



Aquatic Vet News

World Aquatic Veterinary Medical Association

4th Quarter 2011

Volume 5: Number 4

Name that Tune-a Fish

At the World Veterinary Congress in Cape Town, our intrepid Secretary, **Chris Walster**, managed to photograph some of the native fauna of the Indian Ocean near South Africa [see page 7 for report about the WVC meeting].

The fish below are waiting for YOU to identify them. This is a chance to show your expertise in knowledge of the world of fishes. Send an email to the *Aquatic Vet News* editor, **Nick Saint-Erne** (Saint-Erne@Q.com) with the scientific names of the fish pictured below, and you could win a prize from WAVMA. Winners that correctly identify the fish below will be listed in the next newsletter.

Fish 1



Fish 2



Fish 3



Fish 4



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World Aquatic Veterinary Medical Association

Editor's Note

As usual, and likely experienced by those reading this as well as me while writing this, it is hard to believe that the year 2011 is ending already. Every year it seems like time just goes by faster and faster. I have several ideas as to why this phenomenon occurs. First is that as we get older, we become accustomed to most activities that we perform on a daily basis, and we tend to do them without conscious thought—such as getting out of bed, getting dressed, brushing our teeth, driving to work, leaving at the end of the day, eating a dinner that is similar to what we have eaten for years...etc. It is only when something that is out of the ordinary happens that it becomes memorable, and at the point of it being recognizable as a new experience, it then slows down the internal clock.

Think about children, when every day something new occurs to them that has never happened to them before; a new person in school, a new activity in the classroom, a family vacation to a new city, introducing a new food at dinner, even a visit to a different store with their parents. It is no wonder time goes by slowly for children (ask your kids how long it is before a school vacation begins—to them it will be nearly eternity!). But for us, that time will be here in an instant.

So my solution is to do something new everyday, and think about that experience. Try a new food, eat at a new restaurant, read a new book (especially one from a different author or different genre from which you are accustomed), visit a new place, make a new friend—all of these things will take time and will be more memorable and thus space out events than if you keep doing the same thing every day. Try it!

My second theory is that as you grow older, each day is a smaller percentage of your total life, so time becomes less significant. For example, if you are 8, and it is 4 months until summer vacation, you need to wait for a period that is equivalent to 0.25% of your total life for that event to occur. But if you are 40 and are waiting for that same amount of time, it is only 0.0083% of your life. The older you are, the less significant any one period of time becomes in your life, so it seems shorter.

My solution to long life is to celebrate as many birthdays as you can, and do something different every day!

Nick Saint-Erne, DVM
Aquatic Vet News Editor
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Executive Reports

President's Report

As I look back over this past year, I can feel comfortable and confident that I will pass the gavel on to the new President, Dr. Dusan Palic this January with our organization stronger and more influential than at any other time in the past. I am happy to see that the result of the work of our Executive Board has been to allow WAVMA to become an important voice in the world of companion animal medicine. We are now officially an affiliate member of the World Small Animal Veterinary Association. As such, WAVMA members, though our representative, will be able to influence worldwide policies and positions relating to companion animal medicine and husbandry. If any issues in this area are of interest or concern to you or your practice, please contact me or our representative, Dr. Devon Dublin. In the coming months, we will prepare a list of issues concerning ornamental fish that should and will be presented to the WSAVA at the next conference in March 2012.

Our new website has finally come online this past quarter. I would like to thank secretary Dr. Chris Walster and the rest of the Communications Committee for all their hard work in making it happen. Both the appearance and functionality of the new site is really impressive. I especially like the photo of the handsome model that was used to represent the President on the home page!

Of equal importance to WAVMA members is the finalization of a contract, beginning on Nov. 15, 2011, with the association management company, MatriXamc. As a founding member of WAVMA, I feel content that as we have reached this point in our development, we have a skilled and accessible partner available to help us grow.

Beginning this past July, I have been in active discussion with the principals of MatriXamc about our organization; where we came from, where we are now and where we ultimately want to go. Through these discussions, we have tapered our to-do list to focus first and foremost on showing how an outside management company can help us with both fundraising and membership growth. These areas will be critical to the completion of planned programs requested by our members. As these initiatives are put solidly in place, we will gradually add new projects to the list of managed tasks. It has been my observation over the past few years that our organization, like many other professional organizations, suffers from a reliance on volunteers within the membership to keep the ball rolling for the ultimate benefit of all. I applaud those members who have volunteered of their talents (and will strongly recommend them for the honor of a Fellowship in WAVMA; another new member benefit soon to be inaugurated!). However, I have come to

realize that in life, priorities require each of us to consider family first, our practice next, then somewhere down the list between watching football and playing video games comes volunteering one's time towards helping WAVMA function. And this is no way to run a business! And as any business needs a steady income stream to function and especially to grow, it is through professional management that this can happen, allowing us, as aquatic veterinarians, to do what we do best; promoting the advancement of aquatic veterinary medicine.

Thank you for allowing me to serve you as the WAVMA President for 2011. With my best wishes for a great 2012,

Julius Tepper, DVM

2011 WAVMA President

cypcarpio@aol.com



WAVMA New Members

Members are the life-blood of any professional Association. Please join us in welcoming the following new members:

Full Members:

John Howe (USA)

Julie Boutet (USA)

Stephen Pycroft (Australia)

Greta Van de Sompel (Belgium)

Olanike Adeyemo (Nigeria)

Daniel Corcoran (USA)

Student Members:

Stephanie Norman (USA)

Samuel Hurley (New Zealand)

Secretary's Report

It has been a busy summer and autumn for WAVMA and next year promises to be the same with several member benefits to be finalized next year.

After the success of the IABC in Trondheim (for which plans have already started for a third Biosecurity conference in 2013), the focus of WAVMA's biosecurity efforts moved to the World Veterinary Congress in Cape Town in October. Around 42 people attended the two day event, which provided WAVMA with good publicity in southern Africa and around the world. The latest mention of the meeting was in JAVMA (<http://www.avma.org/onlnews/javma/dec11/111215e.asp>) and the World Veterinary Association also put out a press release during the meeting.

Continuing to actively promote aquatic veterinary medicine, WAVMA will be holding a one day session at Aquaculture America 2012 in Las Vegas (Feb 28 – Mar 3), we are looking to attend the SAVMA Convention in Purdue (Mar 15-17) and the Eastern Fish Health Workshop in Lake Placid (Apr 23-27), and there will be a one day sponsored WAVMA session at AVMA Convention in San Diego (Aug 4-7). Whilst the Board had been looking to hold a multiday conference in Egypt during the autumn of 2012, it has been decided to defer the meeting due to the current political situation there. As such, if anyone has an interest in holding a WAVMA conference in Europe towards the end of next year, please let me know. The Board is keen that there is a European event next year similar to the conference in Greece in 2010.

Looking further ahead, discussions are already taking place for WAVMA to organize sessions at the World Veterinary Congress 2013 to be held in Prague and the World Small Animal Veterinary Association Congress 2013 in Auckland.

WAVMA is now an Affiliate member of the World Small Animal Veterinary Association (www.wsava.org), which brings both benefits and obligations to WAVMA. For those members interested in ornamental or pet species this is exciting news, as it means WAVMA can promote pet fish medicine at the highest level around the world. Devon Dublin was appointed WAVMA's representative (liaison) and I will represent WAVMA at the next WSAVA Congress in Birmingham (UK) next March. Please let either Devon or me know if there are any issues you wish to raise with WSAVA or that WAVMA should promote.

The Board is also actively pursuing membership of the World Veterinary Association (www.worldvet.org) and an application has been submitted, which is expected to be accepted. As with the WSAVA, this will bring obligations and benefits and will be of more interest to our members involved in aquaculture. This is very important, as the FAO sees aquaculture as providing the necessary additional protein to feed a growing world

population. As with terrestrial agriculture this cannot be achieved without veterinary input and WAVMA along with its members will be well placed to provide this.

Last month, after several rounds of negotiation, the Board agreed to retain MatriXamc (www.matrixamc.com) as a management service provider, with the intent to promote membership, member services and sponsorship of WAVMA. Put simply, the job of running WAVMA is getting too big for the time available on a voluntary basis. Indeed, those of you who have been members since the start will recognize that the time from start to finish for WAVMA projects is often prolonged. Whilst the Board has the time to oversee the development of WAVMA, it can often be problematical to arrange meetings with colleagues who are so busy in their professional lives, in order to progress specific projects.

The Board hopes to finalize several member benefits during 2012. These include the WAVMA Fellowship program, Certified Aquatic Veterinary Practitioner (Cert-AqVP) program and webinars through the WebCEPD program. Further details of these programs will be circulated through the member listserv and add even greater value to your membership.

Members are reminded that membership runs from the 1st of January through the 31st December each year and by the time you read this you should have received at least one membership renewal email. Dues payment can be made online through a secure credit card payment system in your member profile or paid through the post to the Treasurer. Those who do not pay their 2012 dues by the 1st April 2012 will be deactivated from the website. This means that although your original details will still be available to you, you will not be able to access the member's only section of the website or receive any benefits. If you have forgotten your log in details or have any problem concerning the website then please email administrators@wavma.org.

Finally, the almost ubiquitous appeal for content to put on the website. As some of you will have noticed, the front page needs updating and the last news item was posted in July. Part of the problem is time, but also the imagination of the administrators. I for one do not like repeating news that has been put out by others unless it refers directly to WAVMA. This clearly limits the news items I can put up on the website, even though people from over 80 countries have visited the site since May. The website is there for members to use and to promote WAVMA, so if you have any items you would like to publicize from yourself—to meetings or interesting observations—then please let me know.

Have a Wonderful Holiday Season—

Chris Walster BVMS MVPH MRCVS

WAVMA Secretary

chris.walster@onlinevets.co.uk

Photo from: <http://angelsatticdesigns.com/images/products/jpg>



WAVMA Committee Reports

Student Committee

Recognizing Student Committee difficulties, the Communication Committee will incorporate Student Committee members into the Communications Committee, to oversee social media (Facebook, LinkedIn, blogs, etc.) and student communications activities.

Meet the Student:

My name is **Sophie Whoriskey**, and I am currently a third year vet student at the Atlantic Veterinary College in Canada. Before starting at AVC, I completed an



honours bachelor degree in Marine Biology at Dalhousie University in Nova Scotia. While at Dalhousie, I had the privilege of working with the Ransom Myers Research lab, the Canadian Sea Turtle Network, and the Atlantic Salmon Federation in areas such as biological modeling, field research, and public outreach and conservation.

After my University graduation, I spent a year and a half working as a research assistant for the Department of Fisheries and Oceans and the Atlantic Halibut Commission. I also spent three months as an intern in the medical center at the New England Aquarium and travelled in South East Asia before starting at AVC.

As a veterinarian I hope to build a career in aquatic animal medicine, one which incorporates research, conservation, and clinical practice. I look forward to meeting and working with fellow WAVMA members!



Sophie Whoriskey measuring an unknown sea creature—or perhaps a toupee.

Meetings Committee Report

The Meetings Committee has been busy arranging our schedule for the coming year. We have 4 venues we will be present at in 2012. The year kicks off with **Aquaculture America 2012** in Las Vegas, Nevada from February 29 - March 2, 2012. In addition to our information booth, we have organized a special session titled "Reducing the Risk of Disease" on Thursday, March 1, 2012, with several WAVMA members as featured speakers.

The **41st SAVMA Symposium** will be held from March 15-17, 2012 at Purdue University, West Lafayette, IN. As in the past, WAVMA will have our information booth at this event. This is the best opportunity for WAVMA to promote aquatic veterinary medicine to US vet students.

The **World Small Animal Veterinary Association 2012 Congress** will take place in Birmingham, England from April 12-15, 2012. As a new member of this organization, WAVMA will have a representative present.

The **AVMA Annual Convention** will take place in San Diego, CA from August 4-7, 2012. In addition to our information booth, in conjunction with the AVMA Aquatic Veterinary Committee, we have organized a special full day session on August 7. Watch for more details in the months ahead.

Julius Tepper, DVM

Meetings Committee Chair

cypcarpio@aol.com

WAVMA Student Mentoring Program

Purpose: To provide an opportunity for student members to be guided and advised by full members of the organization in their pursuit of a career as an Aquatic Veterinarian.

Are you interested in being a Mentor?

Would you like to apply to be a mentee?

Do you wish to receive additional information?

Contact us at:

WAVMA_Student_Cmte@mailhost.wavma.org

WAVMA is now an Affiliate Member of the World Small Animal Veterinary Association (WSAVA)

WSAVA is an association made up of other veterinary associations from all over the world, which are concerned with small or companion animals and whose primary objective is to advance the quality of veterinary medicine and surgery relating to small animals. WSAVA has in excess of 90 members (National veterinary associations) and affiliate members (veterinary discipline-oriented associations), representing over 75,000 individual veterinarians globally.

Because many of our members are directly involved with what are considered aquatic companion animals that is ornamental fish and public aquaria, WAVMA submitted an application in 2011 to become an Affiliate Member of the World Small Animal Veterinary Association (WSAVA) and was invited to present to support our application at the 2011 WSAVA general meeting in Jeju, South Korea.

The application was presented on October 13th, 2011 by Dr. Devon Dublin via a 5 minute slide presentation followed by a question and answer segment, which centred on our work in the field of ornamentals and the quantity of our members involved in this particular practice.



Dr Devon Dublin presenting at the WSAVA

The assembly was assured of our commitment to working together to promote and educate its membership in the area of aquatic veterinary medicine. Our work in relation to Biosecurity and our collaboration with the OIE was also highlighted.

Jeju is the largest island in South Korea at 73 km wide and 41 km long. A self-governing province, the island was formed from a series of volcanic eruptions and is dominated by Mount Halla, which rises to 1,950 metres above sea level. It was at this picturesque location that our application was approved by the WSAVA General Assembly.

As a result of this alliance, discounted registration for WAVMA members is now available for all WSAVA Congresses held throughout the world, access to the WSAVA global network of companion animal veterinarians and the possibility to participate in WSAVA Continuing Education Programs.

We look forward to organizing aquatic veterinary sessions and WAVMA meetings at the Annual WSAVA Congress in the future and WAVMA is now poised to send a representative with voting privileges to the WSAVA General meeting, which will be held in Birmingham, England on April 11th, 2012.

Dr. Devon Dublin DMVZ

WAVMA Director-at-Large
Hokkaido, Japan



Veterinarian representatives at the WSAVA meeting

The WSAVA Congresses attract large numbers of veterinarians and veterinary nurses/technicians from many countries. They are able to learn from top international speakers on all aspects of small animal practice.

Proceedings from the Congresses are easily accessible online at www.wsava.org as well as made available to veterinary schools and libraries, and provide a valuable source of the most up to date knowledge.



WAVMA at the 2011 World Veterinary Congress

David Scarfe PhD DVM, Chris Walster BVMS MvPH
MRCVS & Dušan Palić DVM PhD

WAVMA's promotion of aquatic veterinary medicine is making an impact on global veterinary medicine and the aquaculture industries. This was very evident at the World Veterinary Congress, not only during the four day program organized and run by WAVMA, but in the interactions with our veterinary colleagues and producers from southern Africa and many other parts of the world.

Equally important, it was an great opportunity to interact with decision makers from the World Veterinary Association and the national veterinary organization leadership from many countries. For some, the opportunity to have a meeting in South Africa brought the opportunity for family and social programs, and to enjoy African wildlife and game reserves and some of the world's most beautiful scenery in and around Cape Town.

While preparation for the 4-day aquatic veterinary program took more than a year to develop, it was a great success and attracted as many as 70 participants to some sessions. While to some, this number may appear small, in perspective it was a larger audience than we've seen in some national meetings and was comparable to the attendance of many other "traditional" veterinary sessions. There's no doubt that our veterinary colleagues are looking to aquatic veterinary medicine as a way to expand their horizons, that a rapidly increasing number of veterinary students are exploring opportunities in aquatic veterinary medicine, and that a large number of animal owners and producers are now actively seeking veterinary assistance.

The first two days of the WAVMA-organized aquatic veterinary program covered general disease issues and opportunities in practice, it was the 2-day veterinary aquaculture biosecurity program that got the attention of both veterinarians and producers. Leapfrogging from a workshop in Trondheim, Norway (August 14-17, 2011), the WVC program had a full day of table-top exercises and a full day on-farm evaluating a fully integrated trout farm.

Our interaction with world leaders included starting negotiation for WAVMA-organized aquatic veterinary sessions with the Czech Chamber of Veterinary Surgeons, who are hosting and organizing the 31st World Veterinary Congress (September 17-20, 2013) in Prague, Czech Republic. WAVMA would be responsible for organizing several sessions on aquatic veterinary medicine at the next WVC in 2013.

South Africa and Cape Town presented great opportunities for "African Adventures" that most only dream about. Visiting large public aquaria in Durban and Cape Town, with veterinary colleagues showing us

"behind the scenes" activities that the public seldom see, opened everyone's eyes. It was a great opportunity to see some world-class fish exhibits.

Some say the picturesque Cape Town and surrounding rural agricultural areas with the vineyards, mountains and unique fauna and flora in the Western Cape are among the most impressive and beautiful in the world. We agree, and the family activities and tours offered some opportunities that many will never forget, including trips to the Game Reserves to see the native African wildlife.

But perhaps the most impressive WAVMA activity was the aquatic veterinary biosecurity workshop. Success came from taking a slightly different, but refined approach for Southern Africa and building on the program developed for the 2nd International Aquaculture Biosecurity Conference & Workshop in Trondheim. (WAVMA was a major contributor of the 2009 and 2011 IABC programs, and is a partner of what now is the International Veterinary Aquaculture Biosecurity Consortium that now oversees and helps coordinate many aquatic veterinary biosecurity programs around the world.)

The table-top biosecurity session, in which both veterinarians and producers participated, involved providing focus-groups (each having vets, government officials and producers) with specific scenarios for developing structured, practical and effective steps for implementing a biosecurity plan or program. [See last issue, AVN 5(3) for more information about Biosecurity workshop that was held in Trondheim]

The next day's on-farm workshop then allowed these groups to use the consensus practices developed on the first day and see how they may be implemented on a real, working fish farm. The groups were able to guide an operation to develop a site-specific biosecurity plan and evaluate, audit and certify processes that would ensure efficient and economical disease prevention, control and eradication plans that will meet both local or National regulations and international (OIE) standards.

Perhaps unique to this approach are three things:

- 1) that workshop facilitators let participants develop their own approaches that meet core, standardized methods; 2) focus on any epidemiological unit (from the farm to the nation); and 3) provide an opportunity for participants to experience and use these principles and approaches on a real operation. The most important educational approach being applied is letting participants come to their own conclusions, rather than lecturing to, or "talking at" the audience about what they *should or must* do. We truly believe this approach is core to encouraging others to adopt and implement the actions for which they will now have ownership.

ListServ Letters

Kamikaze anemone kills fishes

I had just blogged about an anemone that went through the mincer, releasing nematocysts that I suspected killed the fish. One of my colleagues suggested release of a toxin. What do you believe happens in such a case?

The blog is pasted below.

Yours sincerely,

Dr Richmond Loh
BSc BVMS MPhil (*Vet Path*) MANZCVSc (*Aquatics & Pathobiology*) DipPM CMAVA
Veterinarian / Adjunct Lecturer Murdoch University
The Fish Vet, Perth, Western Australia.
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2011/09/20 — TheFishVet Blog

One of my clients rang me in distraught. Soon after installing a wave maker, his *Heteractis magnifica* anemone that had made a home for itself and hadn't moved from the one spot for nearly a year, decided to "walk". And walk it did, but only briefly until it encountered the powerhead and minced itself in the propeller blades. Within 4 hours, all fish species in the tank started becoming ill and died. The clinical signs they presented include listlessness, respiratory distress and death.

This reminded me of a case in aquacultured fish during my time working as a veterinary fish pathologist in a state veterinary laboratory. Usually, the netting used for aquacultured fish become fouled with aquatic organisms, and they are regularly taken ashore to be pressure cleaned and dried before re-use. But one time, the management thought it would save time and money to pressure clean the nets in-situ. Soon after this was done, high fish mortalities began to appear. Those fish that were affected were moribund and showed respiratory distress.

Microscopic analysis of the organs of the fishes showed widespread, multiple pin-point skin and gill damage as well as severe splenic and liver damage. Such a pattern of damage was similar to previously reported cases of jellyfish stings. In this case of aquacultured fish, it was discovered that one of the "fouling" organisms on the nets included hydrozoans. These are very closely related to jellyfish and have stinging cells known as nematocysts. The pressure cleaning is suspected to have pulverised the hydrozoans, showering the fish with the stingers. Ever since this event, the management has decided not to take short cuts with cleaning their nets.

So, back to this ornamental aquarium fish case. It is

suspected that fishes were exposed to stingers that were released from the "suicidal" anemone. There is no rescuing severely affected fishes. The only things you can do is to remove your fishes from the dangerous waters. Try to catch the fishes out and house them in separate tank. Alternatively, very large water changes would be needed to dilute the dangerous stingers.

Reply:

Hello Dr. Loh and other WAVMA members,

From what I understand about defense and predatory mechanisms of anemones/cnidarians, it does appear that mechanical stimulation triggers the release of vesicles (among other things) within the nematocysts containing the toxins. Certainly being shred to pieces would qualify as mechanical stimulation and release an overwhelming amount of toxin in the environment.

As for the mechanism of action of the toxin, it appears that (of the toxins most intensively studied to date) these have the most significant effect on voltage-gated sodium channels (competitive binding), whereby the target organism would display neurologic signs and paralysis.

Toxins released by nematocysts of other sea creatures like hydrozoans have been shown to cause hemolysis and lysis of other cells, which may explain other clinical signs and histological lesions observed in other cases you described. The anemone toxins are polypeptides (as many toxins are); those studied to date appear to have a similar function to scorpion toxin but bind sodium channels with less affinity than these.

I have a few papers and a book to recommend if anyone is interested!

Véronique LePage BSc DVM
MSc Candidate, Comparative Pathology
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Heteractis magnifica (Quoy & Gaimard 1833) in Fiji
<http://www.wetwebmedia.com/Pix%20Of%20The%20Day%20Marine/POTD%20SW%20Arch%20411-440/swpotd438.htm>

Betta Photographs Needed

A publisher has asked me for the following. They don't want to be contacted directly, so I agreed to pass on e-mails. If you have what they want and want me to send them your information, please get back to me.

Here is what they are looking for:

"We are trying to locate photos of Bettas with various diseases or conditions (specifically Velvet disease, Ich, or fin rot) for inclusion in a chapter on that subject in a Pet Owner's manual.

For photographers we will pay \$50.00 for one-time use of each interior photo, providing the photographer is able to supply high-resolution images (at least 300 dpi)."

Donald W. Stremme, V.M.D.

dstremme@vet.upenn.edu

Fish Intestinal Bacterial Flora

I am doing research about the normal GI tract bacterial flora in two freshwater aquarium fish species. But I want to know some subjects before that:

-Which places of GIT are best for sampling? In one paper I read "the GUT," (what does it mean?) and in some older paper it mentioned "1. Stomach, 2. one third of the intestine, and 3. three fourths of the intestine." Which one is better site to sample?

-Which kind of bacteria is likely to be cultured: aerobic or anaerobic or both?

The best regards,

Babak Shoabi, DVM

IAU, Karaj Branch, Karaj, Iran

Cell: 0098-9122886874

drshoabi74@gmail.com

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Replies:

Gut is a general term used for the gastrointestinal tract, very non-specific to any organ. I think most of the past studies have done aerobic cultures for ease of culture, but that is probably not the "best" approach. I would recommend you look at both the fish microbiology literature and the human literature -- there are bioreactor systems that simulate "gut" bacteria in humans.

Renate Reimschuessel VMD, PhD

301-210-4024

FDA/CVM/Vet-LRN

<http://www.fda.gov/AnimalVeterinary/ScienceResearch/ucm247334.htm>

Renate.Reimschuessel@fda.hhs.gov

It's a while since I did an in-depth literature search for GI and other bacteria that are normal non-pathogenic inhabitants of finfish (vs. those that are transitory, incidental bacterial "contaminants," acquired from water that contains bacteria from homeotherms like humans, livestock, birds, etc), but I think this type of research will be very important. While not as glamorous as investigating pathogenic bacteria, it will make a major contribution to finfish bacteriology, and it might put a lot of other research results into context.

A. David Scarfe PhD, DVM, MRSSAf

American Veterinary Medical Association

Direct phone: (847) 285-6634

dscarfe@avma.org

Great idea. But wouldn't what is thought to be normal flora actually contain a few bugs that may be pathogenic and would surface as secondary invaders when the host was hit with a primary disease? I think it's difficult to tell when something is "normal flora". Are yeast really normal flora in human colons? Don't they become pathogenic and cause Thrush or GI allergic irritable bowel disease (I know that's controversial). You would need to do genomics to show different clades. Also, why should nematodes, trematodes and fungi be left out. The sampling data would be there and it would be a shame to gloss over them. You could collect samples and collaborate with other specialists. More funding might come your way.

Also, wouldn't normal flora differ with location for the same species of host all over the world? You'd need fish cultures from 10 different locations. Perhaps a pilot study of aquarium fish would be helpful. It would be a great contribution. I hope you find my suggestions helpful and not critical.

Dave Kesternman, DVM

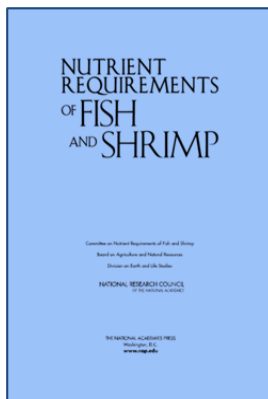
kestdvm@yahoo.com

Literature Reviews / Clinical Abstracts

BOOK Review – *Nutrient Requirements of Fish and Shrimp.*

Committee on the Nutrient Requirements of Fish and Shrimp, National Research Council (2011) Published by National Academy of Science, Washington DC, USA 376 pp. ISBN-10: 0-309-16338-2.

Reviewed by A. David Scarfe, PhD, DVM, MRSSAf (Adapted from NRC and other information).



This text is an excellent reference source for aquatic veterinarians who work closely with finfish and shrimp producers, and those working in research settings or with feed companies. The volume leans on the continued growth of the aquatic farming industry that depends on the development of nutritious feeds to maximize fish growth and health while minimizing the environmental impacts caused by uneaten feed and animal waste.

The volume was designed to be a comprehensive summary of current knowledge on nutrient requirements of fish and shrimp, and also to be forward-looking by including information to explain the nutritional science that underpins nutrient requirements. This approach allows the reader to understand better both the strengths and weaknesses of current information, and to use the information appropriately. The reader will also understand the importance of nutrient requirements to the production of efficient, economical, and sustainable feeds for use in aquaculture.

The book evaluates the scientific literature on the nutrient requirements of fish and shrimp in all stages of life. It focuses on the species that are most important commercially (catfish, tilapia, bass, trout, salmon, sea bass and sea bream, and shrimp), but other emerging species (halibut, Atlantic cod, and winter flounder) are included.

Based on recent scientific literature on the nutrient requirements of fish and shrimp at all stages of life, the report provides an extensive discussion of each of the nutrient classes, including proteins, lipids, carbohydrates, vitamins, minerals and a review of experiments to determine nutrient requirements. This material forms the basis for updated values for the daily requirement intakes of essential nutrients.

Topics such as the digestive physiology and metabolism of fish are reviewed to provide context for understanding how to use nutritional data in preparing feeds and applying appropriate feeding regimens to support efficient aquaculture production. Sustainable alternatives to the fish meal and fish oil found in many commercial aquaculture feeds are needed for aquaculture production

to continue to expand. However, fish meal and fish oil constitute important sources of nutrition in aquatic feeds, conferring desirable characteristics to the diet and health of the cultured organism. The report reviews efforts to identify sustainable alternatives to fish oil and meal. Fish fed diets that contain fish oil are a rich source of omega-3 fatty acids in the human diet. However, when fish are cultivated using alternative feeds that do not contain fish oil, their omega-3 fatty acid content is reduced. Currently, there are no ideal substitutes for fish oil as a source of long-chain polyunsaturated fatty acids.

Feeds constitute the major source of environmental pollution resulting from aquaculture, either directly, in the form of uneaten feed, or indirectly, through animal waste. These pollutants can contribute to the nutrient loading of the culture system and the environment. The development of feeds that provide balanced nutrition to maximize growth, while minimizing environmental effects, depends on knowing the species' nutritional requirements—and meeting those requirements with diet formulations and appropriate feeding practices.

Given the state of the world's fisheries, future demand for seafood and fisheries products can only be met by expanded aquacultural production. Such production will likely become more intensive and increasingly depend on nutritious and efficient aquaculture feeds containing ingredients from sustainable sources. This challenge can only be met by applying the latest nutritional and feed production information.

Several challenges are associated with the fishes' aquatic existence, including differences in husbandry and feeding and the fact that aquatic animals are poikilothermic. Another challenge is the high degree of variability among individuals, strains, and stocks compared to livestock and poultry. These complications make it necessary to use appropriate experimental designs with adequate replication such that treatment effects can be detected. The need for proper interpretation of results is also discussed, along with the importance of choosing a valid response criterion.

Aquaculture production is sure to increase, both in quantity and in the range of organisms being produced, and increasing aquaculture production should be conducted in a manner that lowers the environmental effects of various production systems and that utilizes sustainably produced feed ingredients. These goals are both connected to nutrient requirements; without solid information on nutrient requirements of the range of farmed aquatic species, feeds cannot be formulated using alternative feed ingredients. Anyone wanting to be ahead of the game in providing assistance to these industries should have this volume on their shelf.

The NRC Report can be purchased from http://www.nap.edu/catalog.php?record_id=13039.

BOOK Review –***Applied Fish Pharmacology.*****Keith M. Treves-Brown MA, VetMB, MRCVS (2000)****Kluwer Academic Publishers/Springer-Verlag,
310pp. ISBN 0-412-62180-0.**

Reviewed by John F. Burka, PhD & Gerry Johnson, DVM (originally published in Can Vet J. 2002 June; 43(6): 468).

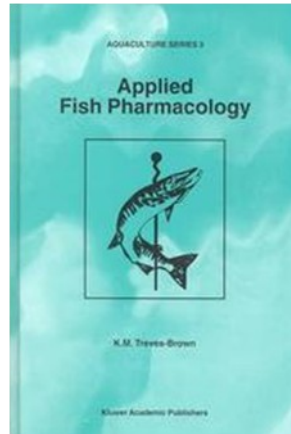
Applied Fish Pharmacology was written to provide veterinarians and fish farm management personnel with basic information on the different drugs used in Aquaculture. The book gathers together a wide variety of information from many of the disciplines involved in the approval and use of drugs in fish, enhancing the readability for those wanting to gain a comprehensive view in a rather concise format.

For the most part, the difference between factual studies and the author's summary opinion is readily distinguished. The book offers a mix of facts and informed opinions that are only intermittently referenced. It is difficult to determine why some points are referenced and others that seem equally important lack references. Many references are dated and, considering that aquaculture is a rapidly emerging industry, this presents a problem that will age the book more quickly than normally would be the case.

Recognizing differences in the physiology of fish is essential to understanding the problems associated with drug approval for the aquatic environment. Ectothermic animals may have a wide range of body temperatures, affecting both the uptake and distribution and biotransformation of drugs. The book does a credible job of summarizing both complications and proposed solutions.

The reader unfamiliar with fish or with the aquatic environment can review the subject easily and quickly, in a manner that has not been available in a consolidated form. Once subjects are identified, there is little supporting literature listed to follow up. The intermittent publications that are listed have good bibliographies, however, and are quoted for the major subject areas that the author feels are most important. For example, there are statements about the idiosyncrasies of fish physiology that the reader may wish to pursue, but the base information to verify the content or follow up on some other aspect of particular interest cannot be found by reviewing the literature.

Antibacterial and antiparasitic drugs and anaesthetics are well presented with overviews of the pharmacokinetic and pharmacodynamic parameters. Some drugs,



such as the tetracyclines, quinolones, and sulfonamides, are covered in good detail with species comparisons, whereas details for others, including penicillins, macrolides, and antiparasitic agents, are sparse. Resistance concerns are discussed for the antibacterial, but not the antiparasitic agents. It was good to see environmental concerns discussed for most agents. It would have been useful to have had more information on emerging new drugs, such as AQUI-S® and emamectin. It was nice to see chapters on breeding induction agents, immunostimulants, and vaccines, all used in new husbandry and therapeutic strategies in aquaculture.

The author qualifies the need to view the subject broadly, including both approved and unapproved products, due to the differences in regulations within various countries. Good overviews of legislation in the European Union and the USA are provided, with some information from the Far East and New Zealand. Canadians should not expect any particular national reference as this country is not included in the regulations discussed.

So does everyone dealing with fish treatment need to have this book at their fingertips? There are times when a review or a better understanding will solve a problem or change thinking on the choice and use of drugs. The format allows accessible information to be read easily by veterinary and graduate students not familiar with the complexities of fish pharmacology. For the academic and practicing fish veterinarian, frustration may occur with the lack of references.

The world of fish pharmacology and regulations changes quickly and this book may have a limited life as a reference. However, there is nothing else readily available for those interested in this subject, which is why, the author says, he wrote it.

With acknowledgements, preface, an index and references the chapters are organized in four parts, including:

Part One: General Considerations – 1) Methods of Drug Administration, 2) Safety of Fish Medicines, 3) The Law;

Part Two: Antibacterial Drugs – 4) Comparative Aspects, 5) Tetracyclines, 6) Penicillins, 7) Macrolides, 8) Sulfonamides, 9) Potentiated sulfonamides, 10) Quinolones and Fluoroquinolones, 11) Other Systemic Antibacterial Agents;

Part Three: Other Chemotherapeutic Agents – 12) Systemic Anti-Protozoal Agents, 13) Externally applied antimicrobial agents, 14) Ectoparasiticides, 15) Anthelmintics; and,

Part Four: Pharmacodynamic Agents – 16) Anaesthetics, 17) Breeding induction agents, 18) Sex control, 19) Immuno-stimulants, 20) Vaccines, 21) Osmoregulators, 22) Disinfectants.

Colleague's Connection

A Route to a Career in Aquatic Veterinary Medicine Prof Ronald J. Roberts

I have now been a full-time Fish Veterinarian for nigh on 45 years, but I still remember well my initial involvement. I come from a small fishing port in Kintyre, on the west coast of Scotland, and was a keen angler. Thus when I was a pathology assistant in the University of Glasgow Veterinary School and increasing numbers of wild Atlantic salmon were arriving for post-mortem examinations—a previously unheard of event—I was naturally chosen, as the most junior faculty member, to try to make sense of the problem. It was, in fact, the famous 1960s epizootic of Ulcerative Dermal Necrosis, and my introduction to fish dermatopathology, a subject which has beguiled me ever since.

In order to make any sense of the problem, it was clear we had to learn a lot more about the basic anatomy and pathological processes of teleosts. Since such a corpus did not exist, we had to start developing the specialism. I was also able to encourage others and at that time some excellent work on the basic inflammatory response was done in Canada by veterinary pathologists Finn and Neilson and also by Klontz in the US. I was very fortunate that two of the key Professors in the Medical School at Glasgow at the time, John Milne, Professor of Dermatopathology and Dan Capell, Regius Professor of Pathology, were also keen anglers and I had a wonderful training in basic histopathology of vertebrate skin and other organs from them.

The most important event for me at that time was an invitation to speak at the conference on Comparative Pathology of Fishes at the US Armed Forces Institute of Pathology, in Washington in 1972. Although there had been previous studies and conferences on diseases of fishes from an aetiology point of view, largely involving parasitologists and bacteriologists, this was the first to be organized from a comparative medical point of view.

Thus it brought together not only the anatomists and zoologists who had been heroically holding the fort for many years in the absence of much medical interest, but also the medics and a few of us veterinarians, who were trying to bring our own professional skills to bear on this fascinating new arena. The aim of the symposium and its resultant text was to try to present at least a start at creating a proper comparative pathology of fishes. It demonstrated many great lacunae, but it also made a very good start. It also introduced me to Stan Snieszko, one of the main promoters of the conference, himself a product of the Veterinary Department of the Jagellonian University in Poland, but now the doyen of fish bacteriologists and Director of the Leetown Lab.

I also began a lifelong friendship with the eccentric raconteur who was then just about the only US fish vet-

erinarian, the outspoken but clinically very competent Dr Bill Klontz. I also met with Leetown staff such as Ken Wolf, Glenn Hoffman and Marsha Landolt, with all of whom I collaborated thereafter.

In Glasgow I had expanded my interest beyond the wild salmon to involvement with the nascent rainbow trout industry and also the interesting experimental work going on in domestication of plaice, turbot and halibut at the UK White Fish Authority. The world seemed to be beating a path to my small door, but I fear I was largely the one-eyed man in the land of the blind. I did however, have the remarkable skills and equipment of one of the world's greatest veterinary schools behind me.

Soon, though, the fish work was growing out of proportion to what the department that was firmly oriented towards world-class cancer research and animal parasitology could allow. Fortunately, the Dean, a wonderful mentor, Sir William Weipers, saw the problem and encouraged me to develop the concept of a centre to marry the skills of the veterinarian with the fish and aquatic knowledge of the biologists, and with the background support of a number of very senior British veterinarians, I was able to attract a large programme grant from the Nuffield Foundation and subsequent funding from the Wellcome Trust to establish such a centre at the University of Stirling.

I directed the Stirling Institute for 25 years, during which time we educated some 50 veterinarians in aquatic studies and many such as Hugh Ferguson, Hamish Rodger, Tony Ellis (not a veterinary graduate but who took immunology and pathology elements of the undergraduate veterinary course at Glasgow as well being my first PhD student), Ana Afonso, Jimmy Turnbull, Victoria Alday, Lydia Brown, Effie Athanassopoulou, Peter Scott, Benny Laxdal, Sharif Mohammed and Tore Hastein have become well recognised as world authorities and a credit to the profession. Unfortunately nowadays, Stirling is not what it was; it does not have a veterinary director and other institutions, better funded and I believe better guided, have overtaken it. During my time we did well, reached the very top national research and teaching gradings and even won the Queen's Award for Industry and a visit from the iconic Princess Diana. [Below-RJR has the Princess sign in!]



One of my first overseas visits was to Croatia to visit my friend Nikola Fijan, the Professor of Fish and Bees, who had made a name for himself in both Zagreb and in the US, where he was first to isolate the Channel Catfish Virus. Nikola was very concerned that we had no modern textbooks of fish pathology based on recent science rather than very old ideas or aquarist quackery. He urged me to try to write something of a unified text and I made a start on his idea in his laboratory in 1974. Unfortunately, it became apparent that any such text also needed to address the basic concepts of water quality and teleost anatomy and physiology and while I could manage much of it, I did need to dragoon a few specialists in areas such as virology and parasitology. Anyway, the book 'Fish Pathology' was finally published in 1978 and was a remarkable success. It has now been translated into ten languages, has been virtually rewritten four times to try to keep up with the expansion of the subject and has even had the honour of being illegally copied in both English and Mandarin.

The fourth Edition of 'Fish pathology' is due out in February 2012 and this will certainly be the last one. I do not believe one book can encapsulate the subject any longer, as it has grown so large, and certainly I cannot envisage even the thought of doing it once more.

During my time at Stirling I was fortunate enough to undertake a number of overseas missions. By far the most significant was the UN Mission investigating the panzootic of mortalities in rice field fishes across Asia, which I led. The condition, of unknown aetiology, was potentially a threat to the entire green revolution. Luckily we were able to resolve it. To our surprise it was caused by a clonal aphanomycete, spreading in standard epizootic fashion from Australia across South East Asia to Europe. As well as causing mayhem in the old world, it then appeared in the new. It was, in fact, the real cause of the so called 'Pfisteria hystera' in Chesapeake bay, USA, which had funded the support for many marine ecologists for a long time. The matter was ultimately resolved by American veterinarian Ed Noga and colleagues once our work was published.

There were also wonderful World Bank missions to India, and collaborations in Kenya with the remarkable Rene Haller in Mombasa and of course my long term collaboration in Thailand with Drs Supranee and Lek, where we built the Regional Aquatic Animal Health Laboratory (AAHRI). I was surprised and very pleased to receive for my Asian work the Royal Decoration of Commander of the Order of the Crown, from HM the King of Thailand, only the second time it had been awarded to a foreign national.

I left Stirling in 1996 after a very bitter disagreement with new bureaucrats, but immediately I was able to start two new endeavours. I was not in the best of health, but was unable to resist the opportunity offered to me by the University of Idaho to take up a part time appointment with Professor Ron Hardy as a Distinguished Visiting Professor in the new Aquaculture Institute, which he had modelled in many ways on what we had built at Stirling. This still allows me to visit Idaho frequently, take part in teaching and research and also use the Hagerman Institute as the publishing base for the Journal of Fish Diseases, which I had established in 1978 and was now the top rated Journal in its field.

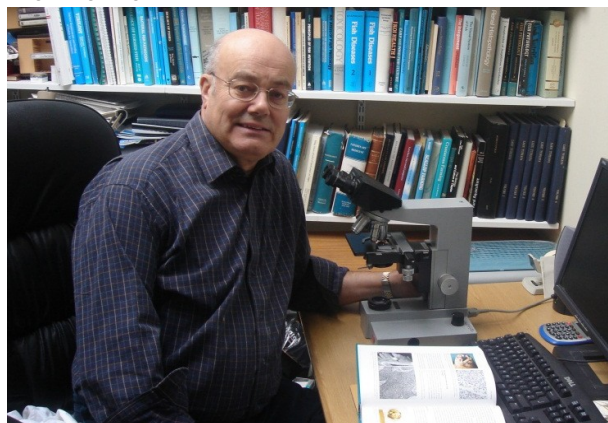
The other major opportunity I was presented with was in Scotland, where I was asked to join the Board of Landcatch, the land-based salmon company. I was tasked with developing a new technology-based use for the large marine tank system owned by the company, which was becoming uneconomic with

the drop in farmed salmon prices. Out of this opportunity, I was able, with a great deal of support, to develop the concept of a salmon breeding company like the international poultry and pig breeding companies, but with a much heavier emphasis on molecular genetics as the conduit to selection decisions, because we had not had the advantage of two millennia of selection by normal breeding to develop our pedigrees upon.

As a result, Landcatch Natural Selection, as the breeding company was called, became the first commercial egg producer with fully pedigreed stock, and consistent selection based on EBVs. We even identified the first QTLs for a fish disease, and Landcatch was the first company to market stock carrying the markers for resistance to virus disease IPN in its commercial products.

Recently the company was bought by the world's second largest pig and poultry breeding company, Hendrix Genetics. The value was mainly in our molecular genetic expertise and high pedigree stocks. They are taking it forward very well and it is very satisfying to see one's babies in good hands.

So what now, as I enter my eighth decade? Well I still keep an interest at Hagerman, visiting Idaho when I can, and we now teach a special fish elective for the final year DVM students of the Washington State University at Pullman. I also retain involvement on a lesser scale with LNS. My main interest nowadays, however, is in research on Heat Shock Proteins and their induction by a wonderful product, Pro-TEX, which Ron Hardy and I have been helping to develop. For me, its most wonderful effect is that in human formulation it abolishes jet lag and also the exhaustion I used to get after geriatric squash matches (www.protexH.com). Work with colleagues in Ghent and Malaysia, though, has shown remarkable effects in preventing and curing infections in shrimp, where we suspect the heat shock protein system is the main defence, since they do not have an immune or inflammatory system *per se*. We also use it for reducing stress mortalities when transporting young salmon hundreds of miles in well-boats and for air freighting high value Koi from Japan.



Professor Ron Roberts BVMS PhD FRCVS FRCP FRS(Edin).

My forty year effort to take veterinary medicine into fish production has been a long and fascinating saraband. I've had many ups and a few downs, but I can certainly say that there are now an awful lot more veterinarians working in fish health, an area where their professional skills were so lacking, and at least some of that success is due to my efforts. Now, though, its also really nice to be back at straightforward veterinary work with my herd of LLeyn sheep back in Kintyre from whence I started the journey.

Clinical Reports

Detection of Asymptomatic *Francisella* spp. Carriers in Tilapia Cultured in Hawaii

Clyde S. Tamaru¹, Kathleen McGovern-Hopkins¹, RuthEllen Klinger-Bowen¹, Bradley "Kai" Fox¹, Allen Riggs², Todd Low² and Nathene Lynn Antonio³ and James Brock³ (¹Department of Molecular Biology and BioEngineering, College of Tropical Agriculture and Human Resources, University of Hawaii at Manoa. ²Aquaculture and Livestock Support Services, Hawaii Department of Agriculture. ³Moana Technologies, LLC).

Reprinted from Center for Tropical & Subtropical Aquaculture (Hawaii, USA) Regional e-News, July 2011, with permission.

In 1994, wild and farm-raised populations of tilapia (*Oreochromis mossambicus* and *Sarotherodon melanotheron*) on Oahu began to die of an unknown disease that was similar but not identical to piscirickettsiosis in salmonids. Only tilapia were affected and mortalities occurred only during the cooler months (October to April) of the year. In the years that have followed, mortalities from the disease have been recorded only in Oahu farm-raised tilapia populations and again usually during the months that experience cooler temperatures. The development and widespread availability of molecular detection techniques (e.g., polymerase chain reaction or PCR) identified the disease is caused by a *Francisella*-like bacteria (FLB) that continues to impact farmed fish and mollusks worldwide.

Under the auspices of a Center for Tropical and Subtropical Aquaculture project entitled, "Regional Biosecurity: Operational Biosecurity and Diagnostic Surveillance" and through a collaborative private-public partnership between Moana Technologies LLC, Hawaii Department of Agriculture and the College of Tropical Agriculture and Human Resources, the capacity to detect FLB utilizing PCR methodology with *Francisella* sp. primers has been accomplished and validated for use in the islands. Active outbreaks with mortalities being experienced on Oahu have already been monitored. An example of the relative amounts of FLB-DNA in spleen collected from tilapia suffering from FLB disease is summarized in Figure 1. Apparently the amount of FLB-DNA present in this spleen sample can be diluted at least 100 fold.

Although the improved molecular tools for detection and diagnosis of francisellosis have become available, major gaps in understanding the life history of FLB remain. Project work group members have taken advantage of outbreaks, as they occur, and have obtained preliminary information that can be used to direct future research objectives. For example, an urban aquaponic producer in Kaneohe was experiencing persistent mortalities in his tilapia production tank and gross examination revealed

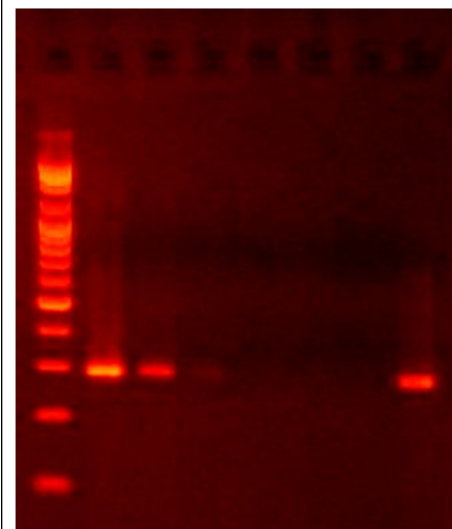


Figure 1.

Serial dilution CTSA case #T17.

Lane 1: Ladder, Lane 2: vial T17, Lane 3: 10⁻¹, Lane 4: 10⁻², Lane 5: 10⁻³, Lane 6: 10⁻⁴, Lane 7: no template, Lane 8: +RLO control.

granulomas in the gill and spleen. The mixed population consisted of two strains (i.e., golden and "koilapia" Figure 2), and on March 2, 2011 eight individuals (four from each strain) were sacrificed and gill and spleen samples were excised for PCR analyses. An alternative collecting method was also tested: swabbing gill tissue onto fast technology analyses (FTA) cards. FTA paper (Whatman Inc., Clifton, NJ) is specially treated to bind and protect nucleic acids from blood, plant and animal tissue extracts from degradation. For analysis, a small disc is punched from the FTA paper containing the DNA sample of interest, washed, dried and used for polymerase chain reaction (PCR) testing.

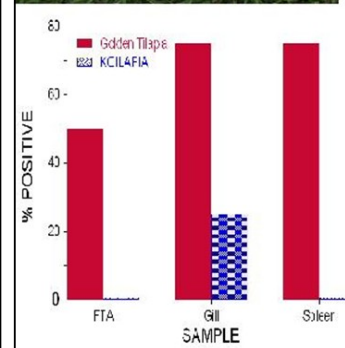


Figure 2 (top).

Photographs of two popular strains of tilapia on Oahu;

Figure 3 (bottom).

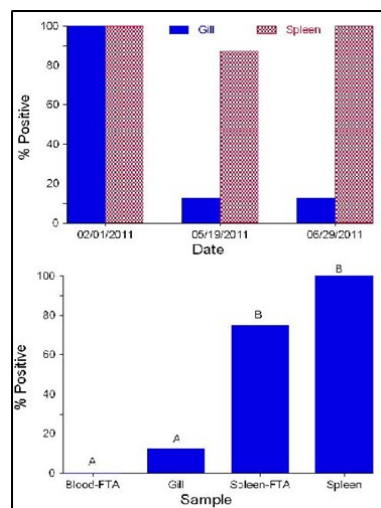
The percentage of samples containing FLB DNA from tilapia undergoing active disease outbreak.



The results (Figure 3) indicate that use of FTA cards were not as sensitive in detecting positive individuals, as only 2 of 4 individuals were detected as being positive, versus 3 of 4 when using gill or spleen tissue directly. One would expect that during an active outbreak, with mortalities occurring, the majority

of individuals within the confines of the same tank would be infected. That was not the case, as the majority of individuals positive for FLB were of only one strain (i.e., the golden). The results can only be considered preliminary because of the low sample size (N=4) for each strain analyzed. The implication, however, is that there may be some strain related resistance to FLB and clearly a topic for future investigation.

An earlier outbreak in an urban aquaponic system located in Waimanalo, Oahu was sampled on February 1, 2011. Mortalities were occurring with individuals possessing granulomas in gill and spleen characteristic of the disease. In this case, however, the tank was emptied and the surviving fish were moved to a separate aquaponic rearing system in another location. Mortalities had ceased prior to the population being sampled again on May 19, 2011. At this point in time, specimens (n=8) were sacrificed, but were asymptomatic for FLB with the exception of possessing moderate to high numbers of granulomas in the spleen. Spleen tissue was preserved in 10% formalin and processed for histopathology, which revealed the presence of FLB in the infected spleens. The same tank was re-sampled (n=8) on June 29, 2011 with fish remaining asymptomatic, with the exception of moderate to high numbers of granulomas in the spleen. Gill and spleen samples from both May and June were subjected to PCR analyses and the results are summarized in Figure 4. A significant decrease in the percentage of FLB-DNA positive gill samples occurs with tilapia. This is consistent with the observation of fish beginning to breathe and feed normally as impairment of the gills is drastically reduced during recovery.



From their feeding and overall behavior, one could easily make the assumption that the infected individuals had fully recovered from the disease episode. However, as seen in the results from both May and June, a very high incidence of individuals retain FLB-DNA in their spleen, indicating that the pathogen was present but at a subclinical level. It remains to be determined whether

these individuals are infective and what stressors might trigger a renewed outbreak.

The availability of an asymptomatic population of tilapia allowed the project work group to determine what tissues and techniques are most useful for detecting infected individuals. The same individuals sampled in June were also used to examine if FTA cards and blood were suitable for identifying positive individuals. The PCR results are summarized in Figure 5. Clearly, blood collected using the FTA cards are not suitable, as all samples were negative. In contrast, when spleen is used directly in the PCR assay, all individuals were found to be positive for FLB-DNA. The low percentage (1/8 or 12.5%) of individuals that were detected using gill tissue directly is consistent with the results obtained in the previous month. When spleen samples are collected using the FTA cards, a lower (6/8 = 75%) percentage of individuals detected FLB-DNA than when spleen is used directly (100%). The difference, however, is not statistically significant, indicating that the use of the FTA card may still have some utility.

Our collaborative partnership has successfully developed the capacity to detect a *Francisella*-like bacteria using PCR technology. This is the same pathogen that has been reported to infect tilapia on the continental U.S. as well as many parts of the world. Data obtained from outbreaks on Oahu have begun to reveal the necessary information if we are to devise a disease management program for this particular pathogen. Preliminary data indicates that there may be strains of tilapia that are more susceptible to the disease, identification of which strains would be very important to the industry both in Hawaii and abroad.

Gill tissue apparently is only useful for detecting positive individuals using PCR during an active disease outbreak (i.e., when mortalities are occurring). That similar results might also be obtained by just visual examination of the gills during an active infection indicates that the utility of gill tissue for detection of this pathogen at the molecular level is not cost effective. Furthermore, the utility of gill tissue detecting individual carriers of the pathogen from an asymptomatic population is questionable.

Blood as a suitable tissue was being considered from the standpoint of having a non-lethal method of sampling. However, its poor performance in the current investigation rules out its usefulness in that capacity. At present, only the spleen and a lethal sampling protocol appears to be viable as a dependable method for use with asymptomatic tilapia.

The use of the FTA cards represented a quick and fast means of collection and preserving DNA and although it did show some promise for one tissue (spleen) it was still not as good as using the tissue directly. Additionally, obtaining spleen still requires lethal sampling, which further diminishes the utility of FTA cards for the detection of FLB.

[CONTINUED ON PAGE 16]

Detection of Asymptomatic *Francisella* spp. Carriers [CONTINUED FROM PAGE 15]

One of the more significant observations obtained by project work group members is the existence of asymptomatic carrier individuals once the clinical outbreak has subsided. Although long suspected, this is the first known report that such a situation exists with this particular pathogen and adds to the current growing body of knowledge. Apparently, when an infection subsides, for reasons that remain to be determined, replication of the pathogen in gill tissue begins to wane allowing fish to feed and take in oxygen normally. However, a high percentage of these same individuals have FLB-DNA in their spleens for a prolonged period after infection.

The results indicate that the pathogen remains in the spleen albeit at a subclinical level. One implication of this result is the immediate need to locate and maintain stocks that do not harbor the pathogen, as the carriers can easily be mistaken for healthy individuals. Infected individuals could unknowingly be transported to other locations (e.g., farms) where in all likelihood they will infect their cohabitants. Designing how to obtain and distribute tilapia stocks that are FLB free would assist Hawaii's industry, as this disease continues to result in major losses of stock. The significant losses experienced in previous years resulted in the transportation of Tilapia between Oahu and the rest of the Hawaiian Islands to be restricted (PQ Policy 98-09 Section 150A-8, HRS - November 5, 1998) and currently this restriction remains in effect. The rationale for the restricted policy is clearly supported by the current results. However, the current restriction in movement of tilapia stocks has and will continue to hamper the development and growth of tilapia aquaculture in the islands and clearly designing a means in which tilapia stocks can be rid of and remain FLB pathogen free becomes a very high priority for the project work group.

Emerging Issues

Atlantic cod's unusual immune system survives without 'vital' immune genes

Norway – August 13, 2011

The cod genome lacks a set of genes that were thought to be indispensable for immunity against bacteria and other parasites. Atlantic cod have evolved to survive without a set of genes that scientists thought were essential to the immune system, according to an analysis of the fish's genome.

Researchers hope the finding will lead to better vaccines for farmed cod – protecting declining fish stocks – and may even open new avenues of medical research for human disease. "Pathogens are a major challenge to fish farming, particularly under the dense stocking conditions that are typical of aquaculture, and vaccination is a major approach to protect from diseases," said Prof Christopher Secombe, head of the Scottish Fish Immunology Research Centre (www.abdn.ac.uk/sfirc/). The new research will help them to target vaccine research more effectively.

The research team discovered that Atlantic cod do not have a set of immunity-related genes called [MHC Class II](#) that are found in almost all backboned animals. In other species, these genes contribute to the immune system's ability to recognise invading bacteria and parasites. "We could not find MHC Class II and also two other genes that are essential for protection against pathogenic bacteria and other parasites coming from the outside," said Professor Kjetill Jakobsen from the University of Oslo in Norway, who led the study.

The MHC molecules coded by the genes latch onto pieces of pathogens and present them on the surface of the infected cell, so that the cells can be recognised and destroyed by the immune system. There are two kinds of MHC molecules: MHC Class I molecules specialise in finding viruses within cells and MHC II molecules police the outside of the cell looking for bacteria and parasites. It was thought that both types of MHC molecule were crucial for survival.

But it appears that over evolutionary time, as the MHC Class II genes have been lost in cod, other genes have stepped in to compensate for the loss. "It is one of the most striking examples to date of the amazing plasticity of the immune system over evolutionary time," said Professor Jim Kaufman, an immunologist from the University of Cambridge. "From a traditional point of view MHC Class I cannot fight bacterial infections, but maybe it can in cod because they have 10 times more gene copies of the MHC Class I than other fishes and humans do," he said.

Their results, published on Wednesday in the journal *Nature*, could present new possibilities for the treatment



of human disease. "This has some implications for medical research. I can tell you that I had a talk at the main hospital here in Oslo and there were hundreds of doctors sitting there listening to me talking about cod," said Jakobsen. "Maybe we can regulate the human immune system differently and maybe that could be treatment against certain diseases, multiple sclerosis for example."

Scientists hope that the finding will also lead to improved vaccines for farmed Atlantic Cod. Prof Secombe said the discovery that Atlantic cod don't have MHC II would prevent vaccine developers wasting time trying "to trigger something that is actually missing".

For more details see Nature News - <http://tinyurl.com/3lmxjln>. Or Nature at <http://tinyurl.com/3u4p9pd>.

Wild B.C. salmon test positive for 'lethal' virus linked to fish farms

Vancouver, British Columbia —October 18, 2011

Wild sockeye salmon from B.C. have tested positive for a potentially devastating virus that has never been found before in the North Pacific. Infectious Salmon Anemia is a flu-like virus affecting Atlantic salmon that spreads very quickly and mutates easily, according to Simon Fraser University fisheries statistician Rick Routledge.

ISA can be fatal to Atlantic salmon, especially those confined in fish farms. Its effect on wild sockeye is unknown. The virus detected in sockeye smolts by the Atlantic Veterinary College in P.E.I. — Canada's ISA reference lab — is the European strain of ISA, the same virus that devastated fish farms in Chile four years ago. "It is described as highly contagious and lethal," said Routledge, who had underweight Pacific sockeye sent for testing at the suggestion of B.C. salmon biologist Alexandra Morton. Of the 48 fish sent for testing, two were found to have the virus.

Morton raised concerns about the possible presence of the virus in B.C. after seeing Ministry of Agriculture and Lands disease reports describing "classic" ISA-like lesions in farmed salmon. An investigation by the Canadian Food Inspection Agency found no risk of ISA at the sites identified by Morton. More than 4,700 tissue tests for ISA were conducted on B.C. farmed salmon over the past eight years and every one has come back negative, according to Ian Roberts, a spokesman for B.C.'s largest salmon farming company, Marine Harvest. Another 65 tests conducted in the past quarter were also negative.

"As far as we know, (Marine Harvest) is clean of this disease and we want to keep it that way," said company environmental officer Clare Backman, who also represents the B.C. Salmon Farmers Association. "Just because it is present in these Pacific salmon doesn't mean

it's a health issue. Pacific salmon are not as affected by ISA as Atlantic salmon."

ISA has been found in wild Atlantic salmon in Nova Scotia's Bay of Fundy, a fish population that is depressed and on the verge of extinction, Routledge said. "There is really no information on the impact it could have on Pacific sockeye salmon, which is where we found it," he said. Like the flu in humans, ISA can exist in a relatively benign form and then mutate into a more deadly version of itself, Routledge said.

The juvenile fish that tested positive were migrating down Rivers Inlet, a sport fishing destination 100 kilometres north of Vancouver Island, from Owikeno Lake. The smolts likely contracted the disease from adult spawners returning to the lake, or from their parents, Routledge said. "That means the virus has been around for several years," he said. "The only plausible source of this virus is fish farms." DNA testing on the virus could help determine its source, he said.

B.C.'s aquaculture industry has imported more than 30 million Atlantic salmon eggs over the past 25 years, mainly from Iceland, the United States and Ireland, according to the Department of Fisheries and Oceans. ISA is usually found in Atlantic salmon, though it can also infect herring. The virus devastated fish farms in Chile in 2007 and 2008, killing millions of fish and resulting in the closure of both fish farms and processing plants. Fish farms in Scotland and Norway also have suffered lethal outbreaks, according to Morton. "The New York Times reported from Chile that the Chilean aquaculture industry suffered more than \$2 billion in losses," Morton said. An investigation by scientists from the University of Bergen concluded that Atlantic salmon eggs imported to Chile from Norway likely were the source of the virus.

Suspected cases of ISA must be reported to the Canadian Food Inspection Agency under new regulations introduced in January 2011. Confirmed cases must be reported to the World Organization of Animal Health. The CFIA is investigating the P.E.I. lab's positive test results, but has not yet confirmed the diagnosis of ISA.

Source: vancouver.sun.com. Other news reports/press releases are available at <http://tinyurl.com/4yh54fy>, <http://tinyurl.com/3f9z7sv>, <http://tinyurl.com/3fzorsr>,

Items extracted from AquaVetMed e-News.

AquaVetMed e-News provides information to veterinary and veterinary-allied subscribers concerning aquatic animal medicine, health, welfare, public health and seafood safety, obtained from a variety of sources (largely AquaVetMed subscribers). While provided by the American Veterinary Medical Association's Aquatic Veterinary Medicine Committee and are for public distribution, they do not necessarily reflect the opinion of the AVMA or the veterinary profession.

Legislative and Regulatory Issues

FDA to Step Up Inspections of Imported Products

Washington, DC –
June 22, 2011

The U.S. Food and Drug Administration announced Monday a new strategy to help ensure the safety and quality of imported drugs and food products. The plan, which calls for coalitions of international regulators and increased data sharing, was created in response to rapidly rising imports of FDA-regulated products and a complex global supply chain. The strategy is outlined in a special report called the Pathway to Global Product Safety and Quality, the agency said in a news release.

"Global production of FDA-regulated goods has exploded over the past 10 years. In addition to an increase in imported finished products, manufacturers increasingly use imported materials and ingredients in their U.S. production facilities, making the distinction between domestic and imported products obsolete," FDA Commissioner Dr. Margaret A. Hamburg said in the news release. "There has been a perfect storm -- more products, more manufacturers, more countries and more access. A dramatic change in strategy must be implemented."

To protect the health of U.S. consumers, the FDA needs to modify the way it conducts business and to act globally, according to the report. This new approach includes four main elements:

- The FDA needs to team with counterparts worldwide to create international coalitions of regulators charged with improving and guaranteeing product quality and safety.

- These coalitions need to develop international information systems and networks and boost their sharing of data and regulatory resources.

- The FDA must improve its information gathering and analysis capabilities, with an increased emphasis on risk analysis.

- There will be increased FDA cooperation with industry, public and private groups, and the agency will allocate its resources based on risk.

The FDA said it's also expanding its food-safety efforts under the FDA Food Safety Modernization Act (FSMA). There will be new inspection mandates, including one to inspect more than 19,000 foreign-food facilities by the year 2016.

"FDA-regulated imports have quadrupled since 2000," Hamburg said. "The FDA and our global regulatory partners recognize this new reality and realize we must work proactively and collaboratively to address the challenges we face."

See <http://tinyurl.com/3ue5oto> for the original story.

FDA discloses efforts against banned antibiotics in Indian shrimp

July 4, 2011

The US Food and Drug Administration (FDA) has provided more details on its steps to tackle the continuing problem of the use of banned antibiotics in Indian shrimp aquaculture. The action addresses the Southern Shrimp Alliance's (SSA) concerns pertaining to a rise in shrimp consignments from an Indian exporter currently subject to two separate Import Alerts. The shipments of shrimp products by GVR Exports Pvt Ltd and Sagar Grandhi Exports Ltd are particularly worrisome to the group.

William Jones, the Acting Deputy Director for Office of Food Safety, Centre for Food Safety and Applied Nutrition (CFSAN), FDA, wrote a letter explaining that the agency's sampling programme found nitrofurans and associated metabolites in 9.1 per cent of shrimp and shrimp products from India sampled in 2009.

"In April 2010, the Agency sent a team of aquaculture experts to assess India's overall control of veterinary drug residues in products intended for the US market," the letter reads. "The Agency provided several recommendations to better assure the safety of the shrimp being exported to the US."

India has since executed several of the recommendations, such as a mandatory preharvest sample and testing scheme for banned residues for all shrimp sold to the US.

In contrast to 2009, FDA explained, in 2010 its sampling programme detected nitrofurans and associated metabolites in just 2.9 per cent of shrimp and shrimp products sampled, possibly due to India's adoption of the preharvest sampling and testing programme.

See the source (<http://tinyurl.com/6zenxkw>) for the full story.

Koi Herpesvirus Early Warning Report

United Kingdom –

August 9, 2011

An early warning report has been issued by Defra for two reported cases of Koi *Herpesvirus*. The Fish Health Inspectorate (FHI) at Cefas are investigating outbreaks of Koi *herpesvirus* at a fishery near Horsham, West Sussex and at a fishery in Ellesmere Port, Cheshire.

Initial controls have been placed on the affected sites to prevent further spread of this disease. The FHI are currently assessing the extent of the outbreak and the options available for the control of the disease.

Details of the affected site will become public information when a confirmed designation is issued and this will be published through the Aquatic Animal Health & Movements website. Details of all sites under confirmed

designations for notifiable disease can be found at www.defra.gov.uk/aahm/disease.

Koi *herpesvirus* disease affects all varieties of common carp *Cyprinus carpio*, including varieties such as mirror, leather, koi, and ghost koi. Mortalities are usually 100 per cent and there is no treatment. Clinical signs include lethargic or erratic behaviour, loss of balance, loss of mucus resulting in dry, rough patches, sloughing of mucus, and sunken eyes. Gills are most frequently affected displaying necrotic patches of dead tissue, often with secondary infection of bacteria and fungi.

Producers having concerns regarding their own fish stocks of fish, or require advice on biosecurity measures, please contact the Fish Health Inspectorate 01305 206700 or at www.cefas.defra.gov.uk/contact-us.aspx.

PHARMAQ starts fish vaccination in Vietnam

December 7, 2011

Ho Chi Minh City, Vietnam –

The first ever commercially available fish vaccine in Vietnam has been given an observation license by the country's Ministry of Agriculture and Rural Development. The term observation means that the vaccinated fish will be followed closely by the authorities and PHARMAQ. "This is the first ever fish vaccine commercially available in Vietnam and represents a breakthrough to both the Vietnamese seafood industry and to PHARMAQ", says Kjersti Gravningen, General Director PHARMAQ Vietnam Ltd.

ALPHA JECT® Panga 1 is a vaccine administered by injection that provides protection against the bacteria *Edwardsiella ictaluri* causing disease in pangasius. PHARMAQ Vietnam is entering into a new phase with the exiting challenge of establishing the best practice for fish vaccination in Vietnam. Activities will include vaccination training and close collaboration with the farmers during and after vaccination. "Our team is prepared and ready for these challenges. The implementation of vaccination will make difference for the farmers in Vietnam." Kjersti Gravningen enthusiastically concludes.

"By the introduction of ALPHA JECT® Panga 1 we have reached a great milestone in the history of PHARMAQ and taken another step to strengthen our presence in the global fish health market. Our activities in Vietnam are an essential part of our strategy in exploring the potential of the Asian aquaculture industry", says Morten Nordstad, CEO in PHARMAQ.

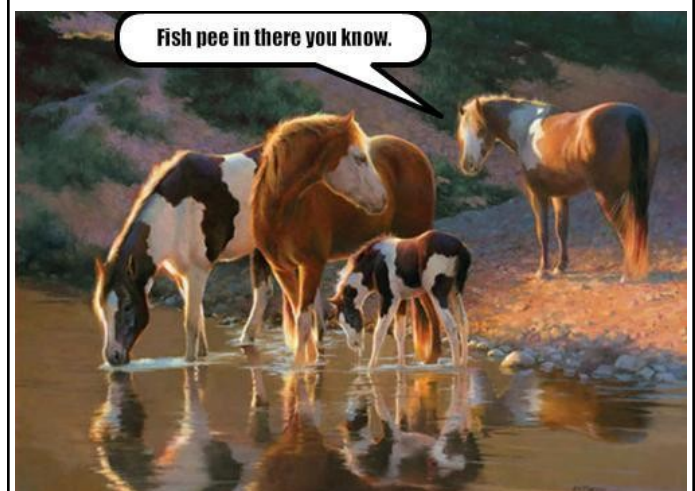
For further information, please contact Kjersti Gravningen, General Director PHARMAQ Vietnam Ltd. www.pharmaq.no.



In these fun pet podcasts, you'll learn all about aquarium fish and other aquatic animals, the aquarium industry, and the science and art that surround this fascinating hobby!


The podcasts are hosted by [Dr. Roy Yanong](#), an aquatic veterinarian at the University of Florida, Tropical Aquaculture Lab.

Check it out on PetLifeRadio.com or download it for FREE on [iTunes](#)




Aquatic Veterinary CEPD

Veterinarians attending these meetings may be awarded veterinary CEPD credit towards annual re-licensure or re-registration, which is required in some countries to practice veterinary medicine. Individuals should check with the organizers to see if CEPD certificates are provided.

 Meetings with Caduceus are sponsored by a Veterinary School or Organization.

Aquaculture America 2012

Aquaculture America 2012

 **AVMA/WAVMA Joint Aquatic Veterinary Session
"Reducing the Risk of Disease"**

February 28 - March 2, 2012

Las Vegas, Nevada

AQUACULTURE AMERICA 2012 returns to one of the favorite entertainment spots in the world for the only major national aquaculture conference and exposition held in the U.S. The U.S. Aquaculture Society (formerly U.S. Chapter of WAS) joins with National Aquaculture Association and the U.S. Aquaculture Suppliers Association to produce the annual Aquaculture America meetings. These sponsors are joined by the annual meetings of Aquacultural Engineering Society, American Tilapia Association, Striped Bass Growers Association, US Trout Farmers Association, US Shrimp Farming Association and many more associations. There will be a special aquatic veterinary medicine session sponsored by the AVMA and WAVMA. For more information, contact:

Conference Manager

P.O. Box 2302

Valley Center, CA 92082 USA

Tel: +1 760 751 5005

Fax: +1 760 751 5003

Email: worldaqua@aol.com

Website:

<https://www.was.org/WasMeetings/meetings/Default.aspx?%20code=WA2011>

WSAVA/FECAVA/BSAVA World Congress 2012

April 11-15, 2012

 **Birmingham, UK**

On the heels of a very successful WSAVA 2011 Jeju World Congress, preparations are well underway by WSAVA and its Congress partner FECAVA and host BSAVA for the World Congress 2012. Held at the ICC/NIA in Birmingham, World Congress 2012 will be the largest international veterinary event ever held in the UK.

Offering more than 40 streams of veterinary CPD lectures, featuring 300 lectures by world-class speakers spread over 4 days, a world-class exhibition space showcasing the latest industry advances from over 250 exhibitors, plus a vibrant social programme, this event caters for all levels and abilities of veterinary practice staff and includes extended Management Streams.

For more information, including registration details, please visit the [Congress website](#).

The 37th Eastern Fish Health Workshop

April 23-26, 2012

Lake Placid, NY.

For more information see:

<http://www.facebook.com/pages/Eastern-Fish-Health-Workshop/164449723610923?sk=events#!/pages/Eastern-Fish-Health-Workshop/164449723610923?sk=wall>

The Florida Marine Mammal Health Conference IV

April 24-27, 2012

Mote Marine Laboratory in Sarasota, FL.

The purpose of this conference is to address issues bearing on the health and well being of the four principal species of wild marine mammals found in Florida waters: manatees, bottlenose dolphins, pygmy sperm whales and Northern right whales, as well as captive marine mammals at theme parks, aquariums, and zoos.

ABSTRACT DEADLINE is February 1, 2012

IAAAM MEETING AND CONFERENCE

MAY 12-16, 2012

 Atlanta, GA

The 43rd Annual Meeting and Conference of the IAAAM will be held in Atlanta, GA. We will start on May 12, 2012 and go through May 16, 2012. The first call for abstracts will be sent via email. The abstract due date will be on or before February 10th, 2012 and the instructions for authors and a sample abstract will be available on the IAAAM website. If you have questions, please contact:

Ilze Berzins at iberzins@sheddaquarium.org

AQUAVET® I & II**May 27 - June 23, 2012**

Roger Williams University in Bristol, RI

The University of Pennsylvania School of Veterinary Medicine and the College of Veterinary Medicine at Cornell University are pleased to announce the 2012 AQUAVET® I & II Programs. They are aquatic veterinary medicine education programs that currently consist of two courses that will be presented at Roger Williams University in Bristol, RI in June 2012.

AQUAVET I: An Introduction to Aquatic Veterinary Medicine is a 4-week course (27 May - 23 June 2012) intended primarily for veterinary students.

AQUAVET II: Comparative Pathology of Aquatic Animals is a 2-week course (27 May - 9 June 2012) that is oriented toward the pathology of diseases of aquatic invertebrates and fish that are used in biomedical research, encountered in display aquaria and are of importance in commercial aquaculture. Veterinary students can receive credits for the course and graduate veterinarians can receive CE credits.

Applications for admission will be due by January 14, 2012 and may be obtained on the web site. Additional information may be found at www.aquavet.info.

FLAVOBACTERIUM 2012**JUNE 5-7, 2012**3rd International Conference on Members of the Genus *Flavobacterium*.

Åbo Akademi University, Turku (Åbo), Finland

Organized by the Laboratory of Aquatic Pathobiology, Environmental and Marine Biology, Department of Biosciences, this meeting will take place in the Arken Campus at the Åbo Akademi University, close to the Aura River and Turku Cathedral. Arken offers well-equipped facilities for the conference and hotels in the center of Turku and are within walking distance from the meeting venue. Turku is served by an international airport with connections from Stockholm, Copenhagen, Gdansk, Riga and Helsinki and a port with ferries from Stockholm.

The conference will provide a platform for oral presentations on diverse aspects of these environmental and pathogenic microorganisms. Participants are especially encouraged to submit abstracts on the biology and epidemiology of Flavobacterial species.

For more information, registration, hotel information, abstract submission and practical information see the conference website:

<http://www.abo.fi/flavobacterium2012>.

SHRIMP PATHOLOGY SHORT COURSE**JUNE 18-29, 2012**

University of Arizona, Tucson, Arizona, USA.

The course, entitled "Shrimp Pathology Short Course: Disease Diagnosis and Control in Marine Shrimp Culture", is taught by Dr. Donald Lightner and his colleagues from the Aquaculture Pathology Laboratory at the University of Arizona. This intensive course consists of comprehensive lectures and practical laboratory training that is focused on current methods used to diagnose, prevent, and treat the principal diseases of cultured penaeid shrimp. This program also provides an excellent opportunity for participants to meet and interact with others involved in shrimp disease research and management.

For additional information regarding the course, visit: <http://microvet.arizona.edu/research/aquapath/index.htm> or contact Donald V. Lightner or Rita Redman (Short Course Coordinator), Department of Veterinary Science and Microbiology, The University of Arizona, Building 90, Room 102, 1117 E. Lowell St., Tucson, Arizona 85721, USA. FAX: (520)621-4899, Tel: US +1 520-621-4438, E-mail: dvl@email.arizona.edu; ritar@email.arizona.edu or aquapath@ag.arizona.edu.

One day, a rather drunken ice fisherman drilled a hole in the ice and peered into the hole and a loud voice from above said: "There are no fish down there!"

He walked several yards away and drilled another hole and peered into the hole and again the voice said: "There are no fish down there!"

He then walked about 50 yards away and drilled another hole and again the voice said: "There are no fish down there!"

He looked up into the sky and asked: "God, is that you?"

"No, you idiot," the voice said: "I am the skating rink manager!"

FOLLOW WAVMA**ON****LinkedIn**

[Aquatic Veterinary Opportunities](#)

[Aquatic Veterinary/Animal Health Research Position Skretting, Stavanger, Norway](#)

Skretting ARC is seeking an aquatic veterinarian or paraveterinary professional (PhD) with research experience in disease control, pathology, applied immunology (preferably with a focus on fish and/or crustaceans), to work with planning, interpretation and implementation of R&D projects in fish/shrimp health.

The positions offer the opportunity to:
 Join an established team of 20 researchers
 Work in an international environment
 Utilise own research facilities and conduct contractual research worldwide
 Play an important role in identifying, testing and implementing new concepts
 Interact with, and travel to, other company sites throughout the world

Applicants shall combine a high level of understanding of their technical area with an innovative mindset and good skills to interact and communicate with people. Applications are invited from candidates with the described skills and experiences. The working language is English and the working location Stavanger, Norway. We offer competitive remuneration combined with relocation assistance. For information regarding this position please contact Charles McGurk, Health Manager, tel no: + 47 51 82 55 69; mobile +47 95 96 13 26; email:

charles.mcgurk@skretting.com.

Please send your CV and application by e-mail before December 21, 2011 to liv.noedland@skretting.com.

Skretting Aquaculture Research Centre (ARC) is the central R&D unit for Skretting, an international fish and shrimp feed producer. Skretting ARC's main objective is to provide research and technical support regarding fish feed for farmed seafood. ARC core competencies are within fish and shrimp nutrition and health, feed raw materials, feed safety & quality and feed manufacturing processes. Its facilities include a fish trials station, a pilot plant for feed production and a well-equipped modern chemical laboratory. Based in Stavanger, Norway, Skretting ARC has 60 highly skilled employees from 16 different countries, many of whom have postgraduate qualifications. In addition, Skretting ARC co-operates with universities and research institutions worldwide. Skretting ARC is owned by the Dutch stock listed company Nutreco.

[Aquatic Animal Veterinarian Fellowship \(1-year term\) Shedd Aquarium. Chicago, USA](#)

This term position is based in Chicago but will also require international travel for extended periods of time. On site, the fellow will share clinical responsibility for Shedd's medical caseload, consisting of marine mammals, fishes, birds, reptiles, amphibians and invertebrates (32,000+ animals). Offsite, the fellow will assist in several of Shedd's field programs. Position will start Jan. 1, 2012. Initial term is for one year with the possibility of extending to a second year.

The veterinary team consists of two clinicians, a resident, four veterinary technicians, two water-quality laboratory technicians and a part-time microbiologist. Shedd Aquarium is a private not-for-profit institution and is accredited by the Association of Zoos and Aquariums.

Job Responsibilities – will include maintaining medical records, participating in quarantine and preventive health programs and working with residents and preceptors. Meeting support may be offered during the second year based on conducting, compiling and presenting the results of a clinical case report and/or research project.

Position Requirements – a minimum of two years' full-time experience working in the area of aquatic animal medicine, with an emphasis in marine mammal medicine is required. In addition, a one-year clinical experience in a clinical practice/internship is a plus. Clinical proficiency in diagnostic testing is required (e.g. biopsy collection, blood collection, radiography, ultrasound and endoscopy). The ability to work independently is a must. Candidates must possess a DVM/VMD or equivalent from an AVMA-certified program and be eligible for an Illinois veterinary license.

To apply – applicants should submit a cover letter including statement of career goals, curriculum vitae, three letters of professional reference and an official veterinary college transcript (electronic versions of resumes are preferred) to: Tiffany Tuckett, Human Resources, John G. Shedd Aquarium, 1200 S. Lake Shore Drive, Chicago, IL 60605, USA; jobs@sheddaquarium.org; Fax: 312-663-0971.

To all student members

You can be featured in the next edition of AVN.

Simply send your biography and photo to the editor

or to

WAVMA Student Cmte@mailhost.wavma.org

Veterinary Student Externship Program Georgia Aquarium, Atlanta, USA

The Georgia Aquarium provides veterinary students the unique opportunity to gain experience in the field of aquatic animal medicine at one of the largest aquariums in the world.

Preceptorships/externships lasting a minimum of 4 weeks and a maximum of 8 weeks are available. Preference will be given to 3rd and 4th year students but all may apply. Preceptorships are not available November 20 - January 10 or July 1- July 31.

Work hours are typically 7:30 – 4:30, but subject to change based on the medical needs of the collection. Students should expect to work some weekend days. Low cost housing may be available but should not be counted on. Students should provide their own transportation to and from the aquarium. A current tetanus vaccination and health insurance are required.

Students will spend time working in the commissary, the water quality and diagnostic laboratory, necropsy, quarantine and with clinical cases. Individuals are expected to produce a written case report with an associated PowerPoint presentation during the last week of the preceptorship and will also complete a research or special project. There is an assigned reading list intended to broaden the student's knowledge base in aquatic animal husbandry and clinical care. There are 5 veterinarians on staff, 3 of which are full time clinical positions. Through a partnership with the University of Georgia, College of Veterinary Medicine we have an established aquatic veterinary pathology program as well as a growing clinical partnership with the zoological medicine service.

Applications will be evaluated twice annually. Applications for an externship between January 11 and July 1 are due by March 1 of the preceding year. Applications for an externship between August 1 and Nov 20 are due by November 1 of the preceding year. For example, one wishing to do an externship from March 15 to April 15, 2013 should submit a complete application no later than March 1, 2012. It is the student's responsibility to check that their application packet is complete as incomplete applications will not be considered.

For more information, contact:

Dr. Tonya Clauss, DVM, MS

(tclauss@georgiaaquarium.org)

or Dr. Aimee Berliner, DVM

(aberliner@georgiaaquarium.org);

Attn: Vet Extern Program, Veterinary Services, Georgia Aquarium, 225 Baker Street, Atlanta, Georgia 30313. Electronic submissions are encouraged.

Graduate Student (Ph.D.) Position Atlantic Veterinary College, Charlottetown, PEI, Canada

A doctoral student position is available on a project investigating genetic diversity of infectious salmon anaemia virus (ISAV) (Kibenge *et al.*, 2009, *Virology Journal*, 6:88) and antiviral genes (Workenhe *et al.*, 2009, *Molecular Immunology*, 46:2955-2974). Candidates should have a BSc or DVM or MSc in virology, cell biology, molecular biology, biochemistry or a related discipline. Prior laboratory experience in cell culture, and cellular and molecular biology techniques, is required.

Graduate student stipend will be at the current NSERC maximum salary/stipend for doctoral students.

Applicants should be independent, creative, goal-oriented and have strong written and verbal communication skills. An ability to work in collaboration with others in a busy lab is essential.

If interested, please submit a current *Curriculum Vitae* (CV) with cover letter stating your research interests and outlining practical experience as well as course work in virology, cell biology, molecular biology, biochemistry and related disciplines, university transcripts, and contact information for 3 professional references to: Dr. Fred Kibenge, Department of Pathology & Microbiology, Atlantic Veterinary College, University of Prince Edward Island, 550 University Avenue, Charlottetown, PEI C1A 4P3, Canada. Tel: 902-566-0967 (office) / 902-566-0940 (lab); Fax: 902-566-0851; e-mail: kibenge@upe.ca.

WAVMA is now on Facebook!



Assisted by the WAVMA Student Committee, WAVMA and aquatic veterinary medicine is being actively promoted on Facebook.

Become a WAVMA "friend" and feel free to post information useful for other veterinarians, veterinary students, and inform the public about what aquatic veterinarians do.

Simply go to www.facebook.com and search for "WAVMA"

**Aquatic Veterinarian /
Freshwater Fish Health Manager Position –
Marine Harvest Scotland, Health Department**

We currently have a vacancy for a Fish Health Manager to provide health coverage for all Marine Harvest Scotland's Freshwater sites.

The successful applicant will be required to become an integral part of the Health Team, to monitor the health of the fish on these sites through regular visits and as part of the team to take appropriate corrective action in the face of disease with the objective of maximizing survival and performance. The position allows scope for personal development and independent working, within the framework of support and joint responsibility provided by the existing team of experienced aquatic veterinarian or fisheries biologist.

The main duties will include the following:-

- To provide a diagnostic service to the sites for rapid detection of disease through implementing appropriate sampling protocols.
- To provide advice, support and training to farm staff on best practice with regard to the health and welfare of the fish.
- To supervise the use of medicines and support the development of new medicines and treatment methods.
- To collate data on fish health
- To produce regular reports for the rest of the Health and Production Teams.

In addition, should the successful candidate be a member of the Royal College of Veterinary Surgeons, he/she will be required to prescribe medicines where appropriate and take joint veterinary responsibility for the animals (Atlantic Salmon) within the care of Marine Harvest Scotland. Candidates should be computer literate and ideally have previous experience of working in a similar role.

If you are interested in applying for this post, please submit a CV with a supporting letter to: Vicky Ferguson, Human Resources Manager, Marine Harvest Scotland, Business Resource Centre, Blar Mhor Industrial Estate, Fort William, PH33 7PT. Additional information on Marine Harvest employment or this position, go to:

www.marineharvest.com/en/Career1/Working-in-Marine-Harvest/ or contact vicky.ferguson@marineharvest.com.

**Department Head
Professor of Comparative Biomedical Sciences –
Louisiana State University, Baton Rouge, LA, USA**

The desired applicant will have a veterinary degree, PhD and experience in a professional environment such as a School of Veterinary Medicine or a Health Science Center; experience in fiscal and personnel management; history of continuing success in obtaining extramural funding, be eligible for the title of full professor and for

approval as a member of the LSU Graduate Faculty; dedicated to building on the strengths of a successful program and departmental faculty; ability to communicate effectively with people at all levels of the university, industry and private sectors; ability to provide progressive leadership for the department's broad, multidisciplinary programs; strong commitment to graduate student recruiting and to the professional development of faculty, staff and students.

The Department Head serves as the leader of a vibrant group of faculty and staff focused on biomedical research and teaching of veterinary and graduate students; administers the teaching, research and service programs of the department; responsible for the administration of the curriculum taught by the department faculty in the professional and graduate programs; expected to participate in the research mission of the SVM through maintaining a vigorous research and graduate program and works to assure the success of the department and its faculty, staff and students; responsible for administrative duties to include budgetary and personnel management related to the department's faculty, staff and students.

The Department Head as the Executive Officer of the Academic Department, is responsible to the Chancellor through the Dean of the School and the Executive Vice-Chancellor & Provost, and holds office at the pleasure of the Board of Supervisors. An offer of employment is contingent on a satisfactory pre-employment background check. Application deadline is January 20, 2012 or until a candidate is selected.

For further information and full job description, please visit our website at: <http://www1.vetmed.lsu.edu/CBS/index.html>. Apply online and view a more detailed ad at: www.lsusystemcareers.lsu.edu – Position #026868.

The Department of Comparative Biomedical Sciences has a major emphasis in biomedical research and provides professional and graduate education in the areas of Cell and Molecular Biology, Comparative Veterinary Anatomy, Comparative Physiology, Veterinary Pharmacology, and Clinical and Inhalation Toxicology. The Department presently has 21 faculty positions, 23 technical and support staff and 15 graduate students. The Department has excellent research and support equipment and physical facilities, including the School's Inhalation Toxicology Laboratory, Analytical Systems Laboratory, Equine Medication Surveillance Laboratory, Aquatic Toxicology Laboratory, Zebrafish Facility and the Microscopy Center.

For more information: LSU SVM

<http://www1.vetmed.lsu.edu/svm/>;

CBS Department:

<http://www1.vetmed.lsu.edu/CBS/index.html>

European Union Reference Laboratory for Fish Diseases Coordinator – National Veterinary Institute, Aarhus/Copenhagen, Denmark

The European Union Reference Laboratory (EURL) for Fish Diseases seeks a veterinarian or paraveterinary professional with a strong scientific background to take part in the functions and duties of the laboratory. The Laboratory is funded by the European Commission. The functions and duties are concerned with harmonizing diagnostic procedures for notifiable fish diseases in Europe. The EURL for Fish Diseases is currently located at the Division for Fish Diseases, Department of Poultry, Fish and Fur Animals, National Veterinary Institute (NVI), Aarhus, Denmark. The NVI is an institute of the Technical University of Denmark.

It is planned that the Department will close its facilities in Aarhus end of 2013, and the Division for Fish Diseases will move to DTU Campus in Lyngby, north of Copenhagen during 2013. The successful applicants must therefore be prepared to work in the Copenhagen region from 2013. The position is permanent and is vacant from January 1st, 2012. Currently the Fish Diseases Division has a staff of 22 (1 professor, 2 Senior Researchers, 8 Researchers and 11 technical staff) plus a number of PhD and graduate students.

Application deadline - 9 January 2012

Responsibilities

Research on the control, diagnosis, identification and characterization of fish pathogens with special focus on the exotic and non-exotic diseases listed in [Council Directive 2006/88/EC](#)

Organizing and preparing the Annual Meetings and Workshops for the National Reference Laboratories for Fish Diseases (NRLs).

Organizing inter-laboratory proficiency tests for the NRLs
Identification and characterization of fish virus isolates, including the production of antibodies against the isolates.

Updating and maintaining the EURL library of fish virus isolates.

Updating and maintaining the EURL webpage www.eurl-fish.eu

Consulting for the EU Commission and for National Reference Laboratories, and training in laboratory diagnostic techniques

Epidemiological analysis and risk assessment on the introduction and emergence of fish diseases in EU.

Qualifications

The applicant must have a degree in veterinary medicine or PhD in a field related to fish diseases. Experience with fish pathology and relevant laboratory techniques are desirable, as is computer literacy and experience with project management. A thorough knowledge of spo-

ken and written English is essential. You will work in collaboration in a team consisting of 5 academics and 6 technicians, which requires a good ability to co-operate.

The appointment and salary will be based on the collective agreement with the Confederation of Professional Associations. The allowance will be agreed with the relevant union.

Application

We must have your online application by 9 January 2012. Please open the link "apply for this job online" and fill in the application form and attach your application, CV, diploma and a list of publications. Applications should be submitted in English. Applications and enclosures received after the deadline will not be considered. All interested candidates irrespective of age, gender, race, disability, religion or ethnic background are encouraged to apply.

For further information contact (DO NOT SEND APPLICATION MATERIALS) Professor Niels Jørgen Olsen, +45 7234 6831, njol@vet.dtu.dk. To read more about the institute at www.vet.dtu.dk/English.aspx.



Vaccines in Fish Medicine

Hugh Mitchell, MS, DVM
AquaTactics Fish Health

As a standard in small and large animal veterinary practice, vaccines are both an important aspect of practice economics and an incentive for a client to have regular “wellness” checks done by a veterinarian on his or her pet or herd (much more satisfying to all than “fire engine” medicine).

Well before the germ theory evolved, vaccines were “invented” in 1796 when Edward Jenner collected pus from human cow pox lesions and found that injecting the mixture into children prevented small pox (“Vacca” is latin for “cow”). In fish, there really wasn’t any research done on fish immunology until the late 1930’s. This research stalled and seemed to be forgotten through the World War II years as fish hatcheries toyed around with and adopted many of the chemotherapeutics we know today.

With the advent of modern day fish farming in the sixties and seventies, vaccines emerged in the US commercial trout industry, and then the global salmon farming industry. The challenge for fish has always been the economics, with “herds” consisting of numerous low-value individuals, as well as accessibility difficulties.

The growth and value of farmed salmon really kicked the technology into high-gear and provided R&D incentives necessary to develop successful formulations and application techniques. Working first out of Wildlife Vaccine in Colorado and then Biomed in Seattle, Dr. Thomas Goodrich pioneered some of the first immersion and injectable formulations for salmon and trout. Multi-national pharmaceutical companies followed and technologies were further developed and honed. Now there are even DNA-vaccines in commercial use for fish – way ahead of most mammalian technologies.



Vaccinations being given at one of the earliest successful commercial mass fish injection operations in Machias, Maine, 1990.

With all that said, the field is still young and the diversity of species, situations and value of fish still presents several challenges to fish culturists and veterinarians in accessing and adopting satisfactory immunoprophylactic programs. As veterinarians know, vaccines are only one tool in a proper integrated fish preventive health program. There are many situations that can lead to poor performance, if not where a vaccine option is contra-indicated.

What are the factors a veterinarian should consider when deciding whether a vaccine might be appropriate for an individual fish, or a fish culture situation? Obviously, mode of application is a key consideration. The vast majority of today’s fish culture is done in large extensive ponds. Great strides have been and are being made in orally-administered vaccines, but the pathogens and the situations don’t always cooperate to make this an effective choice. Immersion vaccines are the next easiest to facilitate, with antigens being taken up through the gills and mucus membranes (skin), with some ingestion, as the fish is typically immersed in a diluted bacterin for a minute or so. Certain pathogens work extremely well with immersion vaccines and a satisfactory duration and level of protection can be achieved.

An example of this would be *Vibrio* sp. Bacteria. There are many different strains and species of *Vibrio* that cause vibriosis in marine fish. Although their lipopolysaccharide layer actually confers some beneficial non-specific protection for other diseases, they tend to be very strain and species specific in conferring protection between *Vibrios* (i.e., little cross-protection between different strains and species of *Vibrio*). Suffice it to say, no marine fish in an aquaria or fish farm should die of a known *Vibrio* infection. The vaccines are inexpensive, easy to administer through immersion, and very effective.

By far, the most effective way to vaccinate fish is through injection, either I.M. or I.P. (intra-peritoneally, or more correctly: intra-coelomically). For both strength of protection and duration, injection is the best option, even though it is often a challenge to figure out a feasible way to handle and inject the fish in a timely and cost-efficient manner.



Injectable vaccines for fish also provide for the greatest flexibility in formulation design to suit a particular situation. Veterinarians are in a perfect situation to arm themselves with some basic fish immunology knowledge and go between the fish culturist and a vaccine producer to have one designed appropriately. Variables in the design and use of a vaccine for a particular circumstance include (but are not limited to): *the pathogens of interest, other pathogens, the fish species, husbandry situation, disease history, facility history, the dose volume, the relative proportions of antigenic material used (for multivalent preparations), the amount of purification and downstream processing, the fermentation/growth process used, the adjuvant used, the emulsifier and process (if needed), the application logistics, the handling stress, the timing, and the duration of protection needed.*

It is even possible to compound vaccines with antibiotics to give clients a tool to provide immunoprophylaxis to carrier state populations. This can be an invaluable service in a fish veterinarian's arsenal.



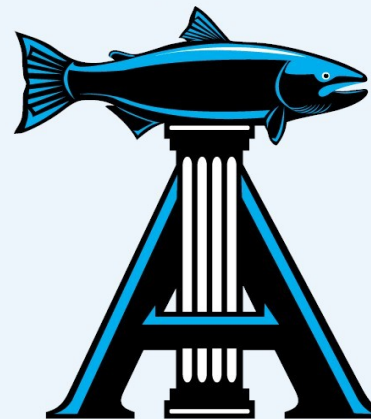
One interesting aspect of fish is not only newly discovered immunoglobulins, but a general notion that their immune system may not be able to respond to as many antigen epitopes as the mammalian system. This simply may be a phylogenetic function ("less evolved"), however it seems to mean that for many fish, the non-specific segment may be relatively more important. Therefore, the choice of adjuvants and non-specific immune stimulants can be even more critical for vaccine efficacy than in mammals.

Unfortunately, it also means that a fine line has to sometimes be walked between the right amount and too much non-specific stimulation. This has been well-documented in salmonids, where adverse vaccine reactions have resulted in severe melanosis of the muscle (and filet), fibrotic tags within the peritoneal cavity leading to poor growth, and poor FCR and carcass quality.

A vaccine should be thought of as a medical procedure and there are several known and unknown intrinsic and extrinsic factors that greatly influence vaccine efficacy and the risk of adverse events. This makes the fish health practitioner a perfect guide in ensuring that they are provided with the best immunoprophylactic solution for their needs.

This has been a brief snapshot into fish vaccinology. As more veterinarians become involved with fish and the level of clinical medicine is enhanced, so will the realization that one of the most important tools in human and terrestrial veterinary medicine should also be a staple in fish and any fish medicine practice. For more information, see the website: aquatactics.com

ADD
CUSTOMIZED VACCINES
 TO YOUR FISH MEDICINE PRACTICE
 (They are not just for other animals.)



AQUATACTICS.COM

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p:425-821-6821

Jack had an awful day fishing on the lake, sitting in the blazing sun all day without catching a single one. On his way home, he stopped at the supermarket and ordered four catfishes. He told the fish salesman: "Pick four large ones and throw them to me, will you?"

"Why do you want me to throw them at you?" asked the fish monger.

"Because I want to tell my wife that I caught them."

"Okay, but I suggest that you take the trout."

"Why is that?" Jack asked.

"Because your wife came in earlier today and said that if you came by, I should tell you to buy the trout. That is what she'd like for supper tonight."

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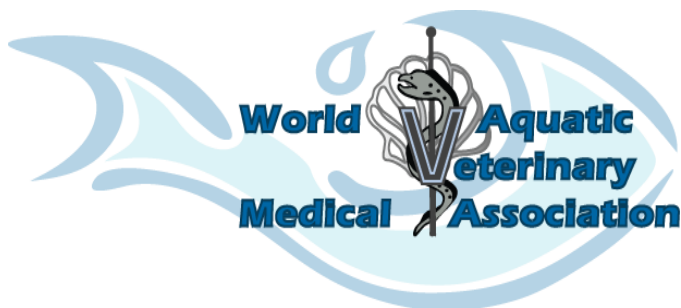
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One Profession; One Discipline; One Voice—Cohesive & Inclusive!

WHO ARE WE

The mission of the World Aquatic Veterinary Medical Association is to serve the discipline of aquatic veterinary medicine in enhancing aquatic animal health and welfare, public health, and seafood safety, in support of the veterinary profession, aquatic animal owners and industries, and other stakeholders.

The purpose of the World Aquatic Veterinary Medical Association is:

- To serve aquatic veterinary medicine practitioners of many disciplines and backgrounds by developing programs to support and promote our members, and the aquatic species and industries that they serve.
- To identify, foster and strengthen professional interactions among aquatic medical practitioners and other organizations around the world.
- To be an advocate for, develop guidance on, and promote the advancement of the science, ethics and professional aspects of aquatic animal medicine within the veterinary profession and a wider audience.
- To optimally position and advance the discipline of aquatic veterinary medicine, and support the practice of aquatic veterinary medicine in all countries.

Aquatic Vet News

Instructions for Authors and Contributors

Do you want to make an impact and a contribution to aquatic veterinary medicine? If so, consider becoming a regular or periodic contributor to the quarterly *Aquatic Vet News*.

Help make the *Aquatic Vet News* the source for pertinent and important news. If you would like to be an Associate Editor or have material published in AVN, contact Nick Saint-Erne (Saint-Erne@Q.com).

We particularly invite contributions for (and Associate Editors to assist with) the following regular columns:

Aquatic Vet Q&A

Short description of a problem and solution to an issue – if you don't have the solution, ask the questions and let readers submit solutions for the next issue.

Clinical Cases

Clear description of a distinct clinical case or situation and how those were resolved.

Book Reviews

Brief review of a published book, including an overview and critique and where to obtain the book.

Legislative & Regulatory Issues

Description of legislation or regulations with information on how to access further details.

Externships, Internships & Residencies

Description with specific contact information for veterinary student externships and post-graduate internships or residencies at private practices, institutions, universities or organizations.

Meetings & CEPD Opportunities

Description of upcoming aquatic veterinary educational meetings noting the meeting title, dates, location, and contact person or website.

Jobs Available

Description of available full or part-time employment for aquatic veterinarians.