Structural adaptations of marine animals and how it increases survival of species.

Aim: To investigate the structural adaptations of marine animals and how it increases survival of species

Method:

1. Visit to the Aquarium (6th of July)
2. Photos were taken using an iPhone 7 plus.
3. Photos were edited with 'Apple Photos' app by enhancing definition and sharpness, and alterations to exposure, brilliance, highlights, shadows, contrast, brightness and black point settings.

Theory (scientific explanation):

Oceans, covering over 70% of the Earth, are a vast, dynamic expanse of water that houses diversity. From the sunlit surface waters teeming with plankton and fish to the mysterious, depths of the abyssal zones, oceans support a myriad of life forms. The variety of habitats range from mangroves to coral reefs, to the open ocean and many more. Each different habitat plays a vital role in maintaining the health of our planet, influencing weather patterns, carbon cycling and providing livelihoods for millions of people. The delicate balance of ocean ecosystems is essential for the survival of numerous species and the health of our environment.

Scientists believe that up to 91% of marine organisms have not yet been identified. Most identified species have developed physical features that enable them to survive in their environments, known as structural adaptations. Different marine animal species are able to adapt to certain habitat conditions, including water movements, temperature, food availability, and water salinity. Structural adaptations can range from one singular feature on an organism's body, the whole organisms' structure in general, or both.

For example, the bodies of many fast-moving marine animals, such as sharks or dolphins, are streamlined, a form which has little resistance to water. This means that the animals are able to travel faster due to decreased water friction. A singular structural adaptation would be the *ampullae of lorenzini* on a shark's nose. These small pores enable sharks to detect movement in the water by sensing the electric fields set off by other organisms. This allow the shark to catch prey even when it is in an environment of low visibility, hence, increasing survival of species.

In penguins, apart from having streamlined bodies and flippers that allow them to glide through the water, they also have special under-eye glands. Referred to as '*supraorbital glands*', these glands help the penguin's body rid extra salt. The secretion of salt and fluids are collected on beaks, then shaken off. These effective glands allow a penguin to ingest salt water, thus removing chances of dehydration. Furthermore, penguin feathers have two components: one down layer which consists of fluffy feathers that trap an insulating layer of heat close to the body, and one waterproof layer, consisting of stiff feather tips that overlap each other like a lattice, acting as a waterproof barrier. The outside of penguin feathers is also coated by a naturally secreted oil, further adding to its waterproof properties.

Despite being commonly confused for their close relatives, weedy seadragons are NOT seahorses. Their main differences are in their tails; seadragons cannot grasp with their tails, while seahorses utilise their tails to hold onto seagrass for support. Weedy seadragons have the ability to camouflage, being able to match their environment almost perfectly. Furthermore, weedy seadragons have leaf-like projections from their body, making them able to blend into their natural environment in seagrass plantains, protecting them from predators.

Moray eels are most known for their eerily still appearance, however, possess many adaptations. Their jaws, capable of severe damage, have a variation of teeth shapes and sizes for multiple prey types, such as shellfish. Furthermore, moray eels have a second pair of jaws; the '*pharyngeal jaw*' which is located in the back of their throats. The pharyngeal jaw, equipped with curved, sharp teeth, are able to shoot out to capture prey, the nature of these teeth allowing the eel to firmly grasp its prey, aiding in swallowing as the jaw retracts back into the throat. Additionally, moray eels are scaleless and have thick skin. The skin is covered by thick layers of protective mucus, which is produced at high rates, and contains toxins such as hemagglutinin (a naturally occurring glycoprotein that cause red blood cells to agglutinate), warding off predators and parasites.

Well known to everyone, the famous clownfish has a structural adaptation that enables its survival. Similar to the Moray eel, clownfish have a layer of mucus covering their bodies, protecting them from the stinging tentacles of the anemone. This allows them to form a symbiotic mutualistic relationship with the anemone, where both are benefited.

Furthermore, even the simplest organisms have adaptive structures. Jellyfish, apart from having the well-known venomous tentacles that help trap prey and ward off predators, have radially symmetrical bodies. Radiating from a central axis, the radially symmetrical bodies of jellyfish allow them to detect food and danger in every direction, benefiting their survival.
All these adaptations allow increased survival.

Bibliography:

- The Electric sense of sharks and rays (published 01/08/1971) The Electric Sense of Sharks and Rays | Journal of Experimental Biology | The Company of Biologists (Accessed 22/06/2024)
- The Leafy Seadragon, *Phycodurus eques*, a Flagship Species with Low But Structured Genetic Variability (published 01/03/2017) Leafy Seadragon, Phycodurus eques, a Flagship Species with Low But Structured Genetic Variability | Journal of Heredity | Oxford Academic (oup.com) (Accessed 22/06/2024)
- Insights into the Genomics of Clownfish Adaptive Radiation: Genetic Basis of the Mutualism with Sea Anemones (published 04/03/2019) Insights into the Genomics of Clownfish Adaptive Radiation: Genetic Basis of the Mutualism with Sea Anemones | Genome Biology and Evolution | Oxford Academic (oup.com) (Accessed 22/06/204)
- Functional morphology of the pharyngeal jaw apparatus in moray eels (published 14/01/2008) Journal of Morphology | Animal Morphology Journal | Wiley Online Library (Accessed 22/06/2024)
- Salt and Water Metabolism of the Adélie Penguin (published 01/01/1968) Salt and Water Metabolism of the Adélie Penguin - Douglas - 1968 - Antarctic Research Series - Wiley Online Library (Accessed 22/06/2024)
- SALT GLANDS (published 01/1959) SALT GLANDS on JSTOR (Accessed 22/06/2024)
- Adaptations of the Lovable Little Penguin (published 2015) Little Penguin - Adaptations of Australian Animals (weebly.com) (Accessed 18/06/2024)
- The Fairy Penguin *(Eudyptula minor)* (published 2015) Fairy Penguin - Adaptations (weebly.com) (Accessed 18/06/2024)
- What are jellyfish made of? (updated 16/06/2024) What are jellyfish made of? (noaa.gov) (Accessed 18/06/2024)
- Ocean habitats (updated 01/12/2016) Ocean Habitats - Oceans, Coasts & Seashores (U.S. National Park Service) (nps.gov) (Accessed 19/06/2024)
- Understanding the Moray Eel: Myths and Facts Unveiled (published 20/04/2024) Understanding the Moray Eel: Myths and Facts Unveiled (abyss.com.au) (Accessed 20/06/2024)

Structural adaptations of marine animals and how it increases survival of species.

Acknowledgements:

- I would like to thank my friends and siblings for accompanying me on the trip to the aquarium and providing me support with my investigation.
- I would like to thank my teacher and parents for helping me whenever I had struggles and providing me with support and encouragement with my investigation.