FISH STORY—THE LIFE OF AN AQUACULTURE VETERINARIAN

CARING FOR AN ORPHANED CARIBOU CALF

CANNABIS AND VETERINARY MEDICINE

OPHTHALMIC EXAMINATION OF THE ADULT PATIENT

WHAT IS COOPERATIVE VETERINARY CARE?

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If the question is what is BC’s number one agricultural export, the answer might surprise you. It’s salmon. Given that, it is no surprise that aquaculture, the production of aquatic or marine organisms, continues to grow at an exponential rate in order to meet global seafood demands.
In BC, the primary fish species being cultured is Atlantic salmon (Salmo salar). Aquaculture employs thousands of people in BC, many of whom live in small coastal communities on Vancouver Island and the Central Coast. Fish production occurs in sea cages as well as land-based facilities that are primarily used for early rearing. As in all livestock production, animal health and welfare are key components to a successful and sustainable aquaculture industry and provide an important role for veterinarians to play.

The lifecycle of a typical farmed Atlantic salmon is two-and-a-half to three years from egg to plate. This includes one year in fresh water and one-and-a-half to two years in salt water. Broodstock, or those fish used to produce eggs for the next generation of fish, live one more year at sea before they are spawned. The first year of life is spent in a hatchery, where eggs are fertilized, incubated, and hatched. The newly hatched fish, called alevin or sac-fry, develop into parr. While hatcheries allow producers the ability to regulate rearing and water quality parameters, particularly in recirculating aquaculture systems, little can be done to control or regulate environmental factors and water quality at sea. However, various tools and technology have helped fish producers mitigate the potentially devastating impacts of poor environmental conditions; air diffusers and oxygenation systems have helped manage challenges such as low dissolved oxygen levels or harmful plankton blooms that may occur at certain times of the year.

Farmed salmon are incredibly efficient live-stock, with feed conversion rates close to 1:1 (1 kg of fish is produced with a little over 1 kg of feed). Salmon are fed specialized pelleted diets at different sizes and life stages; in addition to marine fish oil and protein, feeds are being developed to incorporate an increasingly higher proportion of land-based ingredients, including plant-based products as well as by-products of other livestock industries such as feather meal. Salmon feed also includes the carotenoids astaxanthin and canthaxanthin which, in addition to adding nutritional value to the feed, also give salmon flesh its distinctive colour.

As an aquaculture veterinarian working in the BC salmon industry, I am responsible for the health and well-being of millions of farmed fish. From egg to harvest, I also have the responsibility to minimize any risk to wild fish populations and the ecosystem as a whole. My job includes on-site fish health visits as well as analyzing fish health and production data. I need to apply the principles of biosecurity, preventative health management, production data analysis, and client relationships to promote the health and welfare of our patients. I ensure our customers receive a healthy, nutritious, and safe product, and help drive continual improvement in all aspects of production and processing.

The Association of Aquaculture Veterinarians of BC (AAVBC) includes around twenty veterinarians involved in the BC aquaculture industry, including both the private and public sectors. This association meets and corresponds to discuss current fish health and veterinary issues, and responds to questions, comments, and concerns from the industry, regulators, and the public. Larger aquaculture companies in BC employ veterinarians to manage the health of their fish on a full-time basis, while smaller operations hire veterinarians when their services are required. In addition to on-farm veterinarians, there are also many veterinarians who work in ancillary fields, including diagnostics and pathology and research, as well as government and regulatory affairs. Aquaculture veterinarians must possess a broad and extensive knowledge of fish health, both wild and farmed; we must put into action on a regular basis our knowledge and training in clinical medicine, herd health, food safety, virology, bacteriology, parasitology, physiology, pathology, toxicology, pharmacology, epidemiology, and ecosystem health, among others. Within the AAVBC, individual veterinarians have developed specialty interests in one or more of these disciplines.

Part of being an aquaculture veterinarian includes visiting fish farms. In addition to observing the fish themselves, we observe the farm facility, environmental and water quality parameters, fish husbandry practices, and biosecurity measures in place. Many of BC’s farm sites are located around the north and west of Vancouver Island, and the drive up from Campbell River usually takes two to three hours depending on where we’re headed, followed by a boat ride which may be over an hour. A typical site visit day starts around 6 AM, sometimes earlier depending on the boat schedule. We load up our fish health gear at our lab, including equipment for performing post-mortems and collecting samples, as well as anything else needed for current research and development (R&D) projects. Many of our visits are done solo, but it’s also common to be accompanied by one of our fish health technicians. At a minimum during a site visit, we’ll perform post-mortem examinations on fresh mortalities which are pumped up daily from all pens; we will collect diagnostic samples depending on what we observe on the post-mortem exam, including bacteriology, PCR tests for specific pathogens, and histology. We also routinely catch fish with a seine net and anesthetize some to check for sea lice numbers and gill health status. During sea lice counts, we also have the opportunity to collect non-lethal samples including blood for CBC and biochemical, gill swabs for PCR testing, as well as gill clips and skin scrapes for microscopic examination. As part of the Aquaculture Conditions of License, each farm has to conduct a minimum number of sea lice counts per month, depending on the time of year. Depending on company policy, and to improve our ability to monitor and manage sea lice, many producers exceed this minimum requirement, counting sea lice biweekly or even weekly year-round. If the established threshold (farm average of three motile sea lice per fish) is exceeded during certain times of the year, we have to take actions to reduce this number. Sea lice are certainly a hot topic, both in BC and around the world. In truth, sea lice rarely pose a significant health concern for our fish. The thresholds established are precautionary, and largely in place for the protection of out-migrating juvenile salmon to ensure sea lice do not impact their survivability. The out-migration period is from March 1 to June 30 of any given year, and if sea lice numbers reach the established threshold during this time, a plan must be communicated to the Department of Fisheries and Ocean, and action must be taken to decrease the sea lice load. If fish are large enough in size, the action may be to harvest them. If they are not, several treatment options are currently available to us which we use as part of our integrative pest-management (IPM) strategy. The longest used treatment in BC has been emamectin benzoate (SLICE 25), an in-feed product with residual activity for six to eight weeks post-treatment. BC is one of the last places in the world where emamectin benzoate can be used as an effective treatment for motile sea lice, as resistance has developed in other areas from inappropriate use or the lack of effective IPM.

In BC, a concerted effort has been made to limit the use of antibiotics, and sea lice treatment programs are vigorously monitored. If resistance develops, the industry will be able to respond quickly and effectively.

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development of resistance to this product with the use of alternative treatments, the most common of which are hydrogen peroxide baths; others include freshwater baths, as well as new mechanical removal technology such as the Hydrolicer, which uses high pressure jets to remove sea lice. Bath treatments are generally performed with a wellboat (a vessel with a well for storage and transport of live fish), but can also be performed in a tarpaulin; fish are pumped onto the boat or into the tarpaulin, treated for a set period of time, then returned to their pen. Bioassays are routinely performed on sea lice pre- and post-treatment to assess the level of sensitivity to different treatments.

Wild salmon, which are often covered in sea lice upon their return from the open ocean, are a blessing in disguise for sea lice management. Although on-farm sea lice numbers tend to spike when wild salmon return, passing sea lice to our farmed salmon, this also introduces to the population naïve sea lice which have never undergone any treatment, therefore propagating their genetics and helping keep the sea lice on our farms sensitive to the treatments we use.

Fish health and production data, which can be analysed to identify patterns or clues as to what the source of a given challenge may be. Another challenge we face is communicating the science and facts of our industry. There is a great deal of public interest in the aquaculture and fisheries sciences, particularly in the interactions between wild and farmed salmon. We have a responsibility to be transparent about our operations, and we take that very seriously.

The aquaculture industry is constantly advancing and evolving. Improved farming technology, such as remote feeding systems, underwater cameras, and mortality removal systems have helped us better manage the health, welfare, and productivity of our fish. The reality is that there is an increasing demand for healthy and nutritious sources of food. The BC salmon industry and the veterinarians who care for the fish we grow are a vital part of ensuring that people of BC and the world are able to eat healthy nutritious food to nourish our bodies.

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For the most part, antibiotic use on BC fish farms is minimal. The vast majority of treatments are for tenacibaculosis (also known as mouth rot, bacterial stomatitis, or yellow mouth), a disease affecting smolts under 400 grams in size and occurring in the first few months post-salmon entry. There is an active effort to develop a vaccine against this bacterial disease, which has already been successfully developed for some other species of fish in other parts of the world. Other diseases and fish health issues sometimes encountered include Progressive Gill Damage and Amoebic Gill Disease, as well as some bacterial diseases such as Winter Ulcers (caused by the bacteria Mortrella viscosa), Bacterial Kidney Disease (BKD), Salmonid Rickettsial Septicemia, and Furunculosis. Most of these diseases occur sporadically in a few fish here and there. In cases when there is a more serious fish health concern at the population level, fish may be treated if deemed appropriate, or may be harvested out or culled depending on the life stage and extent of disease. Broodstock are screened for BKD, as well as a number of other pathogens including notifiable viral pathogens such as Infectious Hematopoietic Necrosis, Infectious Salmon Anemia (never identified in BC) and Viral Hemorrhagic Septicemia. The eggs of any broodstock which tests positive are discarded to limit any chance of vertical transmission of pathogens.

R&D is another important component of what aquaculture veterinarians do. Although R&D is an important part of all veterinary medicine, the overall lack of information and understanding regarding fish health when compared to other livestock species makes it all the more important in our line of work. We often collaborate with various researchers and academic institutions to improve our understanding of fish health and welfare, health management strategies and technologies including vaccine development, and environmental impacts, as well as other relevant areas.

As in any area of veterinary medicine, being an aquaculture veterinarian comes with its challenges. There are always new or changing fish health issues which we have to address and deal with. It’s important for us to stay current and engage in new R&D to try to better understand these issues. The aquaculture and fish health community is quite tight-knit, and members from BC, Canada, and around the world often correspond and collaborate; often the problem you’re facing has been encountered by someone elsewhere. The aquaculture industry does an excellent job of capturing the science and facts of our industry.