Abstract

This experiment was done over a three hour class period and included the dissection of the external and internal anatomy of a Dogfish Shark. Dissection of organisms helps to find reasons for how body parts/organs are able to do certain things and function. Spiny dogfish are ideal for dissection experiments because of their size and abundance. There was no real hypothesis for this lab; we did this dissection to further our understanding of the dogfish’s anatomy and to make the class more entertaining. Our class was broken up into four groups. In each of the groups, there were three smaller groups, each responsible for a different part of the experiment (dissector, teacher, and note taker). We used a dissecting pan/plastic layered with newspaper, dissecting tools (scalpel, scissors, probes, and forceps), gloves and safety glasses. This paper focuses on the analysis of our group dissection to better understand the anatomy of the Dogfish Shark. To do this, strict guidelines from a class lab copy better instructed us on each step of what to do (ex. The body is divided into the head, trunk, and tail. Label each of these sections). Although there are a few times in this experiment, when asking our TA to help us, my group did an excellent job in figuring most of it out ourselves. The results gathered were consistent and precise to the lab copy.

Introduction

The Spiny Dogfish has earned its popularity due to the large numbers and consequent ease of capture in the sea, convenient storage, and representative anatomy. Estimates of the dogfish’s life span range from 25-100 years. Its body size (three to four feet) is small and cartilaginous compared to most sharks. The first known fossil records discovered for the spiny dogfish dates back to the Devonian period, approximately 400 to 450 million years ago. The records identify the class of fish by distinct characteristics different from other fishes; jaws and
paired fins, a cartilaginous skeleton, lateral gills, dermal placoid scales, pectoral fins, and the shape/arrangement of teeth. This lead scientist to categorize it as Phylum: Chordata, Class: Chondrichthyes, Family: Squaliforms and Species: Squalus acanthias. Spiny dogfish can be found in the western Atlantic from Argentina up to Greenland, and spanning the eastern Atlantic from Iceland to northern Russia down to South Africa, including the Black and Mediterranean Seas. In the Pacific, spiny dogfish inhabit all reaches of the waters from the Bering Sea, down to New Zealand as the southwestern extent, and to Chile as the southeastern extent (pic on page 6 shows map). They generally travel in large schools, but occasionally can find loner. Dogfish feed on small pelagic fish (herring, smelt and sandlance). They typically swallow their food whole or bite it into relatively large pieces. Its U-shaped stomach has a very strong acids and enzymes to dissolve most of what is eaten. The stomach produces an easily absorbed, soupy mush. Only this liquid mush enters the intestines because the pyloric valve (the valve between the stomach and the intestines) is small. Indigestible things, (like very large bones and non-nutritive items) are vomited. Spiny dogfish have white dots lining either side of them. They do have a single spike at the front of their two dorsal fins. The dogfish shark has no anal fins (fin on the belly by the tail), while all other sharks do. Its body shape can be described as streamlined or fusiform, enabling it to glide through the water. Small tooth like scales called placoid scales or dermal denticles run down the body of the shark. This helps to create the streamlined appearance and hydrodynamic advantage for the shark by funneling water through the grooves of the scales. The shark benefits from these scales by reducing drag and improving swimming efficiency. The scales mimic a sandpaper texture, which rough contact against a dogfish can cause small minor wounds. Male dogfish have claspers, which are elongated pelvic fin edges. Claspers are used in reproduction. Female dogfish have a cloaca, one opening that
serves digestive and reproductive functions. During the dissection my group found the sex of our dogfish to be a female (because of the cloaca). Just like all fish, the dogfish shark also has gills (used to filter oxygen). There are 5-7 pairs of gills located on the side of body (by head). The shark’s gills help out by taking up absorbed oxygen from the water. The dogfish has a two-chambered heart, with an atrium and ventricles. The S-shaped tube (heart) is located in the head region of its body. The shark heart pumps the blood through the afferent branchial arteries (ventral aorta) to the capillaries in the gills (where blood oxygenates). The blood then leaves the gills through the efferent branchial arteries (dorsal aorta) and then through the body tissues. Once the tissue receives the oxygenated blood, it sends it back to the heart veins.

Materials and Methods

In order to do this dissection, it required the group to pick one person willing to dissect the shark. The dissection of the dogfish performed as followed: The shark was turned on its back facing upwards so that it was lying on the dorsal fins. Our group dissector made an incision with a scalpel (dissection kit/tools were provided by class) spanning from one pectoral fin to the other and then using the scissors to cut a straight line from the middle of the incision down to the pelvic fins. Further incisions were made along the pelvic fins, creating two flaps of skin which were pulled back and pinned down. Due to the opening that was created from our incision and cutting the proper viewing for what was being asked to find was clear. The regions located on the right, left, and median livers were visible, as well as the gall bladder, stomach, pyloris, pancreas, spleen, and intestines. A little more digging around and playing with the shark allowed us to also view the rectal gland and the ovaries, the rectal gland (found in the pelvic area past the intestines and spleen), and the testicles (found near the median liver). Our last incision was made near the pectoral fins, where the skin was carefully cut off to revealing the circulatory organs. The heart
was the last organ that the group viewed from our dogfish. We located all of the hearts ventricles, atrium, conus arterious, and branchial arteries. To better understand the methods from this lab, a figure of the dogfish dissection can be viewed on page 9.

**Results**

The overall result taken from this dissection lab was a better understanding of a Dogfish Shark anatomy. It provided a live glimpse inside of a shark’s body and allowed visual/hands on experience to better understand the different Organs and how they function. By the end of the dissection, the digestive and circulatory systems of the shark had been explored, as well as the outer anatomy.

**Discussion**

The Dogfish Shark is an extremely adapted and evolved predator of the sea. This is due to their efficiency as swimmers, which is in turn due to their body shape. However, they do not have swim bladders to help them maintain any sort of buoyancy. Instead the dogfish has three livers; two of these livers (the right and left) are enormous relation to the size of the shark. These livers function as the swim bladder by secreting a special chemical which is very low density, providing more buoyancy. They also possess placoid scales or dermal denticles, which provide a large hydrodynamic capability. These denticles are tooth-shaped, and cover the entire shark. They increase hydrodynamics by reducing drag. The heart of the dogfish resembles a small tube-like organ that inhibits the blood flow. The Dogfish has a valvular intestine (like small intestines of a human). Inside the valvular intestines is the spiral valve, which increases surface area of digestive properties. Since the dogfish usually swallows its food whole the valvular intestine helps aid the flow of soupy mush that the stomach produces.
Conclusion

The spiny dogfish is an ideal species to dissect for research because of its size and abundance. It clearly and accurately represents the anatomy of sharks in an ideal size. The abundance of the spiny dogfish also suggests that research purposes on this shark will not produce a major flux for the number of species.
Work Cited


Pictures


http://www.flmnh.ufl.edu/natsci/ichthyology/gallery/Descript/SpinyDogfish/SpinyDogfish.html
Dogfish world distribution map

Dogfish dissection:
Organs of a Dogfish
Moody Gardens Field Trip

The field trip to Moody Gardens on Monday April 1, was extremely exciting and a wonderful experience. Not only did we get to visit the aquarium, but we also got to see the rainforest. While in the rainforest I viewed several Macaw parrots (hyacinth, military, blue and gold, and scarlet). After leaving the rainforest we were left to view and roam freely around the aquarium and experienced a bull seal. I enjoyed viewing all the fish exhibits and seeing them in their natural habitat. I got to talk to an animal keeper and get information on summer internships and info on all the different animals they take care of and learned interesting facts about each one of them. Overall the experience obtained from this field trip was educational and enjoyable. It was my first time at Moody Gardens and I feel I came out of this trip with information that will help me better myself as a marine biologist.