

The



quatic

eterinarian



Reef Exhibit at Waikiki Aquarium
Photo: Nick Saint-Erne
(See related article on page 12)

Formerly *Aquatic Vet News*

Volume 7, Number 2
Second Quarter, 2013



THE AQUATIC VETERINARIAN

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WORLD AQUATIC VETERINARY MEDICAL ASSOCIATION

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.

The ideas presented in this publication express the views and opinions of the authors, may not reflect the view of WAVMA, and should not be implied as WAVMA recommendations or endorsements unless explicitly stated. Information related to the practice of veterinary medicine should only be used within an established valid Veterinarian-Patient-Client Relationship.



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Submissions may be edited to fit the space available.

[See page 9 for further instructions to authors.](#)

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EDITORIALS

Second Quarter 2013

Editor's Note

Competing for my time in finishing this issue of *The Aquatic Veterinarian* recently has been a 5-day trip to visit water turtle farms in the bayous of Louisiana, a 2-day Koi Health seminar I presented at the Annual Meeting of the Hawaii Goldfish and Carp Association, finishing my documentation for the Certified Aquatic Veterinary Practitioner program, and finalizing 5 presentations I'm presenting at the upcoming American Veterinary Medical Association Annual Convention in Chicago. Oh, and of course there is my job and my family activities.

Hmmm, needless to say I keep busy. But I still find time to do the necessary WAVMA activities because I really value the benefits of belonging to this organization and recommend that all members get involved in keeping WAVMA growing and serving the needs of Aquatic Veterinarians.

It is now time to nominate members for the WAVMA Executive Board positions for 2014. Please consider nominating yourself or another member willing to serve on the Board, or even sign up to work on a Committee. Look on the WAVMA.org website for more information.

Also, I would like to thank those Contributing Editors that have supplied articles for the journal, or have reviewed the submitted articles for me. Thanks again for your help—you will also be getting certificates you can use for your C-AqVP program documentation!

And to fill in the gaps in the text in this issue, I have included photos from my recent trips!

Nick Saint-Erne
Saint-Erne@Q.com
Editor



2013 WAVMA Programs

Once again, this year's WAVMA Program has a strong educational theme with WAVMA being involved in organization or providing content for these meetings:

AVMA 150th Annual Convention

Chicago, Illinois. 19 - 23 July

World Veterinary Congress

Prague. September 17 - 20 September

International Aquaculture Biosecurity Conference.

Munich. 25 - 27 September

Additionally WAVMA Board members will attend the WSAVA Congress, FVS Scientific Meeting, SAVMA Convention and EAFP Conference, amongst others.

Cover Photo:

Reef Exhibit at Waikiki Aquarium

Photo: Nick Saint-Erne

[See related article on Page 12](#)

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"

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EXECUTIVE REPORTS

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President's Report

I hope that your summer is going well. The second quarter of 2013 has been very busy for WAVMA, its Executive Board, and its many committees. This quarter witnessed the birth of the *Aquatic Veterinarian* in its new format, with some peer-reviewed publications. The publication is now registered with the United States Library of Congress. Our editor, Dr. Nick Saint-Erne, and other members of the Editorial Board are working hard to get you updated on the new frontiers in aquatic animal medicine.

The Certified Aquatic Veterinary Practitioner Program is currently in its first experimental phase, and the Committee is working on preparing the application package and simplifying the process. This program is expected to be available to all WAVMA members this fall. The program will recognize members who have the knowledge, skills, and experience as aquatic veterinary practitioners.

A council was formed of 2012 WAVMA Distinguished Fellows. This high caliber advisory council will steer WAVMA activities and seek ways to prepare our members in this rapidly growing field, creating a balance with the different sub-disciplines of our profession. The council will soon seek your nomination for 2013 Fellows. Please consider nominating yourself and others whose vision will contribute to the mission of WAVMA.

The second quarter has also witnessed obvious activities in the area of continuing professional development. WAVMA put together an excellent program in Sustainable Aquaculture that was very well attended in Nashville, Tennessee in February. During the 2013 American Veterinary Medical Association (AVMA) Annual Convention to be held in Chicago, Illinois July 19-23, WAVMA is offering CEPD opportunity that include both lectures and wet laboratory experience.

Last, but not least, I encourage each of you to serve on the 2014 Executive Board of WAVMA. This great organization needs your input, expertise, and creativity to continue to serve all of you.

I hope to see you all in the next annual meeting in Prague, Czech Republic in September.

Mohamed Faisal, DVM, PhD. Doc. Honoris Causa
2013 WAVMA President
College of Vet Medicine Michigan State University
East Lansing, MI
faisal@cvm.msu.edu

Colleagues:

Recently we learned of a tragic accident within our aquatic veterinary community and request your assistance. **Dr. Fernando Mardones**, a WAVMA Member and recent PhD graduate from the University of California - Davis, his wife Loreto Godoy, and their family were on vacation in southern California when a car crossed the median divider on highway and hit their vehicle head-on. The accident took the lives of both of Fernando's parents, and Loreto is not expected to survive. Fernando and his two young daughters (9 months & 4 years old) were injured but will recover. Being from Chile, Fernando and his remaining family are in desperate need of assistance to cover some very large immediate medical and other expenses.

For those not well acquainted with Fernando, he has been a very active member of our aquatic veterinary community. His experience and interest in quantitative epidemiology have helped us understand the dynamics of infectious animal diseases, and how they affect domestic and wild animal populations. In particular, he has developed methods for applying epidemiological approaches to commercial aquaculture, including surveillance and control, risk assessment, modeling and spatio-temporal analysis of ISA infections from Chile and numerous salmonid viral disease outbreaks in California.

As a community we can best help by providing some much needed financial assistance. A fund has been set up to help the family and we encourage you to consider offering support to Fernando at this time of such overwhelming loss. In just a short time, a number of his friends and colleagues have helped in contributing about half of the anticipated \$75,000 needs. Please consider contributing, no matter how small at www.gofundme.com/3czto4



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Secretary's Report

Well it is official; this Spring is the coldest in the UK for 30 years and the 6th coldest on record. It is the end of May and we are still waiting for the may blossom to come out and it is only the second day warm enough to wear shorts so far this year.

Despite the climatic chill, WAVMA has once again been busy promoting aquatic veterinary medicine around the world. Several members attended the Aquaculture Insurance Risk Management Conference in Turkey and the FVE meeting on Fish Health and Welfare in Brussels. AIRM demonstrated the need for veterinarians to be involved and facilitate the development of aquaculture insurance whilst the Brussels meeting confirmed the need for aquatic veterinary medicine to be part of the veterinary curriculum and the important role vets have to play regarding fish welfare. The recommendations from the Brussels meeting will be conveyed to the EU Commission. Whether it will make any difference, time will tell.

Thanks to the efforts of Dr. David Scarfe, the WAVMA Scholarship Committee is working their way through over 120 applications for grants from students and recent graduates. This compares to around 30 applicants during the previous round. Whilst some of the applicants do not fulfill the criteria set by the committee, there is certain to be many disappointed applicants who deserve support. If you have not done so, consider donating to the scholarship fund. Details are on the WAVMA website.

Talking of the website, the front page recently went through a facelift with the addition of a brief promotional video put together by the Communications Committee, the addition of a twitter feed (#wavma) and a revamp of the news column. WAVMA also has a new blog site (wavma@work) which is still in development.

Please have a look at these changes and sign up to the various social media WAVMA is now involved in (Facebook, LinkedIn, Blogging, Twitter, NOVICE). As we all know, the more traffic between these sites and the WAVMA website increases the visibility of WAVMA on search engines such as Google and helps promote aquatic veterinary medicine.

The WAVMA Fellows recently held their first meeting to look at ways they can contribute to the running and development of WAVMA. The minutes of the meeting need to go to the Executive Board to approve the approaches suggested, but areas considered included Fellows acting as mentors, peer reviewing papers for the recently revamped *The Aquatic Veterinarian* and assisting developing or reviewing WAVMA non-administrative policies & positions (e.g. those that affect the practice of aquatic veterinary medicine).

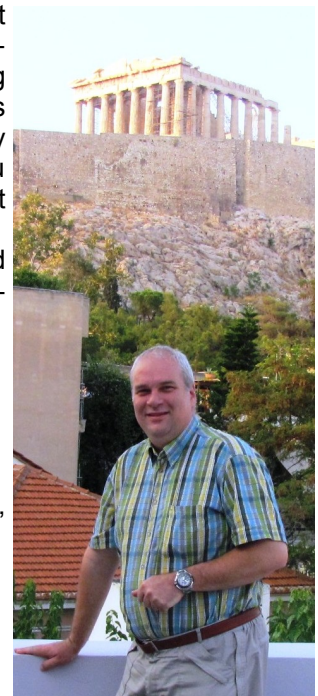
Other areas are progressing slowly, such as the Cert AqVP and Livedrive, which only requires me to get around to sending out a communique to the Members-L. Hopefully by the time you read this I might have done it and our President is putting pressure on the trial cohort of the Cert AqVP to finish their submissions.

A final point is that it is the time of year for nominations for next year's WAVMA Board. Please consider if you wish to stand for office. Being a board member actually looks good on your CV and as WAVMA is a not for profit organization actually provides experience that could land you that dream job. Increasingly veterinary associations and commercial companies are asking for people with experience at Board level and whilst board meetings are not as formal as say commercial companies, the matters dealt with are similar.

Finally, there are two reminders: WAVMA will hold a meet and greet during the AVMA Convention in Chicago during five days of presentations on aquatic veterinary medicine. If you know you are attending please let Dr. Julius Tepper know. The AGM will be held during the World Veterinary Congress in Prague.

Hope to see you there!

Chris Walster, BVMS, MVPH
WAVMA Secretary
Secretary@wavma.org



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WAVMA Executive Board Member Nominations

Nominations of Full Members are now open for the following WAVMA Officer and Director-at-Large positions for individuals willing to serve as Executive Board members for January 1 – December 31, 2014. Self-nomination is acceptable and individuals currently serving in these position are eligible for re-election.

If you are, or know someone who might be interested in helping chart the course for WAVMA in 2014, please follow up with ensuring a nomination is submitted. **A completed Nomination form needs to be e-mailed by August 5, 2013 to:**

parliamentarian@wavma.org

These positions are available:
President-Elect (would serve as President in 2015 and Past-President in 2016)
Secretary
Treasurer
Director-at-Large (2 positions)

On or about August 6, 2013, information on all nominees will be distributed to members, and a 30-day on-line "absentee voting" ballot will be available. Paper ballots will also be available for members attending the WAVMA Annual General Meeting in Prague, Czech Republic (to be held in conjunction with the World Veterinary Congress, September 17-20, 2013 – details will be forthcoming).

If anyone would like a brief explanation of Executive Board member responsibilities, please contact me directly.

Dave Scarfe

parliamentarian@wavma.org



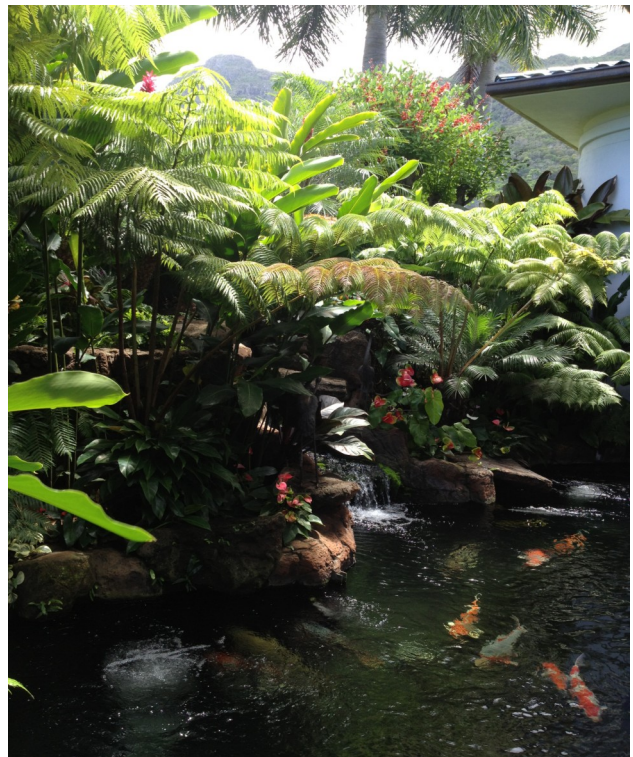
Treasurer's Report

With nearly 200 WAVMA members paying dues for 2013, we are off to a great first half of the year. Our bank account has \$13,654.47 in it currently, but we have the upcoming AVMA meeting in Chicago with a Social evening for WAVMA members, and our Annual General Meeting in September with budgeted expenses. Still, we should end 2013 ahead of last year. Our total income and total expenses are within budget for the first half of the year (see below).

SUMMARY	ACTUAL	BUDGETED
Total income	8,425.00	15,050.00
Total expenses	5,677.31	16,042.09
Income less expenses:	2,747.69	-992.09

We have purchased some new software tools to expand our digital communications abilities: Survey Monkey, Vimeo, ProProfs, WordPress, LiveDrive. You will be seeing more use of these as the year goes by, working to improve member benefits. Stay tuned!

Koi pond at a home I visited in Hawaii!



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COMMITTEE REPORTS

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Meetings Committee Report

The Meetings Committee of WAVMA is pleased to announce the Members' Networking Dinner Meeting will be held on Monday, July 22, 2013, from 6:30-10:00 PM in conjunction with the 2013 American Veterinary Medical Association Convention. The AVMA Convention is always one of the best attended veterinary conferences in the USA. This year will be no exception. Many WAVMA members will be on hand as we are planning, in collaboration with the AVMA Aquatic Veterinary Committee, a full 5-day program of both introductory and advanced lectures, as well as for the first time, a fish medicine wet lab to be held at the Shedd Aquarium.

The WAVMA reception will be located in the Hyatt Regency Chicago Hotel, 151 East Wacker Drive, Chicago, IL 60601. We will be meeting in the Wrigley Room, on the Bronze Level of the West Tower. A wonderful array of tasty foods has been ordered for our enjoyment, along with a great opportunity to meet old and new friends and members of our Executive Board. Members and their guests

are invited to attend. As seating is limited, please contact me at the email address below if you are planning to attend.

For those members who are unable to attend this Chicago meeting, we will also be the voice of aquatic veterinary medicine at the upcoming 2013 World Veterinary Congress, to be held in Prague, Czech Republic from Sept. 17-20. We will be responsible for 2 days of veterinary continuing education. We are planning our 2013 Annual General Meeting at a dinner reception to be held at a local venue.

More information will be coming in the next few weeks, so watch for the announcement as the details are ironed out. This will be an ideal opportunity for all our European members to meet with other members. Plan to attend if you can.

Julius M. Pepper, DVM
Meetings Committee Chair
cypcarpio@aol.com

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AUTHOR'S INSTRUCTIONS

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Instructions for Authors and Contributors

While any information relevant to aquatic veterinary medicine might be published, we particularly invite contributions for the following regular columns in *THE AQUATIC VETERINARIAN*:

Colleague's Connection

An article explaining why and how a veterinarian became interested in aquatic veterinary medicine and what that veterinarian has done in their aquatic veterinary career.

Peer-Reviewed Articles

Original research or review of any aquatic veterinary topic. Articles will be reviewed by 3 veterinarians and comments and changes referred back to the author prior to publication. The text for an article begins with an introductory section and then is organized under the following headings:

- Materials and Methods
- Results
- Discussion (conclusions and clinical relevance)
- References (cited in the text by superscript numbers in order of citation).

Clinical Cases

Clear description of a distinct clinical case or situation and how it was resolved. These may be submitted for peer-review. Begin with the signalment (species, age, sex, body weight or length) of the animal or animals, followed by a chronologic description of pertinent aspects of the diagnostic examination, treatment, and outcome, and end with a brief discussion.

Book Reviews

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

Publication Abstracts

Abstracts of published veterinary and scientific journals with full citation/reference (authors, date, title, and journal volume and page numbers – ½-1 page).

News

Brief synopsis or information about aquatic veterinary news published elsewhere. List original source of information.

Legislative & Regulatory Issues

Synopsis or description of emerging legislation or regulations with information on how to access further detailed information or a link to website.

Meetings and Continuing Education and Professional Development (CE&PD) Opportunities

Description or synopsis of upcoming aquatic veterinary or (veterinarian-relevant) non-veterinary in-person or on-line educational meetings noting the meeting title, dates, location, and contact person or website.

Jobs, Externships, Internships or Residencies

Description with specific contact information for veterinary student externships and post-graduate internships or residencies at private practices, institutions, universities or organizations. Description of available full or part-time employment for aquatic veterinarians, with contact information.

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All submissions should be in 10-point Arial font, single spaced. Submissions may be edited to fit the space available.

We can also use editors to proof-read submissions or review articles. Please contact the Editor if you are interested in assisting.

The World Aquatic Veterinary Medical Association also has opportunities for members to assist with committees. Contact any member of the Executive Board to volunteer to help.



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COLLEAGUE'S CONNECTION

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Meet WAVMA Secretary and Fellow— Chris Walster

I'll come clean, I never dreamed of being a vet or for that matter of being an aquatic animal vet. I actually wanted to be a dairy farmer and saw veterinary medicine as being a way to earn money to buy a farm along with learning something useful. The realities of dairying soon made me realise that early mornings are not my forte, so veterinary medicine it was. It then took me much of my career to find out what really interested me and in reality that was learning, but by this time I had fallen for fish and epidemiology. A strange combination and not really economically viable in private practice, but extremely interesting. That is the power of a veterinary degree, it equips you with so much potential and ability to follow your heart.

So what got me interested in fish? Certainly not my veterinary course in the early 1980s where in five years I was exposed to half a day on aquaculture during a visit to the Institute of Aquaculture, Stirling. I recall little now of that half day except spending much of it in the Students' Union trying to warm up from a visit to the Howietoun fishery, one of the oldest trout farms in Scotland and owned by the Institute.

My only other experience of fish was keeping a couple of goldfish as a kid in our garden pond (which was actually an old sink) and occasional angling trips. In 1988 I decide a coldwater fish tank would look nice in a corner of my flat, it did not look too costly and seemed easy to maintain. The first mistake of any fish keeper! This was followed by new tank syndrome and strange white specks on the fish that looked a bit like salt grains. With no knowledge of what was happening, and with the internet being a few years in the future, I swallowed my pride and returned to the pet shop for advice. The trauma of an experienced veterinarian having to go to a pet shop to obtain health advice persuaded me that I really needed to learn more, but my options were limited.

No internet, textbooks were expensive (nearly a week's salary each) and I had no idea what to buy or if any were available. No continuing education, at least for aquatics, unless I signed up for a degree/MSc at Stirling, and the idea of contacting a colleague was a non-starter as I knew no-one suitable. So I learnt off my clients and soon realised another facet of a veterinary degree, I might not have been taught much about fish but I actually

knew a lot about diseases, pathological processes and treatments, which all could be applied to fish reasonably successfully. Over the next couple of years I built up a client base, offering services to hobbyists and retailers, working out how filter systems operated and the need for measuring water quality. It was a lot more fun than doing small animal consults and felt as if I was working at the forefront of veterinary knowledge, or at least my own. I was hooked.

In 1990 I bought my first practice and there was a bit of a hiatus with fish medicine for a year or two. I saw the odd fish but really did not have the time to pursue my interest. Then I spotted a notice for a meeting of the Fish Veterinary Society just down the road from me. I booked the day off and suddenly had colleagues to bounce ideas off, learn from and really find out what I needed to know. My first impression was how much legislation there was, probably as up till that point it had not seemed very relevant. The other impression was how much more these colleagues knew than me. I clearly needed an opportunity to learn, but by now with a family, this meant I had to earn some money.

Towards the end of 1995 an opportunity arose, Mag Noy at the time the largest producer of ornamental fish in the world and based in Israel, required a vet to work for them in the UK. It was part-time in the sense that it was only really busy from Easter till about the start of September, but it paid and offered a couple of weeks in Israel each year. Fish work with foreign travel could not be dismissed!

Believing that others would know more than me, particularly when it came to farms, I needed a strategy and for the only time in my life went to the interview wearing a suit. Amazingly it worked and the following February I was flying out to Israel taking Stoskopf's *Fish Medicine* with me as some light reading in a vain attempt to bring my knowledge up to scratch.

On the whole, the next four or five years were brilliant, I had the time to expand the practice and really get into fish work. The trips in February and August were hard work, an overnight flight landing in Tel Aviv at 5:00 AM and on the first farm by 6:00 with work finishing 12 hours later. It certainly was hard work, followed by hard play, particularly if buying groups were present – usually young lads often on their first trip abroad so you can guess the rest. But the opportunity to be able to explore the cultures and history of Israel was fantastic and I would

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certainly recommend the country for a holiday.

Back in the UK it was also hard work with a lot of travelling, often starting early morning and arriving home late at night. I had "clients" from the southern tip of Britain up into Scotland, although the focus was dealing with Mag Noy's importers' health issues and improving management and facilities. I had a lot of fun, such as being flown to Denmark to inject one koi, along with some stressful times - usually associated with visits to a particular importer, neither of us could tolerate each other so never really formed a working relationship of trust which is paramount for any VPCR.

Of course, all good things must come to an end and this started when one of the largest farms in Mag Noy, Magan Michael, contracted what became known as KHV in spring 1998 and around two-three years later my contract with Mag Noy ended. Indeed Mag Noy no longer exists. KHV, though, opened up a new chapter and exposed me to how regulators work, how research on a new disease is carried out and a new thing called PCR. I still remember sitting down to lunch in Baltimore during the 1998 ISAAC with Ra'anah Arie (Mag Noy's Israeli vet at the time), Barry Hill and David Alderman. The meeting was arranged so we could inform OIE of a serious new disease. I have to admit I was somewhat petrified, but Barry certainly knew the place to get the best crab cakes and an excellent lunch was had.

KHV probably occupied me for the next six years in one way or another and proved a very interesting journey. I probably have the "honour" of being the first UK vet to see a case and certainly was the first to write a clinical description in English. I had the privilege to see the research effort in Israel which included internationally renowned HIV researchers and famous fish pathologists, and the work carried out at UC Davis to develop Oren Gilad's PCR. One may ask why HIV researchers were involved initially? This came about from a report to the German section of the EAFP either in early 1996 or late 1995. This report was given by a Belgium vet called Mario Blom who reported on K.I.S.S. - Koi Immuno-Suppressive Syndrome seen in Belgium during 1995 and undoubtedly referred to what became known as KHV. Indeed the first case of KHV I saw in the UK probably came from Belgium through illegally imported carp and it certainly seemed as if the fish's immune system had been destroyed. Whilst perhaps the initial history of KHV is now irrelevant, the actual history is

somewhat different to that reported in journals. A lesson to always be somewhat sceptical of what is peer reviewed.

KHV also got me in to another area of acting as an expert witness. To date, I have not been on the losing side with my proudest case acting for the defendant in a case brought by the Environment Agency over fish movements. We won with two experts on our side against 19 on the other, with the prosecutions mistake being to submit a paper from 1935. The abstract certainly supported their case but the body of the paper said something different which fully supported our side. The moral being: make sure you read thoroughly any evidence you submit. The worst case was over a poorly designed pond, subsequent to losing the case the "designer" assaulted me and then had a nervous breakdown with severe consequences for his young family. Court cases are never easy and should be avoided at all costs. A famous KHV case in the UK led to the retailer fleeing the country and losing his business. Intriguingly I am certain that the case was a miscarriage as his experts failed to notice that the customer had previously imported (probably) illegal koi from Belgium.

The next major influence on my career was the FMD outbreak in the UK in 2001. I have a small holding which at the time had two cows, Annabel and Magic, a pig called Petunia and nine Jacobs. We lived just on the edge of the Staffordshire hotspot and spent several weeks not knowing if our live stock would be slaughtered under the contiguous cull. For six months we had restrictions on movements and were required to wash and disinfect all vehicles moving on to and off the premises as well as having to change from "indoor" to "outdoor" clothes every time we left the house. This also meant for several months that morally I could not visit our farm/equine practice which ultimately led to its demise in 2002. Interestingly, we were the only premise in our area to fully comply with the biosecurity measures over this period (well, as a vet I had no choice - imagine being prosecuted for failures) and I really wanted to know if the contiguous cull was necessary. This led to an interest in biosecurity and epidemiology and in 2006, having not really resolved either issue in my mind, I started a Masters in Veterinary Public Health. Well I got the answers I wanted in the first lecture - models only work if you ask the right question, use the correct data and ensure results are strictly interpreted. Beyond that, wash your hands was the message.

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Where am I now? Well I am lucky, I have a largish practice which to all intents and purposes runs itself. I probably spend a day a week on practice management issues and see a few fish, I still enjoy visiting clients particularly those with high quality koi or good facilities. I could spend all day just watching fish. My fish work has allowed me to travel to most parts of the world and I get to spend most days researching topics of interest. That is not to say that I have time on my hands, I have projects to finish stretching back fifteen months.

My proudest professional moments undoubtedly are receiving my veterinary degree, closely followed by my Masters and this year being elected a Fellow of WAVMA. Although my career was never planned, I would not change any of it, except perhaps some of the lows, usually involving fall outs with colleagues, where I wish they had not happened, and things could have been handled more amicably.

I have three wishes, firstly to be able to keep fish, as I currently cannot even keep goldfish alive for more than a few months (but do not tell the clients). Secondly, that aquatic veterinary medicine continues to expand and reaches the recognition it deserves and fish deserve. Thirdly, that WAVMA continues to thrive and increasingly becomes **the** aquatic veterinary medical association to join and to inform aspiring aquatic vets.

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**DO YOU HAVE A STORY TO TELL
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VETERINARY MEDICINE?**

Send your article (<1,000 words) with pictures to AVNeditor@wavma.org.

A Trip to the Waikiki Aquarium Nick Saint-Erne, DVM

Recently I was in Hawaii to present my two-day seminar on Koi Health for the Hawaii Goldfish and Carp Association. Notwithstanding being in a beautiful tropical paradise while it was 118 degrees F back in Phoenix, I was also treated royally by the Hawaiian koi keepers.

Staying an extra day after the seminar before returning home, I took the opportunity to visit the Waikiki Aquarium. While it is a very small venue right on the beach, it is very well done and worth visiting if you are in Hawaii.



It is the third oldest aquarium in the United States. The Aquarium opened on 19th March 1904 with 35 tanks and 400 marine organisms, and during its first year, the internationally renowned biologist David Starr Jordan proclaimed it as having the finest collection of fishes in the world. It was considered state-of-the-art at that time, and currently its exhibits are being updated. See their website for more information:

<http://www.waquarium.org/>



A surgical approach to study differential gene expression of the fish pathogen

Flavobacterium spartansii Loch and Faisal 2013

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Introduction

At least three bacterial species within the genus *Flavobacterium* are known to cause devastating diseases in wild and captive fishes; namely, *F. psychrophilum*, *F. columnare*, and *F. branchiophilum* (reviewed by Bernardet, J. F., Bowman J. P., 2006¹). Recent studies have begun to uncover novel and “less-typical” flavobacterial species associated with fish diseases all around the world, including Africa², Europe³, Asia⁴, and South America⁵. Likewise, recent research in our laboratory revealed the involvement of an array of never before described *Flavobacterium* spp. in disease outbreaks of Great Lakes fishes⁶, which resulted in the description of a novel fish-pathogenic flavobacterial species, *F. spartansii*⁷.

Vaccination against bacterial pathogens is currently one of the most important methods for preventing bacterial diseases in farmed fishes; however, vaccine development relies primarily upon the identification of virulence factors that are employed in bacterial pathogenesis. For example, elucidating some of the virulence factors used by *F. psychrophilum*, *F. columnare*, and *F. branchiophilum* has led to the development of some vaccines that convey varying degrees of protection against them^{8,9}. This knowledge is, however, currently unavailable for the newly described fish-pathogenic *Flavobac-*

terium spp. Most studies aimed at identifying flavobacterial virulence factors are performed on strains that have been grown *in vitro* on artificial culture media. However, bacterial components that are necessary for survival and disease causation within a fish host can be quite different from those components produced in an *in vitro* environment. As a result, research on some bacteria that are pathogenic to farm animals has utilized experimental models in which bacteria are encapsulated within a semipermeable chamber, implanted into the peritoneal cavity of the host, and later retrieved. Then bacterial secretions or messenger RNA from the semipermeable chamber are investigated^{10,11}. This method has also been applied to study fish-pathogenic bacteria, including *Vibrio salmonicida*¹², *Photobacterium damsela*¹³, *Aeromonas salmonicida*¹⁴, *A. hydrophila*¹⁵ and *Flavobacterium psychrophilum*¹⁶.

The newly identified *F. spartansii* has been associated with diseases in Chinook salmon (*Oncorhynchus tshawytscha*), brown trout (*Salmo trutta*), and brook trout (*Salvelinus fontinalis*)¹⁷. In this study, we employed a surgical approach to implant dialysis tube chambers, impregnated with *F. spartansii*, into the coelomic cavity of pathogen-free adult lake trout (*Salvelinus namaycush*) and then identified the genes that were differentially expressed when *F. spartansii* encountered its fish host.

Materials & Methods

Bacteria and dialysis chamber preparation. The type strain of *Flavobacterium spartansii* (T16^T), which was originally recovered from the kidney of feral Chinook salmon (*Oncorhynchus tshawytscha*)⁷, was revived from cryopreserved stock by inoculation onto fresh cytophaga agar (CA) plates¹⁸, and incubated at 22° C for 48 hrs. A single colony was then inoculated into fresh CA broth, incubated at 15° C until a logarithmic phase of growth was achieved (~18 hrs¹⁷), and bacteria were then harvested by centrifugation at 4300 x g for 15 min, washed once with sterile phosphate buffered saline (PBS), and resuspended in sterile PBS to an optical density corresponding to 10⁸ colony forming units (cfu) ml⁻¹.

Dialysis tubing chambers were prepared as described by Lafrentz *et al.*¹⁶ with minor modifications by cutting the tubing (12-14 kDa cutoff, 25 mm flat width; Sigma, catalog number D9777) into 20 cm lengths and soaking them in deionized water over-

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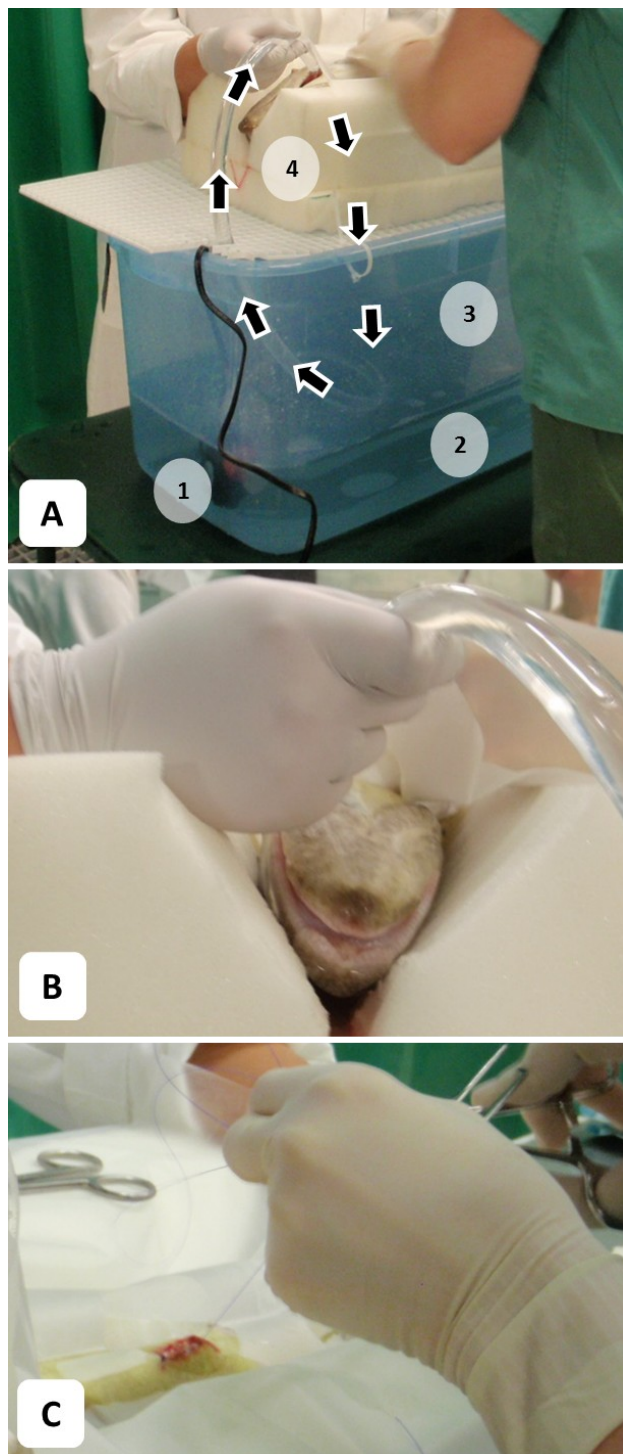
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night at 4° C. Two consecutive knots were tied on one end of each dialysis tube, placed in PBS, and then the tubes were sterilized in an autoclave (121 °C, 20 min). On the day of the surgery, 1.2 ml of the bacterial suspension from above was added to each dialysis chamber (100 µl was saved for bacterial enumeration via colony counts/serial 10-fold dilutions) and the open end aseptically tied with two consecutive knots. The new knotted area was then dipped in 70% ethanol, rinsed in sterile PBS, and chambers stored in PBS until implantation.

Fish surgery and chamber implantation. Pathogen-free adult lake trout (*Salvelinus namaycush*, mean length & weight of 55 cm, 1.6 kg), which were raised from eggs in the authors' laboratory at Michigan State University Research Containment Facility, were anesthetized in carbonate buffered MS-222 solution (100 mg/L MS-222 & 200 mg/L Na₂CO₃) for up to 10 minutes depending on the rate at which surgical anesthesia was reached. Anesthetic depth was assessed via observance of a loss of equilibrium, loss of muscle tone, and loss of the escape, tail, and eye reflexes. Fish were then placed in dorsal recumbency in a foam supportive holding tray and 100 mg/L solution of MS-222 flushed over the gills using a recirculating pump and fish anesthesia delivery system (Figure 1A and 1B).

The ventral surface of the fish was gently wiped with a wet towel to remove the mucus over the incision site and then disinfected with 2% (w/v) chlorhexidine acetate surgical scrub. A clear plastic sterile drape (3M Steri-Drape) was placed over the fish in order to retain moisture around the fish and prevent moisture leakage that could compromise the surgical field (Figure 1C). A small ventral mid-line incision was made cranial to the pelvic fins and one dialysis tubing chamber containing the bacteria was gently fed through the incision site. The incision site was immediately closed with a continuous Ford interlocking pattern using PDS II monofilament suture (3-0, 26mm 1/2c reverse cutting needle; Figures 2A & 2B), rinsed with sterile PBS, and fish immediately returned to the holding tank (11° C).

After being observed for 30 minutes post-surgery, fish were examined every 15 minutes for 2 hours, and then every 8 hours for a 48-hour period, after which they were observed twice daily. A total of 6 lake trout underwent chamber implantation. In addition, 6 dialysis chambers containing bacteria were placed in 1000 ml of fresh sterile CA broth



and incubated at 11° C; these served as *in vitro* grown bacteria, while those in the fish served as the *in vivo* group.

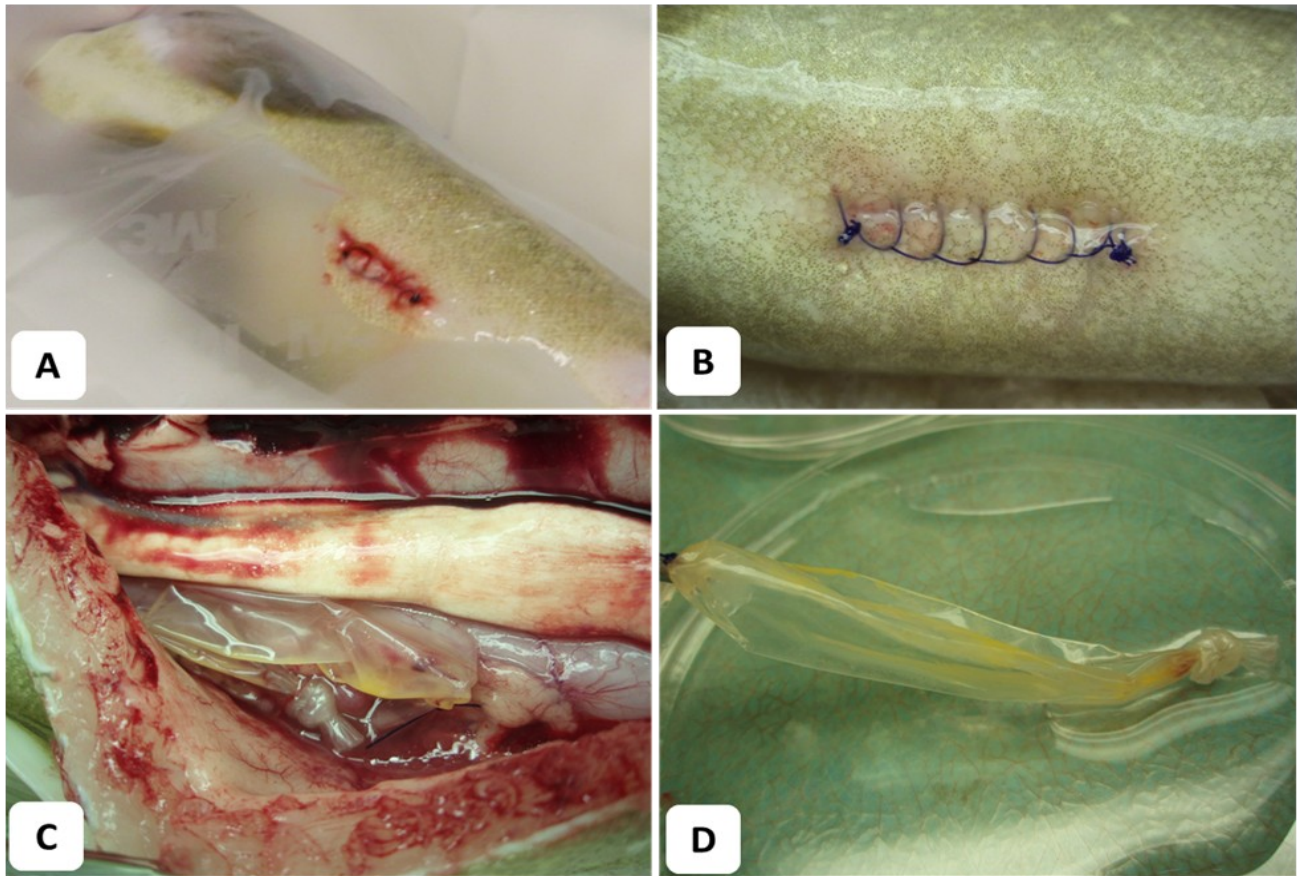


Figure 1. (Left) Surgical implantation of dialysis chambers containing *F. spartansii* into lake trout (*Salvelinus namaycush*) for suppression subtractive hybridization studies. A) Anesthesia delivery system utilized in surgical implantation procedures of this study. A submersible power head (1) was used to gently pump sodium bicarbonate-buffered MS 222-laden water (2) from a reservoir (3) over the gills of dorsally recumbent lake trout held in a foam supporting tray (4). Arrows depict the flow of water within the system. B) An anesthetized adult lake trout being held in the foam supporting tray as a dialysis tube chamber is being implanted into the coelom of the fish. C) An anesthetized adult lake trout held in the foam supporting tray that is covered with a clear plastic sterile drape (3M Steri-Drape) in order to retain moisture around the fish and prevent moisture leakage that could compromise the surgical field. The incision site was sutured with a continuous Ford interlocking pattern (see also Figure 2A & 2B) using PDS II monofilament suture (3-0, 26mm 1/2c reverse cutting needle).

Figure 2. (Above) A) Incision site of lake trout immediately after being sutured with a continuous Ford interlocking pattern. B) Incision site as observed 6 days post-surgery. C) Dialysis tube chamber containing *F. spartansii* still within the coelomic cavity of a lake trout. D) Extracted dialysis tube chamber containing *F. spartansii* after being rinsed in sterile phosphate buffered saline.

Bacterial harvest post-surgical implantation. At day 1 and day 6 post-implantation, three fish were euthanized via MS-222 overdose (250 mg/L), at which time the bacterial chambers were retrieved (Figure 2C) and washed in PBS (Figure 2D). The contents of the chamber were then extracted using a sterile needle/syringe, CFUs enumerated via serial 10-fold dilutions and plate counts, and immediately cryo-preserved in liquid nitrogen and maintained at -80° C until RNA extraction, as was also done for the chambers incubated in media. Chamber contents were also inoculated onto trypticase soy agar (TSA) and CA plates to rule out bacterial contamination.

Identification of differentially expressed genes of F. spartansii in vivo using suppression subtractive hybridization. Total RNA was extracted from cryo-preserved flavobacterial samples using the RNeasy Protect Midi Kit (Qiagen, Valencia, CA) according to the manufacturer's protocol. RNA extracts were then enriched for bacterial mRNA using a MICROExpress™ kit according to the manufacturer's protocol, and then polyadenylated. Construction of a cDNA library was performed using the BD Clontech™ PCR-Select™ cDNA Subtraction Kit (BD Biosciences, Palo Alto, CA) according to the manufacturer's protocols and as detailed in Xu, W. and Faisal, M., 2008¹⁹. The cDNA from the *in vivo* flavobacteria served as the tester for the first hybridization, while the *in vitro* grown flavobacteria served as the driver. Expressed sequence tags (ESTs) that were present in the tester only were maintained and enriched, ligated to the pGEM®-T Easy Vector, transformed in DH5α competent cells, screened via PCR to ensure EST uptake, and finally sequenced¹⁹. Resultant sequences were then searched in the GenBank database using BLAST and the putative function of each gene predicted based upon the function of the most similar gene(s)¹⁹.

Results & Discussion

The surgical procedure for implanting *F. spartansii*-laden dialysis tube chambers into the coelom of six adult lake trout has successfully allowed us to identify some of the differentially expressed genes in response to an *in vivo* environment. The actual surgical process took no more than 3 minutes per fish, and all fish recovered from anesthesia within 5-10 minutes. No behavioral signs of morbidity, nor any gross signs of disease, were observed in any of the 6 fish during their time within the holding tank/prior to euthanasia. At the time of euthanasia, the incision sites showed external evidence of healing, especially for those fish that were sampled at the day 6 post-implantation (Figure 2B). Additionally, when the incision sites were observed from within the coelom, further signs of healing were evident (Figure 3).

However, in some instances, diffuse petechial hemorrhage in the body wall in contact with the dialysis tube chamber and fibrinous adhesions were observed. This may suggest that the chambers themselves cause some degree of irritation that results in an immune response from the fish or that bacterial toxins produced by the encapsulated

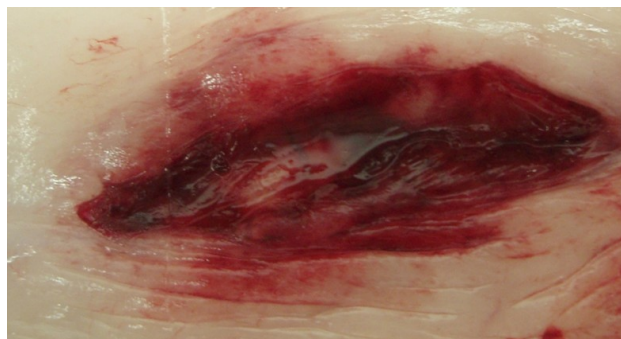


Figure 3. The incision site within the internal body wall of an adult lake trout 6 days after surgical implantation of a dialysis tube chamber containing *F. spartansii*. The margins of the incision are clearly rounding and inflammation/hemorrhage surrounds the site.

bacteria diffused through the dialysis tubes, thus eliciting a host response.

Colony counts of the bacterial suspension within the dialysis tube chambers demonstrated that *F. spartansii* grown under *in vivo* conditions proliferated to a higher number than did those grown under *in vitro* conditions (data not shown), thus suggesting that some host factors are beneficial for this bacterium. Bacterial cultures from the dialysis chambers did not yield any bacterial growth other than *F. spartansii* on TSA and CA; however, inocula taken from the coelomic cavity for bacterial culture indicated that *F. spartansii* managed to escape from some of the dialysis tube chambers and survive within the host, which is yet another indication of their potential infectivity. Other studies have also reported the ability of bacteria to escape dialysis tube chambers and attributed it to their ability to "swim through the knots" that are ligating the chambers¹².

Results from the suppression subtractive hybridization experiment demonstrated that *F. spartansii* that encountered host factors (i.e., *in vivo* grown) are more active and produce a number of factors, some of which are similar to virulence factors produced by other bacteria pathogenic to fish. For example, a partial sequence most similar to an *atpA* gene for the putative arginine ABC (ATP binding cassette) transporter permease (AJ749789) was identified. This is of particular interest because ABC transporters are transmembrane proteins that transport substrates across bacterial membranes and can play an integral role in antibiotic resistance in bacteria²⁰. These same proteins also play an

important role in virulence for *Yersinia pestis*²¹, *Salmonella enterica*²², and *Streptococcus pneumoniae*²³ by allowing the bacteria to obtain metal ions that are vital to their survival within a host²⁴. Interestingly, some ABC transporters are extremely immunogenic and have been used in the development of efficacious vaccines against numerous bacterial pathogens²⁴. Thus, the finding of a differentially expressed component of an ABC transporter gene from *in vivo* grown *F. spartansii* indicates that it may also be a virulence factor for this bacterium and warrants further investigation.

Also of interest was the differential expression of genes most closely related to a transposase gene from *Listonella anguillarum* (AM402994) and a *trpB* gene for a putative transposase from *Photobacterium damsela* subsp. *piscicida* (AJ749797). The presence of transposase genes suggest that horizontal gene exchange has/is occurring within this bacterium, which can be associated with acquiring genes associated with enhanced virulence in other bacterial species²⁵. In addition, a partial sequence most similar to a gene encoding for a putative cytochrome C oxidase protein from *Photobacterium damsela* subsp. *piscicida* (AJ749800) was also differentially expressed in *in vivo* grown *F. spartansii*, which is consistent with enhanced metabolic activity of the bacterium in response to the host environment. Gene sequences most similar to an open reading frame (ORF) encoding for a hypothetical protein of unknown function from *Photobacterium damsela* subsp. *piscicida* (AJ749803) were also detected, though what role this protein may play in bacterial virulence remains to be determined.

As mentioned above, bacteria were clearly able to reach the coelom of the lake trout. In this same context, host molecules also work their way into the chambers, which is one of the primary reasons for using this approach to study factors associated with host-pathogen interactions. Thus, the surgical implantation process of this study worked quite efficaciously for the purpose it was used for. In conclusion, this study further demonstrated the utility of surgical implantation procedures for studying bacterial virulence factors *in vivo*. Moreover, such a surgical approach clearly has a variety of applications for the study of fish pathogens.

Acknowledgements

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Louisiana Turtle Farm
Breeder Pond



The paradigm of using probiotics in finfish aquaculture practices

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It is generally accepted that, among the critical factors important to the commercial success of any aquaculture business, disease control and feed related problems are the main factors affecting production performances. Apart from the fact that only a limited number of approved and efficacious drugs and chemicals are available for disease prevention and control measures, the traditional strategies based on antibiotics and chemical disinfectants are no longer seen as safe practices, due to the emergence of antimicrobial resistance and concerns over the food and environmental contamination, as well as public health considerations. Neither can vaccines be seen as fully reliable tools in controlling disease in finfish populations, as their availability for emerging pathogens for certain finfish species can be limited. Therefore, preventing disease from entering fish populations still remains the most important epidemiologic tool in aquaculture.

A fast growing alternative method of disease prevention in fish populations is now the use of biotic (probiotics and prebiotics). *Probiotics* are defined as live microorganisms feed as supplement, which beneficially affects the host by "improving intestinal balance", whereas *prebiotics* are known as non-digestible food components that beneficially affect the host by "selectively stimulating growth and/or activity of one or a limited number of bacteria in the colon" ^{1,7}. Sometimes the supplements may contain both pre- and probiotics, case in which the biotics are named *synbiotics*.

An increasing attention has been paid lately to the use of dietary supplements consisting of biotics, to boost health, welfare and performances of animals, and to reduce the presence of opportunistic pathogens. Although it has been suggested that probiotics may exert host specific and strain specific peculiarities⁸, the biotics are generally believed to have an immunomodulatory activity through stimulation of systemic and local immunity (i.e. increase phagocytic, lysozyme and complement activities, support elevation of expression of pro- and anti-inflammatory cytokines, and increase the number of mucosal antibodies and acidophilic granulo-

cytes)¹⁻⁸. *In vitro* and *ex vivo* studies also showed that probiotics can outcompete pathogens through secretion of bacteriocines, organic acids, siderophores and competition for adhesion sites³, and that they can influence intestinal microbionta composition⁶⁻⁸.

Although the range of studied probiotics in aquaculture seems to be wider than in terrestrial animals, the best documented organisms being lactic acid bacteria (e.g. *Lactobacillus plantarum*, *L. aciophilus*, *Streptococcus faecium*, *Bacillus* spp., *Pediococcus acidilactici*) and yeasts (e.g. *Saccharomyces cerevisiae*, *Debaryomyces hansenii*) in combination with certain prebiotics (e.g. MOS - mannan oligosaccharides; FOS – oligofructose; inulin; chitosan)^{1,4,6,9} we are just facing a transitional stage, aiming at moving towards implementation of probiotics in fish diets at the industrial level. This is because there are a number of unknown characteristics about the exact mode of action of biotics in fish and their impact on the gut physical barriers and on the autochthonous microbionta. There are also potential drawbacks to the implementation⁷. Insufficiently tested probiotics that may negatively impact the environment, regulatory constraints and the decreased viability of probiotics during the feed manufacturing process may all deter from extensively using biotics at industrial scale at present.

However, commercial aquatic feed formulations that have probiotics and prebiotics (mono- or multi-species) incorporated within, are now available to be routinely administered in aquaculture practices, which should bring about, within short to medium term, a better understanding of the practical and economic benefits of these applications.

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Alligator Snapping Turtle in Louisiana

An overview of the current state of knowledge on autochthonous GI microbionta in finfish

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It is generally accepted that the main routes of infection in finfish are skin, gills and gastrointestinal (GI) tract. All of these systems and structures serve essential functions and have natural mechanisms that protect them to some degree against pathogens. Of particular importance in protective immunity in fish are the roles played by the mucosal defenses of GI tract which, together with gills and skin, are the major interfaces of the animals with their environment. Innate immunity is the body's first line of defense against invading microorganisms, and together with the physical and biochemical constituents of the immunity (i.e. intestinal mucosa, cells, mucus, enzymes and molecules), gut microflora is an ecosystem where new and potentially pathogenic bacteria should find it hard to get a hold.

Unlike terrestrial animals, where the autochthonous or *normal* GI microbionta seems to be more stable, in finfish it has been suggested that factors like gut structure, developmental stages, diet, environmental conditions of rearing, season and stocking density can cause shifts in indigenous GI microbial composition at individual level^{8, 10}. Recently, there have been made valuable scientific additions to the knowledge on GI bacterial communities in a number of marine and freshwater finfish species^{4, 5, 7-10}, by studying gut microflora in different finfish species through means of molecular tools. Apparently, GI microbionta in finfish includes generally lactic acid bacteria⁵, under normal conditions, the dominant microbial species in intestines of some finfish are anaerobic (i.e. 99% in Nile tilapia - *Oreochromis niloticus*⁸), different autochthonous microbial communities may inhabit different parts of the intestines⁹, the use of pre-probiotics in food¹⁻¹⁰, the stocking density¹⁰ and the rearing environment⁸ may change dramatically the GI microbionta composition of some cultured finfish species.

Although in recent years substantial research has been conducted to characterize the gut microbionta in finfish, little is yet known about the microorganisms, their biology, distribution and role in finfish nutrition and health. It is probably due to the

fact the investigations have relied on traditional cultivation-based techniques, which only allow the investigation of cultivable bacteria (mostly, at the group level), while the non-cultivable organisms, which in most cases account for the majority of the bacterial population in the GI tract of many finfish species, have remained largely unidentified. More reliable and advanced molecular identification methods (i.e., PCR-DGGE–polymerase chain reaction-denaturing gradient gel electrophoresis, TTGE–temporal temperature gradient gel electrophoresis, RISA–ribosomal intergenic spacer analysis, RFLP–restriction fragment length polymorphism^{8,9}) are being suggested as more reliable future tools to be used in order to characterize more precisely the gut microbiota in finfish. Furthermore, in perspective, advanced studies on biotics should provide for more precise data on digestive microflora in finfish.

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Alligator Snapper showing its normal disposition!

THE AQUATIC VETERINARIAN

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CLINICAL REPORTS

Second Quarter 2013

FISH DISEASE IN TURKEY

By Peter Werkman

A Dutch government organization called PUM (Project Uitzending Managers) connects people in developing countries who have a problem that cannot be solved using local help to semi-retired experts in The Netherlands. When help is needed, PUM looks for an expert in any occupation among their 3400 members and, after some exchange of information, a match is made between the expert and those in need of help. The expert flies to the developing country; travel expenses and costs for medical supplies, vaccinations and tropical clothes is paid by the PUM organization. The person or company that needs the help has to provide room and board and transportation from the airport.

For PUM, I have visited Malawi in 2000, India in 2010, Georgia (Black Sea) in 2011 and now Turkey in January 2013, all for problems with fishes. The fish disease problem on two fish farms in the South West of Turkey was that as soon as the water temperature goes up in July and August many fishes die from skin wounds. In January the problem was not very big, but I saw some fishes with small skin lesions. (Picture 1) About 90 other fish farmers more or less had the same problem.



At first there was a misunderstanding about what kind of fishes were involved. After two days, I found out that the fishes were not pike perches, but Levrek seabass (*Dicentrarchus labrax*). These seabass have a better, more fatty taste than the seabass kept in sea cages.

The seabass fry came from a hatchery and were put in eight large ponds of 45x14x3 meters (Picture 2) in well water with a salt content of 0.5 gram/litre. Water quality of the well water was excellent, no ammonia, nitrite or nitrate and the oxygen level was over 6 mg/L. Paddle wheels provide more air in the water in the summer. The fishes are caught and slaughtered at a weight of 500 grams body weight.



In order to make a diagnosis of the skin problem I needed some sheep blood agar plates and a lot of enquiring in human hospitals was done to obtain four plates. We went to a hospital and we marched to the laboratory through corridors with many people waiting. The person who guided us was the supervisor of the parking lot and also the owner of a coffee bar next to the parking lot and after obtaining the plates we were invited to have tea. (Picture 3) The two fish farmers on the left had a nice young lady (seated on right) provided to translate from Turkish to English and vice versa.



After taking sterile probes from the skin wounds, the liver and kidney, I found the livers very brittle and yellowish. No parasites were found and no abnormalities were seen on the other organs. I took the agar plates back to a fish disease laboratory in The Netherlands and from the liver, kidney and skin *Aeromonas veronii* was found, a secondary pathogen bacterium. So, it was not necessary to use an antibiotic.

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To get more information, I asked the fish farmers to catch seven more seabass from "healthy" ponds. I opened these fish and in all of them the livers had the same yellowish colour and you could press your finger right through them. (Picture 4).



The labels of the fish food bags showed a fat percentage of 20%. Possibly could this be the cause of the fatty livers? I could not get any information about the kind of fat that was used.

When I was asked to come to Georgia in 2011, where a fish farmer had problems with his trout, it also turned out to be a nutritional problem. Their fish food came from Turkey and showed text only in Turkish. Nobody in Georgia had asked for a label in the language of Georgia, which is Georgian or Russian. I asked a Turkish colleague to translate the label and then I visited a Dutch fish food company to have them look at the label nutritional formula and asked their opinion. They told me that the label showed a twenty-time overdose of anti-oxidants. I advised the Georgia fish farmers to use food from another food company, not from Turkey.

Because of the findings in Georgia with the fish food, I advised the fish farmers in Turkey to use food from another company with a fat content of about 10%. My supposition is that as a result of the high fat content in the fish food causing fatty livers, the immunity of the fishes is reduced and that they are more susceptible to disease by bacteria and parasites. Hopefully by giving food with a lesser fat content the livers could regenerate to a normal dark brown colour with a good solid structure. Under good circumstances this could be reached in four or five months.

Regardless of frequent mails to the fish farmers, I have not gotten any information of improvement. But I keep trying to get an updated on this case.

Peter Werkman, veterinarian for fishes
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Dr. Peter Werkman with two Turkish fish farmers and their translator.

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GRAND ROUNDS CASES

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Mortality in Walleye Larvae

Is there someone who has knowledge about walleyes? My client put about 100 000 larvae in a tank and after 2 weeks they began to swim straight up. There was Nitrogen supersaturation at 104%. The gas bladder seems to be ok and we didn't see any gas bubbles in the gills, or in the fins and no sign of exophthalmia.

No parasites were found on skin, or in gills. We lost almost all of them over 2-3 days. They were feeding well before that episode.

About 200 survived, but the same signs began again 2 weeks later, with no gas bubbles. At the histology, the pathologist saw some (light) muscle necrosis, but nothing else.

Does anyone have an idea of what it could be? Do you have data about the number of larvae we can put in a tank and when we should classify them ?

Thank you.

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Have you tried bacterial isolation, particularly for flavobacteria and motile aeromonads?

Mohamed Faisal
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Could the myopathy be related to nutritional causes like vitamin E or selenium deficiency?

Dr Richmond Loh
DipProjMgt, BSc, BVMS, MPhil (Pathology)
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I agree that filamentous bacteria are a possibility, and mortality can appear quite suddenly in such cases, all dead in 24 hours or a few days. The relatively large bacteria clog the gills of these small fish, and death is by asphyxiation/ anoxia. And filamentous bacteria produce enzymes that cause severe tissue necrosis on gills, skin and into underlying dermis...it also often gets complicated by other common water bacteria, the aeromonads or vibrios that can lead to deep muscle necrosis.

Fits in with history, 2 weeks into larviculture, just when water quality is starting to deteriorate a bit, as can't do too much water exchange in larviculture at this stage. This stimulates increased mucus and promotes bacterial overgrowth. You can easily see these filamentous bacteria in wet mounts or histology. Culture requires special cytophaga agar.

I think it is too early at this stage for nutritional/ Se/ Vit E deficiency, usually nutritional disease rumbles on and you see signs during the growth spurt at several 100g or so. This is my experience anyway, but others may have seen it differently.

Susan Gibson-Kueh
Director, TwoFish 5000
BVSc, MSc (Aquatic Vet. Studies)
PhD (Fish Pathology)
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Bacterial/fungal/water quality problems are good rule-outs, but I've seen larval losses approaching 100% in many species due to viral issues. I'm just wondering: walleyes, Quebec....VHS? Did anyone do any viral cultures?

Dr. Peter L. Merrill
wetvet@comcast.net

I looked at my lab records for the last seven years to determine if there has been any infectious disease problem with walleye fry associated with high mortality rates. We never experienced any mortality events at this age, and seldom did we have any bacteria isolated. Most of the bacteria isolated are motile aeromonads. No viruses were isolated from this age group, including VHS, and no external parasites. All of the fry were produced by spawning wild walleye at four different sites within Michigan in both Lake Michigan and Lake Huron watersheds, not far from Quebec.

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I have never seen muscle softening in walleye fry, but in Wisconsin and parts of Canada the microsporidian *Heterosporis sutherlandi* has been described associated with muscle softening in areas where it multiplies. On the contrary, we find multiple parasites, cestodes and monogeneans in particular, fungi, bacteria, and viruses (retroviruses, VHS, lymphocystis, and herpesviruses) in the spawning broodstock runs.

Based on my experience and talking to hatchery managers, walleye fry are relatively hardy and do not have major mortalities in their early life stages. Hence and as you stated, it may be an environmental issue.

Lastly, if you are involved with health issues of Great Lakes fishes, I highly recommend that you attend the bi-annual meetings of the Great Lakes Fish Health Committee. The Committee has two representatives from each of the eight Great Lakes states, two Canadian provinces, native tribes, and several agencies (including Canadian DFO). Try to join us; our next meeting is in Duluth, Minnesota the first week of August.

Mohamed Faisal

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Thank you for all opinions. No filamentous bacteria have been seen at histology, or on fresh smears. No viral cultures have been done. No mortality happened in all the other tanks, and no other sick fish, even in all exterior ponds. No dead fish in all the other species raised in the fish farm. That is why we thought that water quality was the source of the problem.

Here in Quebec, it seems that mortalities in walleye larvae are frequent and different each year. But we still don't control the culture of this species. For the last 3 years there has been great variation of the water temperature when the spawning occurs. So it seems difficult to spawn the wild fishes. Maybe there is also a relation with water temperature when the eggs are extracted.

The biggest problem is that fish producers don't consult vets or don't do lab work when they have big mortalities.

Andrée Lafaille DMV, MSc.

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Sutures for a Surgeon to Suture a Sturgeon

...or other fish species

I'm performing an exploratory surgery and enterotomy on an 8-10 inch Redtail Catfish this Friday that ate a plastic plant. The plastic plant has ruptured through the body wall (yikes!) so prognosis is poor. In the event that I actually get to the point where I can suture some bowel loops I was wondering if anyone had some suggestions for suture material type since I assume the suture won't dissolve.

I was planning to use a 6.0 or 7.0 silk or PDS, any other suggestions? Additionally, I was going to perform a Ford interlocking pattern for the body wall but simple interrupted for the bowel, does that sound about right?

Ronit Lavie, DVM

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Monocryl Plus appears to be the preferred suture material for fish, with less tissue reaction and it also guards against infection.

Donald W. Stremme, V.M.D.

donaldstremme@gmail.com

Muscle layers can be closed with absorbable suture material in a simple continuous suture pattern. Trapped air in the abdomen should be removed by suction while closing the muscles and before closing the skin. In smaller fish, the muscle layer and skin may be closed in one layer.

For skin closure use small monofilament nylon suture material with a swaged-on reverse cutting needle. Simple continuous or simple interrupted suture patterns are most often used to oppose the margins of the skin incision. Remove the skin sutures in 2-3 weeks, or when the skin appears adequately healed.

Nick Saint-Erne, DVM

Saint-Erne@Q.com

ANATOMY & PHYSIOLOGY ABSTRACTS

Compiled by Dr. David Scarfe

Reproductive Cycles of Marine Mammals

Pomeroy P (2011). *Anim. Reprod. Sci.*, 124 (3-4): 184-193.

Abstract

Marine mammals conform to the general mammalian reproductive system centered on the hypothalamic–pituitary–gonadal axis. Most marine mammals are long-lived and of large body size with lesser reproductive rates than many other animals, a consequence of their interaction with the marine environment where the demands of acquiring resources from the ocean must be balanced with the need for bearing offspring in a suitable place for survival. The degree of spatial and temporal separation of these life history phases in many species is a key feature of their ecology. The reproductive physiology of pinnipeds, cetaceans, sirenians, sea otters and polar bears has been more thoroughly characterized for the more accessible species.

Disorders of the Respiratory System in Pet and Ornamental Fish

Roberts HE & SA Smith (2011). In: SE Orosz & CA Johnson (eds), *Veterinary Clinics of North America: Exotic Animal Practice*, 14(2): 179-206.

Abstract

The respiratory organ of fish is the gill. In addition to respiration, the gills also perform functions of acid-base regulation, osmoregulation, and excretion of nitrogenous compounds. Because of their intimate association with the environment, the gills are often the primary target organ of pollutants, poor water quality, infectious disease agents, and noninfectious problems, making examination of the gills essential to the complete examination of sick individual fish and fish populations. The degree of response of the gill tissue depends on type, severity, and degree of injury and functional changes will precede morphologic changes. Antemortem tests and water quality testing can, and should, be performed on clinically affected fish whenever possible.

Molecular Pathology of Vertebral Deformities in Hyperthermic Atlantic salmon (*Salmo salar*).

Ytteborg E, G Baeverfjord, J Torgersen¹, K Hjelde & H Takle (2010). *BMC Physiology*, 10:12-16.

(An open access publication available at:

<http://www.biomedcentral.com/content/pdf/1472-6793-10-12.pdf>)

Abstract

Background: Hyperthermia has been shown in a number of organisms to induce developmental defects as a result of changes in cell proliferation, differentiation and gene expression. In spite of this, salmon aquaculture commonly uses high water temperature to speed up developmental rate in intensive production systems, resulting in an increased frequency of skeletal deformities. In order to study the molecular pathology of vertebral deformities, Atlantic salmon was subjected to hyperthermic conditions from fertilization until after the juvenile stage.

Results: Fish exposed to the high temperature regime showed a markedly higher growth rate and a significant higher percentage of deformities in the spinal column than fish reared at low temperatures. By analyzing phenotypically normal spinal columns from the two temperature regimes, we found that the increased risk of developing vertebral deformities was linked to an altered gene transcription. In particular, down-regulation of extracellular matrix (ECM) genes such as col1a1, osteocalcin, osteonectin and decorin, indicated that maturation and mineralization of osteoblasts were restrained. Moreover, histological staining and in situ hybridization visualized areas with distorted chondrocytes and an increased population of hypertrophic cells. These findings were further confirmed by an up-regulation of mef2c and col10a, genes involved in chondrocyte hypertrophy.

Conclusion: The presented data strongly indicates that temperature induced fast growth is severely affecting gene transcription in osteoblasts and chondrocytes; hence change in the vertebral tissue structure and composition. A disrupted bone and cartilage production was detected, which most likely is involved in the higher rate of deformities developed in the high intensive group. Our results are of basic interest for bone metabolism and contribute to the understanding of the mechanisms involved in development of temperature induced vertebral pathology. The findings may further conduce to future molecular tools for assessing fish welfare in practical farming.

Reproductive performance of alternative male phenotypes of growth hormone transgenic Atlantic salmon (*Salmo salar*).

Moreau DTR, Conway C & Fleming IA (2011). *Evol. Applications*.

Abstract

Growth hormone (GH) transgenic Atlantic salmon (*Salmo salar*) is one of the first transgenic animals being considered for commercial farming, yet ecological and genetic concerns remain should they enter the wild and interact reproductively with wild fish.

Here, we provide the first empirical data reporting on the breeding performance of GH transgenic Atlantic salmon males, including that of an alternative male reproductive phenotype (i.e. small, precocially mature parr), in pair-wise competitive trials within a naturalised stream mesocosm. Wild anadromous (i.e. large, migratory) males outperformed captive reared transgenic counterparts in terms of nest fidelity, quivering frequency and spawn participation. Similarly, despite displaying less aggression, captive reared nontransgenic mature parr were superior competitors to their transgenic counterparts in terms of nest fidelity and spawn participation. Moreover, nontransgenic parr had higher overall fertilisation success than transgenic parr, and their offspring were represented in more spawning trials.

Although transgenic males displayed reduced breeding performance relative to nontransgenics, both male reproductive phenotypes demonstrated the ability to participate in natural spawning events and thus have the potential to contribute genes to subsequent generations.

The Chelonian Respiratory System

Bennett T (2011). In: SE Orosz & CA Johnson (eds), *Veterinary Clinics of North America: Exotic Animal Practice*, 14(2): 225-239.

Abstract

This article reviews anatomy, physiology, diagnostic techniques, and specific disease syndromes of the chelonian respiratory system. Respiratory disease is common in chelonians and is a cause of significant morbidity and mortality in these animals. Mycoplasma, herpesvirus, and iridovirus are reviewed in depth.

Metabolic and respiratory status of stranded juvenile loggerhead sea turtles (*Caretta caretta*): 66 cases (2008–2009)

Camacho M, MP Quintana, OP Luzardo, MD Estévez, P Calabuig & J Orós (2013). *J. Amer. Vet. Med. Assoc.*, 242 (3): 396-401.

Abstract

Objective—To document venous blood gas, acid-base, and plasma biochemical values for stranded juvenile loggerhead turtles at admission to a rehabilitation facility, compare these values among stranding causes, investigate differences in these values for turtles that survived versus those that died, and establish the baseline values for successfully rehabilitated loggerhead turtles (*Caretta caretta*).

Design—Retrospective case series.

Animals—66 stranded juvenile loggerhead turtles that were hospitalized between 2008 and 2009.

Procedures—Venous blood gas, acid-base, and plasma biochemical values at the time of admission were compared retrospectively among turtles with different stranding causes. Initial results were compared between turtles that survived and turtles that died. Results for survivors were compared between the time of admission and time of release.

Results—57 (86.36%) turtles had various types of acid-base disorders at the time of admission to the rehabilitation facility. Of these, 33 (57.9%) had mixed acid-base disorders and 24 (42.1%) had primary acid-base disorders. All acid-base disorders were classified as mild to moderate, except 1 case of severe metabolic and respiratory acidosis. Except for the debilitated turtles (in which the mean initial glucose concentration was much lower than that observed for the rest of turtles), there was no difference in initial values when comparing stranding causes. Turtles that died during rehabilitation had significantly higher initial anion gap and osmolality, compared with turtles that survived.

Conclusions and Clinical Relevance—Acid-base disorders were present in most stranded juvenile loggerhead turtles. Evaluation of accurately obtained, temperature-corrected venous blood gas, acid-base, and plasma biochemical values can provide important clinical and prognostic information and a valuable basis for the implementation of adequate and rapid treatment for stranded loggerhead turtles admitted to rehabilitation facilities.

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NEWS AND VIEWS

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New nonlethal test developed to detect fish virus

June 15, 2013
Ithaca, NY, USA

Cornell University, College of Veterinary Medicine researchers have successfully identified the presence of a deadly virus - the viral hemorrhagic septicemia virus (VHSV) - by using techniques that are not lethal to fish.

The current method to test if a body of water has infected fish requires sampling the major organs from many indigenous fish, because of concerns that less invasive samples might not be sensitive enough to detect the virus. In a study published in March's *Journal of Veterinary Diagnostic Investigation* (25:2), VHSV was indeed detected from fin and gill tissue biopsies, which cause little harm to collect.

"We were concerned about how many fish we were sampling for surveillance," said graduate student Emily Cornwell, first author of the study. "Up until this point, all of our sampling was lethal. We want to avoid taking fish that are important for sport or that are protected." Because the virus can span multiple regions, thousands of fish are typically tested, said co-author Rod Getchell, Ph.D. '02, senior research associate in microbiology and immunology.

Fish infected with VHSV display signs of external and internal bleeding, and commonly die within a few weeks. VHSV infection remains incurable, so minimizing its presence is paramount. Testing fish for the European strains of VHSV from samples collected nonlethally has been possible since 2009. However, "The Great Lakes genotype has only been known since 2005, so its pathogenesis has not been as well-studied," said Cornwell. "Even though the viruses are similar, they have different hosts they can infect."

This less harmful sampling will allow for more thorough and long-term VHSV studies, such as tracking the disease's progression. "Fish can be asymptomatic, but then the infection can flare up. There are a lot of intricacies about the course of disease we don't understand," said Cornwell, who is in her fifth year of the dual DVM/PhD program at Cornell.

To test whether the Great Lakes VHSV strain could be detected from less invasive samples, the researchers collected small clips of tissue from the fins and gills of fish injected with VHSV. RNA extracted from fins and gills revealed a viral presence

as successfully as RNA from several internal organs -- the current, but lethal, sample.

The traditional method also only successfully identified the virus about 50 percent of the time in one of the fish types used in the study, even though the fish were exposed to a million copies of virus. "The traditional viral isolation technique is not as sensitive, which is why we chose to inject the fish -- that way, we knew for sure that all of the fish were exposed," said Cornwell.

Regulations dictate that fish must be tested using the traditional viral isolation method, said Getchell. "For example, if you want to move fish from the Great Lakes -- a restricted area, you will have to use the approved techniques. The [new] molecular techniques, even though they're more sensitive, are not part of the regulations yet," said Getchell. Getchell remains hopeful that this study will help "tip the world in the molecular direction. The evidence is mounting, so, slowly, the rules will change."

See <http://vdi.sagepub.com/content/25/2/203.abstract> for the abstract of the publication mentioned.



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New oyster disease test could give aquaculture a hand

June 16, 2013

Scientists in the College of Veterinary Medicine at Oregon State University (OSU) have developed a new, inexpensive and precise way to detect the toxin secreted by *Vibrio tubiashii*, a bacterial disease that a few years ago caused millions of dollars in losses to the oyster aquaculture industry in the Pacific Northwest. When perfected and commercialized, the new assay should give oyster growers an early warning system to tell when they have a problem with high levels of this toxin and must take quick steps to address it. Findings were just published in the *Journal of Microbiological Methods*.

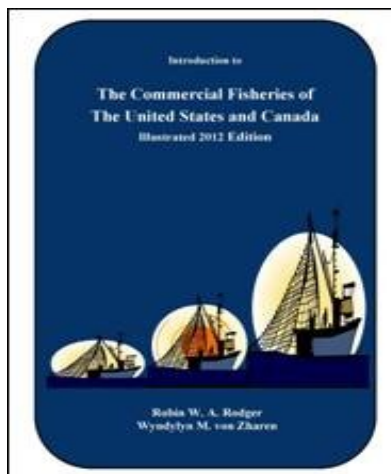
Vibrio tubiashii has caused major problems for oyster growers in recent years, especially in 2007 when a major outbreak almost crippled the industry. When the bacteria and the toxin it produces reach unacceptably high levels, they can kill the tiny seed oysters before they have a chance to grow.

"We still need to improve the sensitivity of the test and better quantify results, but it should provide information in about 30 minutes that used to take three or four days," said Frances Biel, a faculty research assistant in the OSU Department of Biomedical Sciences. "That type of rapid detection will let oyster growers know they have a problem while they can still do something about it."

The oyster die-offs that began happening in the late 2000's appear to have various causes, researchers say, including changes in ocean acidification. Some measures were taken to help deal with the acidification, but widespread die-offs continued to occur that couldn't be linked to that problem. The vibriosis disease caused by this bacteria was found to be a major concern. The largest shellfish hatchery on the West Coast, in Oregon's Netarts Bay, faced near closure as a result of this crisis. "Shockingly little was known about *V. tubiashii* at first, and the toxins that it produces," said Claudia Hase, an OSU associate professor of veterinary medicine. "It secretes a zinc-metalloprotease compound that's toxic to shellfish, and that's what our new assay is able to detect."

See the source (<http://tinyurl.com/mdf9eqt>) for the full story.

The full article, DN Gharaibeh, FM Biel & CC Häse (2013). Development of monoclonal antibody-based assays for the detection of *Vibrio tubiashii* zinc-metalloprotease (VtpA). *J. Microbiol. Meth.*, 94 (2): 125–132 is accessible at <http://www.sciencedirect.com/science/article/pii/S0167701213001607>.



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“Caring for health and welfare of fish: A critical success factor for aquaculture”

Brussels, 16-17 May 2013

“Fish, as other food producing animals, get sick, their welfare can be compromised and the food they produce has to be healthy. Veterinarians, through education and experience, have a holistic view on how health, welfare and the environment interlinks and therefore have a key role to play within aquaculture” emphasized FVE President Dr. Christophe Buhot at the conference the Federation of Veterinarians of Europe (FVE) organized on aquaculture. *“Vets care for people and animals, including fish. It is essential to ensure that sufficient veterinary expertise is available to the aquaculture sector.”*

The event attracted more than 150 people from European Institutions, National Authorities, veterinarians, fish producers, scientists and many other stakeholders as well. This large number of participants underlined the enormous interest our society takes in aquaculture, which is a fast growing sector.

The EU is not self-sufficient in fish products and requires imports from other countries. There is a significant potential in EU for increasing production in aquaculture, both in terms of capacity and exploitation of new species. This growth should be encouraged and supported at national and EU levels.

The large diversity of fish species being kept, each with their own specific needs, should be taken into consideration when regulating the sector. Close collaboration between the aquaculture industry and the veterinary profession should be ensured, in order to guarantee optimal health management of fish farms at all stages of production and to put in place sustainable and viable solutions for the future.

Lack of availability of veterinary medicines specific to fish is a problem in the EU. The medicines legislation review should try to ensure incentives to encourage the development of these medicines.

FVE organized this conference in association with the Irish Presidency of the Council and the support of European Commission, Directorate-General for Health and Consumers and Directorate-General for Maritime Affairs and Fisheries. All presentations given during the conference and the conclusions reached are available online:

http://www.fve.org/uploads/publications/docs/13_003_aquaculture_conference_rev.pdf

Conclusions of the FVE Conference:

- We need to acknowledge the extended diversity in fish species, in order to be in a position to propose and put in place sustainable and viable solutions for the future.
- Veterinarians are the experts in animal health and welfare, including fish. It is essential to ensure that sufficient veterinary expertise is available to the aquaculture sector. This will also ensure food safety and protect public health.
- Close collaboration between the aquaculture industry and the veterinary profession should be ensured, in order to ensure optimal health management of fish farms at all stages of production.
- Effective epidemiological monitoring is essential for the appropriate health management of fish-farms and shall be supported by the development of specific diagnostic tests. This will also underpin biosecurity of farms.
- Research on fish vaccines and antiparasitic medicines should be promoted.
- Research on alternative innovative non-medical treatments should be encouraged as well.
- Availability of veterinary medicines specific to fish must be ensured throughout Europe. Any review of the relevant legislation must ensure incentives and adequate return on investment to encourage the development of these medicines.
- Antibiotics for fish are POMs and must be prescribed by a veterinarian for the fish under his/her supervision.
- Industry and veterinarians should collaborate on best practices and vaccination programmes in order to prevent the development of antimicrobial resistance.
- Risk-based controls of animal movements should be enforced, particularly concerning imports from third countries, in order to avoid introduction of new pathogens that may threaten the health of local aquatic species.
- The EU is not self-sufficient in fish products, and requires imports from third countries. However, there is a significant potential in EU for increased production in aquaculture, both in terms of capacity and exploitation of new species. This growth should be encouraged and supported at national and EU levels.
- It is important not only to acknowledge the wide diversity of fish species, but also to encourage the growth of the different varieties of aquaculture. Research must be supported and targeted towards all the different species.

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- The particular needs of aquatic organisms during their handling, transport or slaughter must be addressed by legislation.
- We call on the EU Commission to put more emphasis on fish welfare standards in the Commission's Animal Welfare Strategy.
- Veterinary schools should be encouraged to include in their curricula aquatic veterinary disciplines and/or training programmes, in order to ensure a high level of knowledge, skills, and competencies of the graduate. This is particularly important in EU countries where aquaculture is a significant food producing industry.
- Licensing of fish farms should be based on scientific knowledge and sustainable farming practices. To this end, state officials involved in this work must have adequate education and knowledge of the field.

The National Marine Fisheries Service and the U.S. Fish and Wildlife Service completed a review of the status of the hawksbill sea turtle.

The review is required every 5 years for species listed under the U.S. Endangered Species Act. The hawksbill sea turtle was listed in 1970 as endangered with extinction throughout all of its range. The previous review of the hawksbill's status was completed in 2007.

Based on the best available information, the Services conclude the hawksbill sea turtle should not be reclassified to threatened or delisted. The review can be found on each agency website at:
National Marine Fisheries Service: <http://www.nmfs.noaa.gov/pr/listing/reviews.htm#species>
U.S. Fish and Wildlife Service: <http://www.fws.gov/southeast/5yearReviews/5yearreviews/index.html>



[Dolphins dying in Indian River Lagoon](#)

30 dolphins dead in Indian River Lagoon

BREVARD COUNTY, Fla. —

Dolphins and manatees are dying in Brevard County's Indian River Lagoon twice as quickly as last year. Scientists are scrambling to figure out what's killing them. They say it may have something to do with the mammals' changing habitat. Several agencies are joining forces to solve the mystery.

Scientists from Hubbs SeaWorld Research Institute recovered three dead dolphins in Brevard County. That brought the count to 30 just since the beginning of the year. Even more manatees have died.

For marine biologist Megan Stolen and her co-workers at the institute, there have already been many calls to Indian River Lagoon to investigate a dolphin death.

"It's especially hard to see young animals die," Stolen said. The dead dolphins they have been finding are "really skinny," but aside from that, have no obvious problems in common. Biologists have taken tissue samples and tested for toxins, but haven't discovered anything definitive.

"We're not exactly sure what's happening with the pelicans and manatees either," Stolen said. There have been more than 100 unsolved manatee deaths between last July and this April, enough for the National Oceanic and Atmospheric Administration to declare a marine mammal unusual mortality event. That triggers an investigation.

Florida Fish and Wildlife officials think algae blooms may have contributed to the manatees' deaths. The blooms can block out sunlight, negatively impacting sea grass growth, a staple of the manatee diet. Scientists said they don't know if the crisis is natural or man-made. Stolen said even if they knew what's happening, there may only be so much they could do about it.

See full story:

<http://www.wftv.com/news/news/local/30-dolphins-dead-indian-river-lagoon/nXj4J/>

Where Human Trash Accumulates in the Deep Sea

June 5, 2013,
Science News

Surprisingly large amounts of discarded trash end up in the ocean. Plastic bags, aluminum cans, and fishing debris not only clutter our beaches, but accumulate in open-ocean areas such as the "Great Pacific Garbage Patch." Now, a paper by researchers at the Monterey Bay Aquarium Research Institute (MBARI) shows that trash is also accumulating in the deep sea, particularly in Monterey Canyon.

Kyra Schlining, lead author on this study, said, "We were inspired by a fisheries study off Southern California that looked at seafloor trash down to 365 meters. We were able to continue this search in deeper water -- down to 4,000 meters. Our study also covered a longer time period, and included more in-situ observations of deep-sea debris than any previous study I'm aware of."

To complete this extensive study, Schlining and her coauthors combed through 18,000 hours of underwater video collected by MBARI's remotely operated vehicles (ROVs). Over the past 22 years, technicians in MBARI's video lab recorded virtually every object and animal that appeared in these videos. These annotations are compiled in MBARI's Video Annotation and Reference System (VARS).

For this study, video technicians searched the VARS database to find every video clip that showed debris on the seafloor. They then compiled data on all the different types of debris they saw, as well as when and where this debris was observed.

In total, the researchers counted over 1,500 observations of deep-sea debris, at dive sites from Vancouver Island to the Gulf of California, and as far west as the Hawaiian Islands. In the recent paper, the researchers focused on seafloor debris in and around Monterey Bay -- an area in which MBARI conducts over 200 research dives a year. In this region alone, the researchers noted over 1,150 pieces of debris on the seafloor.

The largest proportion of the debris - about one third of the total - consisted of objects made of plastic. Of these objects, more than half were plastic bags. Plastic bags are potentially dangerous to marine life because they can smother attached organisms or choke animals that consume them.

Metal objects were the second most common type of debris seen in this study. About two thirds of these objects were aluminum, steel, or tin cans. Other common debris included rope, fishing equipment, glass bottles, paper, and cloth items.

The researchers found that trash was not randomly distributed on the seafloor. Instead, it collected on steep, rocky slopes, such as the edges of Monterey Canyon, as well as in a few spots in the canyon axis. The researchers speculate that debris accumulates where ocean currents flow past rocky outcrops or other obstacles.

The researchers also discovered that debris was more common in the deeper parts of the canyon, below 2,000 meters (6,500 feet). Schlining commented, "I was surprised that we saw so much trash in deeper water. We don't usually think of our daily activities as affecting life two miles deep in the ocean." Schlining added, "I'm sure that there's a lot more debris in the canyon that we're not seeing. A lot of it gets buried by underwater landslides and sediment movement. Some of it may also be carried into deeper water, farther down the canyon."

In the same areas where they saw trash on the seafloor, the researchers also saw kelp, wood, and natural debris that originated on land. This led them to conclude that much of the trash in Monterey Canyon comes from land-based sources, rather than from boats and ships.

Although the MBARI study also showed a smaller proportion of lost fishing gear than did some previous studies, fishing gear accounted for the most obvious negative impacts on marine life. The researchers observed several cases of animals trapped in old fishing gear.

Other effects on marine life were more subtle. For example, debris in muddy-bottom areas was often used as shelter by seafloor animals, or as a hard surface on which animals anchored themselves. Although such associations seem to benefit the individual animals involved, they also reflect the fact that marine debris is creating changes in the existing natural biological communities.

To make matters worse, the impacts of deep-sea trash may last for years. Near-freezing water, lack of sunlight, and low oxygen concentrations discourage the growth of bacteria and other organisms that can break down debris. Under these conditions, a plastic bag or soda can might persist for decades.

MBARI researchers hope to do additional research to understand the long-term biological im-

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pacts of trash in the deep sea. Working with the Monterey Bay National Marine Sanctuary, they are currently finishing up a detailed study of the effects of a particularly large piece of marine debris -- a shipping container that fell off a ship in 2004.

During research expeditions, researchers occasionally retrieve trash from the deep sea. However, removing such debris on a large scale is prohibitively expensive, and can sometimes do more damage than simply leaving it in place.

Schlining noted, "The most frustrating thing for me is that most of the material we saw -- glass, metal, paper, plastic -- could be recycled." She and her coauthors hope that their findings will inspire coastal residents and ocean users to recycle their trash instead of allowing it to end up in the ocean. In the conclusion of their article, they wrote, "Ultimately, preventing the introduction of litter into the marine environment through increased public awareness remains the most efficient and cost-effective solution to this dilemma."

Story Source:

The above story is reprinted from [materials](#) provided by:

[Monterey Bay Aquarium Research Institute.](#)

Journal Reference:

Kyra Schlining, Susan von Thun, Linda Kuhnz, Brian Schlining, Lonny Lundsten, Nancy Jacobsen Stout, Lori Chaney, Judith Connor. Debris in the deep: Using a 22-year video annotation database to survey marine litter in Monterey Canyon, central California, USA. *Deep Sea Research Part I: Oceanographic Research Papers*, 2013; DOI: [10.1016/j.dsr.2013.05.006](https://doi.org/10.1016/j.dsr.2013.05.006)

American Association of Fish Veterinarians formed to advance fish medicine in North America

The American Association of Fish Veterinarians (AAFV; fishvets.org), founded in 2012, is an association of licensed North American veterinarians who practice fish medicine either as part of their traditional practice; with or alongside their institutional employment; or as their main species group within their practice.

Fish medicine can be roughly divided into pet fish (e.g., tropical & pond species like koi), food and bait fish (aquaculture production), lab animal, and natural resource fisheries. Some of our members practice in all areas; others are more special-

ized in one or the other. A central function of this association is to advance the quality and stature of clinical fish veterinary practice.

The Mission of the AAFV is: a) to further the art and science of fish veterinary medicine by enhancing and promoting knowledge, proficiency, professional standards, and viability of fish medicine for veterinarians; b) to increase the value, visibility, and acceptance of fish veterinary medicine for our stakeholders; and, c) ultimately, to improve fish, human, and environmental health.

Interested veterinarians are encouraged to visit the AAFV website (fishvets.org) and/or to contact Dr. Roy Yanong (roy@ufl.edu), Dr. Hugh Mitchell (hughm@aquatactics.com), or Dr. Stephen Smith (stsmith7@vt.edu) for more information.

Also, if you are interested in "working up" some ornamental/aquarium fish cases online with some fish vet colleagues? Please join Shane Boylan, DVM (South Carolina Aquarium), Todd Cecil, DVM, DABVP-Avian (Western Aquatic Animal Veterinary Service), and Roy Yanong, VMD (Tropical Aquaculture Laboratory, University of Florida) for "Aquarium Fish Clinical Cases," sponsored by the American Association of Fish Veterinarians, and VIN on July 21, 2013, 9 pm ET.

These AAFV-VIN rounds are free of charge for participants who are either members of the American Association of Fish Veterinarians (fishvets.org) or VIN members (beta.vin.com/) (or both). Rounds will be presented using powerpoint with speaker narration, in VIN's classroom setting. If you are not currently a member of either, but would like to join, please be sure to do so as soon as possible so that you are in the system.

Login info for AAFV members: Go to www.beta.vin.com/aafv and click Classroom in navigation bar at top of screen. Login info for VIN members: Login to <http://beta.vin.com/> and click "Rounds" in navigation bar. Click on appropriate "Attend this session" link.

Both methods will take you to the exact same classroom. You can email VINGRAM@vin.com with any questions/problems about passwords-but please check to make sure you have your login information at least several days before the "Rounds" to prevent any login issues.

Several more AAFV-VIN fish rounds are being planned for 2013, as well.

Roy Yanong
AAFV President, 2013

Study reveals disease-causing parasites in dead otters

Jun 18, 2013

Research undertaken by the Cardiff University Otter Project has revealed a number of disease-causing parasites in the bodies of dead otters. The findings were revealed at the BBC Summer of Wildlife event held at the National Museum of Wales. Spread by cat faeces and present in 39.5% of otters examined was *Toxoplasma gondii* - the most insidious of the parasites. Findings showed that the infection was prevalent across many areas of the UK, with significantly more cases arising in the East. How this affects otters is yet to be determined – further investigation in this area is planned-but in humans the parasite can lead to miscarriage and retinal abnormalities.

Parasitic flatworms were found in 18.3% of otters – these could be divided into two species: *Pseudamphistomum truncatum* and *Metorchis albidus*. The former flatworm is native to Eastern Europe and infects a range of wild carnivores; both are associated with pathological damage to the otter gall bladder. Dissections of affected otters revealed gall bladders to be inflamed or thickened. Both parasites can infect any fish eating mammal – including humans.

A species of tick called *Ixodes hexagonus* was found in nearly a quarter of otters (24.3%). Up to 122 ticks per otter were identified. More ticks were found on younger otters than adults. Scientists reason that this is likely due to younger otters tending to spend more time in the holt (an otter den). As otters are common carriers of this tick, this may have implications for vector-borne diseases, which can infect humans and their companion animals.

Speaking of these findings, Dr Elizabeth Chadwick said: "The project's research on the parasites that infect otters has revealed previously unknown aspects of their distribution and ecology. Continued work is necessary to help us to better understand their transmission pathways and the impacts that they have on otters, other wildlife and human health."

See Website:
<http://phys.org/news/2013-06-reveals-disease-causing-parasites-dead-otters.html>



Farmed Salmon Raises Blood Levels of Omega-3s

By Rosalie Marion Bliss

People who eat farm-raised salmon can increase their intake of beneficial omega-3 fatty acids to levels that may help reduce their risk of heart disease, according to studies by U.S. Department of Agriculture (USDA) scientists.

The studies by Agricultural Research Service (ARS) nutritionist Susan Raatz and physiologist Matthew Picklo address concerns about whether farm-raised salmon have less available omega-3s than salmon caught in the wild. The scientists work at the ARS Grand Forks Human Nutrition Research Center in Grand Forks, N.D. ARS is USDA's principal intramural scientific research agency.

Two omega-3 fatty acids (eicosapentaenoic acid and docosahexaenoic acid) are abundant in oily fish such as salmon, tuna, mackerel, and herring. Consuming 250 milligrams daily of EPA and DHA—the amount in a 3-ounce farmed salmon fillet—has been associated with reduced heart disease risk.

The scientists evaluated a group of 19 healthy human volunteers who were provided three different portion sizes of farm-raised Atlantic salmon. Each volunteer was assigned to consume two weekly servings of one of the three portion sizes of salmon for a four-week period. After a "blood-clearing" break of four to six weeks, a different portion size was served, followed by another break. Then the third portion size was served, so that each volunteer had tested all three portion sizes.

The raw weights of the salmon portions fed to the volunteers were 90 grams (about 3.2 ounces), 180 grams (about 6.3 ounces), and 270 grams (about 9.5 ounces). The Dietary Guidelines for Americans recommend consuming 8 ounces of seafood weekly.

Blood was collected from each of the 19 subjects at the beginning and end of each treatment. The results showed that EPA blood levels doubled after the volunteers consumed the 6.3-ounce portions and increased nearly threefold after they consumed the 9.5-ounce portions. Also, based on the blood indicators, DHA levels were elevated by about 50 percent, regardless of portion size.

This research was published in the Journal of the Academy of Nutrition and Dietetics. [Read more](#) about the research in the May/June 2013 issue of Agricultural Research magazine.
<http://www.worldvet.org/node/10958>

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New study looks at killer whale deaths to understand whales' lives

By Dene Moore, The Canadian Press

VANCOUVER - Researchers are learning a lot about the lives of orcas from the deaths of orcas, thanks to a team of experts from British Columbia and the United States. Though killer whale carcasses are on occasion found washed up on beaches around the North Pacific, few tests were being done to figure out why or how. The lack of information became a real concern when researchers noticed an alarming drop in the 1990s in the population of southern resident killer whales found around southern Vancouver Island as far south as California. They declined about 20 per cent in a decade, dropping to about 78 individuals.

"This raised quite a bit of concern," said Stephen Raverty, of the B.C. government's Marine Ecosystem Health Network. "We were very interested in trying to place this in context of whether it was something that was occurring just regionally, or whether it would have broader ramifications for the populations along the western seaboard... and up into the eastern Pacific as well."

So Raverty and Joseph Gaydos, of the University of California Davis' SeaDoc Society, thought a checklist of sorts for whale necropsies could garner helpful information. That list was distributed from Russia to Japan, Alaska to Mexico, almost a decade ago. They have now published their first study of the information gathered. The study, in the journal *Marine Mammal Science*, looks at tests from 371 stranded whales dating as far back as 1925.

Thanks to the protocol developed by Raverty and Gaydos in 2004, there have now been necropsies performed on dozens of animals. In the coming months, Raverty, a veterinary pathologist with the B.C. Ministry of Agriculture and Lands, and his colleagues will examine test results more closely, looking for information about diseases, contaminants and other factors that may be affecting the endangered whales.

The necropsies have shown that the orcas absorb extremely high loads of man-made toxins, suffer from infectious diseases and, in the case of fish-eating populations, depend primarily on severely depleted salmon stocks.

For full article, go to:

<http://www.ottawacitizen.com/technology/study+looks+killer+whale+deaths+understand+whales+lives/8504922/story.html>

Even Whales Get Bitten by Mosquitoes

By Virginia Morell

No one has ever reported a wild orca dying from a mosquito-borne disease. But it's a different story for killer whales in captivity. In 1990, Kanduke, a 25-year-old male orca died suddenly at SeaWorld Orlando, the victim of encephalitis virus carried by a mosquito. And in 2007, Taku, a 14-year-old male orca, died at SeaWorld San Antonio; unknown to his trainers, he'd been infected with West Nile Virus, the disease's tell-tale lesions spotted during a necropsy of his brain tissue.

Captive orcas are particularly susceptible to these mosquito-borne diseases, scientists reported last month in the *Journal of Marine Animals and Their Ecology*, because of the shallow pools they're kept in. Two researchers observed seven captive orcas at SeaWorld in Florida for thousands of hours from 10:00 p.m. until 6:00 a.m., noting their behaviors. Most of the time, the whales stayed in a "logging" position, basically resting close to the surface.

In the early evening hours, the scientists also observed mosquitoes landing on the animals' exposed dorsal fins for a meal. Captive orcas may also be more susceptible to these diseases, the scientists say, because they suffer from sunburn and broken, damaged teeth, which weaken their immune systems.

More captive orcas in the United States may be similarly infected, but the presence of such diseases is rarely noted in the National Oceanic and Atmospheric Administration's records of the animals' deaths, the scientists say. Instead, at least in Taku's case, the official cause of death was "pneumonia" without any reference to the bug bite.

For full article, go to:

<http://news.sciencemag.org/sciencenow/2013/05/scienceshot-even-whales-get-bitt.html?ref=hp>



Waikiki
Aquarium

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Fatal fungus found in third major amphibian group, caecilians

Batrachochytrium dendrobatidis is known as the amphibian chytrid fungus and can cause a deadly disease that is decimating some of the world's frogs, toads, newts and salamanders. However, the fungus had not been detected in the other lesser-known major group of amphibians, the caecilians, until now. An international team led by scientists at the Natural History Museum and Zoological Society of London (ZSL) have found the first cases of chytrid fungus infections in caecilians. They report their findings in the journal *EcoHealth*.

More than 200 caecilians caught from the wild had DNA tests carried out on swabs of their skin to check for the amphibian chytrid fungus. The study included 29 caecilian species from 5 countries in Africa and South America, which is the largest genetic survey of this fungus in caecilians to date.

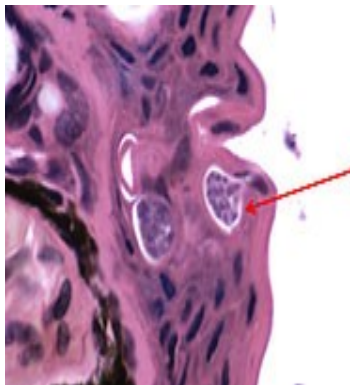
The team's results revealed the chytrid fungus in 58 individuals (nearly 30%). They examined the skin of some of the infected caecilians under the microscope to determine whether, and how, the fungus could infect the skin. It was living in the skin in the same way it is known to in frogs and salamanders. Some of the caecilians in the study died from the chytrid disease, chytridiomycosis.

A third of all amphibians in the wild are under threat of extinction and the chytrid disease is known to be a major contributor in many cases. The amphibian chytrid fungus is a skin pathogen - it lives in, and damages, the outer skin layers that contain large amounts of the protein keratin. This can be deadly because amphibians breathe and take up water through their skin.



Scientists took skin swabs from more than 200 wild-caught caecilians to test for the potentially deadly chytrid fungus.

It is often thought that the amphibian chytrid fungus is spread in water. However, the caecilians that tested positive in this study live in the soil so the fungus is likely to also spread on land.



The chytrid fungus infection shows up under the microscope - the red arrow points to the oval shaped space containing fungal spores within an infected area in the caecilian's skin.

There are nearly 200 species of caecilians, which belong to the Order Gymnophiona (meaning 'naked snakes'). This compares with more than 6,000 species of frogs and toads, and more than 600 newts and salamanders. Caecilians are long and limbless, but unlike snakes, they lack the external scales of reptiles.

Caecilians have reduced eyes and a pair of unique sensory tentacles and some can grow to a 1.6 metres long. Most live in moist tropical soils as adults, but a few species in South America are fully aquatic. Some caecilians lay eggs but others give birth. In some species the hatchlings peel and eat the specially modified and nutrient-enriched skin of their mothers!

Because most species of caecilians live buried in the soil, they are rarely studied and very little is known about most of them. As a result, more than two thirds of caecilian species are 'Data Deficient' on the IUCN Red List because there is too little information to know if they are threatened or not.

This new research shows that the amphibian chytrid fungus now infects all the major groups of amphibians and means that scientists now need to consider it as a potential threat to caecilians in the wild.

For full story, go to:

<http://phys.org/news/2013-05-fatal-fungus-major-amphibian-group.html>

Pregnancy Test Frog May Have Spread Fatal Fungus

Stephanie Pappas
LiveScience Senior Writer

A frog once widely imported and bred by hospitals because it lays eggs when injected with a pregnant woman's urine may have brought a deadly amphibian infection to the United States. African clawed frogs infected with the fungus *Batrachochytrium dendrobatidis*, or Bd, could have brought the fungus to California shores, according to a new study. The frogs, *Xenopus laevis*, carried the infection in Africa decades before it showed up in North America, the research finds.

There are other possible carriers for Bd, including the American bullfrog, which has also been moved around the world by people who farm bullfrogs for their meaty legs. What the new study shows is that humans have an ethical responsibility to dying frogs, said lead researcher Vance Vredenburg, a biologist at San Francisco State University. "Humans are directly involved," Vredenburg told LiveScience. "That means we can't just sit around and say, 'Well, what can we do? We can't do anything.' We need to do something, since we caused the problem."

Bd kills by infecting amphibian skin, causing it to thicken by up to 40 times what is normal. Because frogs, salamanders and other amphibians breathe and take in nutrients through their skin, this is often disastrous. Individuals of many species die within days of infection, Vredenburg said.

"Over 400 species of amphibians are thought to have been driven either to extinction or near extinction by the arrival of this disease," he said. But some survive. Those include the American bullfrog and the African clawed frog, leading to speculation that these species could be asymptomatic carriers that help spread the disease.

The African clawed frog first came to the United States in the pet trade and in zoo collections in the early 1900s. By the 1940s, researchers had discovered that the hormones in a pregnant woman's urine stimulated egg-laying in the frogs, leading hospitals to import the amphibians in greater numbers. If you found out you were pregnant between the 1940s and the 1970s, an African clawed frog might be to thank for that information.

The frogs are also used in biomedical research labs, though 11 states now restrict their import. Escaped or released African clawed frogs and their

descendants have set up permanent homes in several spots across the United States, including California. Bd caused its first mass die-off of Californian frogs in 1978 and has been spreading through the state since.

To trace the origins of the infection, Vredenburg swabbed the skin of 178 African clawed frogs collected in Africa between 1871 and 2010 and another 23 collected in California between 2001 and 2010. The dead frogs are held in the collections of the California Academy of Sciences. Using a technique called polymerase chain reaction, or PCR, Vredenburg and his colleagues were able to amplify the small fragments of DNA they got from the swabs to determine if any Bd DNA was present. The fungus had infected 2.8 percent of the African frogs and 13 percent of the Californian frogs (or three specimens). The oldest infection dated back to a frog collected in Kenya in 1934. The timing reveals that Bd was already present in African populations before the African clawed frogs started coming to California in large numbers. The researchers report the findings on May 15 [in the journal PLOS ONE](#).

A recent study, published this year in the journal Proceedings of the National Academy of Sciences, found that Bd strains are very diverse and have a complex genetic history. The oldest lineage found originates in Brazil, but that doesn't mean an older strain won't be found elsewhere, the researchers reported.

Hope for halting Bd is currently slight. Researchers believe that some of the survivor amphibians fend off infection thanks to [microbes living on their skin](#), Vredenburg said. If these friendly bacteria could be identified, perhaps vulnerable frog populations could get a defensive boost of their native bacteria, he said.

Original article on [LiveScience.com](#).
<http://www.livescience.com/32043-pregnancy-test-frog-spread-fungus.html>



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Irondequoit Bay Fish Kill Linked to VHS

An ongoing fish kill in Irondequoit Bay, Monroe County, New York has been linked to viral hemorrhagic septicemia (VHS) virus, the NY Department of Environmental Conservation (DEC) announced on May 28, 2013.

VHS is a fish disease and does not pose any threat to public health. To reduce the likelihood of spreading VHS in New York State, anglers and boaters are encouraged to abide by the following guidelines:

- Do not transport fish from one body of water to another! Note that this practice is illegal without a DEC fish stocking permit;
- Only release bait fish into the water body it was taken from. Bait purchased commercially should not be released into any body of water;
- Do not dispose of fish carcasses or by-products in any body of water.
- Remove all mud, aquatic plants and animals from all gear, boats, motors and trailers before leaving a body of water;
- Drain your live well, bilge and bait tanks before leaving the water you are fishing or boating on. Anglers or boaters using any water body known to be infected with the VHS virus should disinfect their live wells and bait wells with a 10 percent chlorine/water solution (1 $\frac{3}{4}$ cups bleach per gallon of water). Rinse well to remove all residual chlorine;
- Follow all fish health regulations and inform your friends about the fish health regulations.

Inspections by DEC aquatic biologists on April 25 and 29 indicate that nearly all of the dead and dying fish observed were gizzard shad, a medium-sized member of the herring family. White perch, yellow perch and freshwater drum were also observed. A sample of two gizzard shad, one yellow perch and one freshwater drum were collected and sent to Cornell University College of Veterinary Medicine's fish pathology laboratory. Results have shown that all three species of fish collected were infected with the VHS virus.

VHS is caused by a rhabdovirus (rod-shaped virus) that may affect fish of all size and age ranges. It does not pose any threat to human health, but is a serious disease of fresh and saltwater fish. VHS can cause hemorrhaging of fish tissue and can cause the death of infected fish. Once a fish is infected with VHS, there is no known cure. Not all infected fish develop the disease, but they

can carry and spread the disease to other fish. It has caused fish mortalities ranging from a few fish to thousands. VHS has been in Lake Ontario for a sufficient period of time such that vulnerable fish species have been exposed to the virus, and have likely developed sufficient immune response that will reduce the likelihood of large-scale die-offs. The virus is, however, capable of mutating, which could again render fish populations vulnerable to disease outbreaks.

Mortality of gizzard shad in late winter and early spring is common and occurs cyclically, although it usually affects lower numbers of shad locally. This species is very sensitive to cold water temperatures and their inability to acclimate causes mortality at low temperatures. Gizzard shad are living near the northern edge of their range in the Great Lakes, making them especially susceptible to cold temperatures. Generally mild winters may have allowed their population to increase during recent years. In this particular case, late winter cold stress is suspected to have weakened this fish making them more susceptible to the VHS disease.

The VHS virus was linked to a large die-off of fish in Lake Ontario in 2005, and again in 2007. Since that time, it has been blamed for fish kills in Lake Michigan, Lake Huron, Lake St. Clair (MI), Lake Erie, the St. Lawrence River, Skaneateles Lake, Seneca-Cayuga Canal, Conesus Lake, and several inland lakes in Wisconsin and Michigan.

VHS can be spread from one water body to the next through a variety of means, usually involving the movement of infected fish. One method of inadvertently spreading VHS is by moving fish from one water body to another. VHS may also be spread through the discharge of water contaminated with the virus in live wells, bait wells, ballast tanks and bilge areas. DEC asks for the cooperation of ALL anglers and boaters to help prevent the spread of VHS.

If you witness a large number of dead or dying fish (usually 100 or more), please contact the nearest DEC regional office and ask for the Bureau of Fisheries. For more information about VHS, please see the DEC's web site. Questions about the Irondequoit Bay fish kill or VHS can be e-mailed to Bureau of Fisheries or by calling 585-226-5343.

Source: <http://www.dec.ny.gov/press/91272.html>.

THE AQUATIC VETERINARIAN

Volume 7, Number 2 **LEGISLATIVE & REGULATORY ISSUES** Second Quarter 2013

FDA Announces Grant Funding Available for Veterinary Testing Methods June 24, 2013

The U.S. Food and Drug Administration has announced the availability of grant funds to bolster efforts to validate testing methods as part of the Veterinary Laboratory Investigation and Response Network (Vet-LIRN). Vet-LIRN is a network of state and university laboratories that receive funding from FDA to increase testing capabilities and assist the agency in its investigations into potential problems with animal feeds (including pet foods) and animal drugs. Validation of new test methods helps FDA to diagnose animal feed and drug-related issues and respond to these events more rapidly to protect public health.

FDA is specifically requesting proposals to develop and validate methods to test animal samples (such as tissue, blood, milk or urine from sick animals or from vermin) for chemicals or pathogens that pose threats to animal feeds either as unintentional contaminants, or possible economic or bioterrorism adulterants.

FDA developed the Veterinary Laboratory Investigation and Response Network (Vet-LIRN, formerly Vet-LRN) to increase the safety of human and animal health by investigating potential adverse events involving animal feed or animal drug contamination or adulteration. The testing of diagnostic specimens adds insight into investigations not routinely obtained from traditional food testing laboratories. Such investigations require detection methods that are validated for organs and diagnostic samples such as urine and feces, which are not typical food matrices. It is the purpose of this program to expand and validate detection methods among cooperative agreement laboratories. This activity is designed to increase the suite of validated methods available for testing during outbreaks or events. It is also designed to strengthen the collaborations and integration of the network laboratories to encourage seamless interactions during actual emergency related testing. Eligibility is limited to only Vet-LIRN network laboratories.

For more information on the Veterinary Laboratory Investigation and Response Network see:

www.fda.gov/AnimalVeterinary/ScienceResearch/ucm247334.htm

For more information about the grant program see:

<http://grants.nih.gov/grants/guide/pa-files/PA-13-244.html>

Special Permits for Oyster Farmers Hit by Virus June 16, 2013

New Zealand –

Special permits can now be issued to some oyster farmers whose businesses have been affected by the oyster herpes virus to gather wild (feral) Pacific oysters, which will come as a great relief to the local oyster industry.

Mike Sabin, MP for Northland commented: "I have had a number of meetings with Northland oyster farmers over the past 18 months and have a great deal of empathy for their plight, with this virus devastating their spawning stock and putting the industry on its knees, so this decision will be a real boost for local farmers."

"Farmers raised the question with me of harvesting feral oysters as a potential means for them to remain viable while solutions to the virus were being developed, something I talked over with the Minister and officials."

"As it currently stands, oyster farmers are only able to gather feral oysters if they have a commercial fishing permit, something that they explained to me wasn't a workable fit for their scenario and wasn't viable given their difficult financial situation."

"I am pleased to announce that the Minister for Primary Industries (MPI), Nathan Guy, has approved a new special purpose permit under section 97(1)(c) of the Fisheries Act 1996 enabling MPI to issue special permits to oyster farmers to collect feral oysters and transfer them onto their marine farms, for later re-harvest and sale," said Mr Sabin.

The decision follows consultation with Maori and other affected stakeholders, Mr Sabin saying the permits will be valid for three years to allow the oyster industry to recover from the impacts of the virus and the permit would still be subject to food safety requirements. In approving the special permit purpose, Minister Guy acknowledged the unusual and special circumstances of this particular situation, providing a cost effective mechanism for farmers to recover while they try to rebuild their industry

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

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MEETINGS OF INTEREST TO AQUATIC VETERINARIANS

Veterinarians attending these meetings may be awarded veterinary CE/CPD credit towards annual re-licensure or re-registration to practice veterinary medicine. Individuals should check with the organizers if CE/CPD certificates are provided.

2013 SALMON DISEASE WORKSHOP

July, 2013 (dates to be decided)
Corvallis, Oregon

This workshop is designed for professionals working in the fish health field and will emphasize recent advances and developments in our understanding of salmonid diseases. The workshop is limited to 20 participants on a first come, first served basis.

For more information, if you wish to receive graduate credit and to register, please contact Dr. Jerri Bartholomew at 541-737-1856 or e-mail at: bartholj@science.oregonstate.edu
A website for more information and with links to registration will be posted in the near future.

August 22-24, 2013 – Fish Histology Workshop Murdoch University Perth, Australia

This 3-day workshop will be held at the teaching multi-header microscope suites at the Murdoch University School of Veterinary and Life Sciences. The workshop is designed with the fish health diagnostician as well as researcher/ would-be-researcher in mind. At the end of the workshop, participants will have developed some level of confidence in carrying out sound disease investigations in finfish, appreciate normal finfish histology as well as be able to recognize significant and emerging diseases of important cultured finfish species in Asia and Australia.

The workshop will cover both freshwater ornamental fish and marine food fish. There will be opportunity to spend some time on histological materials that participants are encouraged to bring along to the workshop. Participants will receive a set of DVDs of selected virtual microscopy slides reviewed during the workshop, which will serve as invaluable resource reference materials. There will be ample opportunity to seek the opinions of presenters as well as other participants during the workshop. The workshop program will be announced as soon as it has been finalized. Do register your interest with the conference organizers.

For more information, please contact Dr Susan Gibson-Kueh at S.Kueh@murdoch.edu.au

AFS 2013 Little Rock: Preparing for the Challenges Ahead **September 8–12, 2013**

Little Rock, Arkansas

Begin making plans to attend the AFS 143rd Annual Meeting, themed “Preparing for the Challenges Ahead,” in Little Rock, Arkansas on September 8–12, 2013.

Contributed paper and poster abstracts are due by March 15, 2013.

Details will be found at:

www.afs2013.com/call-for-papers.

Meeting details and registration will be found at: www.afs2013.com.



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2013 AQUAVET® I & II & III

The University of Pennsylvania School of Veterinary Medicine and the College of Veterinary Medicine at Cornell University are pleased to announce the 2013 AQUAVET® I & II Programs as well as the new AQUAVET® III offering. 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 2013 and one on aquarium medicine which is at three venues.

AQUAVET® I: An Introduction to Aquatic Veterinary Medicine is a 4-week course (26 May - 22 June 2013) intended primarily for veterinary students.

AQUAVET® II: Comparative Pathology of Aquatic Animals is a 2-week course (26 May - 8 June 2013) 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.

AQUAVET® III: Clinical Aspects of Captive Aquatic Animal Medicine is a 5 week course (24 June - 27 July, 2013) and is limited to a small number of students. The venues include GA Aquarium, U of GA and Dolphinaris, Cancún, México.

Veterinary students can receive credits for the course and graduate veterinarians can receive CE credits.

More detailed information and applications for admission (due by January 15, 2013) are available on the web site www.aquavet.info.

2nd Australian Scientific Conference on Aquatic Animal Health

July 8-12, 2013

Pullman Reef Hotel, Cairns, QLD

The Second Australasian Scientific Conference on Aquatic Animal Health will be held in Cairns (<http://www.pullmanhotels.com/gb/hotel-2901-pullman-reef-hotel-casino/index.shtml>), Queensland, Australia. The conference provides a forum for presentation of diagnostic, research, management and policy issues encompassing all areas of aquatic animal health and bio-security.

The FRDC Aquatic Animal Health Subprogram is pleased to announce that Prof Hugh Ferguson (Head of the Department of Pathobiology, Director of the Marine Medicine programme, Professor of Pathology, School of Veterinary Medicine, St George's University, Grenada, West Indies), and Prof Don Lightner (Aquaculture Pathology Laboratory, Department of Veterinary Science and Microbiology, University of Arizona, OIE Reference Laboratory for Crustacean Diseases) have accepted invitations as Conference Keynote Presenters.

To submit a presentation abstract, or receive further announcements and information on the program, please contact Joanne Slater (email: joanne.slater@csiro.au).

EAFP 16TH INTERNATIONAL CONFERENCE ON DISEASES AND SHELLFISH

SEPTEMBER 2-6, 2013

Tampere Finland

The 16th International Conference on Diseases of Fish and Shellfish will be held at the Tampere Hall Conference Centre in Tampere, Finland. Scientific and technical sessions consisting of invited talks, keynotes, oral presentations, poster presentations and workshops. An EAFP General Assembly will take place during the Conference. Planned social events include a Welcome Cocktail, Civic Reception and the traditional Conference Banquet.

More information will be available on the EAFP website as well. Feel free to contact our Meeting Secretary if you have any questions or need additional information.

Jose A. Garcia, EAFP Meeting Secretary, Dept. Sanidad Animal, Fac. Veterinaria, Universidad Complutense de Madrid, Avda. Puerta de Hierro s/n, 28040-Madrid, Spain. Fax: +34 (91) 394-3908. E-mail: gcabrera@vet.ucm.es.



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31st World Veterinary Congress

17-20 September 2013

Prague, Czech Republic

150th Anniversary of the World Veterinary Association

Detailed program, abstract submission form as well as information about registration, social events etc. are available on the website:

www.wvc2013.com

We look forward to meeting you in Prague in 2013



WORLD VETERINARY
ASSOCIATION

20th annual ARAV Conference

September 15th-19th,

Indianapolis, Indiana, USA

The ARAV 20th Annual Conference Registration is open. Please go to: <http://www.arav.org/> to register.

Hotel – The conference hotel is the Sheraton Indianapolis City Centre Hotel, located in downtown Indianapolis at 31 W. Ohio Street. The area is safe and clean and full of activities. All major shopping and restaurants are within six blocks of the hotel.

Room Reservations -- We have obtained a very affordable room rate of \$129.00 per night (plus tax) for single, double, triple or quad housing. In addition we have arranged for complimentary internet in all overnight guest rooms (the usual cost being \$11.95/24 hours) and discounted self-parking at \$12.00 for all attendees.

The Sheraton Reservation phone number is 888-627-8186; be sure to say that you will be attending the ARAV/AEMV conference to make sure that you receive the conference room rate in the block reserved for our attendees

On-line – a customized “StarGroup” website is also available for those wishing to book their room reservation on-line. Just log-in to <https://www.starwoodmeeting.com/StarGroupsWeb/res?id=1306121144&key=1A330>

Marine Wildlife Vet Courses in South Africa & Mozambique

September 17-29, 2013

After the success of participation on Wildlife Veterinarian course, Wild Spirit presents Marine Wildlife Course. Because animals in the oceans need to be protected as well and have lots to share with you.

Marine Wildlife Course is a training program that combines science, interaction and experience with marine animals in South Africa and Mozambique. This course provides knowledge of biology, physiology, behavior and dynamics of emblematic species such as white sharks, southern right whale and humpback whale, penguins and dolphins.

This programs aims to contribute to wildlife conservation and animal welfare through your active participation and training of professionals.

If you are an animal professional who has a passion for marine mammals and wildlife and you have always wanted to get involved on conservation in Africa or if you have always wished to learn from experts in the field... Now, it's time to do it.

Click to watch our previous experience:

<http://www.youtube.com/watch?v=Bqhg4H4jIA>

Contact us:

info@thewildspirit.com

www.thewildspirit.com



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www.wvc2013.com

We look forward to meeting you in Prague in 2013



WORLD VETERINARY
ASSOCIATION

2014 INTERNATIONAL SYMPOSIUM ON AQUATIC ANIMAL HEALTH

Aug 31 – Sept 4, 2014

Portland, Oregon

I am pleased to announce that this meeting will be held in Oregon! Late summer is a beautiful time to be here and Portland is a wonderful city with lots to offer.

Stay tuned for details as meeting planning progresses. I do promise a great venue and fun events – of course the scientific program will be outstanding.



39th World Small Animal Veterinary Association Congress

16-19 September, 2014

Cape Town, South Africa.

Abstract Submission Opens: November 1, 2013

<http://www2.kenes.com/wsava/pages/home.aspx>

Join us for both the stimulating sessions and the special flavor of Cape Town, a city filled with unique flora and surrounded by beautiful beaches, vineyards and natural beauty.

Cape Town is one of the world's most stunning locations, and is a popular tourist destination filled with natural beauty and a rich variety of stimulating activities. Safari adventures depart regularly from the area.

Kevin Stevens

Local Host Chairman



International Aquatic Veterinary Biosecurity Symposium & Workshop: Meeting International, National & Producer Expectations

September 22-25, 2013

Ludwig-Maximilian University,
Munich, Germany

A program for veterinarians, producers and government officials – Lead of by a half-day reception and social interaction reception to set the scene for participant collaboration and interaction for one day of invited speakers, contributed presentations and posters describing how standardized veterinary biosecurity programs can be implemented; one day of table-top exercises for developing practical biosecurity plans tailored to specific needs; and, one day of on-farm to implement both guidance and table-top exercise experiences of the previous days.

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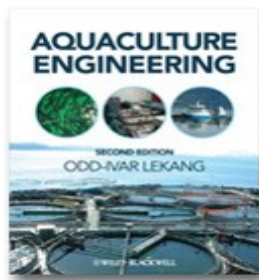


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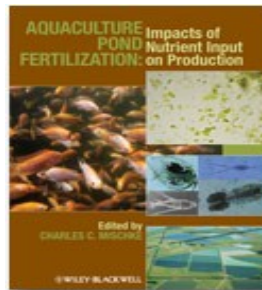


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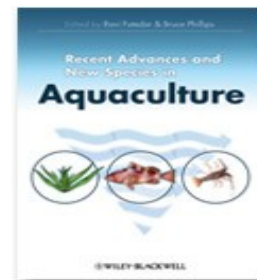
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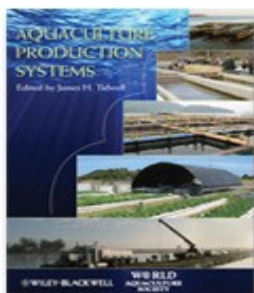
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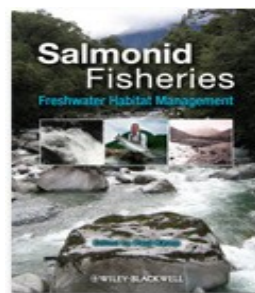
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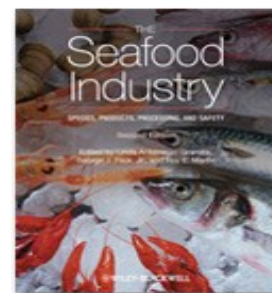
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