The Bottlenose Dolphin – One Of The World's Most Intelligent Mammals In Marine Life

Tursiops truncatus also known as the Bottlenose dolphin is the most studied and well-known species of the marine mammal species. They belong to the Delphinidae family in the suborder Odontoceti and order Cetacea. The Bottlenose dolphin has many impressive attributes that makes them one of the world's most intelligent and charismatic mammals in marine life.

All through their worldwide range, bottlenose dolphins are regularly found in shallow coastal ecosystems in their global range with a limited water temperature of 10-32 degrees Celcius. In particular, in the Pacific Ocean bottlenose dolphins are found across Nothern Japan to Australia and from Southern California to Chile. They are also present in the Hawaiian Islands offshore in the eastern tropical part of the Pacific. The Bottlenose is also found in the Atlantic ocean region from Nova Scotia to Patagonia and from Norway to the tip of South America. The most common species of dolphins are found along the coast of the United States to the Gulf of Mexico, the Mediterranean Sea and the Black Sea. The bottlenose dolphin in the Black Sea has been identified by their subspecies T. truncates ponticus. Within the two Pacific and Atlantic coast there are two different types of Bottlenose dolphins based on their distribution. Morphotypes and ecotypes are determined by its offshore form and coastal form. For example, the dolphins found in the northeastern Pacific typically differ genetically and physically. Their tooth and skull size differ, dietary patterns, and body composition from the rest. Thus, those dolphins are said to be coastal and offshore ecotypes. However, the dolphins in the western North Atlantic demonstrated both ecotypes. Color differentiation, morphology and group size between the offshore and coastal ecotypes is comparable to the pattern seen within the pacific, but when it came to size variation they were reversed. Majority of the dolphins in the coast are smaller than the offshore mammals. Such as other marine life animals, the bottlenose dolphin migrates due to various reasons such as water temperature, dietary patterns, seasonal migration. It is found that some coastal dolphins in higher latitudes adjust to seasonal migration, by locomoting south to warmer climates in the winter unlike the other vast amount of dolphins located in warmer waters.

The distribution of coastal bottlenose dolphins is typically uneven and dependent on habitat type and accessibility of food resources. However, the bottlenose dolphins found in the Gulf of Mexico are at risk for habitat degradation due to oil and gas exploration and extraction. Provided that about 21% of natural gasses and 30% of oils are produced within the United States derives from the Gulf of Mexico. As a result of this, the potential risk of oil and gas are extremely high. Oil spills are exceedingly harmful to marine life. The aquatic food web is ruled

by low trophic levels, which play an important role in suggesting that potential bottom-up impacts in the ecosystem are influential.

Bottlenose dolphins are typically thought to be expedient feeders. They are very versatile to prey on different species, depending on the availableness of resources. In particular when foraging dolphins seek habitats that are most abundant. Their diet consists of fish, shrimp, squid, small sharks, and other vertebrates. Notably, coastal dolphins consume fishes and bottom-dwelling vertebrates, while offshore dolphins dietary preference are fishes and squids. Group sizes and foraging methods varies during feeding events. One way dolphins scavenge is through large groups, in open waters, a group of dolphins often encircles a pile of fishes and herd into a small compact pool. The dolphins then take turns charging to feed. Closer to the ocean shoreline dolphins roll on their sides with one pectoral fin up trapping the fishes in the mud bank and slightly opening their mouths to capture its prey. Another technique they use is called “whacking” in which the dolphin strikes the fish with its fluke launching it in the air and seizing it for nourishment. Since dolphins aren’t able to chew their foods, the mastication of their meal is processed in their forestomach.

Hence its digestive system is made up of three-chambered parts; forestomach, main stomach, and pyloric stomach. The forestomach acts as the storage unit, it is responsible for keeping the consumed food in place until ready for complete digestion. While the main stomach operates as the “powerhouse of the cells” the breaking of enzymes and hydrochloric acid gets released to complete the digestive process. Lastly, the pyloric stomach retains all of the digested food until passed down to the small intestine for absorption and cellular metabolism. There are small openings between the three-chambered stomachs which makes it difficult for foreign objects to pass-through when consumed. If the material cannot be absorbed for nutrients it then travels to the large intestine and out the rectum.

Furthermore, just like any other living mammal oxygen is an important source for the functioning of cells and survival. Unlike fishes, dolphins often have to rise to the surface to breathe, but when submerged into the water they hold they’re breaths. Bottlenose dolphins breathe through a blowhole. The blowhole is essentially the nostril of a dolphin and whale and is located at the top of their head. It’s protected by a muscular flap that provides a watertight seal. They have two nasal cavities that increase the efficiency of gas exchange, more importantly, this allows more surface area for the lungs to acquire rapid gas exchange. The pleurae of dolphins are dense and flexible, their respiratory organs consist of myoelastic fibers for greater elasticity. Tiny bronchioles are present along with sphincters that bring to an end the alveoli from the rest of the lung. For the purpose of thermoregulation, a marine mammal such as dolphins must maintain constant body temperature. In order to retain and or loss heat, the dolphins have several strategies to do so. To start with, the decrease in their surface area helps allow them to conserve heat. Another way is increasing insulation since dolphins lack fur their body fat is

made out of blubber. Blubber differs from fat in that it not only contains fat cells but a fibrous network of connective tissues as well. In fact, the bottlenose has a higher metabolic rate which means that they're able to sustain their body temperature while in colder water temperatures. Thus, the arteries in the flippers, flukes, and the dorsal fin are enclosed with veins. As a result, the energy from the blood that passes through the veins is transmitted to the venous blood rather than the environment. For the purpose of the counter exchange, dolphins are supported by conserving its body temperature.

Cetaceans excretory system is one of the many complex component units of the bottlenose dolphin. Even though the bottlenose are known to be aquatic mammals but in fact, they have acquired skills that allow them to transition from terrestrial to aquatic environments. Because of this, the bottlenose requires a way of adapting to an environment with higher salinity. Since they lack specialized glands to excrete salt, the kidneys of a dolphin contain lobules that are divided into numerous reniculi. The reniculi aids with filtration of excess salt in daily dietary consumption. As for the salt that is enabled to be absorbed during digestion flows to the bladder and then out as either urine or feces. Being that dolphins lose water with their feces because of their hyperosmotic environment this leads to a higher concentration of salt in their urine (Cozzi 2016).

The skeleton of the dolphin is intricately tailored to its marine lifestyle. Considering that dolphins do not require strong limbs for support, their bones tend to be weaker because of buoyancy in the water. Their backbone is flexible which allows locomotion in various directions. The pectoral fins are flattened and used for steering. While on the other hand, the dorsal fin and tail flukes are composed of fibrous fatty material, this grants them balance and impulse respectively. Because they're constantly swimming the flukes tail are extremely powerful and support its weight. That is to say, the composition of the ribs and the spine is rather flexible to allow the ribs to disintegrate when it dives. The skull is of the bottlenose is considered to be "telescoped". Telescoping refers to the posterior displacement of the upper and lower jaws. It can be done by the compressing the front and the back of the skull leaving all parts overlapping each other. For that reason, the skull is tilted upward in line with the axial skeleton. The brain of a dolphin is relatively larger to its body mass, moreover, the lungs are compacted by short and wide trachea. Its trachea is supported by cartilage rings and bronchioles.

In contrast, like humans, the bottlenose has well-developed sensory organs and rely on their senses for survival. Dolphins have excellent vision in and out of the water. It is said that dolphins have the ability to see objects from far at least 12 to 18 feet in the air and about 9 feet underwater. They have vastly developed tapetum lacidum, a light-reflecting layer that emits lights through the retina permitting an enhanced vision through photoreceptors (Schwab et al. 2002). A dolphin's retina consists of rod and cone cells, which allows them to have a clear vision in dim and bright light. Rod cells are photoreceptors that can regulate in dim light yet cone

cells are responsible for vision in brighter light. It is known that dolphins are primarily monocular, however, they possess the capability of being binocular (Dawson 1980). Behavioral research suggests that bottlenose can detect taste. The skin of the bottlenose is sensitive to vibration tactile. Areas, particularly around the orbital sack, blowhole, genital area, and more, have sensory nerves. Echolocation is used amongst many marine animals, one reason why dolphins use this technique is for navigation. Additionally, dolphins use echolocation for foraging, sight, and communication. Considering the amount of research on their hearing range reveals that dolphins have an acute sense of hearing. Generally, it has been measured that their hearing ranges within 150-160 Hz. In comparison to human beings, their auditory perceptions are extremely advanced. In fact, they can hear sharper sounds from a variety of scales. But even though the bottlenose has such complex components that create a well-developed sensory system it lacks the ability to smell. This is absent due to the fact that their brain lacks olfactory bulbs and or an olfactory system.

One remarkable characteristics mammals have is the ability to give birth and nurture their young. The bottlenose dolphins have a 12 month gestation period, throughout this time the mother invests a vast amount of energy into caring and raising her young. They can breed throughout the year however breeding season is affected by its demographic region. Since their young's lack independency and depend on maternal care this allows their calves to learn various survival skills exhibited by their mother. On average, the bottlenose calves spend about 3-6 years under maternal care before weaning off. On average, the female dolphin sexually matures at 5-13 years of age and for the males, they sexually mature from the ages 5-12. In like manner, copulation occurs between male and female. Interestingly, they have different approaches to mating behavior; individually or in alliances. When a male seeks for a female to mate with her searches for a female that is in estrus (Jenkins 2009). During this act, the male will separate the female from her home territory and prevent other males from having access to her. The bottlenose dolphin typically copulates in a belly to belly method facing the same direction. While courting, the male will position himself by arching his back, clapping his jaw and begin to penetrate the female. Copulation generally lasts around 10 seconds after penetration. Formerly, the female reproductive anatomy consists of the genital slit that contains a vaginal orifice cranially and anal the anus caudally. The vagina has thick walls composed of circular and longitudinal muscles. In addition, the uterus has two main uteri called the cornua. Both cornua contain a uterine gland and connective tissue when expecting the uterus thickens and the muscular tissue provides peristalic contraction during birth to assist with delivery. In regards to the male reproductive organs, it originates from the rear pelvic region. The male genital is protected by the prepuce until erection. Hence, it is composed of 3 fibrous layers with testes located in the abdominal cavity just right behind the kidneys (Hovinen et al. 1998).

Just like other animals, the bottlenose dolphin must find ways of protecting themselves from attacks and predators. The main mechanism dolphins use to protect themselves from predation

is detecting echolocation and driving in large pods. Since travelling in larger pods has many benefits, mainly fleeing predators away the chances of an attack to occur are very slim. But if faced with a possible attack the bottlenose will shake their body with speed and strike aggressively.

To summarize, the bottlenose dolphin is quite an interesting species with extraordinary factors that differentiate them from the rest. From having the abilities to transition from terrestrial to aquatic environments, different breathing methods, and stunning long term memory are just a few attributes that make them different.