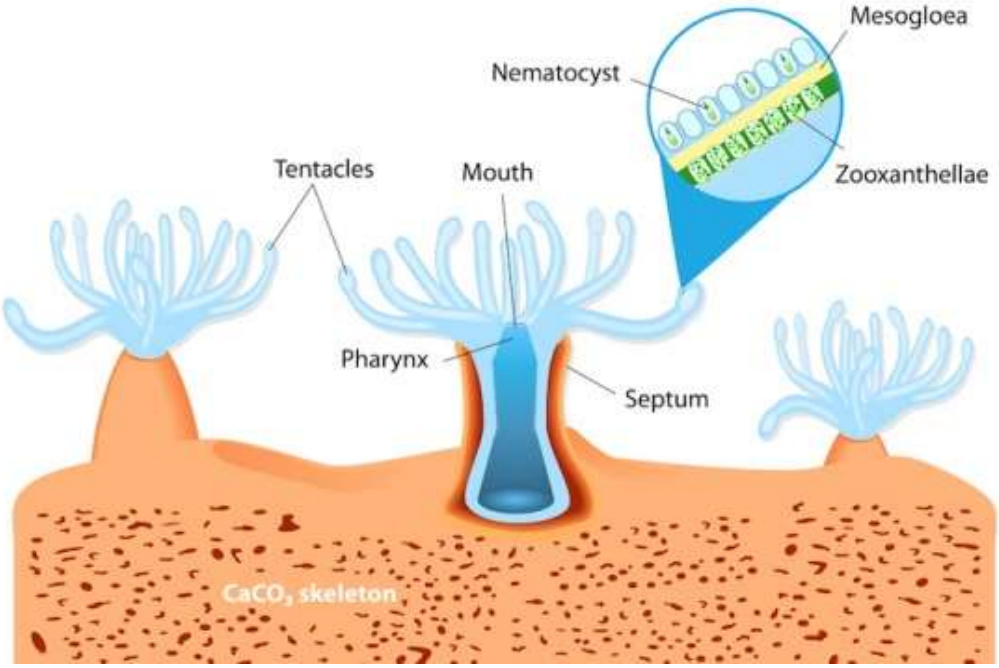
This process wherein 2 organisms help one another is often called symbiosis or mutualism. The terms are often used interchangeably. Technically, **mutualism** is an ecological interaction between at least two species (=partners) where both partners benefit from the relationship.

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.

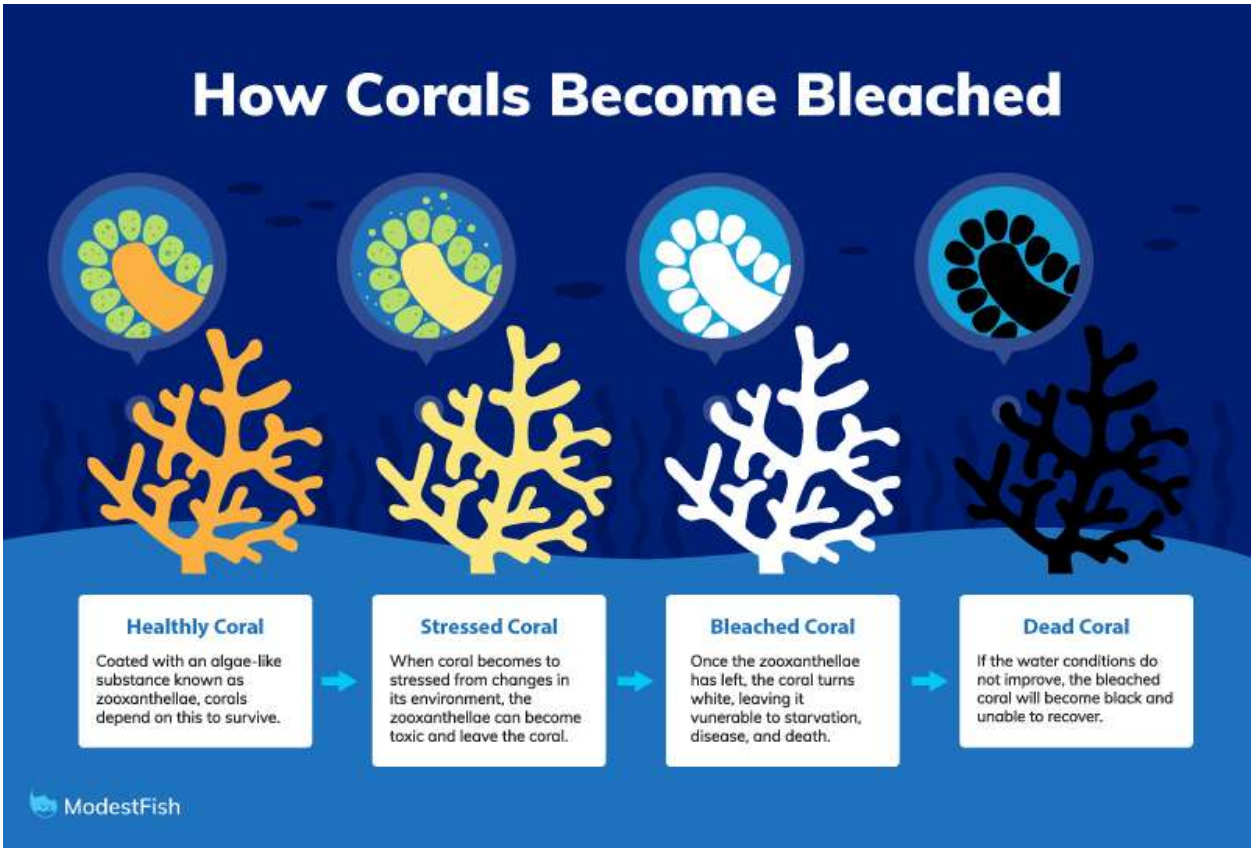
Coral is an extremely important habitat. Coral is an animal which has a dinoflagellate living in it called Zooxanthellae

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



If the coral is stressed, the Zooxanthellae leave the coral and the coral becomes “bleached” and may die if the Zooxanthellae do not return.



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.

Some list the following 5 as the most dangerous:

(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.

(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.

(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 Shortfin Mako is believed to be the fastest of any shark, able to swim up to 20 miles per hour. Prior to attacks, the sharks tend to swim in figure eight patterns and approach their prey with mouths open. The popularity of Mako meat in shark fin soup has reduced their populations; the World Conservation Union has listed the Shortfin mako as "Near Threatened."

(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

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*

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.

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

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

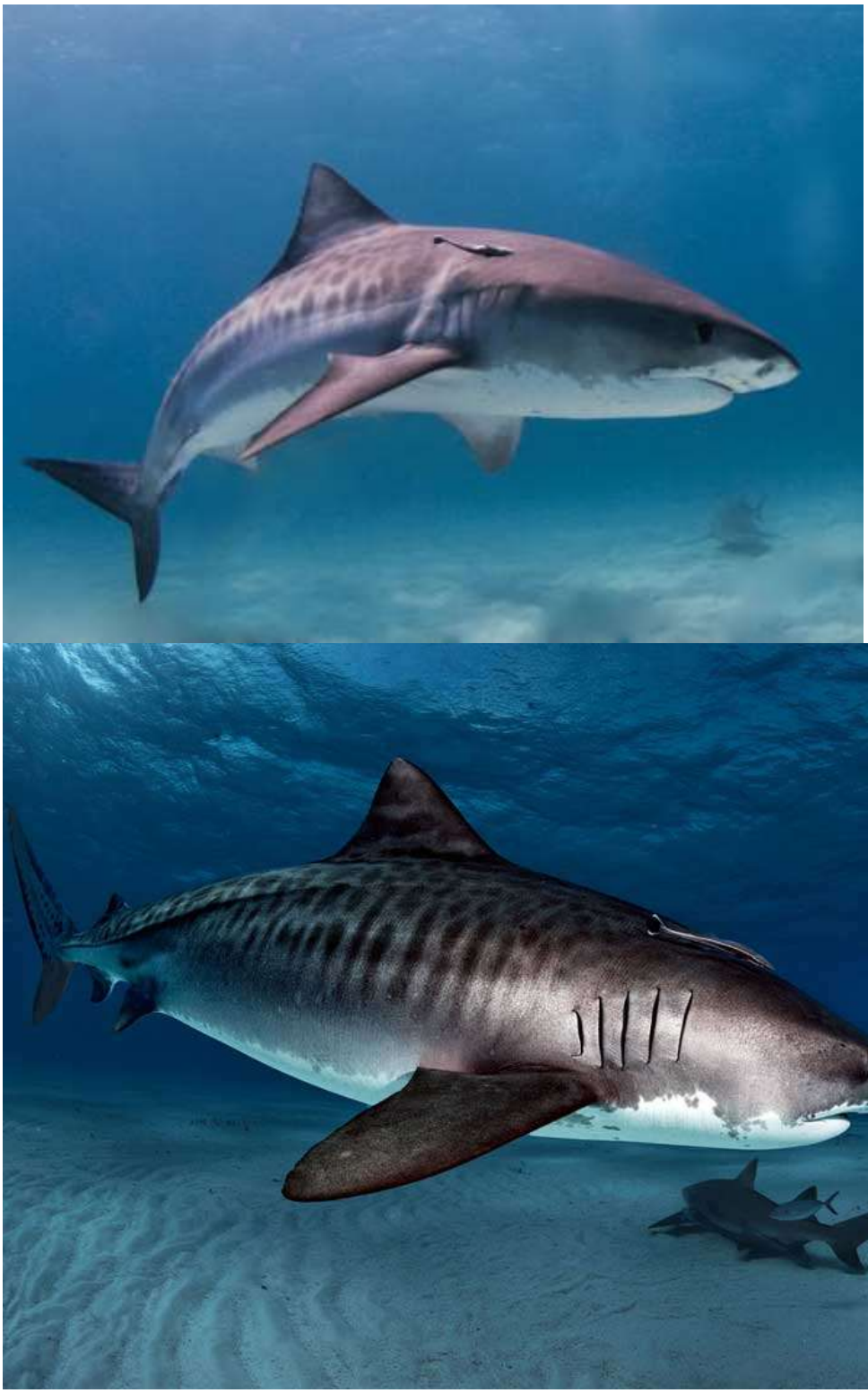
Great White with mouth open – Look at all those teeth

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)



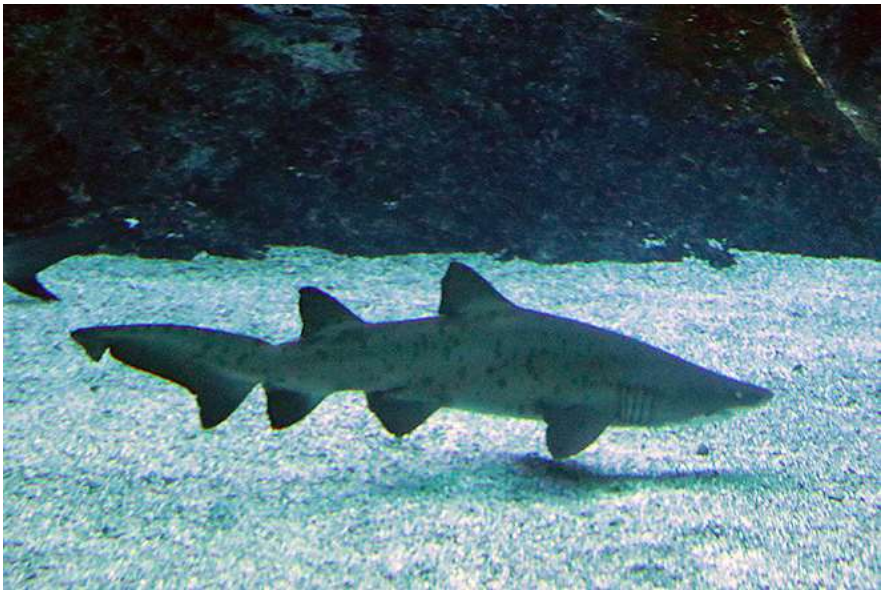
Ocean White tip (unknown # of attacks many fatalities)

Shortfin Mako (45 attacks 3 fatalities)

Bronze Whaler Shark (35 attacks 2) fatalities

Blue (32 attacks 4 fatalities)

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



Researchers now distinguish between provoked and unprovoked attacks)

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 about 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 common in "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 populations.

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

BONY FISH

Osteichthyes or “bony fish”. This class has the largest number of vertebrates in it over

Reptiles

Examples: Sea turtles – marginally alligators and crocodiles

ALLIGATOR

Residence:	mainly freshwater habitats
Jaw:	shaped like the letter 'U'
Teeth:	upper teeth visible when mouth is closed
Skin:	dermal pressure receptors located on the jaw

Photo: ©Luis Castaneda Inc./Riser/Getty

CROCODILE

Residence:	freshwater and saltwater habitats
Jaw:	shaped like the letter 'V'
Teeth:	upper and lower teeth visible when mouth is closed
Skin:	dermal pressure receptors located on the entire body

Photo: ©Raphael Van Butsele /The Image Bank /Getty

SALTWATER CROCODILE

Average size: 5M (16.4FT)

Lifespan: 70 YEARS

Weight: UP TO 1,000KG (2,205LB)

Population: 200,000-300,000

Teeth: 60+

Saltwater crocodiles have been known to tackle other apex predators, such as bull sharks

AMERICAN ALLIGATOR

Lifespan: 35-50 YEARS

Average size: 4M (13FT)

Teeth: 74-80

Weight: UP TO 460KG (1,012LB)

Population: OVER 1 MILLION

Alligators are capable of short bursts of speed, leaping out of the water quick enough to catch prey unawares

The crocodile has a more distinctive V-shape snout, whereas the alligator has more of a U-shape. The crocodile's shape is optimised for snatching their prey, while the alligator's is better for crushing, as it has more leverage.

The jaws of these two behemoths differ greatly. The top of an alligator's jaw is wider than the lower part and has slots for the lower teeth to fit into, so only the upper teeth are visible when closed. Conversely, a crocodile's jaws are identical in size. Its teeth interlock, so both upper and lower teeth can be seen.

While in early times a number of huge reptiles dominated the oceans, most are now gone. Only the sea turtles are representing these animals at this time.

Crocodiles and alligators are more associated with rivers than the ocean, but in some cases, they may wander into the ocean near the shore.

While alligators can tolerate some salt water they are largely fresh water animals. Some crocodiles are salt water crocodiles but are not very good swimmers so they are usually close to the shore. There are reports of them far out to sea on occasion.

Mammals

Marine mammals are those that either live full time in the ocean like whales (Cetaceans) and manatees (Sirena). The whales are divided into 2 groups – those with teeth (odontoceti). This group includes several whales like the sperm whale and porpoises and dolphins). The other group are baleen whales (mysticeti) (the blue whale, the right whale). Baleen is a kind of "plastic" looking material (keratin that hangs down from the whale's gums and acts as a kind of strainer for the plankton these whales eat. Others live in the water and come on the land fairly easily – seals and sea lions (pinnipeds). Some are often on the land like sea otters and polar bears who are dependent largely on the ocean for food.