COLORADO AQUACULTURE ASSOCIATION

THE FISH LINE

Web site: www.colaqua.org

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THE COST OF DISEASE OUTBREAKS IN AQUACULTURE

by Carolyn Gunn, Aquatic Veterinarian, Colorado Parks and Wildlife

Disease problems constitute the largest single cause of economic losses in aquaculture. Losses incurred by fish farmers are related to disease, floods, oxygen depletions, interruption of the water source, predation, chemical poisoning, theft, and other miscellaneous causes, but disease is by far the most significant factor. Sometimes aquaculturists don't put pen to paper to actually track monetary losses related to disease outbreaks unless the losses are catastrophic, but disease issues can significantly erode profits.

In an aquaculture production model, there are resources (considered inputs) which are used to produce the final product, including "fixed" costs such as infrastructure and other overhead. There are "variable" costs, such as feed, purchase of eggs/fish, labor, and disease outbreaks. These costs contribute to the value of the final product (called the output.) Aquaculturists strive to maximize returns by decreasing the cost of variables.

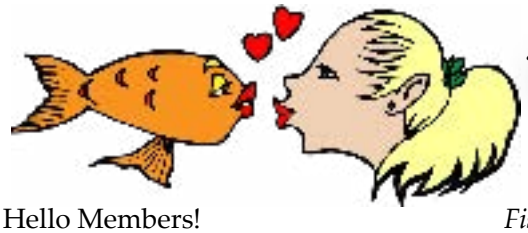
Of all the variable inputs, disease outbreaks are the least predictable and can result in many added costs. These costs include increased labor (picking mortalities, applying treatments, changing management techniques), cost of examination by fish health personnel, laboratory charges, cost of medication, cost of lost product, and decreased feed conversion and growth in fish that have suffered a disease outbreak.

The easiest way to deal with disease is to prevent it in the first place. By decreasing stress due to crowding, poor water quality and inadequate nutrition, many potential disease processes can be avoided. Ensuring adequate biosecurity at a facility and prevention of introduction of pathogens from outside sources is very important. A number of management techniques can be used to help prevent disease outbreaks, including thinning of fish, salting, withholding feed, and use of vaccination programs where feasible. Prompt reduction of stressful conditions may lead to self-cures without the need to resort to use of treatment drugs.

If a facility does experience a disease outbreak, the manager must weigh the benefit to cost ratio of having a fish health expert examine the fish versus trying to manage the outbreak alone. Without an early and accurate diagnosis of the cause of a disease outbreak, chances increase of wasteful "shotgun" treatments (trying every drug you have on hand without knowing what the primary problem is), costly retreatments, and ongoing mortalities. An exam by a fish health professional increases the chances for an early and accurate diagnosis and effective treatment.

In addition to loss of product, there are many "hidden costs" related to disease outbreaks in an aquaculture setting. These include decreased growth and feed efficiency; fish that have a lowered resistance to subsequent disease outbreaks; supply shortfalls for clients; fish with frayed fins, skeletal abnormalities, or other external lesions; customers noting decreased fish quality or ability to thrive; and an increased price of remaining fish so the grower can recoup losses. Additionally, most economic loss estimates fail to include the cost of labor, interest, lost production time, expenses of disinfecting, and costs of restocking.

In summary, by using Best Management Practices, especially preventing stress, and by ensuring good water quality and nutrition, disease outbreaks can be prevented from occurring, which will result in a higher quality product and reduced costs.



President's Corner

Hello Members!

If you were unable to join us for our annual meeting in January, this *Fishline* issue is targeted towards you. I received great feedback regarding the 2014 meeting and felt that it was one of the best we have had in the last few years. I want to thank the board members for all of their hard work with preparation and the presenters for taking time out of their busy schedule; also a BIG thank you to Skretting for sponsoring the happy hour again this year.

Our annual meeting began with presentations from Colorado Parks and Wildlife clarifying the changes to the hierarchy within their organization, proposed changes to regulations, status of the Hofer/Harrison egg program, and a panel Q&A on the new fish health inspection program. Concerns from the membership were expressed and acknowledged. We also heard from Dr. Paula Schaffer on the development of the new animal diagnostic lab at CSU, Hugh Mitchell with AquaTactics on fish health, Dr. Carolyn Gunn regarding the cost of diseases in aquaculture, Elizabeth Brown on aquatic nuisance species updates, and many others. During the association board meeting, we discussed next year's annual meeting and the future of the *Fishline*. Elections were also held for board term expirations. Keep reading to find out more!

In February, our industry was represented at the 2014 World Aquaculture meeting held in Seattle. Dr. Sara Ahola, who has taken over as the Aquaculture Program Manager for Scott Leach at the Colorado Department of Agriculture, was brought up to speed and shown around by Ken Cline and Jeremy Liley. Also, I attended the 23rd annual Colorado Governor's Ag Forum Conference in Denver. This conference was focused on Farm to Table: Consumer Preferences. It was a great opportunity to hear about the significant shift in the preferences of consumers, statistics on how Coloradoans perceive "locally grown," and the opportunities arising across seas. I attended a breakout session on the weather outlook for 2014 hoping to gain some insight to this upcoming year. However, the big story is that no one really has any idea of what this year's weather will bring... What I did find out is that we are in a great place for snowpack across more than 90% of the state and we are approaching our wettest spring month: March. I hope the weather gods are on our side

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In This Issue ...

THE FISHLINE is published by the CAA. Contact Erin Stewart, Aqua Sierra, Inc., with your submissions for the next issue of The Fishline at erinstewart1@aqua-sierra.com or 303-697-5486.

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FISH HEALTH 101: A REFRESHER

by Dr. Hugh Mitchell, Fish Health Manager, AquaTactics Fish Health

(*From presentation made to Colorado Aquaculture Association, January 24, 2014*)

Fish culture health can be divided into 5 key areas, each of which should be examined whenever there is a disease problem that needs to be solved or prevented. Elements within can be both specific and general for the diseases of concern. As per many other things on a fish farm, the key to success is the old adage: "doing the common things uncommonly well" and this should be kept in mind as each area is discussed later in the context of *integrated fish health management.*

First, a reminder of what integrated fish health management is and isn't. It IS NOT simply: "Have a disease, find a treatment." The mentality should be that medicating or treating a disease is a band aid and it means that something has gone wrong – that you and your crew most likely could have controlled. This is both a settling and unsettling sentiment as it means that you and your crew are largely responsible for disease in your fish (at least that should be the mindset for your business and you should refrain from "blaming the bug"). Studies in agriculture have shown, that given the same systems across livestock facilities, the most significant difference to herd health and productivity are the people and the level of "stockmanship" in those people. Integrated health management realizes that the pathogen (disease-associated organism) doesn't equal the disease. There is rarely one simple solution ("silver bullet") in curing or preventing a disease. Furthermore: pathogens are common, disease is rare. This is because, from an ecologic viewpoint, production of disease or death rarely favors perpetuation of the pathogen; thus *natural selection favors less pathogenic organisms. This can be a tough concept to grasp, but if the pathogen's interest was ever-increasing death and destruction, we wouldn't be here! When an organism first enters a population, there is a marked disease spike, then an -increasing balance sets up, with regular disease spikes progressing to rare and sporadic (this latter most balanced and common set-up between the fish and the pathogen.) Changing conditions can change this balance (which is more frequent in a fish culture facility), but the take home message is the same:* ***too often we concentrate on trying to get rid of the pathogen instead of the factors that lead to disease****. In MOST cases, if husbandry and environmental conditions are good, fish will be refractory to disease even if the pathogen is present in low numbers in the water or in the group of fish themselves (remember again: infection does not equal disease). In many cases, the cost and effort of trying to keep out the pathogen is greater than that of trying to deal with the factors that bring on disease.*

These factors can be divided into five areas of disease management: 1) Good genetics and a genetic improvement program, 2) Vaccination, 3) Risk factor minimization, 4) Infectious pressure reduction, and 5) Vigilant surveillance and early treatment. The factors can be thought of as a dam that you are setting up to prevent disease from wreaking havoc on your operation. The higher the dam, the lower the risk that a disease will impact your operation BUT the higher you build the dam, the higher the cost to your operation. The key is to find the proper height between risk and productivity. This can be dynamic, and although many elements are general across several diseases, they can be very specific (e.g.: too much egg-jostling or too little flow in incubation can predispose fry later on to "coldwater disease"). Each of these factors is a "brick in the dam," and you can make them as thick as you can for any particular disease, but there has to be a net return to your productivity, especially long term (e.g.: extremely low densities may be a good preventer of "columnaris" but you won't have enough fish to sell to pay the bills). Sometimes you cannot include one of the "bricks" and need to concentrate on the remainders (e.g.: many diseases do not have a cost-effective vaccine available).

Again, in trying to deal with or prevent a particular disease, carefully examine and determine what you can do in each area (i.e.: each "brick"). It is often useful to get an outside consultant perspective in order to avoid the "being too close" phenomena and ensuring that you have all that is known and unknown issues for that disease. Each area below could be a whole article itself, but briefly:

Genetics – this is more long term, but essential. Traditional agriculture has shown that marked improvement over the past half century in productivity and disease prevention through improved genetic stocks. It is a "no brainer" except that resistance to specific diseases is tricky as it is often linked to something undesirable (eg: slower growth). Nevertheless, every facility has programs in place to either continually select for better stock, or test stock from various sources. This can be expensive, but the pay-offs are enormous.

Vaccination is older than the "germ," or at least our knowledge of the existence of them. There is also no question that vaccines have revolutionized society and animal agriculture. If possible, vaccinate for a particular disease. Calculate what a vaccine has to save in order to pay for itself and that will give you an idea of value. If there is an ongoing disease, realize that vaccination may not be the "silver bullet" (as previously discussed), but still might function to reduce the disease or risk to a

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cost-effective level. Remember that there can be several reasons than the obvious for vaccination, including: *protecting against shedding pathogens or raising the threshold of a pathogen load required for infection (see below). Unfortunately, this may be a "missing brick" in the dam as there may not be a specific vaccine that is cost-effectively available for a disease. However, one thing we are learning is that there can be non-specific cross-protection among diseases so, in fish, a vaccination against one disease may actually shore up the immune system to other diseases!*

Risk Factor Minimization –

Disease prevention and control in a fish culture facility (or any agri-business) is an "odds game." Getting disease or preventing it is not an absolute thing, it is predisposed by a set of risk factors. The whole "game" is to do what you can cost-effectively to minimize those factors that are known to contribute to the likelihood of a disease happening. Non-specifically "density" is a prime example of a risk factor to disease. You may carry high densities – pushing the water quality that your facility is able to consistently maintain – and you may get away with this for a while. That is fine, but realize that if you get hit by a disease you may have been "asking for it". Pushing the envelope isn't a wrong approach from a business stand point (depending on your business goals and risk aversion). Just be aware of what you are doing, and if you get a disease that is density related ("columnaris" is an example), then you may have to take drastic density-reducing measures that will cut into your bottom-line. The author has consulted with many facilities where this has happened ("Why do I have disease when I haven't changed anything in three years …"). In retrospect, it often is a "forehead-slapping moment" for everyone on the farm ("We knew that our water quality parameters were fluctuating in and out of optimum"). Some disease-precipitating risk factors are: water chemistry; oxygen saturation; swimming speed; container shape, size and material; temperature; fish strain/species; handling; etc. Again, optimizing all of these can be done but there is a cost. Figuring out the risk aversion of the farm owner and how much should be put into each area for disease risk reduction is very specific to each facility and situation. Sometimes there is no choice and a compromise has to be made (e.g.: water availability and densities or fish numbers). In the end, the prime goal is to minimize the over-used term: "stress." What the real objective is, is minimizing the activation of hypothalamopituitary interennnal axis and the release of catecholamines and cortisol. All this really means is that "stress" of suboptimal husbandry can be tolerated once in a while, but too frequent, or continual, and this "activation" which is intended to allow the fish to cope short term, will actually turn the fish's immune system "way down" and make the odds game in favor of a pathogen causing disease. Interestingly, we are just starting to discover fish health compounds to help in this. Aqui-S 20E, for example, which is available through an Investigational New Animal Drug exemption, can actually reduce this "activation" in the wake of stress (e.g.: handling, transport, grading, etc.) and may turn out to be an extremely important risk reduction tool.

Infectious pressure reduction –

Biosecurity is often thought of as steps and measures to keep a pathogen out of a facility or an area. This can be very tough to do (as has been experienced in terrestrial animal husbandry.) What the focus should be (along with minimization of risk factors), especially for pathogens that are always around (eg: "columnaris"; "pychrophilus"; "fungus") is to keep numbers of pathogens below the "minimum infective dose." The elegant paper by Rose et al 1989. J. of Fish Diseases (12:573) very nicely illustrates this concept with *Aeromonas salmonicida, the agent associated (not causal – as per the above discussion!) with furunculosis. For a particular strain of A. salmonicida they showed that it takes greater than 10,000 "pathogens" (actually: "CFU's", an index of pathogen number) and 1 to 3 days to infect Atlantic salmon in laboratory experiments. Any less bacteria or time and infections didn't result. If they put in 100 "pathogens," they could achieve infection if held for 3 weeks (not 1 week). So, this tells us that even if pathogens are present, risk of infection can be reduced if we strive to keep the pathogen numbers down. How do we do this? With good water flow and tanks that self-clean; good disinfection between batches; in-line disinfection with UV, ozone, and/or chemicals (e.g.: H_{2O2})*, etc. In this same vein, the study looked at how many pathogens sick and dead fish were shedding into the water. They found that 105 to 108 pathogens (CFU's) were shed by sick and dead fish an hour - virtual petri plates of bacteria in your tank, pond or raceway! Get them out with automatic removal systems or at least frequent dipping in the morning and through the day.

Vigilant surveillance and early treatment –

And returning back to the theme of "doing the common things uncommonly well." The importance of continually testing and monitoring the fish cannot be overstated. Contrary to the notion of not treating "prophylactically," EARLY treating (I like to call: "anticipatory") is much more effective (and could be argued fosters LESS antibiotic resistance) than waiting for a raging disease with mortality. Look for disease and get on it quickly before it has a chance to really "ignite" in a group of fish or facility. Traditional agriculture does this through both

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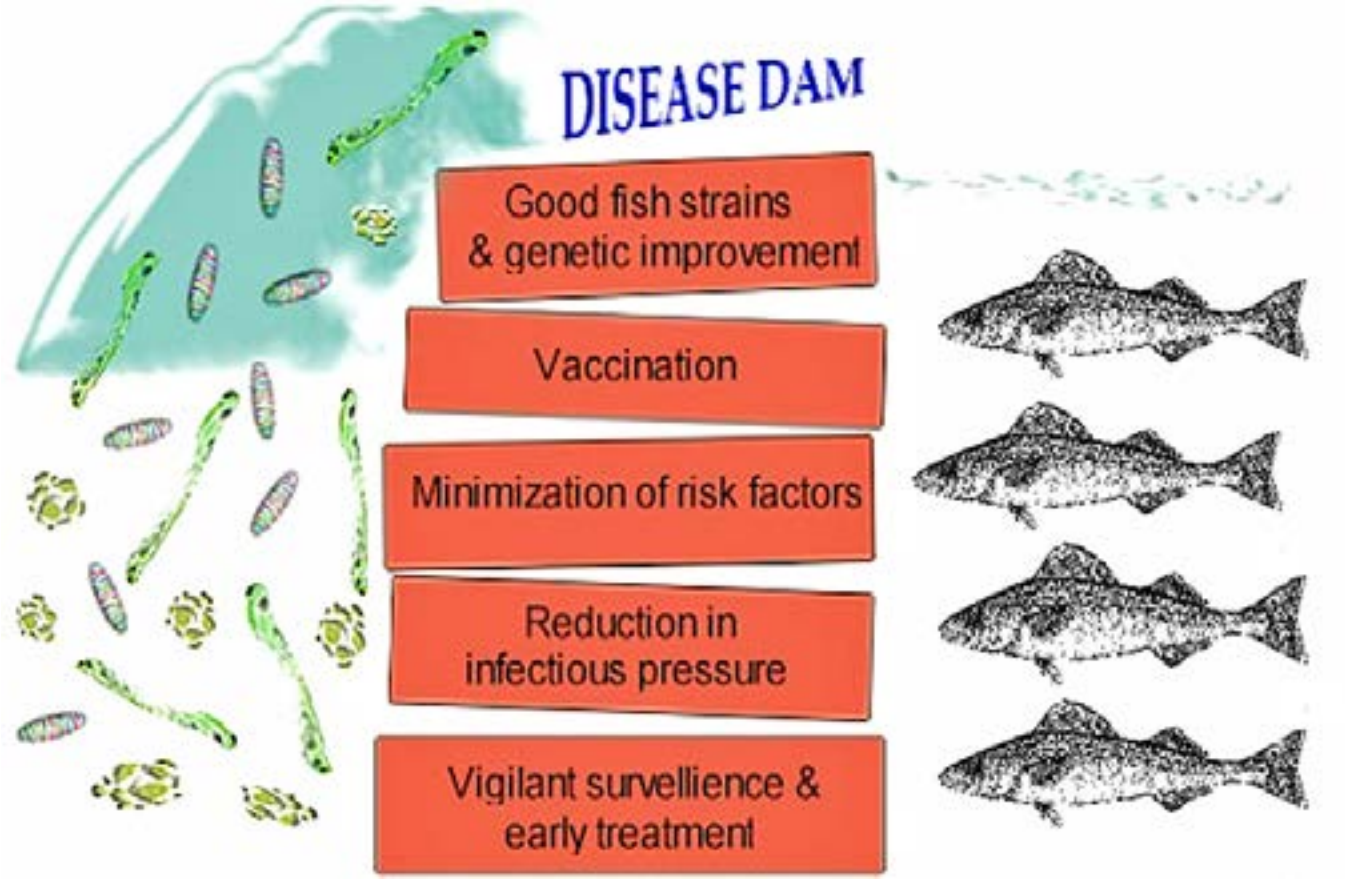
clinical and production parameter recording systems. Based on subsets of productivity measurements, swine farmers, for example can actually have a good idea of what is affecting their herd even before getting any clinical results! Fish farming will eventually get there!

Through integrating the five basic areas of fish health and building a disease dam with each area seen as a brick in the dam, you can solve a current disease problem or minimize the odds of a production disruption to your business in the future. Remember, although many of the elements can be applied across all diseases, each particular disease has its own particular set of known and unknown factors which will require dam "bricks" of different heights (if they exist at all for that particular disease). AquaTactics (as the name implies) is here to help you build this dam for your facility with an expanding level of services and products, so check us out at www.aquatactics.com.



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and we get the precipitation needed to make this year successful for all of Colorado's farmers!

While at the Ag Forum Conference, I was disappointed to meet several other ag industry members that did not even realize that aquaculture was present in the state of Colorado. This reminds me again of the importance of attending these types of meetings and strengthening our force as an industry to be recognized for our contribution. If anyone is interested in learning more, let me know. It would be great to have a larger attendance to these types of functions. As I have repeatedly said, we are all vested in the promotion and success of our industry and should use the CAA or any other possible platform to ensure that accurate representation is attained.

I wish you all a very successful 2014 as spring quickly approaches and we gear up for our busy season.

Kendra Holmes, President

AQUAPONICS IN COLORADO

By: JD Sawyer, Colorado Aquaponics

JD Sawyer from Colorado Aquaponics provided an overview on aquaponics and the important elements involved in raising fish and plants in recirculating systems. Colorado Aquaponics operates a 3,200 sf aquaponics farm called Flourish Farms at a non-profit urban farm called the GrowHaus which operates as a food hub in the middle of a food desert community in NE Denver. The farm produces about 20,000 pounds of produce annually and 2,000 pounds of fish. The system is a hybrid aquaponics system using a variety of plant growing methods such as media based grow beds, deep water troughs, vertical towers and NFT. They are even growing root vegatables in a wicking bed. Much of the talk

centered around the low daily feed rate ratios required to grow plants compared to some of the early research conducted by Dr. James Rakocy in this field. In other words it doesn't take a whole lot of fish to grow a tremendous amount of food. On average there is about 325 pounds of fish in the system consuming about 4 pounds of feed a day. The farm currently raises koi, tilapia and hybrid striped bass. The primary customers for the produce are restaurants and markets within 5 miles of the farm. Regular products include bibb lettuce, kale, romaine and swiss chard. However, the farm also produces a variety of niche products such as microgreens, strawberries, cherry tomatoes and even has fruit trees.

Colorado Aquaponics and the GrowHaus offer free tours every Friday and Saturday at starting at 10 a.m. Colorado Aquaponics also has a wide variety of training courses in aquaponics and related fields. Please visit their website at www.coloradoaquaponics.com for more information.

PROPOSED CHANGES TO CHAPTER 12 - COLORADO PARKS & WILDLIFE

By: Greg Gerlich

Colorado Parks and Wildlife (CPW) Chapter 12 regulations cover Private Lake and Commercial Lake Licenses. The Aquatic Section raised the issue within CPW about whether or not these licenses are still necessary. Region staff felt that the Commercial Lake licenses are still relevant and thus those will stay in place at this time. However, Private Lake Licenses were originally set up to cover the fact that statutorily a license is required to hunt or fish in Colorado. Therefore, a landowner in possession of said license can allow people to fish on their private property without them possessing a fishing license. Further, the Private Lake Licenses was a good mechanism to convey to the landowners information regarding which species of fish to stock and issues with regards to fish disease. The latter functions have largely been passed to the private aquaculturists in terms of responsibilities through CPW regulations updates over the years. CPW is still discussing the merits of Private Lake Licenses internally and will update the CAA if any changes eventually move forward to modify or eliminate the existing regulations in Chapter 12.

Hofer/Harrison Egg Availability and Status of Program

The CPW Aquatic Section still has this program in place. If any private aquaculturists are interested in participating they should contact Jeff Lee at 303-291-7564 or jeff.lee@state.co.us.

These eggs are typically available a couple of times a year depending on CPW meeting in-state needs first as well as any out-of-state or federal hatchery egg trades. To date, a couple of private aquaculture facilities have obtained these eggs.

AQUACULTURE DIAGNOSTICS AT COLORADO STATE UNIVERSITY'S VETERINARY DIAGNOSTIC LABORATORY

By: Paula Schaffer, BS, DVM, MS, DACVP

The health of cultured fish is very important to keeping fish stocks fit and productive. Fisheries can screen for problematic fish diseases to ensure health and productivity. Diagnostics are also important during disease outbreaks, when rapid and accurate responses are necessary.

The CSU Veterinary Diagnostic Laboratory is organizing a new diagnostics section to serve aquatic veterinary medicine and meet the growing needs of Colorado's aquaculture industry. We are staffed with a friendly and knowledgeable team comprised of veterinarians, pathologists, microbiologists and highly skilled technical staff. The lab is equipped for the diagnosis of important infectious diseases, including Renibacterium salmoninarum (bacterial kidney disease), Aeromonas salmonicida (furunculosis), Yersinia ruckeri (enteric red mouth), Flexibacter spp, Myxobolus cerebralis (Whirling disease), and much more. Our histopathology resources allow for the characterization and description of disease in fish tissues that can further our understanding of disease etiologies and pathogenesis.

For more information on available tests or to submit a sample to the Aquatic Diagnostics section, visit our webpage or please contact the laboratory.

http://csu-cvmbs.colostate.edu/vdl/Pages/default.aspx

Colorado State University
Veterinary Diagnostic Laboratory
1644 Campus Delivery
Fort Collins, CO 80523-1644
Phone: (970) 297-1281
dlab@colostate.edu

CSU VDL Aquatic Diagnostics	Common name	Type of test
Bacteriology		
Renibacterium salmoninarum	Bacterial kidney disease	IFA
Aeromonas salmonicida	Furunculosis	Aerobic culture
Yersinia ruckeri	Red mouth	Aerobic culture
Parasitology		
Myxobolus cerebralis	Whirling Disease	Tissue digestion
Pathology		
Myxobolus cerebralis	Whirling Disease	Histopathology
Infectious diseases	Bacterial, viral, fungal, parasitic diseases	
Neoplasia	Cancer	
Toxicosis	Toxins	
Nutritional disease	Dietary concerns	

ANNUAL STOCKING REPORTS & PRIVATE HEALTH INSPECTIONS

By: Vicki Milano, Senior Fish Pathologist,

Colorado Parks and Wildlife Aquatic Animal Health Laboratory

Annual Stocking Reports

Vicki Milano, Senior Fish Pathologist with the Colorado Parks and Wildlife Aquatic Animal Health Laboratory (AAHL), discussed concerns by the Colorado Aquaculture Association (CAA) with the revised Annual Stocking Report Form required by the Colorado Department of Agriculture (CDA) and Colorado Parks and Wildlife (CPW). According to CPW state regulations, any state importer of aquatic animals, or aquaculture permit holder, must submit an Annual Stocking Report Form before they can receive their respective permits. In the past, there were numerous inconsistencies in data reported on the old form, making it difficult, if not impossible, to utilize that information by CPW biologists. In addition, the form was being submitted in many different formats, from hand written paper copies to computer generated databases. To alleviate these issues, and be current with new technology consistent with the livestock industry, a new format was designed by personnel from CDA and CPW. This format included a personalized, drop down menu for each permit holder. The format

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COLORADO'S NEWEST AQUATIC INVADER - DAPHNIA LUMHOLTZI (WATERFLEA)

By: Elizabeth Brown, Colorado Parks and Wildlife

Colorado Parks and Wildlife (CPW) confirmed the identification of a *Daphnia lumholtzi* in Chatfield, Douglas, John Martin, Navajo, and Pueblo Reservoirs, and Pueblo Hatchery during the 2013 field season. *Daphnia lumholtzi* is a prohibited invasive species in both Wildlife Fish Health Regulations and Parks Aquatic Nuisance Species (ANS) Regulations. This is the first detection of this species in Colorado. There are two other waterfleas prohibited in Colorado - *Bythotrephes longimanus* (spiny waterflea) and *Ceropagis pengoi* (fishhook waterflea). The fishhook and spiny waterfleas are not known to be in Colorado.

Collectively, waterfleas are zooplankton aquatic crustaceans that have a jumpy or jerky mode of swimming. They are invasive to North America and spread by the movement of water, recreational watercraft and equipment. *Daphnia* are native to Africa, Asia and Australia. There are historic documentation of introductions through contaminants in the aquarium trade and fish stocking. The spiny and fishhook waterfleas were introduced into the Great Lakes from ships' ballast water coming from Eurasia, similar to zebra and quagga mussels.

Invasive waterfleas out-compete native *Daphnia* and juvenile fish for food, causing a decline in growth rate and survival rate of juvenile fish species, and affecting the larger fish species' food supply. They reproduce rapidly, and have a lack of predators because the spines stick in the throat, making them unpalatable. Once waterfleas are established, they are impossible to eradicate, as there are no viable control methods. Educating the public to clean gear, not move water or animals, and following state watercraft inspection and decontamination procedures are the best methods to contain current infestations and prevent further spread to new waters.

Daphnia lumholtzi has a unique body shape and is distinguished from other zooplankton by its long tail, about the length of its body. The head is mostly a single large black eye and they have swimming antennae that propel them through the water, allowing travel between shallow and deeper waters. Waterfleas can range up to 3 mm in length, depending on the sex and age. The non-native *Daphnia lumnholtzi* also can deploy an elongated helmet, elongated tail and additional abdominal spines in the presence of predator hormones. When the helmet and long tail is not present, the invasive *lumholtzi* look like the native *Daphnia.* However, native *Daphnia* species do not have these defensive characteristics.

Water fleas also have a swimming antenna that propels it through the water column, allowing travel between shallow and deeper waters, which it uses to its advantage, retreating to the depths (10-20m) to avoid predation during the day, and emerging to the surface (0-10m) at night when food is abundant and the water is warmer.

Water fleas are found mostly in freshwater lakes, in temperatures between 39◦-86◦F (4◦-30◦C) and can tolerate brackish water from .04 to 8.0% salinity. They are most abundant in summer and fall, and can reproduce both asexually or sexually depending on environmental conditions. A new life cycle can produce a generation in less than two weeks. Water fleas are also unique in that if the female dies out of water, its eggs resist drying and freezing. A single egg can produce a new infestation, lying dormant for a long period of time and can easily be transported in: ballast and bilge water, bait buckets, live wells, fishing lines, anchors and nets, making these species highly invasive. Resting eggs may also pass, unharmed, through the digestive tracts of fish.

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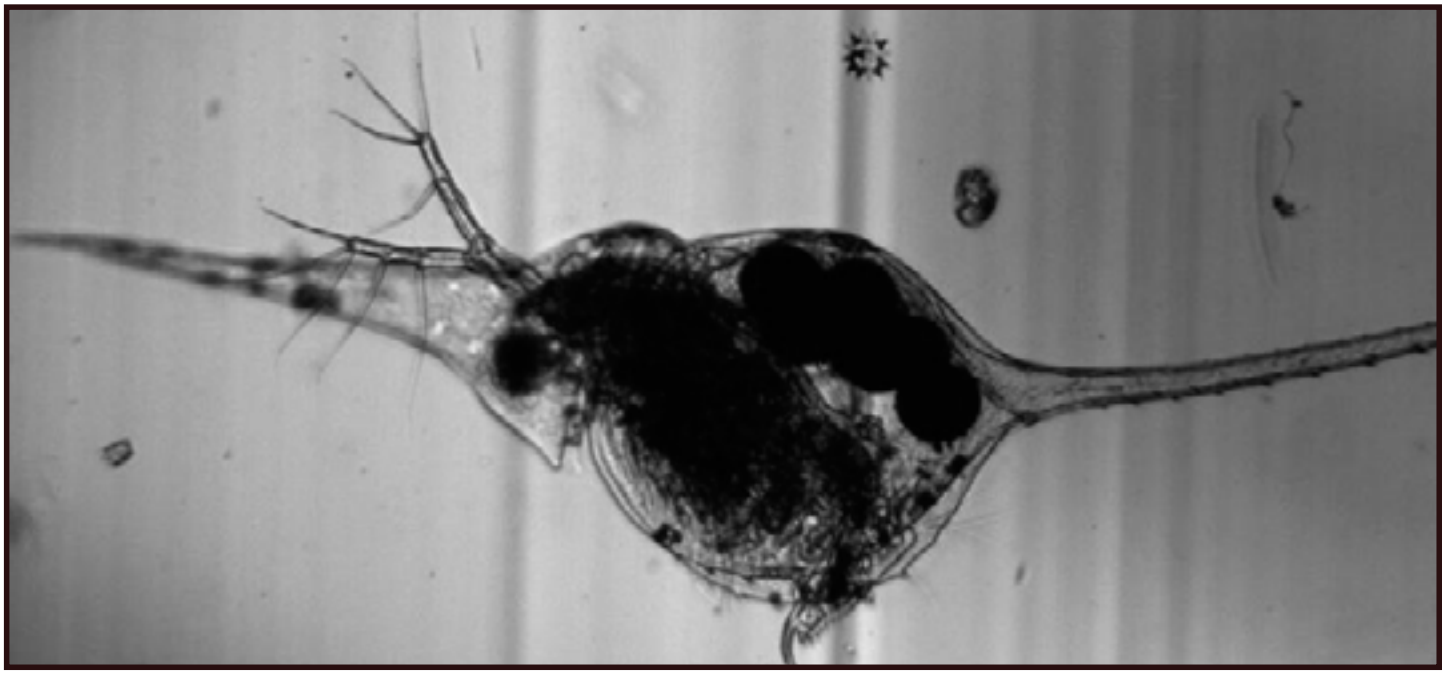
Preventing the spread of invasive water fleas is the best strategy; here is what you can do:

- **CLEAN** all plants, animals and mud from your fishing gear, boat, trailer, and equipment before leaving the water. Clean your boat, tackle, downriggers, trailer, waders, etc. with hot water (above 120◦F) when you get home
- **DRAIN** live wells, ballast and bilge water before you leave the water body
- **DRY** boats and equipment completely before launching in other waters
- **DISPOSE** of unused bait in the trash, not in the water

CPW will continue to sample for waterfleas next year and will update CAA members as new information becomes available. For more information, to ask questions or to report an invasive species, please call the State Invasive Species Program at 303-291-7295 or visit http://cpw.state.co.us/



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would ensure client confidentiality and provide consistent data. Concerns from the CAA included client confidentiality, the difficulty of reporting GPS coordinates, and the unwillingness of their clients to provide said information. There was discussion about continuing the requirement of this form if the data received was not in a useable format. Discontinuance of the form would require a regulatory change. CPW and CDA will take this under advisement with future discussions to take place.

Private Fish Health Inspections

Vicki also covered the privatization of fish health inspections, why it came about, and how the process will work. CPW was directed by the State Attorney General's office to discontinue providing fish health inspections to the private sector because it was considered a diversion of state funds. This means sportsman's dollars cannot fund an activity that doesn't benefit the general public. Vicki empathizes with the hardship this might cause for the private sector, but the CPW's "hands are tied." The CPW's involvement will be at the front and back end of the process. They will provide training to the Qualified Sample Collectors (QSC), including an annual refresher course, and issue fish health inspection reports once laboratory results are received. The private aquaculturist is responsible for contacting a QSC, scheduling an inspection, picking a recognized laboratory from a list provided to them, and paying the QSC and laboratory fees. Responsibilities of the QSC include coordinating schedules with the laboratory, collecting and shipping of samples according to CPW regulation, and providing a copy of the hatchery collection report and inventory to CPW. The recognized laboratory is required to adhere to standardized protocol in accordance with the AFS Fish Health Section Blue Book and CPW's fish health regulations. Upon completion of the assays, the laboratory will submit the results to the CPW.

Dr. Carolyn Gunn recently passed the American Fisheries Society/ Fish Health Section examination to become an AFS Certified Fish Pathologist. She will join the small list of 29 AFS Certified Fish Pathologists in the US.

AFS/FHS offers two categories for certification: Certified Fish Pathologists and Certified Aquatic Animal Health Inspectors. AFS describes a fish pathologist as "an individual in the fish health field who utilizes various disciplines including fisheries biology, water quality, microbiology, parasitology, toxicology, pharmacology, and histopathology to provide an accurate evaluation and diagnosis of fish health problems." Dr. Gunn, in addition to meeting the requirements and taking the exam, had to supplement her DVM course work with a course in Limnology – not required for a DVM but required by AFS/FHS for certification. Certification must be renewed every five years. For more information go to http://www.afs-fhs.org/certification.php. Congratulations Carolyn!

Dr. Harold Hagen Passes Dr. Harold Hagen quietly slipped away on January 29, 2014, at Poudre Valley Hospital. Harold was well known for his love of fisheries sciences stretching his career across several decades, states and agencies including, Peace Corps, Fish and Wildlife Services in Alaska, University of Wyoming, University of Washington, as a National Park Service specialist in South Dakota, and then finally settling at Colorado State University.

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"Fish Bits" - Cont. from Page 9

Dr. Hagen loved sharing his fishing and skiing stories with students and participated in both activities well into his 70's. Dr. Hagen will be remembered for his quick sense of humor, his love of life, his love of Mary Catherine, his wife, his family and the outdoors.

The Fish, Wildlife, and Conservation Biology Department and Warner College of Natural Resources are thankful to have had such a dynamic faculty member share his life and career with us at CSU.

Memorial contributions can be made to St. Joseph Indian School, Chamberlain, South Dakota, or Elder Pet Care in care of Bohlender Funeral Chapel at 121 W. Olive St., Fort Collins, CO 80524. Condolences for the family may also be sent to Bohlender Funeral Chapel. (From CSU website.)

Harold and his three older brothers were close friends of the children of Olaus and Margaret Murie while the families lived in Jackson, WY (late 1930's - early 1940's). According to Margaret Murie, the Hagen home, located at the bottom of Kelly's Hill, the Jackson Hole ski hill, was turned into a ski chalet during the winter months. Harold expanded on his Jackson, WY skiing expertise when in 1943, he enlisted in the Army, Company L, 86th Mountain Infantry Regiment, 10th Mountain Division. He served in Colorado and Mount Belvedere, Italy during WWII.

Dr. Hagen was a member of the US Trout Farmers Association (and on the Board at one time) and was responsible for the naming of their newsletter, Salmonid. His business in Ft. Collins was called Hagen Western Fisheries, Inc.

While a professor at CSU, he taught Ichthyology, Management of Fish in Ponds and Reservoirs, World Fishery Resources, and Natural Resource Conservation (to non-majors).

He also taught multiple fish culture and management courses for both warm and cold water fishes as well as a senior field course where students went to Yellowstone and elsewhere and worked with fishery biologists in the field.

Publications by Dr. Hagen

A fishing guide to Jackson Hole
by Harold K Hagen 1954

A history of American fishing
(Rand McNally classroom library)
Harold K Hagen 1967

An ecological and limnological study of the Green River in Dinosaur National Monument
by Harold K. Hagen and Joseph E. Banks

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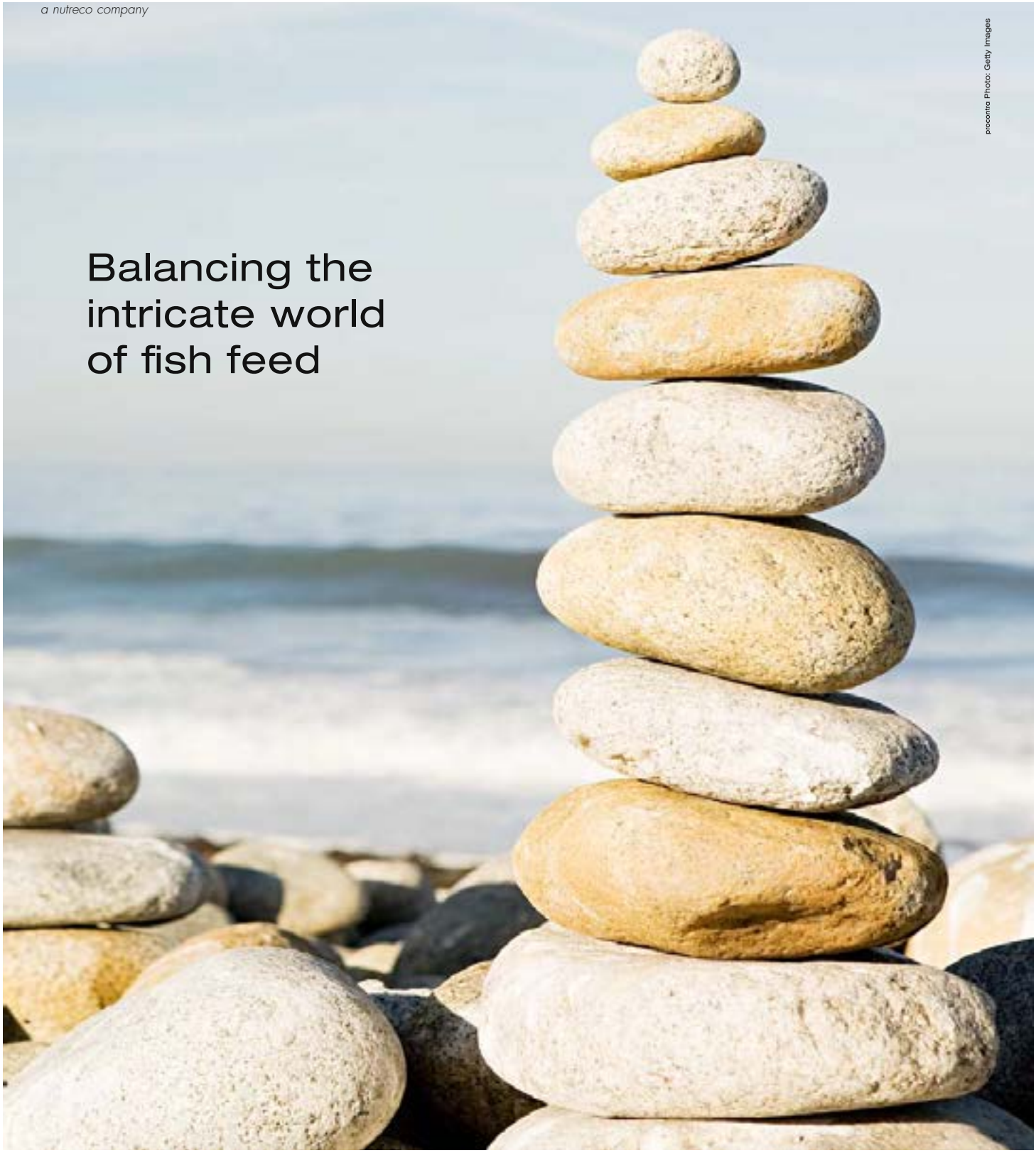

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❑ 7. Aquatic Consultant
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❑ 8. Equipment, Supplies, etc.
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❑ 15. Agencies & Associations