

AQUAVET® I

AAFV REPORT

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The AQUAVET[®] I program took place from May 26 to June 22, 2019 in Bristol, Rhode Island. The intense 4-week program was an introduction to aquatic animal medicine and hosted twenty-two veterinary students and two veterinarians. Student interests ranged from aquatic animal research, clinical medicine, aquaculture, conservation, marine animal rehabilitation, aquarium medicine and management. Despite individual interests, all participants shared one commonality; shaping the future of aquatic animal medicine.



Fig 1; AQUAVET Class of 2019 with Dr. Cindy Driscoll

The program originated in 1977 and was modeled after Anderson's School of Natural History founded by Louis Agassiz. The school immersed their students in learning by providing hands-on application and a "parade of stars" lecturing technique. The AQUAVET® program continued to uphold this tradition by utilizing collecting trips, specimen necropsies, and numerous aquarium visits and tours. The most impressive instruction technique was the "parade of stars". The instructors traveled from all over the USA and consisted of the most renown, influential and recognized doctors within the field of aquatic animal medicine. These instructors paved their way into the aquatic field and often times created their own position by solidifying their need within the field of veterinary medicine. These remarkable individuals are responsible for the positive direction the field is currently headed, and for the afforded opportunities that my generation benefits from today. The aquatic medicine topics covered in the program included; invertebrates, crustaceans, fish, aquaculture, aquarium medicine, and marine mammal.

The invertebrate section of the course covered a wide range of phyla. We learned the anatomy of this diverse phylum, diseases that affect them and methods in which we can treat or prevent disease. One of the most important phyla today include Mollusca. Encompassed within this group are the classes of Bivalvia, Cephalopoda, Gastropoda, and Polyplacopoda. Bivalvia is a markedly important class that is used extensively in aquaculture today. Dermo disease and toxic algae blooms remain significant causes of illness that affect commercial stocks in aquaculture. Dermo is spread by snails and prefers temperatures above 18 degrees Celsius in addition to high salinity. (Smolowitz) Toxic algae blooms can also affect these filter feeders and it is important to incorporate a dry off period for these animals to clear the toxins before human consumption. Cephalopods are used widely in research. They are commonly used to study the nervous system due to their "giant nerve axon". This particular species are also used to study the unique chromatophore and iridophores which allow them the ability to camouflage instantaneously. Cephalopods are often used as intermediate hosts for parasites that cause disease in other marine mammals. In addition to Mollusca, the phylum Anthropoda has commercial aquaculture importance. Limulus polyphemus, the horseshoe crab, are caught wild and bled for their serine based clotting cascade, which is used in hospitals worldwide in endotoxin testing. Lobsters, crabs and shrimp also belong to this phylum and are a part of an immense commercial fishery near New England as well as worldwide. Billions of dollars have been lost in shrimp production due to OIE listed viral diseases. White Spot Disease (WSD) is one of the most notable diseases today and is continuing to wreak havoc with the shrimp industry. (Dhar) We are still actively trying to learn more about this virus focusing on transmission, affected species and preventative strategies.



Fig 2: Collecting blood from a crab

Corals were also discussed within the AQUAVET [®] I program. Corals serve as an important ecosystem for a variety of species. They are home to 25% of all marine life, including 1/3 of all marine species. (Berzins) In addition, they serve as a storm barrier and widely used in human medicine. Unfortunately, the coral reefs are declining due to human impact, global warming and disease. Some diseases include, black band, red band, white band, aspergillosis, white plaque and white patch disease. Dark spot disease and bleaching are also major disease concerns. Diagnosing and treating corals is vital for the preservation of this exceedingly important ecosystem. Diagnosis can be achieved through culture, imaging, histology and impression smears. Some treatments utilized are debridement, sealing and antibiotics or antiparasitic when feasible. There is such a significant decline in coral reefs that reef restoration initiatives are underway all over the world. This area will be of extreme concern and effort to our generation of aquatic veterinarians and marine biologists.



Fig 3; Coral fragging exercise hosted by Joe Yaiullo, Atlantis Marine World

There are over 35,000 identified species of fish. Therefore, rightfully so, the bulk of the course was focused on fish. Fish farming or aquaculture will be vital as our world loses resources and our population continues to expand at an exponential rate. Veterinarians will be one of the most important assets to fish farmers and the aquaculture industry to ensure that successful, safe, and sustainable fish farming practices are utilized.

The AQUAVET [®] I program educated participants on fish taxonomy, anatomy and physiology in detail. This was an imperative area of focus in order to perform several necropsies in addition to practicing common diagnostic procedures that included; venipuncture, gill and fin biopsies, skin scrapes and gross pathology. The course also focused on a wide range of bacterial, fungal, viral and parasitic diseases. We practiced how to prevent, diagnose and treat each type of disease while following veterinary feed

directives and mandatory legal withdrawal guidelines. It is in this capacity that aquatic veterinarians will assist fish farmers to increase yield and profit margins. Today, most of the fish farmer's capital is spent on fish food and treating disease. Disease is most often the main cause of farming collapse and bankruptcy. Veterinarians can assist in advisement on biosecurity plans, water quality treatment, and monitoring plans. With this support, farmers can take part in critical diagnosis and prompt disease treatment before it affects their entire farm.



Fig 4: Gill histology slide on low power

Aquarium medicine and the pet fish industry also are important areas of consideration within aquatic animal medicine. Animal exhibits and in an aquarium educate the public about these unique aquatic creatures, along with the significance for the protection and conservation of their environment. These vital experiences afford us opportunities to inspire invaluable future generations into becoming aquatic animal veterinarians or marine biologists. Therefore, it is imperative that these exhibits are functional and safe for the species that they host. Water quality, disease control and quarantine procedures are all aspects that the veterinarian must assist with. Similarly, aquariums are also found in people's homes. Pet fish also deserve our medical attention and the same principles of water quality, husbandry, quarantine and disease control apply.



Fig 5; Saltwater reef exhibit at the New London Aquarium

Aquatic birds and marine mammals summed up the program. This particular area of study was set in motion with avian necropsies, and tours to the New London aquarium where we conducted physical exams on penguins and seals and culminating with phocid and cetacean necropsies. Other aquariums visited included the New England Aquarium and Mystic Aquarium. The tours incorporated back-stage facilities, husbandry, and training behaviors. We had the opportunity to tour the hospital facilities and food preparation sites. During the penguin physical exam, we learned how to examine the birds and the common diseases to be aware of like; aspergillosis, West Nile Virus, Malaria, EEE and Bumblefoot. (Stremme)



Fig 6; PE on a penguin at the New London Aquarium (LEFT) and Beluga training session at Mystic Aquarium (RIGHT).

The final exercise of the course was to perform a splenectomy, gonadectomy and enucleation on a striped bass. This exercise taught us the proper procedure to anesthetize, provide analgesia, perform surgery and euthanize a fish. In addition, we were afforded the opportunity to practice our surgical skills and demonstrate our proficiency in anatomy and suture.



Fig 7; Closing the coelomic cavity (LEFT) and performing a enucleation (RIGHT)

THE FUTURE OF AQUATIC MEDICINE

The AQUAVET [®] I course provided students with a solid foundation on which they will begin to build their careers in aquatic animal medicine. Students departed this program with not only the knowledge needed to begin their journey, but the introduction to noteworthy contacts within the field and friendships with peers who they will work with to shape the future of aquatic animal medicine. The pioneers that cleared the way and created programs like AQUAVET[®], AAFV, IAAAM and WAVMA allowed the new generation to build on their prior success and make new discoveries in medicine, treatment, disease prevention, rehabilitation and conservation. The AQUAVET[®] class of 2019 left the course determined to make a difference and continue to expand research, clinical medicine, rehabilitation, conservation, aquaria and aquaculture.

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