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The Aquatic Veterinarian

World Oceans Day—8 June 2014
An octopus in the Caribbean reef.
(Photo by Isabelle Kuehn/Shutterstock)
See related article on page 40.

Volume 8, Number 2
Second Quarter, 2014

World Aquatic Veterinary Medical Association

THE AQUATIC VETERINARIAN

Volume 8, Number 2 Formerly *Aquatic Vet News* Second Quarter 2014

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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THE AQUATIC VETERINARIAN

Volume 8, Number 2 CONTENTS Second Quarter 2014

Please send articles, clinical reports, or news items to the editor by the following submission dates:
Issue 1 – February 15 (published in March)
Issue 2 – May 15 (published in June)
Issue 3 – August 15 (published in September)
Issue 4 – November 15 (published in December)
All submissions should be in 10-point Arial font, single spaced.
Submissions may be edited to fit the space available.
See page 17 for further instructions to authors.

Editor's Note

If you missed out on the activities during World Oceans Day on June 8th, (I spent that day flying from Phoenix, Arizona to Toronto, Canada—and never once saw an ocean the whole trip!) then be sure to read the article on page 40 and check out the websites associated with it so you won't miss anything next year. With some planning, maybe WAVMA could tie in some of our activities to World Oceans Day next June 8.

In addition to that topic, there are many other important ocean related articles in this issue of *The Aquatic Veterinarian.* We have five veterinary students reporting on their aquatic educational experiences that were partially funded through the WAVMA/AVMA/AVMF scholarships. Chris Walster also reviews some of the aquatic veterinary educational opportunities starting on page 26.Then Laura Urdes reports on her attendance to the meeting about the *Care and Welfare of Fish* held in Brussels, Belgium (page 29).

The Literature Review section (p. 34-35) focuses on abstracts about Salmon in this issue, and there are several marine animal articles in the News and Views section. Finally, check out the CEPD listings (starting on page 42) to plan your travel calendar for the rest of this year and next, so you can attend some of the Aquatic Veterinary Medicine lectures planned at the upcoming conventions.

I will be in San Diego visiting Sea World and soaking up some cool California partially-cloudy sunshine on the Pacific Ocean beaches in mid-July, and then heading over to Denver for the AVMA Convention and the WAVMA AGM at the end of July. We have three full days of Aquatic Vet lectures at AVMA this year. I hope to see many of you there!

Nick Saint-Erne
Executive Editor

Photo taken at SeaLife Aquarium, Tempe, Arizona by Nick Saint-Erne

Download a QR reader onto your Smart Phone and scan the Quick Response Code to the right. It will take you to the WAVMA.org website page for accessing all of the past WAVMA Newsletters.

You will need your WAVMA User ID and Password to access the most recent back-issues of *The Aquatic Veterinarian.*

Cover Photo:

World Oceans Day—8 June 2014
An octopus in the Caribbean reef.
(Photo by Isabelle Kuehn/Shutterstock)
See related article on page 40.

On World Oceans Day people around our blue planet celebrate and honor the ocean, which links us all. Be a part of this growing global celebration! Thanks to The Ocean Project and World Ocean Network for helping to promote and coordinate this event since 2002. Thank you to the United Nations for officially recognizing June 8th as World Oceans Day, since 2008.

The Ocean Project

President's Report

I am continually in awe of the work that everyone is doing behind the scenes. Members of the different committees work tirelessly, around the global clock, to make the WAVMA what it is. I am humbled to be working in a team of wonderful colleagues. I'm also grateful to our non-committee members who are contributing by livening up the emails with excellent questions and answers. Remembering that much of what we've learnt through our career was not formally taught, we always learn something new with your answers. And to get the answers, we need you to come up with questions.

We are aware that many veterinarians are members of multiple organisations because we want to remain current and maintain our networks. We are hoping that you are benefiting from our WAVMA activities that you will stay with us. Remembering that the 3 areas we are concentrating on this year include:

1. Relevance: to satisfy the needs and wants of its members, through support, CEPD, recognition of prior experience and defending the aquatic area for the veterinary profession.
2. Pre-eminence: about growing the WAVMA brand within our profession (to our colleagues) and outside our profession (to our clients) by promoting the value and utilisation of suitably qualified aquatic veterinarians to our clients.

Reach: through the internet (social media) and engaging in open dialogue with other organisations

The very practical email discussions have inspired us to resume our WebCEPD. We will present excellent topics that will attract aquatic veterinarians, para-professionals and enthusiasts to join in the sessions. This is a way of arming our members with the knowledge and skills we need to do our job; and at the same time, advertise the skill set of aquatic veterinarians, to clients. It also means that member benefits are more equitably shared among a global membership. Keep an eye on <http://www.wavma.org/WebCEPD>. If you have a particular topic you are passionate about, please let us know.

The Certified Aquatic Veterinarian program is another way that the WAVMA is delivering value to its members. Veterinarians in private practice operate in a competitive market, and by displaying the post-nominals (CertAqV), you can display that unique selling point. The peer-reviewed process is thorough and it allows applicants to be recognised for their experience in aquatic veterinary medicine. More information is at: <http://www.wavma.org/CertAqV-Pgm>.

For some time the WAVMA has been trying to find a way to enter into dialogue with other aquatic veterinary organisations around the world. We are establishing an International Aquatic Veterinary Council (IAVC) which will provide a forum for representatives from interested aquatic veterinary organisations to discuss matters of mutual interest.

This year we have also nominated one of our finest members, Prof. Dusan Palic, to run for a position on the Council of the World Veterinary Association. In this process, I learnt that he is the third generation of veterinary professors in his family! His grandfather was the professor of veterinary anatomy, his father was the professor of poultry and Dusan is the professor of aquatic animal health! How awesome is that! And that's only a fraction of his illustrious career. I'm so glad that he's continuing to serve the WAVMA in every way he can. We wish him all the luck to win us a position on the WVA Council as a voice for WAVMA.

We have also set the date for our AGM to be on the evening of Monday July 28, 2014. The meet-and-greet, get-together will include dinner and a short business meeting. This date and location was chosen to coincide with the AVMA Conference in Denver. We hope to see you there.

Dr Richmond Loh
DipProjMgt, BSc, BVMS, MPhil (Pathology) Murdoch, MANZCVS (Aquatics & Pathobiology), CertAqV, NATA Signatory.
President WAVMA

THE FISH VET,
Perth, Western Australia, AUSTRALIA.
http://www.thefishvet.com.au
Ph: +61 (0)421 822 383
Skype: thefishvet

Secretary's Report

The year has unfolded quite assiduously under the current WAVMA board with all of our programs proceeding relatively as planned. I wish to thank all those that have renewed their membership this year. As I indicated, by virtue of being founded in the Chinese year of the Dog, we can expect good things this year. All of us will agree that first and foremost would be the promotion of aquatic veterinary medicine which ultimately will result in more recognition of our noble profession.

WAVMA has received two important invitations that will facilitate this goal. They are from the Companion Animal Journal which seeks to run a series of articles on aquatic veterinary medicine and pet fish care. The second is from the Clinician's Brief, the journal of the World Small Animal Veterinary Medical Association (WSAVA) of which WAVMA is an affiliate member. The second offer is also relevant in light of the fact that WAVMA will be offering a stream of aquatic veterinary medicine for the first time at the WSAVA annual convention in May 15-18, 2015. This indicates that we are slowly but surely being recognized for our efforts over the years and we should give ourselves a pat on the back for this. Against this background, I am appealing to our members to respond favorably to the request for articles which will be both beneficial to you as well as WAVMA.

The CertAqV program is advancing with more members taking advantage of this benefit. As a result, the process is becoming increasing simple since the number of mentors that can assist anyone desirous of pursuing this goal has increased.

It is also important to note that we currently have our highest number of student members in the history of WAVMA. This is wonderful since we do require new blood to take up the reins of the organization as time progresses. As secretary I would encourage our student members to step forward and be a part of committees which can serve as a learning process for you and help to enhance your leadership abilities. Against this background it may even be opportune to have a Student's Committee established that is managed exclusively by our student members but first we need you to come forward and express your desire to do so.

Our Annual General Meeting is just around the corner and we will soon have an opportunity to elect our board members for the next year. I would hope that more of our members would get involved as we seek to take WAVMA forward. As usual, Dr. Tepper will put together a great dinner for us in Denver, Colorado at the AVMA Convention in July. So see you there.

Devon Dublin, DMVZ, MSc. CertAqV
WAVMA Secretary

Center for Sustainability Science

Hokkaido University
Kita 9 Nishi 8,
Sapporo, 060-0809
Japan
Secretary@wavma.org

Nominations for WAVMA Executive Board positions for 2015 are now open

Each year nominations will be accepted for President-Elect, Secretary, Treasurer and Directors -at-Large. Nominee's biographical information is distributed to all members, and a 30-day on-line ballot period allows each Full Member to cast their vote.

Individuals elected for the following calendar year may participate in Executive Board discussion & meetings for the remainder of the current year, and begin their 12-month term of office as voting Board members on January 1 of the following year.

Nominations for the following WAVMA Executive Board positions are now being accepted (self-nomination is acceptable):

- President-elect
- Secretary
- Treasurer
- Director-at-Large (2 positions)

Individuals currently serving as Secretary, Treasurer or a Director-at-Large are eligible for re-nomination. Individuals willing to serve in any of these positions should download the nomination form, complete the required information, and e-mail it (along with a photograph) to the WAVMA Parliamentarian.

Officers/Directors elected will serve as *ad hoc* advisors to the 2014 Executive Board, until they take office as voting members of the Executive Board on January 1, 2015.

Biographical information on all nominees, and a link to the on-line ballots will be emailed to all paid WAVMA members.

For more information and the Nomination form:
http://www.wavma.org/elections

Meetings Committee Report

The Meetings Committee wishes to announce that due to logistical reasons, we have decided to hold our Annual General Meeting this year in Denver, CO in conjunction with the AVMA Convention. We will be hosting a dinner on the night of Monday, July 28, 2014 at 7 PM at a local downtown venue. All members present at the Convention are welcome to join us and enjoy a hearty meal and lively discussion. As space is limited, please contact me as soon as possible to reserve a seat.

The AVMA Annual Convention will take place in Denver, CO from July 26-29, 2014. In addition to our information booth, in conjunction with the AVMA Aquatic Veterinary Committee, we will have several WAVMA members, including President Richmond Loh and Treasurer Nick Saint-Erne lecturing during the aquatic sessions. If you plan to attend, join them for the talks as well as informal discussions during the conference.

The International Symposium on Aquatic Animal Health will be held in Portland, Oregon, Aug 31 – Sept 4, 2014. Many WAVMA members will be speaking there as well.

The World Small Animal Veterinary Association convention, of which WAVMA is a member organization, will take place in Cape Town, S. Africa from Sept.16-19, 2014. Our representative member will be in attendance.

The Asian Fisheries Society will host the Diseases of Aquatic Animals 9, aimed at improving aquaculture in the region, in Ho Chi Minh City, Vietnam from Nov.24-28, 2014. Immediately after, the Singapore Veterinary Association will host the Federation of Asian Veterinary Associations (FAVA) conference, to take place in Singapore from Nov. 28- 30, 2014. President Richmond Loh will be attending and speaking at this conference. Although we were not able to arrange an organized program here, our goals and opportunities for Asian-based aquatic veterinarians will be well represented by Richmond.

Julius Tepper, DVM, CertAqV
Meetings Committee Chair
cypcarpio@aol.com

Membership Committee

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

Full Member (Veterinarian)
Sara **Ahola** (USA)
Tim **Barbé** (Belgium)
Wesley **Baumgartner** (USA)
Kelly **Britt** (USA)
Kerry **Collins** (USA)
Alan **Fudge** (USA)
Christopher **Good** (USA)
Christian **Keller** (USA)
Timothy **Kniffen** (USA)
Melissa **Lindeman** (Australia)
Adolf **Maas** (USA)
Lian **Yeap** (Australia)

Veterinary Nurse; Technician
Tezella **Siu** (Australia)

Affiliate Member (non-veterinarian)
Ray **Wilhite** (USA)

Student Members
Jessica Allen (USA)
Angela Ashby (United Kingdom)
Caroline Beach (USA)
Ainjil Bills (USA)
Halyey Booth (USA)
Weiqin Chee (Australia)
Lauren Christiansen (Granada)
Alexandra Confer (USA)
Kirstin Cook (USA)
Joseph Darrington (USA)
Camille Deloute (France)
Jennifer Dill (USA)
Kyle Donnelly (USA)
Ashlee Dufour-Martinez (USA)
Susan Fogelson (USA)
Samantha Ford (USA)
Paige Garrett (USA)
Sofia Gaviria (USA)
Danielle Godard (Canada)
Whitney Greene (USA)
Thomas Gregory (Australia)
Harry Hamlin-Wright (United Kingdom)
Chelsea Hawkins (USA)
Shazia Jolissaint (USA)
Sarah Knowles (USA)

Student Members (Continued)
Jace Koh (Australia)
Ian Kolbaba (Caymen Islands)
Jessica Koppien (USA)
Jack Kottwitz (USA)
Justin Krol (USA)
Yong Yi Lau (Australia)
Austin Leedy (USA)
Laurie LeMonds (USA)
Eric Littman (USA)
Shelby Loos (USA)
Sanngeeta Macko (USA)
Diva Malinowski (USA)
Davida Marby (Australia)
Christine Mayer (USA)
John McFadden (Granada)
Maggie McQuinlin (USA)
Cecile Mercado (USA)
Teresa Maria Merk (Germany)
Elena Millard (USA)
Erica Moore (USA)
William Mustas (USA)
Ross Neethling (United Kingdom)
Julianne Pasztor (USA)
Julianne Richard (USA)
Jessica Richardson (USA)
Jenna Roseman (USA)
Jake Saunders (USA)
Ashley Schenk (USA)
Kelsey Seitz (USA)
Stephanie Shrader (USA)
Tifanie Silver (USA)
Jennifer Silvers (USA)
Phillipa Sims (Australia)
Staci Spears (USA)
Catherine Thornton Adams (USA)
Emily Trumbull (USA)
Nisha Tucker (Australia)
Brian Vagt (USA)
Lindsey Waxman (USA)
Ashley Welch (USA)
Shawn Wharrey (USA)
Hannah Williams (USA)
Abigail Wisnet (USA)
Hillary Wolfe (USA)
Nick Yeow (Australia)
Adrien Zap (Granada)

Credentialing Committee Report

The WAVMA CertAqV Program is administered by the WAVMA Credentialing Committee, along with the assistance of other Certified WAVMA members who serve as mentors and adjudicators.

To be credentialed by WAVMA as a Certified Aquatic Veterinarian and utilize the CertAqV honorific, individuals must be a WAVMA member, have a veterinary degree from a nationally recognized veterinary school, college or university and have demonstrated general knowledge and competency in core subject areas that are currently considered necessary to practice aquatic veterinary medicine. Students of a nationally recognized veterinary institution of higher education can register for the program, but will not be certified or entitled to utilize the CertAqV honorific until they graduate.

Individuals that desire to participate in the WAVMA CertAqV Credentialing Program are required to:

Be a current member of the World Aquatic Veterinary Medical Association,

Register for the Program (application at www.wavma.org or contact the WAVMA Administrators).

Identify a mentor to assist the registrant through the Program. The potential mentors would be any available WAVMA Certified Aquatic Veterinarians.

Provide the mentor with written evidence of satisfactory completion of each of the core Knowledge, Skills and Experience (KSE) subject areas.

Petition the Credentialing Committee for recognition of completion of all KSE requirements after the mentor has approved the documentation.

The WAVMA Certified Aquatic Veterinarian (CertAqV) program has now certified nineteen aquatic veterinarians. Please welcome our latest Certified Aquatic Veterinarians:

Dr. Laura Urdes, DVM, CertAqV
Dr Christopher Good, DVM, CertAqV
Dr Sharon Tiberio, DVM, CertAqV
Dr Todd Cecil DVM, CertAqV
Dr Adolf Maas DVM, CertAqV

There are an additional eight members currently in the process of being certified.

Help Give Veterinary Students & New Veterinarians the Opportunity to Experience Aquatic Veterinary Medicine.

Support the Aquatic Veterinary Scholarship Program with a Tax-Deductible Charitable Donation.

Every bit helps – $10, or as much as you can afford!

Go to:
www.AVMF.org and then click on

DONATE ONLINE

http://www.avmf.org/donate/

American Veterinary Medical Foundation

2014 WAVMA Programs

WAVMA has once again organised educational programs or will be present at several meetings around the world:

AVMA Convention.
Denver, Colorado. 25 - 29 July
where we will also hold our AGM.

ISAAH.
Portland, Oregon. August 31 – September 4, 2014

FAVA.
Singapore. 28 – 30 November, 2014

Scholarship Committee Report

The World Aquatic Veterinary Medical Association (WAVMA) in collaboration with the American Veterinary Medical Foundation (AVMF) and the American Veterinary Medical Association (AVMA) is pleased to announce the recipients of the 2014 Aquatic Veterinary Education Grants.

Selected from more than 120 applications submitted by veterinary students or recent veterinary graduates from more than 10 countries, the $20,000 provided will allow this year's recipients to explore a career opportunity in aquatic veterinary medicine by attending workshops & meetings, participating in externships or internships, or engaging in small-scale research projects.

Recipients from N. America, Europe and Asia included Jessica Allen, Kendra Baker, Elizabeth Bamberger, Susan Fogelson, Ari Fustukjian, Ashley Heard-Ganir, Elizabeth Hodges, Gary Hoover, Jayme Jeffries, Noelle Litra, Eric Littman, Ross Neethling, Samara Parker, Kaylee Perry, Jenna Roseman, Najim Sekh, Wesley Siniard, Justin Stilwell, Zachary Waddington, Jennifer Wilson-Cohen, Hillary Wolfe & Irene Yen. On completion of these projects each applicant has agreed to publish a report of their experience in ***The Aquatic Veterinarian***, WAVMA's quarterly publication.

Since 2010, when the program was initiated to recognize the contributions of Dr. John Pitts to aquatic veterinary medicine and student education, the program has received more than 350 applications. Through tax-deductible charitable contributions from individuals and organizations made through the AVMF, the program has been able to provide funds to more than 50 veterinary students and new veterinarians from more than 8 countries.

Continuing Dr. Pitts' legacy in forming the Student American Veterinary Medical Association in 1969, and with SAVMA chapters at all AVMA accredited veterinary schools in the United States, Canada and the Caribbean, and representation in the AVMA House of Delegates and the AVMA Executive Board, the WAVMA hopes to continue a similar influence to veterinary students and graduates throughout the world who have an interest in aquatic veterinary medicine.

For more information on this program see www.wavma.org/scholarships, or contact the Program Coordinators (administrators@wavma.org) or the WAVMA Secretary secretary@wavma.org.

Student Committee Report

Current WAVMA Student Chapters:

Murdoch University, School of Veterinary & Life Sciences (established 2014)
Faculty Advisors - Drs. Lian Yeap & Richmond Loh. ***Chapter contact*** – **click here**

Auburn University, College of Veterinary Medicine (established 2013)
Faculty Advisor - Dr. Ray Wilhite
Chapter Contact - **click here**

St. George's University, School of Veterinary Medicine (in development)

Tuskegee University, School of Veterinary Medicine (established 2012)
Faculty Advisor - Dr. Kenneth Newkirk
Chapter Contact - TBA

University of Florida, College of Veterinary Medicine (established 2013)
Faculty Advisor - Dr. Tom Waltzek
Chapter Contact - TBA

University of Illinois, College of Veterinary Medicine (in development)

University of Prince Edward Island, Atlantic Veterinary College (in development)

University of Tennessee, College of Veterinary Medicine (established 2012)
Faculty Advisors - Dr. Michael Jones & Dr. Debra Miller ***Chapter Contact*** - **click here**
View the Chapter's **Facebook** page

University of Wisconsin, College of Veterinary Medicine (in development)

Western University of Health Sciences, College of Veterinary Medicine (established 2014)
Faculty Advisor - Dr. Suzana Tkalcic
Chapter Contact - **click here**

University of Nottingham, School of Veterinary Medicune & Science (in development)

*For information or assistance, please contact the **WAVMA Chapter Coordinator***

To initiate a new Student Chapter see the **"Guidance for Forming a New Student Chapter"** (**click here** to download PDF).

Murdoch University WAVMA Student Chapter Semester One 2014 Report

Introduction

This was the founding year for the Murdoch University WAVMA Student Chapter. Being the first WAVMA student chapter in Australia, New Zealand and Micronesia, it was a challenge to introduce WAVMA to a university that has such a competitive field of existing interest groups. Despite this, we managed to have 10 veterinary students sign up for the WAVMA student membership and were able to hold two talks and an excursion to a Koi Auction.

Roles for Aquatic Veterinarians

On Tuesday 27th March, Dr Richmond Loh gave a presentation on the roles and opportunities available for aquatic veterinarians. Aquatic veterinarians are privileged to be able to have an opportunity to work with a range of taxa including fish, reptiles and mammals, as well as involvement with aquaculture, research and conservation. He provided us with tips on how to break into this industry and highlighted that the opportunities within this niche are diverse and growing. This talk was open to all students within the vet school, and we had an awesome turn out of about 40 students. Sushi was provided for lunch and I believe this event was well received by the attendees.

Koi Society of Western Australia Auction

On Sunday 30th March we went on an excursion to the tri-annual Koi Auction run by the Koi Society of Western Australia. This was a great opportunity for the 5 members who joined us to gain exposure to the ornamental fish trade. We were lucky enough to get some hands on experience treating a Koi that had an unfortunate collision with a brick wall. Each attendee was able to play a role, whether it was catching and restraining the fish, or excising a flap of skin. As none of us had ever attended a Koi auction before, it was an invaluable

experience and one we are all keen on participating in again. I can foresee many of our members leaving the next Koi auction having spent our food allowance on bags of Koi.

Wild Catfish Case Study

On Thursday 15th May, Dr Alan Lymbery presented a case on bacterial disease of wild catfish in northern Australia. He discussed the challenges he faced with conducting the experiment. This event exposed us to the role that aquatic vets can have in research and Veterinary Public Health. With sausage rolls and quiche provided for lunch we had a great turn out of about 20 veterinary students. This was higher than expected with the exam period looming.

Conclusion:

I think that this new WAVMA Student Chapter was able to make a splash for it's opening semester. I can't wait for what the second half of the year will bring us. With the hopes of an excursion to an aquarium and a fish necropsy workshop, I am sure we will be able to attract many more members and expose veterinary students to the developing world of aquatic veterinary practice!

Hui Nee Chin
Murdoch University WAVMA Student Chapter
Founder & President

STUDENT COMMITTEE:
2013 WAVMA/AVMA/AVMF Aquatic Scholarship Recipient Report

Stephen Reichley, DVM
2013 graduate, The Ohio State University

I would like to begin by thanking WAVMA, AVMA, and AVMF for selecting me as a recipient for this award. The funds from this scholarship were used to help offset the costs of the externships I participated in during my senior year of veterinary school at The Ohio State University. As a part of Ohio State's Career Area of Emphasis curriculum for senior students, I was able to tailor my clinical experiences to aquatic animal health.

My first externship was in Norway where I spent time with Dr. Asgeir Østvik at Havbrukstjenesten, AS, a private consulting firm for the Norwegian aquaculture industry. While there I gained exposure to salmon, trout and halibut industries in Norway, increased the efficiency of my fish necropsy skills and gained experience in sample collection for PCR detection of infectious salmon anemia and pancreas disease, participated in sea lice counts of salmon, and many other activities. From there, I joined students from the Norwegian School of Veterinary Science on their fish health field course rotation. With them I further increased my exposure to the aquaculture industry in Norway, discussed the opportunities and challenges facing the veterinary profession in Norway and the U.S., and provided seminars about the U.S. aquaculture industry to veterinary students, veterinarians and aquaculture industry personnel.

My next externship was with Professor Jimmy Turnbull at the University of Stirling's Institute of Aquaculture, in Scotland. Professor Turnbull designed a four-week experience for me that included time at Stirling as well as with the Fish Vet Group and Marine Scotland Fish Health Inspectorate. I was able to work in the disease lab, tropical lab, and Howietoun Fish Hatchery, among other locations at Stirling. During my time with the Fish Vet Group I completed many site visits, performed necropsies, and reviewed diagnostic pathology samples. I completed additional site visits with Marine Scotland in addition to reviewing current legislation and policies affecting different aspects of the aquaculture industry. This externship provided me the unique experience of learning about the industry from an academic, regulatory, and private sector viewpoint.

After my time in Scotland I traveled to Oranmore, Ireland and spent two weeks with Dr. Hamish Rodger at Vet Aqua International. I was most fortunate to have this opportunity with Dr. Rodger as he allowed me to delve into the salmon, trout, and perch industries in Ireland. We spent a good deal of time traveling together as we visited 13 counties, having great and informative conversations along the way. I would be remiss if I did not take this opportunity to thank Professor Sean Callanan from University College Dublin who extended such great hospitality during my visit to Ireland.

My next stop was Rome, Italy where I worked for four weeks with the Food and Agriculture Organization (FAO) of the United Nations. At FAO, I worked with the Fisheries and Aquaculture Department

(FIRA) under Dr. Melba Reantaso and Dr. Rohana Subasinghe focusing on the global aquaculture industry and the impacts of disease on wild and cultured aquatic animals. I was also fortunate to be at FAO during the Committee on Fisheries (COFI) and Codex Alimentarius meetings, which provided me the opportunity to hear directly from member states on challenges they were facing and their priorities regarding aquaculture, food safety and food security. Additionally, I attended the daily Global Early Warning System (GLEWS) meetings and presented a seminar to that group updating them on global aquatic animal health and transboundary aquatic diseases. I also presented a seminar at the end of my externship to FIRA and other FAO employees, interns and volunteers about my experience at FAO and the outcomes of my time there.

I then returned to the United States for clinical rotations at Ohio State as well as additional aquatic animal health externships. In the fall before graduation I was fortunate to spend a month with Dr. Scott LaPatra at Clear Springs Foods, Inc. in Buhl, Idaho. Dr. LaPatra and the wonderful staff at Clear Springs embraced my externship and fully included me in the operations of the company. I was able to work directly on the rainbow trout production facilities with staff and participate in meetings concerning health issues, production techniques, logistics and population management strategies. Here, I was able to integrate my on-farm production experience with experience at the research, processing, byproduct and feed mill facilities to understand practical concepts in vertical integration.

My next externship was with Dr. Kathleen Hartman at USDA-APHIS in Ruskin, Florida. I worked with Dr. Hartman during endorsements of fish health certificates for export of fish to various states and countries. We also performed sample collection for pathogen surveillance on a commercial koi and goldfish farm. While in Florida, Dr. Hartman also arranged for me to complete a biosecurity audit of the University of Florida's Tropical Aquaculture Laboratory and present my findings to the leadership and staff of that facility. I also found some time to work in the Disease Diagnostic Laboratory to increase my necropsy and diagnostic skills of ornamental fish.

My final externship was with Dr. Janet Whaley at USDA-APHIS in Riverdale, Maryland. During my tenure with Dr. Whaley I was able to broaden my knowledge of the U.S. aquaculture industry and the many state and federal programs related to aquaculture. I was also able to meet with key individuals within USDA including the One Health Director, Farm Animal Welfare Coordinator, National Program Leader for Aquaculture and the Aquaculture Import and Export specialist, among others. Dr. Whaley provided me the opportunity to help develop internal and external reports as well as National Veterinary Accreditation training modules related to aquaculture.

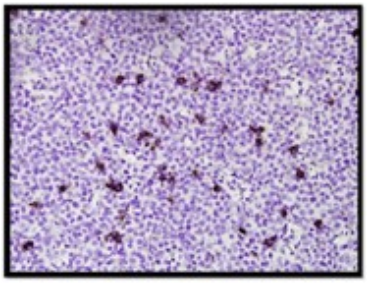
I am very fortunate and most grateful to have been able to arrange for such a varied list of externships relating to aquatic animal health during my clinical year of veterinary school. Ohio State College of Veterinary Medicine was very supportive of my endeavors, which would not have been possible without the individuals who graciously hosted me for these externships. I am humbled by the generosity of those involved in aquatic animal health around the world and wish to extend my sincerest thanks to everyone I had contact with at the organizations mentioned in this article. They have greatly shaped my knowledge in this field and I look forward to expanding on my experiences. I also wish to thank WAVMA, AVMA, and AVMF members who support scholarships like this; without you these invaluable experiences would be unobtainable.

2013 WAVMA/AVMA/AVMF
Aquatic Scholarship Recipient Report

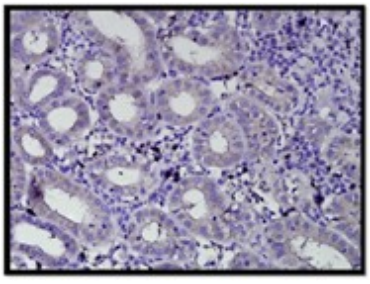
Jenny Munhofen, MS.
University of Georgia,
College of Veterinary Medicine,
Class of 2016 President

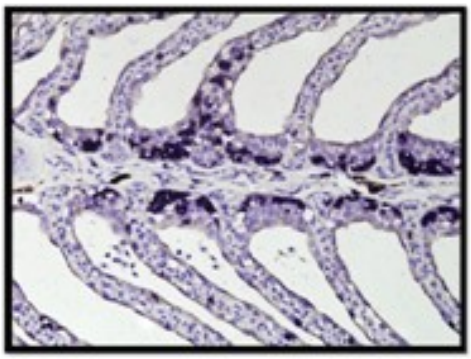
My name is Jenny Munhofen and I am a second year veterinary student at the University of Georgia with intentions to pursue aquatic pathology and or training through the US Army Veterinary Corps.

Last year, I completed an independent study project in the laboratory of one of our amazing veterinary pathologists, Dr. Corrie Brown, investigating which organs in sturgeon (*Acipenser baerii*) produce T and B cells. Specifically, my goals were to develop an *in situ* hybridization technique for RNA-RNA detection of sturgeon (Acipenseridae) immunoglobulin mRNA, characterize T cell populations using immunohistochemistry and determine organ sites of immunoglobulin production and T cell localization. It was during the process of this actual study that I applied for the WAVMA scholarship with intentions to present my work at an aquatic pathology meeting. Fortunately, I had the honor to receive the 2013 WAVMA Aquatic Veterinary Scholarship and was able to present a scientific poster of my results at the annual American College of Veterinary Pathologists meeting in Montreal, Quebec, Canada!



While I was attending the annual meeting, I met several other fish folks who also presented posters or oral presentations. One of my favorite speakers was from the University of Tennessee and shared her work involving lymphocytic characteristics in elasmobranches. The best part of her talk, as well as other speakers, was simply learning about fish medicine! I have yet to attend a veterinary meeting about anything fish related. The most intriguing part of the conference was simply meeting other professionals who have a passion for aquatic medicine and pathology, and I am inspired by their life stories and career goals to study and maximize fish health. This was a great reminder for us veterinary students that are sitting in the classroom trudging through all the dog and equine medicine courses when we want to get our feet wet (absolute pun intended) and also learn about aquatic medicine!





In order to promote the WAVMA scholarship, I gave a presentation to the Zoological Medicine club to encourage my UGA colleagues to learn more about the WAVMA and pursue this scholarship.

I want to thank the WAVMA for this excellent scholarship experience. It is because of your generous efforts that students like myself can further explore the vast array of opportunities in aquatic medicine. I am very grateful for your consideration to help me find my aquatic niche!

2013 WAVMA/AVMA/AVMF
Aquatic Scholarship Recipient Report

Sara Huckabone – 2013 Cornell University, College of Veterinary Medicine graduate

In the winter of my third year in veterinary school I had the opportunity to complete rotations at the Marine Mammal Center in Sausalito, CA and the Marine Wildlife Veterinary Care and Research Center (MWVCRC) in Santa Cruz, CA.

During my combined 6 weeks at these two facilities, I began a research project on fungal infections in stranded marine mammals on the central coast of California. Dr. Melissa Miller, my advisor at the MWVCRC, suggested that I send in my abstract to present at IAAAM. I did, and was accepted, but my application for funding was denied. As a student living in NY, the trip back out to California just for a four day conference seemed unfeasible. However, my dream was to land a job working in aquatic animal medicine in Northern California, so with the encouragement of my family, friends, and Dr. Miller, I decided to take the trip.

The conference was fabulous. I learned so much about the research that is happening not only in California and the US, but all over the world. IAAAM is a truly special conference that demonstrates how close-knit the aquatic community is. The student specific activities allowed me to network with aquatic vets and explore the opportunities that exist in the field. Presenting my research to such a distinguished and influential group of people pushed me way outside of my comfort zone. I was overwhelmed by the support I received from those people who had advised me on the research, classmates from AquaVet, and veterinarians I had worked with previously. They all came to hear me speak and offered kind words after.

The presentation was certainly a high point of the conference, but I also enjoyed that my vet school mentor, Dr. Paul Bowser, was presented with a lifetime achievement award. He supported me from the day that I toured Cornell and expressed interest in fish through graduation. It was also fun to support so many of my friends and colleagues as they got up to give their presentations.

The WAVMA/AVMA/AVMF aquatic scholarship was awarded to me after the conference and it alleviated some of the financial burden of the travel. Now that I have graduated, I am living in my research area on the coast of California. I am currently working with small animals and trying to solidify the basics of medicine that applies to all animals. However, I am keeping my aquatic medicine interests alive. My paper on Coccidioidomycosis in marine mammals will be submitted for publication in the next few weeks. Once this is done, I will begin work as a part-time research assistant on various aquatic animal projects in Santa Cruz.

In addition to IAAAM, I have given my research presentation to my classmates at Cornell as my senior seminar and to a group of doctors in California who gathered for a seminar on aquatic animal health. It will be presented again this week by Dr. Miller at a gathering of sea otter specialists.

Attending IAAAM gave me a lot of inspiration and motivation to keep working on research in aquatic animal medicine and introduced me to a supportive community that I really love being a part of. I am not sure of where my aquatic interest will take me next, but right now the work is bringing me a lot of satisfaction, knowing that I am adding to the knowledge of aquatic animal medicine and doing work that I truly enjoy.

I am really happy that WAVMA/AVMA/AVMF acknowledges the importance of aquatic animal medicine, and support the students who choose to follow their passions down this path. Thank you!!

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

2013 WAVMA/AVMA/AVMF
Aquatic Scholarship Recipient Report

Participation in AQUAVET I & MARVET
Karissa Sciacca
Candidate Class of 2016,
Cornell College of Veterinary Medicine

This past summer I completed AQUAVET 1 and MARVET Grand Cayman. AQUAVET 1 is a four-week program that provided an intro to aquatic veterinary medicine through lectures, wet labs, and field trips. Lecture topics ranged from invertebrates, water chemistry, and aquaculture to marine mammal medicine. Labs focused on subjects such as water chemistry analysis, dissection, and fish surgery. The class also took field trips to a few aquariums to speak with doctors and view various aquarium systems. Aside from learning the facts, this program was also a great opportunity for networking and learning what aspects of aquatic medicine you are most interested in. I learned a great deal about aquatic animals and the field of aquatic medicine itself while at AQUAVET.

After AQUAVET 1, I traveled to Grand Cayman to participate in MARVET. This program also included lectures but focused more on wet lab experiences. Some examples of labs included fish anesthesia and blood draws, bird necropsies, green sea turtle physical exams, dolphin physical exams, and coral reef surveys in the field. This program was amazing for its hands-on opportunities and its networking opportunities as well.

These programs were an excellent first step into aquatic veterinary medicine. They present a little of everything, which helps you to realize what you like more or less than other aspects of the field. I made great connections and opened doors to many more opportunities by participating in these programs. I would highly recommend both to anyone interested in aquatic veterinary medicine.

Karissa Sciacca in Grand Cayman (MARVET program) giving an IM Baytril injection to a koi.

WAVMA/AVMA/AVMF
Aquatic Scholarship Recipient Report

Jessica Dewar
Class of 2014 Tuskegee University, School of Veterinary Medicine, *TU Aquatics Club President*

Based on my experience at MARVET this summer in Grand Cayman, I was able to make contacts with many marine and aquatic veterinarians from all over. It was because of this marvelous and eye opening experience that I could bring back more than just photos to show the students at Tuskegee University School of Veterinary Medicine.

By working with Dr. Tonya Clauss and numerous others I was able to set up a private tour with Dr. Cara Field of the Georgia Aquarium. The idea behind this trip was to introduce students with little to no exposure to aquatic veterinary medicine and to help students well versed in this field to expand on their hopes and opportunities.

The best part was that Tuskegee for the first time ever, teamed up with Auburn students interested in starting a student chapter at Auburn University and we all enjoyed this tour together. This was the first time Auburn aquatic vet students and Tuskegee aquatic vet students were able to meet and share our ideas and stories.

So on September 28th, 2013, we all enjoyed learning from Dr. Field about how the veterinarians and aquarists; chemists, nutritionists and biologists worked together to keep the Georgia Aquarium thriving. This trip helped strengthen the need and want for a student chapter at Auburn University and fueled the passion among the Tuskegee Chapter students. We are now moving toward bigger and better things for the very near future.

2014 WebCEPD Program

This year, the WAVMA Communications Committee is re-launching the Aquatic Vet WebCEPD Program by embracing the internet as a means of more equitably sharing benefits among a global network of our members. After testing several systems over the past year for delivering educational webinars to members, the WAVMA Executive Board settled on one that that is simple and automatically sends reminders to those that register. While these WebCEPD webinars will be delivered by members in different time zones around the world, recordings of the programs will be available through the WAVMA website for future viewing.

Importantly, these webinars are planned to provide continuing education and professional development (CEPD) credit to those that require a certain amount of CEPD every year to be re-licensed or re-registered to practice veterinary medicine. Additionally, instructors at veterinary schools might like their students to participate in webinars as part of a course, or veterinary students may be able to seek recognition from their veterinary school to have participation credited towards their veterinary degree. Furthermore, many of the webinars may be suitable for credit towards the WAVMA Aquatic Veterinary Certification Program (CertAqV) that recognizes veterinarians with "Day-1" competency in aquatic veterinary medicine.

As part of the requirement of receiving CEPD credit, participants will need to satisfactorily complete an on-line knowledge and skills assessment (KSA) after watching each WebCEPD session. These short KSAs (or quizzes) will ensure that each participant fulfils the learning objectives that will be identified at the beginning of each WebCEPD session. While we hope to allow everyone to participate in all WebCEPD webinars at no cost; however, to offset some of the costs for the webinar and the KSA systems that WAVMA has to pay commercial vendors for, there may be a nominal fee for people to complete the KSA and receive a CEPD certificate.

Additional information on this program and specific dates and times for the following tentative webinars will be distributed through WAVMA Members-L and be on the WAVMA website.

Date	Speaker	Topic
August 28, 2014	**Jo Bannister**	**Field Surgical Insertion of Catfish Radio Transmitters**
September 3, 2014	**Nahiid Stephens**	**Dolphin Diseases**
October 8, 2014	**Susan Kueh**	**Barramundi (Asian Seabass) Disease Management**
November (TBD)	**Véronique LePage**	**Seahorse Diseases**
December (TBD)	**Nick Saint-Erne**	**Fish Anaesthesia and Surgery**

If you are interested in presenting, or have ideas about potential topics you would like to see covered in future WebCEPD webinars, please email WebCEPD-Admin@wavma.org.

Go ahead and think outside the box!

Meet Dr. Lydia Brown

The British Veterinary Association has announced that WAVMA member Dr Lydia Brown has been awarded the Dalrymple-Champneys Silver Cup and Medal for 2014. The Award is the Association's most prestigious award. It is open to Veterinary Surgeons who have made a major contribution to the Veterinary Profession and the Awards Committee comprises of Distinguished Veterinarians who must themselves have received the award.

Dr Brown has made major contributions not only through her work in the aquatic pharmacology industry but also as a very well regarded President of the Royal College of Veterinary Surgeons, Chairperson of the Humane Slaughter Society, and founder of the British veterinary surgeon stress support group.

Dr Brown is the third aquatic veterinarian to be recognised by this award, previous holders being Dr Mary Brancker a pioneer of veterinary involvement in fish medicine and Professor Ronald J Roberts, founder of the Journal of Fish Diseases and the Institute of Aquaculture at Stirling, who is also a past President of WAVMA.

Lydia Brown obtained her veterinary degree from Liverpool University, UK in 1978 and her PhD in Aquatic Veterinary Studies from the University of Stirling in 1983. In the mid-1980s Lydia worked as an Assistant Professor at the College of Veterinary Medicine, Mississippi State University (USA), working with channel catfish. Her specialist area was pharmacokinetics of drugs used in aquaculture and some of her research at this time was successfully submitted for the Fellowship of the Royal College of Veterinary Surgeons. She is the Editor of *Aquaculture for Veterinarians.*

She has worked in pharmaceutical companies, the contract research industry and has lectured at veterinary schools on fish farming. Lydia was elected to the Council of the Royal College of Veterinary Surgeons in 1991 and elected President in 1998-1999 (as only the third woman to hold the appointment since the inception of the RCVS). During this time she led the establishment of the Certificate and Diploma in fish health and production, the formation of the veterinary surgeons health support programme and was one of the founding members of the Fish Veterinary Society. She arranged its inaugural meeting at the Glasgow Veterinary School.

At work, Lydia moved from research and technical positions to become Managing Director of Pharmaq Ltd., an international fish health company. As a member of the global senior management team, she worked in a number of aquaculture producing countries throughout Europe, South America, Australia and Vietnam. Her special area of interest remains therapeutants and vaccines used in aquaculture with a special interest in fish anesthesia. She authored the Anesthesia and Restraint chapter in *Fish Medicine*, edited by Michael K Stoskopf, 1993; as well as many other publications.

In 2011, Lydia retired from Pharmaq and is now a consultant. Nationally she is President of the Veterinary Benevolent Fund, Chairman of the University Federation of Animal Welfare and of the Humane Slaughter Association. In her local community, Lydia is Vice Chairman on the Board of Salisbury's local hospital. She has served as a Director-at-Large on the WAVMA Executive Board since 2013.

She and her husband breed two-horned Jacob sheep in Wiltshire, UK.

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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, Internships, Externships 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.

Please send articles, clinical reports, or news items to the editor by the following submission dates:

Issue 1 – February 15 (published in March)
Issue 2 – May 15 (published in June)
Issue 3 – August 15 (published in September)
Issue 4 – November 15 (published in December)

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.

THE AQUATIC VETERINARIAN

Volume 8, Number 2 RESEARCH ARTICLE Second Quarter 2014

Clinical and microbiological manifestation of intestinal dysbiosis in captive Black Sea bottlenose dolphins (*Tursiops truncatus ponticus*)

By Vladimir A. Semenov [1] and Vladimir I. Terekhov[2]

[1] Gelendzhik Dolphinarium JSC, 130 Lunacharskiy Street, Gelendzhik, Krasnodar Region, 353460, Russia;
[2]Kuban Agrarian State University, Krasnodar Region, Russia

Abstract.

A three-year comparative study was conducted to evaluate the qualitative and quantitative composition of the rectal microflora in the distal portion of the intestine of clinically healthy and ill captive Black Sea bottlenose dolphins (*Tursiops truncatus ponticus*). There were seven bottlenose dolphins consisting of 1 male and 6 females that were maintained in captivity for 1.5–12 years. The animals were studied for three years.

Rectal samples were diluted with isotonic solution of sodium chloride in a 1:10 ratio. Further dissolving of feces from 10^{-1} to 10^{-9} was performed later. Several mediums were used for inoculations. Blood was sampled from dolphins' caudal veins and general blood analysis involved the counting of erythrocytes, hemoglobin, leucocytes, leucogram, and erythrocyte sedimentation rate. Feces of healthy animals were almost free of blood cells, while feces from dolphins with intestinal dysfunctions had from six to forty-two leucocytes, as well as two or more erythrocytes per high powered field on microscopic examinations.

Large amounts of dietary fiber and neutral fat were detected in all cases of ill animals. A significant decrease in the amount of normal enzymating *Escherichia coli* and lactobacteria during clinical disease was typical for sick animals. Microbial counts detected reduced numbers of Clostridia, Bifidobacteria, and Enterococci and increased numbers of Proteus, Providencia, epidermal Staphylococci, and Candida fungi. The results showed a change in the number of particular species of intestinal microflora during episodes of dysbiosis, even though the number of pathogenic forms was not high enough to give the pathogens advantage over other bacteria and strongly compete for an alimentary colonization.

Key words: Bottlenose dolphins; dysbiosis; indigestion; intestinal microflora; microecological dysfunctions.

Introduction

As a result of the authors' earlier studies of microorganisms in bottlenose dolphin feces, 11 genera of bacteria belonging to seven families (Enterobacteriaceae, Bacillaceae, Actinomycetaceae, Lactobacillaceae, Streptococcaceae, Micrococcaceae, Pseudomonadaceae) were discovered, as well as a yeast-like fungi (*Candida albican*). *Escherichia* bacteria are the most commonly found. In addition, two bacteria, *Lactobacillus*, reported for the first time in this dolphin species, and the potentially pathogenic *Clostridium* were identified. Several species of *Clostridium* have frequently been cultured from the intestinal tracts of both ill and healthy cetaceans[12]. In some cases they have caused the death of a captive dolphin[6]. Newly captured individuals exhibited far less taxonomic variety of microflora compared to captive dolphins.[9,10] Nevertheless, the comparison of quantitative and qualitative composition of intestinal microflora for healthy and sick cetaceans remains vital.

Materials and methods

The goal of this work was to conduct a comparative study of qualitative and quantitative composition of microflora of the distal part of intestine of clinically healthy and sick captive Black Sea bottlenose dolphins. There were seven bottlenose dolphins (1 male, 6 females, one born in captivity) that were kept in a pool of chlorinated water in the Gelendzhik branch of the Dolphinarium of Utrish during a period of 1.5 to 12 years. The volume of the pool is 1000 m^3 with the average depth of 3 meters. This size allowed keeping 5 dolphins together at a time. They were kept in chlorinated, recycled sea water (pH=7.4–7.6), which was refreshed with 10% new volume daily. Free-chlorine did not exceed 0.1 –0.3 mg/l, while combined-chlorine was equal to 0.7 mg/l. The water was purified with four high-speed filters with the area of each equal to 1.1 m^2 and the volume =1.1 m^3. The animals were studied for three consecutive years (from December 2002 to December 2005). During the studies the dolphins were fed with defrosted fish such as herring, capelin, walleye, pollack, hunchback salmon, poutassou, etc. The food was systematically examined for bacteria and chemical analysis for nutrition was performed.

Sampling of rectum contents for studying the qualitative and quantitative composition of microflora was performed with a sterile plastic catheter (length: 500 mm, diameter: 6 mm). The animals were removed from the water to collect the swabs, the skin surface was wiped with 70% ethyl alcohol. Sampled feces were diluted with an isotonic solution of sodium chloride in 1:10 ratio. Further dissolving of feces from 10^{-1} to 10^{-9} was performed later. Inoculations (1.0 and 0.1 ml) were carried out in every dilution for differential-diagnostic mediums. The authors used the following inoculants: MacConkey agar, 5% blood agar, yolk-salt agar of Chistovich, Endo medium, Saburo medium, iron-sulphite semi-fluid agar, Blaurock semi-fluid medium, stabilized Twin-90 under a layer of sterile liquid paraffin, and bactolactagar to culture lactic acid bacteria. Inoculations were incubated at 37°C for 72–96 hours. Further identification was performed using biochemical test stripes in polystyrene plates.

Identification of microorganisms was performed at the Laboratory of Microbiology of the Krasnodar Veterinarian Research Institute using standard microbiologic methods.[3, 8] The amount of microorganisms (lg CFU [colony-forming unit]/g) was calculated using the method stated in the studies[2] and microscopic studies of feces were performed using standard methods.[1]

Blood samples for studies were drawn from the dolphins' caudal veins[7]. General blood analysis consisted of erythrocyte counts, total hemoglobin, and leucocytes. A leucogram and ESR (erythrocyte sedimentation rate) were performed using standard methods.[1] The analysis of blood serum on whole protein (total protein, TP), albumin, the ferments AST, ALT, AP, GGT, and iron was performed using the biochemical blood analyzer. Data was statistically analyzed by the Student's validation criteria, using Microsoft Office Excel Program.

Results

Adequate estimation of sea mammal health conditions is based on the summary data of its case history, physical examination, and results of diagnostic analyses[7]. Daily dietary consumption and physical activity are the main criteria of initial evaluation of the clinical health of captive-adapted dolphins. A sick animal is not as active as usual, sluggishly approaches a trainer, and often "hangs" on the surface and is generally less mobile. Their appetite decreases, with the average amount of daily feed intake reduced by 30% or more, to the point of totally refusing to feed.

If a pathological process is present in the gastrointestinal tract and causes a dysfunction of the digestive apparatus, a change in microbiocenose of the intestines also occurs. Table 1 presents comparative aspects of fecal examinations in healthy dolphins and in those with disruption of intestinal function.

As seen from Table 1, the feces of healthy animals are usually brown, and free of mucus and dietary fibers. Such feces quickly (during 10–20 seconds) disperse in water in a form of a cloud. The color of feces from mammals is determined by the presence of bile pigments.[11] When conjugated, bilirubin flows into the bowels with bile, where intestinal bacteria turn it into stercobilinogen. This occurs in the distal parts of the small and large intestines. Parts of formed stercobilinogen oxidize to stercobilin and excrete with feces, coloring it brown. Yet sometimes there is a green color to the feces of bottlenose dolphins, which is most likely due to large amounts of stercobilinogen in it. We observed this from time to time after one-day fasting or under short-time stress of dolphins.

Feces of animals with symptoms of dysbiosis have mucous or foam and it poorly dissolves in water. The feces may float on the surface in a spot-like shape or suspend in the water column in the form of heavy mucus. Its color changes from light yellow to dark green.

Microscopic studies show that feces of healthy animals are almost completely free of blood cells, while feces of dolphins with intestinal dysfunction had from six to forty-two leucocytes, as well as two or more erythrocytes per high powered field. Large amounts of dietary fiber and neutral fat were detected in the feces of ill animals.

Microbiological analysis of feces is the main factor in the diagnosis of digestive tract and culture results are presented in Tables 2 and 3. Table 2 shows that in all healthy bottlenose dolphins and in the majority of ill dolphins normal enzymating colibacillus was detected. At the same time, most of the dolphins that showed symptoms of dysbiosis showed significant decreases in the number of lactobacteria ($P < 0.001$). Differences in the presence of other microorganisms, including opportunistic pathogenic, were not significant.

As indicated in Table 3, a significant decrease in the amount of normal enzymating *E. coli* and lactobacteria is typical.

Quantitative indicators of *Clostridia, Bifidobacteria*, and *Enterococci* for sick animals were also at low levels. At the same time a higher number of *Proteus*, *Providencia*, epidermal *Staphylococci*, and *Candida* fungi were observed for these dolphins. Blue pus bacillus was noticed as well. The number of other microorganisms, including hemolytic *E. coli, Klebsiella*, *Morganella*, and *Staphylococci* showed no significant changes.

Blood analyses (Table 4) of animals with dysbiosis showed a tendency in decreasing the amount of eosinophils and an increase in amount of monocytes, although these differences proved to be minor, the differences of neutrophils were not detected. The largest change was found in the blood plasma of ill animals, with alanine transaminase increasing 38%.

Discussion

Culture of the rectal contents showed a change in the numbers of particular resident rectal microflora in animals exhibiting intestinal dysbiosis, though the number of pathogenic forms were not considered high enough to give them an advantage over other bacteria to strongly compete for alimentary colonization. In individual animals there was clinical evidence of dysbiotic characterized by complete refusal of feeding and adynamia, which are likely endogenous infections based on deep microbiological and pathological changes in macroorganisms. Such forms of dysbiosis take the course of mini-infections, caused by pathogenic *E. coli*, *Proteus*, *Staphylococci*, *Candida* fungus, and other microorganisms.[4]

Thus, cytologic and microbiological studies of feces allow for the diagnosis of dysbiotic conditions of the intestine of dolphins at an early stage of infection, therefore allowing treatment to be conducted in a timely manner. The correction of quantitative and qualitative components of the intestine allowed to prevent the inflammation developing followed by infringement of nutrients absorption, voluminous mucus discharge, precipitation of erythrocytes and a large number of leucocytes in the intestine.

Sources and manufacturers

Biochemical test strips; Polystyrene plates: Ltd. Lahcema, Prague, the Czeck Republic.
Biochemical blood analyzer: “Cormay Livia”. Rome, Italy.

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Table 1. Coprological studies data of clinically healthy bottlenose dolphins and bottlenose dolphins with symptoms of mild dysbiosis.

Index	Clinically healthy* (N = 6, n = 19)	Clinically ill* (N = 5, n = 24)
Color	Brown, occasionally green	Green, yellow
Mucus	Small amount or absent	Large amount
Amount of leukocytes in visual field†	0–5	6–30
Amount of erythrocytes in visual field†	0–1	>2
Dietary fibers in visual field	Small amount or absent	Large amount
Neutral fat in visual field	Absent	Large amount

N = number of studied individuals; n = number of studies; † Increased 150x.

Table 2. Microorganisms isolated from distal part of intestines of clinically healthy and ill bottlenose dolphins.*

Microorganisms	Clinically healthy dolphins (N = 6, n = 19)	Clinically ill dolphins (N = 5, n = 24)
Bacteria		
Family Enterobacteriaceae		
Genus *Escherichia*		
E. coli g–	100%	91.7 ± 5.75
E. coli g+	31.6 ± 10.96	25.0 ± 9.03
Genus *Proteus*		
P. mirabilis	10.5 ± 10.23	29.2 ± 9.48
Genus *Providencia*		
P. rettgeri	5.3 ± 5.28	8.3 ± 5.75
Genus *Klebsiella*		
K. ozaenae	15.8 ± 8.60	12.5 ± 6.90
Genus *Morganella*		
M. morganii	15.8 ± 8.60	20.8 ± 8.46
Family Bacillaceae		
Genus *Clostridium*	94.7 ± 5.28	100%
Family Actinomycetaceae		
Genus *Bifidobacterium*	94.7 ± 5.28	83.3 ± 7.78
Family Lactobacillaceae		
Genus *Lactobacillus*	100%	41.7 ± 10.28†
Family Streptococcaceae		
Genus *Enterococcus*	57.9 ± 11.64	33.3 ± 9.83
Family Micrococcaceae		
Genus *Staphylococcus*		
S. epidermitis	47.4 ± 11.77	70.8 ± 9.48
S. aureus	15.8 ± 8.6	12.5 ± 6.90
Family Pseudomonadaceae		
Genus *Pseudomonas*		
P. aeruginosa	0%	8.3 ± 5.75
Fungi		
Genus *Candida*		
C. albicans	26.3 ± 10.38	16.7 ± 7.78

* Frequency of appearance: simple mean ± standard error for sampling fraction in parentheses. N = number of studied individuals; n = number of samples; g– = absence of hemolytic activity; g+ = presence of hemolytic activity; † Degree of reliability of differences against healthy bottlenose dolphins ($P < 0.001$).

Table 3. Condition of intestinal microbiocoenosis of clinically healthy bottlenose dolphins and animals with symptoms of dysbiosis. lg CFU [colony-forming unit]/g *]

Microorganisms	Clinically healthy dolphins (N = 6, n = 19)	Clinically ill dolphins (N = 5, n = 24)
Bacteria		
Family Enterobacteriaceae		
Genus *Escherichia*		
E. coli g–	5.9 ± 0.30	4.0 ± 0.44†
E. coli g+	1.5 ± 0.57	1.2 ± 0.43
Genus *Proteus*		
P. mirabilis	0.2 ± 0.14	1.3 ± 0.45
Genus *Providencia*		
P. rettgeri	0.3 ± 0.32	0.8 ± 0.36
Genus *Klebsiella*		
K. ozaenae	0.7 ± 0.42	0.6 ± 0.36
Genus *Morganella*		
M. morganii	0.9 ± 0.52	1.0 ± 0.43
Family Bacillaceae		
Gen *Clostridium*	5.4 ± 0.65	4.6 ± 0.38
Family Actinomycetaceae		
Genus *Bifidobacterium*	5.5 ± 0.50	4.3 ± 0.50
Family Lactobacillaceae		
Genus *Lactobacillus*	4.8 ± 0.42	1.3 ± 0.35‡
Family Streptococcaceae		
Genus *Enterococcus*	2.9 ± 0.67	1.0 ± 0.31
Family Micrococcaceae		
Genus *Staphylococcus*		
S. epidermitis	1.7 ± 0.50	3.2 ± 0.53
S. aureus	0.7 ± 0.38	0.5 ± 0.30
Family Pseudomonadaceae		
Genus *Pseudomonas*		
P. aeruginosa	0	0.3 ± 0.18
Fungi		
Genus *Candida*		
C. albicans	0.4 ± 0.18	0.8 ± 0.36

* Frequency of appearance: simple mean ± standard error for sampling fraction in parentheses. N = number of studied individuals; n = number of samples; g– = absence of hemolytic activity; g+ = presence of hemolytic activity; † Degree of reliability of differences against healthy bottlenose dolphins ($P < 0.01$); ‡ Degree of reliability of differences against healthy bottlenose dolphins ($P < 0.001$).

Table 4. Hematologic indices of clinically healthy bottlenose dolphins and animals with symptoms of mild dysbiosis.*

Hematological indices	Clinically healthy dolphins (N = 6)	Clinically ill dolphins (N = 5)
Hemoglobin, g/l	168.1 ± 3.41	171.5 ± 3.72
n	24	24
Erythrocytes, $x10^{12}$/l	3.9 ± 0.06	4.0 ± 0.05
n	24	24
ESR, mm/h	2.4 ± 0.34	1.8 ± 0.23
n	24	24
Leucocytes, $x10^{9}$/l	8.1 ± 0.46	7.6 ± 0.40
n	24	24
Band neutrophils, %	2.2 ± 0.26	2.2 ± 0.29
n	24	24
Mature neutrophils, %	53.7 ± 1.92	54.2 ± 2.00
n	24	24
Eosinophiles, %	20.6 ± 1.59	16.3 ± 1.30
n	24	24
Monocytes, %	2.9 ± 0.36	4.5 ± 0.65
n	24	24
Lymphocytes, %	20.7 ± 1.70	23.4 ± 1.56
n	24	24
Whole protein (TP), g/l	73.1 ± 2.56	68.3 ± 1.47
n	9	16
Albumin, g/l	48.6 ± 1.47	46.9 ± 1.67
n	8	14
AST, IU/l	252.9 ± 81.84	254.7 ± 44.01
n	9	19
ALT, IU/l	52.7 ± 13.57	72.5 ± 14.37
n	8	18
AP, IU/l	1141.1 ± 178.44	1147.9 ± 147.94
n	5	9
GGT, IU/l	49.8 ± 11.01	40.7 ± 4.00
n	5	12
Iron, mcg/l	26.8 ± 1.62	22.6 ± 1.63
n	6	13

* Frequency of appearance: simple mean ± standard error for sampling fraction in parentheses.
N = number of studied individuals; n = number of samples.

Educational Opportunities in Aquatic Veterinary Medicine

By Chris Walster

Introduction

Aquatic veterinary medicine will expand dramatically in the next 30 years. If the veterinary profession works together we will not only ensure the profession plays a major role in aquatic animal health and welfare, but be in a position to provide suitable training to any veterinarian wishing a career in this field. I hope thisreview will stimulate further discussion on WAVMA's Members-L.

Background

There will be a 100% increase in global food production by 2050 (*J. Simmonds*). The World Bank (*Fish to 2030*) predicted that by 2030 62% of seafood consumption will come from aquaculture. The President of the OIE stated in 2009 that "predictions are that by 2050 half the animal protein consumed by people will come from aquaculture".

Through greater interconnectedness and speed of distribution of global imports and exports there will be an increased risk and impact of disease. The need for an aquatic veterinary workforce will derive from the impact of disease on production along with the recent expansion in knowledge of, and societal focus on, aquatic animal welfare (see www.fishwelfare.org).

By comparing aquaculture production to similar agricultural industries (e.g., beef) one can estimate the globally required veterinary workforce. Using these comparisons 100,000 veterinarians is not unrealistic.

The OIE's Performance of Veterinary Services (PVS) tool/pathway outlines a model Veterinary Education Core Curriculum (*OIE 1*) and the required Day One competencies expected of a graduating veterinarian (*OIE 2*). In Section 1.2 Scope of the Day One Competencies, "Animal production, in particular the growing sector of aquaculture, is key to satisfy the growing global demand for food. Aquatic animal health programmes need to be strengthened and, to this end, the involvement of veterinarians with competence in aquatic animal health should be assured" and "However, the aquaculture sector is not of equal importance to all countries. Therefore, veterinary education establishments should address competence in aquatic animal health as appropriate to the importance of the aquaculture sector in the country or region".

Current Veterinary Training

If one looks around the world, there are numerous examples of where the veterinary profession has responded to the need for aquatic veterinary medicine education. Examples include the Chair of Fish Diseases at LMU Munich veterinary school established for over 100 years, the Institute of Aquaculture Stirling, the University of Florida, the Atlantic Veterinary College at UPEI, North Carolina State University College of Veterinary Medicine (see www.cvm.ncsu.edu/dvm) where there has been an aquatics department providing courses since its founding in 1981, with these courses often enrolling more than 100 students (*G. Lewbart pers. Comm.*). In the UK both Edinburgh and Glasgow Veterinary Schools now offer specific lectures and the option of final year electives in aquaculture.

DeHaven and Scarfe (*OIE 3*) noted in a 2011 presentation that 58% of veterinary schools in 19 European countries provided some education in aquatic animal veterinary issues and that surveys carried out during the 1990s indicated 84% of veterinary schools in North America provided content relevant to aquatic veterinary issues.

The Federation of Veterinarians of Europe (FVE) has an aquaculture working group and in conjunction with EAEVE is looking to update the information on the provision of aquatic veterinary medicine teaching within Europe. It is often difficult to identify courses specific to aquatic veterinary medicine as they are often included in lectures on exotics and public health (*R Soutar pers. Comm.*). Despite an apparent lack of opportunity at the undergraduate level, rather conversely, it could be argued that undergraduates receive 90% or more of the training they require to enter a career in aquatic veterinary medicine.

Obtaining practical experience during periods of extra mural studies (EMS) can be difficult for undergraduates as there are few private practices that focus on aquatic veterinary medicine. Students often need to gain experience through academic departments, research facilities or public aquaria.

Within the UK, public aquaria do not employ full time veterinarians as opposed to the situation in the USA, nor are there similar courses in the UK such as Aquavet, Seavet, and Marvet in the US.

However post-graduate training is more readily available with numerous opportunities for MSc or PhD. Practitioners can additionally follow the "Board" Certification or Diplomate route. Currently there is no RCVS Certificate module in fish health. The only purely aquatic animal health certificate or diploma offered globally is from the Australia New Zealand College of Veterinary Scientists through their Aquatic Animal Health Chapter (ANZCVS see www.anzcvs.org.au).

A European College of Aquatic Animal Health (ECAAH) was established in April of this year and within the USA there are moves to organise a Board Diploma by the American Association of Fish Veterinarians. In South Africa, the veterinary authorities are working towards a system of aquatic medicine accreditation, with the first aquatic veterinarian specialist award having been made (*D Scarfe* pers. Comm.). Cost can be expensive. As example, the cost of obtaining Diplomate status with the ANZCVS can cost around A$20,000, approximately £11,000 (*R Loh, pers. Comm.).*

The future

The veterinary profession provides benefits to increased food production and food security (*Bonnet et al*). Equally well recognised is how full undergraduate veterinary curricula are (*Hartman et al*). Even if more veterinary schools were convinced of the relevance of aquatic veterinary medicine it would take some 10-15 years for them to gear up.

The maintenance/replacement of 100,000 veterinarians is currently equivalent to the annual output of 30 veterinary schools, which is roughly 7% of the total number of veterinary schools globally recorded by the World Veterinary Association (WVA). Clearly the professional societies such as FVS and WAVMA need to encourage training. Examples include, FVS provides free student membership and scholarships to attend their annual scientific meetings, and WAVMA encourages Veterinary School Chapters and provides Aquatic Veterinary Education Grants through the WAVMA/AVMF scholarship program.

Many members of the profession provide talks to students, thus increasing awareness of aquatic veterinary medicine and most mainstream congresses/conventions (e.g. WVA, WSAVA, FVE, AVMA, NAVC, FAVA) now provide aquatic veterinary streams.

To be more effective it is necessary that the 13 or more aquatic veterinary organisations globally learn to coordinate and cooperate. The profession needs to develop novel methods of education and recognition to circumvent the lag phase in the development of veterinary curricula, the lack of teaching time within veterinary curricula, and the needs of current practitioners for training and recognition e.g. webinars, Massive Open Online Courses (MOOC's). Currently there are no specific aquatic veterinary medicine MOOCS, but practitioners can engage and update their knowledge for free in diverse subjects such as epidemiology, genomics, proteomics, epigenetics, model thinking and medical statistics.

Specific examples of where the profession is utilising these methods includes WAVMA's Certified Aquatic Veterinarian Program (CertAqV), LMU's Fish Welfare Dialogue and e-learning platform, the series of webinars from The Aquarium Vet and WAVMA's Clinical Corner. The CertAqV is equivalent to "Day One Competency" in aquatic veterinary medicine. It provides useful guidance for veterinary schools wishing to explore the topics needed to complete an aquatic veterinary medicine curriculum and can be seen to act as a stepping stone for those wishing to progress to "Board Certification". The course has nine core subject matter modules:

Life Support & Environmental Systems
Taxonomy, Anatomy & Physiology
Aquatic Industries & Husbandry
Disease Pathobiology & Epidemiology
Disease Diagnostics & Treatment
Public Health, Zoonotics & Seafood Safety
Legislation, Regulations & Policies
Practical Veterinary Experience, Client Communications & Entrepreneurship
Principles of Aquatic Animal Welfare & Well-being

WAVMA's Student Chapters will be able to participate in The Aquarium Vet webinars until the end of the year. WAVMA's Clinical Corner provides videos on a specific disease presentation and participants can enter in to a dialogue and ask questions with other members and the presenter.

Conclusions

There is a need for a marked increase in the number and availability of aquatic veterinarians. There is a question mark over whether traditional veterinary education can meet that need.
The profession and industry must work together to

develop novel channels for learning and to ensure the future of aquatic veterinary medicine. Further clarity is needed to accurately assess the number of veterinarians currently available and the numbers needed to meet projected targets.

Web Resources

AAFV
www.fishvet.org

ANZVC
www.anzcvs.org.au

Aquamed. Baton Rouge, LA.
Gulf States Consortium
www.vetmed.lsu.edu/aquamed.htm

AquaVet I and II.
University of Pennsylvania/Cornell University
www.vet.cornell.edu/aquavet/generalinfo.cfm

FVE
www.fve.org

FVS
www.fishvetsociety.org.uk

Marvet
www.marvet.org/

Seavet. University of Florida.
http://conference.ifas.ufl.edu/ame/seavet/

The Aquarium Vet
www.theaquariumvet.com.au

WAVMA
www.wavma.org

WVA
www.worldvet.org/education.php

References

Bonnet et al (2011). Contribution of Veterinary Activities to Global Food Security for Food Derived from Terrestrial and Aquatic Animals. 79th General Assembly of the OIE. (www.oie.int/en/publications-and-documentation/compendium-of-technical-items/)

Fish to 2030. Prospects for Fisheries and Aquaculture. (www.fao.org/docrep/019/i3640e/i3640e.pdf)

Hartman et al (2006), The Future of Training for Aquatic Animal Health Veterinarians. Journal of Veterinary Medical Education. Volume **33 (3)** 389 – 393 (http://jvmeonline.metapress.com/content/l6558m255pj47jn3/?p=2d4dec3f72e740ef88e1499fa5e0cafe&pi=13)

J. Simmons, President Elanco Animal Health: Technology's role in the 21st Century: Economics and Consumers Choice. (www.globaldairyinnovation.com/world-food-supply)

OIE 1. Veterinary Education Core Curriculum OIE Guidelines. (www.oie.int/Veterinary_Education_Core_Curriculum.pdf)

OIE 2. OIE recommendations on the Competencies of graduating veterinarians ('Day 1 graduates') to assure National Veterinary Services of quality. (www.oie.int/fileadmin/Home/eng/Support_to_OIE_Members/Vet_Edu_AHG/DAY_1/DAYONE-B-ang-vC.pdf)

OIE 3. Proceedings of the OIE Global Conference on Aquatic Animal Health Programmes: their benefits for global food security 28–30 June 2011 Panama City (Panama). W.R. DeHaven & A.D. Scarfe. Professional education and aquatic animal health: a focus on aquatic veterinarians and veterinary para-professionals. 139 - 154 (www.oie.int/doc/ged/D12238.PDF)

Establishing Key Objectives for the Sustainable Development of the Aquaculture Sector within the European Union

Notes on the conference "Caring for health and welfare of fish: A critical success factor for aquaculture", Brussels, 2013

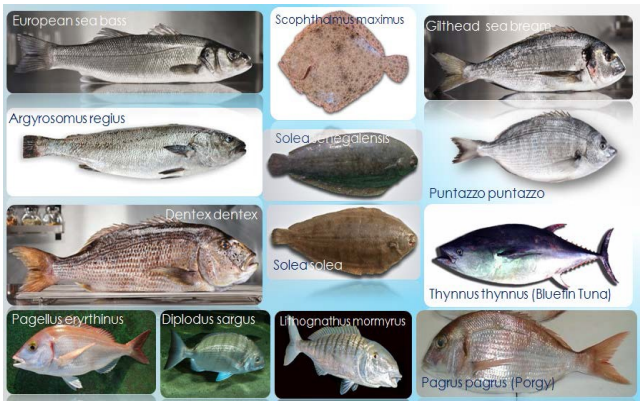
Laura D. Urdeș, PhD DVM PgDip
University of Agricultural Sciences and Veterinary Medicine Bucharest, Romania

On the 16th and 17th of May, 2013, the Federation of Veterinarians of Europe in association with the Irish Presidency of the Council of the European Union, and by the support of the European Commission, organized in Brussels, Belgium, at the International Auditorium, the conference on two of the most sensitive subject areas of aquaculture globally: health and welfare of farmed fish, i.e. "*Caring for health and welfare of fish: A critical success factor for aquaculture*". The conference aimed at bringing together, for the first time, relevant stakeholders involved with the aquatic animal sector at different levels in Europe, to discuss and review the current state of the aquaculture sector in the E.U., identifying the animal health and welfare issues that would need to be addressed in the near future, and to reviewing the role of the veterinary profession in ensuring these requirements are met.

Overview of the Conference Framework and Statements

The conference was structured into four parts, as follows: *Section I – "Aquaculture and Aquatic Animal Health in Europe: Current and Emerging Diseases"*, chaired by Brian Kilgallen (Agriculture Attaché at Permanent Representation of Ireland to the E.U., Brussels); *Section II – "Ensuring Best Practices in Aquaculture"*, chaired by Courtney Hough (General Secretary of the Federation of European Aquaculture Producers)**;** *Section III – "The role of Veterinarian in the Aquatic Business Sector"*, chaired by Christophe Buhot (FVE president); S*ection IV* - a round table discussion, coordinated by Hamish Rodger (Principal at Vet-Aqua International, Ireland).

The event started with the FVE President's welcome message, which was followed by Dario Dubolino's (D.G. MARE) statement on behalf of the E.U. Commission and Martin Blake's (Chief Veterinary Officer-Ireland) official opening address by the Irish Presidency. Some of the subjects during the



section lectures were: O*verview of the Aquaculture Sector*; *Fish Farming Systems and Sustainability; Fish Health; Fish Welfare; The Use of, and Requirements for Veterinary Medical Products in Aquaculture; The Role and Responsibilities of Veterinarians; The E.U. Animal Health Law* (with a focus on the aquatic animal sector), the latter two, being expressed from an OIE perspective.

The round table discussion identified fish welfare as a key goal in the E.U. aquaculture. The dialogue focused on improvements of the E.U legislation and of the research & development E.U. funding programmes required to effectively assist an evolving, sustainable, environmentally friendly aquaculture throughout the Members States into the near future.

Although, in my view, the discussion put much more emphasis on the fish health requirements than the welfare concept and its implications to the industry and society at large, there was a valuable dialogue, not only through its content, but also due to the participation of organization representatives from all the relevant sectors, that expressed their valuable opinions on the two subject matters.

Referring to the condition of the fish market in Europe, the FVE president stated that the fish market was not increasing currently, although it was still one of the most dynamic and diverse meat market sectors. Nor was the E.U. aquaculture sector fully exploited, as it requires imports from non-E.U. countries. For this state of affairs, apart from funds required by farmers to start off the aquaculture business, there are other incentives such as the time necessary for them to establish an enterprise, i.e. 2 to 4 years, the administrative burdens and local/regional regulations, as well as the necessary business and administration knowledge by the farmer to build up a successful business - "… when starting a business in aquaculture, facilitating

exchange of knowledge and decreasing the administration burdens are crucial for the success of an aquaculture business", says C. Buhot, the FVE president.

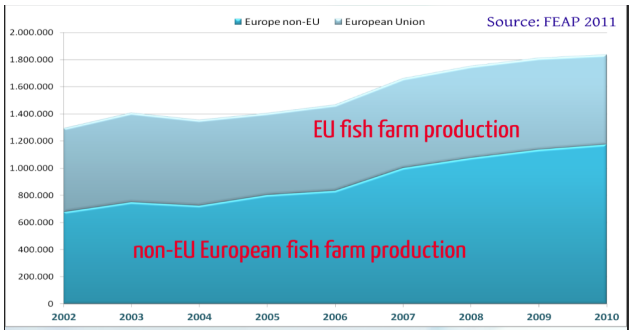
At a superior level, licensing of fishery farms by state officials should be based on scientific knowledge and sustainable farming practices. It is therefore concluded that state officials involved in this work must have adequate education and knowledge in this field.

It was further acknowledged the need for all to recognize one of the existing particularities of this sector, which is the huge diversity of aquatic animal species available to culture through different farming systems. By giving as examples tuna and anguilla, the FVE president related that although there were over 35 species raised by aquaculture globally, there are still a high number of species that no one knows how to culture appropriately. It was essential, he said, to encourage the industry to support research towards different varieties of aquaculture in order to eliminate this gap.

Production diversification, e.g. introducing new (wild) species into aquaculture, and intensification, e.g. finding adequate markets to sell their products profitably, were considered by some of the industry representatives the driving forces for disease outbreaks in European aquaculture. They seemed to view the two factors as being of a greater importance than the fish health issue *per se*. While Richie Flynn, an industry representative, suggests that the fish welfare issue should be addressed by the industry, whereas veterinarians should focus only on the fish health aspect, Sunil Kadri, another industry rep, views farmers co-working with veterinarians in assisting the aquaculture business success. "There is a pathogenic cyclicity", he says, "...it requires a better understanding of production by both fish farmers and veterinarians, in order to commonly ensure fish welfare and health". …"Education and training of both professions are necessary", he goes on saying, "…as there is currently no adequate education to support the three pillars of sustainability" (i.e., society, environment and economy).

Further important statements on the aquaculture status in Europe are that since veterinarians are the experts in animal health and welfare, including fish, sufficient veterinary expertise should be available to the aquaculture sector to ensure its sustainable development. A failure of the veterinary profession to effectively assist the farmer in ensuring optimal health management of fish at all stages of production would call forth serious public health and food safety problems. I would add to these, that it would compromise the success of any aquaculture business, too, on the account of the lack of effective biosecurity and clinical assistance measures into aquatic animal farms.

The insufficient number of aquatic veterinarians in Europe is related to the inadequacy of veterinary courses or training programmes available in veterinary schools. By referring to this problem, it was highlighted that availability of veterinary medicine specific to fish should be ensured throughout Europe, and any review of relevant legislation must ensure incentives and adequate return on investment to encourage the development of the aquatic



veterinary medicine. Referring to the requirement of adequate veterinary workforce to assist the aquaculture development in Europe, it has been my belief that, particularly in the E.U. countries where aquaculture plays a significant role as a food producing sector, veterinary schools must include the necessary aquatic veterinary disciplines with their education and/or training programmes, and they should inform their students and graduates about the need for them to embark into studying and working into this field.

Effective epidemiological monitoring and control of fishery farms was considered essential for an appropriate health management; consequently, a development of specific diagnostic tests, fish vaccines, antiparasitic medicines and science-based data on alternative and innovative (non-medicine) curative means were mentioned among the factors that currently underpin biosecurity of farms. Likewise, it was considered that risk-based controls of aquatic animal movements should be enforced, particularly concerning imports from third countries, to avoid further introduction of new pathogens within naïve local aquatic animal populations.

Current requirements in E.U. aquaculture:

Adequate infrastructure, funds and human resources; increasing competitiveness among farmers; improvement of approved veterinary medicines to be used in aquaculture, including better licensed vaccines; a better integrated pest management in farms necessary to mitigate disease outbreaks; rising awareness on the rational use of antimicrobials in aquaculture; awareness about the Zoonotic diseases; the toxic potential of some aquaculture products; the need for a better standardization of antibiogrammes; facilitating imports of affordable, healthy fish food by fishery farmers; better genetic selection programmes; commitments on research and education.

Major challenges in E.U. aquaculture:

Endemic diseases, overcrowding, deficient nutrition (i.e. mainly vitamin deficiencies and imbalanced feed) and poor water quality, including fish poisoning; as imports of non-European fish populations pose a continuous threat to local farms of aquatic animals, a better control of hazard risks is necessary; the need for fishery farmers to only be accountable to/controlled by specialized veterinarians; ensuring aquatic animal health and welfare in farms - sea lice is currently considered the biggest health problem of the E.U. aquaculture; a better definition of the two concepts of health and welfare, as "…*good health on its own does not ensure animal welfare*…"(B. Hjetnes, NHI); mitigation of stress caused by farming practices and systems; the need for effective recombinant vaccines against bacterial agents. Additionally, there was mentioned the actual problem that fish processing enterprises are facing, as non-transmissible macroscopic parasites must be removed manually from infected fish carcasses.

Official web pages where the conference conclusions can be found:

http://ec.europa.eu/food/animal/diseases/strategy/docs/agenda_28062013_7_1st_en.pdf

http://www.fve.org/news/presentations/IRL%20Conference/Final%20conclusions.pdf

http://www.fve.org/news/index.php?id=89&q=fish

Questions & Answers from the WAVMA Listserv (WAVMA_Members-L@wavma.org)

A Sticky Subject:

Hi All,

I have been asked by a Marron (large freshwater crayfish) researcher to advise them on a suitable substance/sealant to use to seal a hole in the hard exoskeleton and soft exoskeleton under the tail. Identification tags will be placed in the tail and as such a small hole will need to be made in the hard exoskeleton.

Does anyone have any experience with sealant substances on the shells/exoskeletons of crustaceans and if so, which product would you recommend. Epoxy resins are sometimes used to fix cracks in turtle shells and I was wondering if anyone has tried this on crustaceans before! Thanks for your help, it is much appreciated!

Dr. Jo Bannister, BSc.BVMS, BSc.Ans (Hons)
Aquatic Pathology Intern
Perth, Western Australia
jo.bannister@bigpond.com

As a herp vet, I will tell you that you have to be very careful with epoxy. I do not advise that it be used in contact with the soft tissues. Instead, I recommend that you use a fast setting dental acrylic. It's much safer and has lower reactivity with the tissues and immune system. I know that it's also preferable in drilled molluscs.

Adolf Maas
DrMaas@zoovet.us

Just how big of a hole are you talking about? I've used cyanoacrylate in a blue crayfish attacked by a pet turtle. The exoskeleton where it is applied has to be dried completely, which I think can be stressful to the crustacean, but then once dried, it seemed to work for the pinch/crack that I was trying to repair with it.

Jack Kottwitz
jack_kottwitz@hotmail.com

Hello,

Does anyone have a favorite underwater adhesive for post-surgical fish? The fish are research fish getting implants. Thank you!

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207-841-7966

Hi Kerry,

As I recall (it's been awhile, so defer to others with more recent experience), simple interrupted monofilament (non-absorbable) sutures in two layers worked pretty well. Depending on species, cyanoacrylate can cause substantial dermatitis and/or tissue necrosis in fish; but my experience was that it also just doesn't hold up too well in water to begin with...

I know Dr. Evelyn Sawyer was working on thrombin/fibrin-based field bandages derived from salmon blood; if I remember it was originally for vascular applications but the concept might have advanced to the point of some utility for other uses as well.

Regards,

Dr. Peter L. Merrill
wetvet@comcast.net

WAVMA will be hosting a webinar specifically on this topic in the first week of August. Dr Jo Bannister will be sharing her knowledge and experience on field surgery for placing the implants.

Yours sincerely,
Dr Richmond Loh
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Stuck on Sea Turtles:

Dear WAVMA

After attending the recent Seavet course, I'm inspired to be more involved with the sea turtle side of things. To start with, I've some questions.

1. What's the best way to transport turtles? Can they be transported on their backs? Do they need heat pads during winter?

2. What sorts of glues are permissible (and not advisable) for use in their shells if we are needing to attach tags or other material?

Yours sincerely,

Dr Richmond Loh
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P: +61 (0)421 822 383

Hi Richmond,

Yes, heat pads, or better, heated water for winter is a good idea. Otherwise they can develop fungal infections, parasitic problems etc.; the usual infections when temperature is not adequate to their needs. This is especially necessary for hatchlings and juveniles. Also ensure that they get enough natural sunlight, otherwise vitamin D deficiency can occur causing soft shells, etc.

There are a number of epoxy resins that can be used for fixing broken carapaces, holes etc. Certain Dental resins are suitable & good to use for fixing cracks, holes etc., as they are durable, waterproof, non-allergenic & non-toxic to the turtle.

There is a vet, Dr. Anne Fowler, who does a lot of work fixing shells/holes of freshwater turtles, whose seminars I attended several years ago at the ANZCVSC (she is a member of Wildlife Chapter of ANZCVSC). David Blyde from Sea World would also be good to talk to, as he does a lot of turtle rehab work.

Cheers,
Rachel Bowater
Rachel.Bowater@daff.qld.gov.au

I have had a fair amount of turtle experience here in the past 13 years (5 of the 6 Australian species). They are great to work with.

1. Would definitely not transport them upside down and I do not know why anyone would want to do it. They travel in wooden boxes on a soft wet towel very well.

2. Please email me for the adhesive protocol we have used successfully with turtles released with Sat Tags (needed Ethics approval). One has left Victorian waters and is now near Brisbane – about 2000 kilometres in a little over 6 months. She was even photographed by some divers after travelling about 600 – 700 kilometres. [see below].

Regards,

Rob Jones
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Victoria, Australia, 3189
www.theaquariumvet.com.au

The Aquarium Vet

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Salmon Abstracts

Acquired immunity and vaccination against infectious pancreatic necrosis virus of salmon

Munang'andu HM, S Mutoloki & O Evensen
Dev. Comp. Immunol., Volume 43, Issue 2, April 2014, Pages 184–196

Acquired immunity plays an important role in the protection of salmonids vaccinated against infectious pancreatic necrosis virus (IPNV) infections. In recent years, vaccine research has taken a functional approach to find the correlates of protective immunity against IPNV infections. Accumulating evidence suggests that the humoral response, specifically IgM is a correlate of vaccine protection against IPNV infections.

The role of IgT on the other hand, especially at the sites of virus entry into the host is yet to be established. The kinetics of CD4+ and CD8+ T-cell gene expression have also been shown to correlate with protection in salmonids, suggesting that other arms of the adaptive immune response e.g. cytotoxic T cell responses and Th1 may also be important.

Overall, the mechanisms of vaccine protection observed in salmonids are comparable to those seen in other vertebrates, suggesting that the immunological basis of vaccine protection has been conserved across vertebrate taxa.

Isolation and identification of infectious salmon anaemia virus (ISAV) from Coho salmon in Chile

Kibenge FSB, ON Gárate, G Johnson, R Arriagada, MJT Kibenge & D Wadowska.
Dis. Aquat. Org., 45: 9–18.

The isolation of infectious salmon anaemia virus (ISAV) from asymptomatic wild fish species including wild salmon, sea trout and eel established that wild fish can be a reservoir of ISAV for farmed Atlantic salmon. This report characterizes the biological properties of ISAV isolated from a disease outbreak in farmed Coho salmon in Chile and compares it with ISAV isolated from farmed Atlantic salmon in Canada and Europe.

The virus that was isolated from Coho salmon tissues was initially detected with ISAV-specific RT-PCR (reverse transcription-polymerase chain reaction). The ability of the virus to grow in cell culture was poor, as cytopathology was not always conspicuous and isolation required passage in the presence of trypsin. Virus replication in cell culture was detected by RT-PCR and IFAT (indirect fluorescent antibody test), and the virus morphology was confirmed by positive staining electron microscopy.

Further analysis of the Chilean virus revealed similarities to Canadian ISAV isolates in their ability to grow in the CHSE-214 cell line and in viral protein profile. Sequence analysis of genome segment 2, which encodes the viral RNA polymerase PB1, and segment 8, which encodes the nonstructural proteins NS1 and NS2, showed the Chilean virus to be very similar to Canadian strains of ISAV. This high sequence similarity of ISAV strains of geographically distinct origins illustrates the highly conserved nature of ISAV proteins PB1, NS1 and NS2 of ISAV. It is noteworthy that ISAV was associated with disease outbreaks in farmed Coho salmon in Chile without corresponding clinical disease in farmed Atlantic salmon.

This outbreak, which produced high mortality in Coho salmon due to ISAV, is unique and may represent the introduction of the virus to a native wild fish population or a new strain of ISAV.

ISA virus in Chile: evidence of vertical Transmission

Vike S, S Nylund & A Nylund A (2009).
Arch. Virol., 154(1): 1-8.

Infectious salmon anaemia virus (ISAV), genus Isavirus (family Orthomyxoviridae), is present in all large salmon (Salmo salar)-producing countries around the North Atlantic. The target species for this virus are members of the genus Salmo, but the virus may also replicate in other salmonids introduced to the North Atlantic (Oncorhychus spp.). Existing ISA virus isolates can be divided into two major genotypes, a North American (NA) and a European (EU) genotype, based on phylogenetic analysis of the genome. The EU genotype can be subdivided into several highly supported clades based on analysis of segments 5 (fusion protein gene) and 6 (hemagglutininesterase gene).

In 1999 an ISA virus belonging to the NA genotype was isolated from Coho salmon in Chile, and in 2007 the first outbreaks of ISA in farmed Atlantic salmon was observed. Several salmon farms in Chile were affected by the disease in 2007, and even more farms in 2008. In this study, ISA virus has been isolated from salmon in a marine farm

suffering an outbreak of the disease in 2008 and from smolts with no signs of ISA in a fresh water lake. Sequencing of the partial genome of these ISA viruses, followed by phylogenetic analysis including genome sequences from members of the NA and EU genotypes, showed that the Chilean ISA virus belongs to the EU genotype. The Chilean ISA virus groups in a clade with exclusively Norwegian ISA viruses, where one of these isolates was obtained from a Norwegian brood stock population. All salmonid species in the southern hemisphere have been introduced from Europe and North America.

The absence of natural hosts for ISA viruses in Chile excludes the possibility of natural reservoirs in this country, and the close relationship between contemporary ISA virus strains from farmed Atlantic salmon in Chile and Norway suggest a recent transmission from Norway to Chile. Norway export large amounts of Atlantic salmon embryos every year to Chile; hence, the best explanation for the Norwegian ISA virus in Chile is transmission via these embryos, i.e. vertical or transgenerational transmission. This supports other studies showing that the ISA virus can be transmitted vertically.

Expression of the ISA Virus Receptor on Atlantic Salmon Endothelial Cells Correlates with the Cell Tropism of the Virus

Aamelfot M, OB Dale, SC Weli, EO Koppang & K Falk (2012). *J. Virol.*, 86(19): 10571-10578

Infectious salmon anemia (ISA) is a World Organization for Animal Health (OIE)-listed disease of farmed Atlantic salmon, characterized by slowly developing anemia and circulatory disturbances. The disease is caused by ISA virus (ISAV) in the Orthomyxoviridae family; hence, it is related to influenza.

Here we explore the pathogenesis of ISA by focusing on virus tropism, receptor tissue distribution, and pathological changes in experimentally and naturally infected Atlantic salmon. Using immunohistochemistry on ISAV-infected Atlantic salmon tissues with antibody to viral nucleoprotein, endotheliotropism was demonstrated. Endothelial cells lining the circulatory system were found to be infected, seemingly noncytolytic, and without vasculitis. No virus could be found in necrotic parenchymal cells. From endothelium, the virus budded apically and adsorbed to red blood cells (RBCs). No infection or replication within RBCs was detected, but hemophagocytosis was observed, possibly contributing to the severe anemia in fish with this disease.

Similarly to what has been done in studies of influenza, we examined the pattern of virus attachment by using ISAV as a probe. Here we detected the preferred receptor of ISAV, 4-*O*-acetylated sialic acid (Neu4,5Ac_2). To our knowledge, this is the first report demonstrating the *in situ* distribution of this sialic acid derivate. The pattern of virus attachment mirrored closely the distribution of infection, showing that the virus receptor is important for cell tropism, as well as for adsorption to RBCs.

Development of an antibody ELISA for potency testing of furunculosis (*Aeromonas salmonicida* subsp *salmonicida*) vaccines in Atlantic salmon (*Salmo salar* L)

Romstad AB, LJ Reitan, P Midtlyng, K Gravningen & Ø Evensen (2012). *Biologicals,* 40(1): 67-71.

The study was conducted in Atlantic salmon to establish the initial and basic scientific documentation for an alternative batch potency test for salmon furuculosis vaccines. We assessed the antibody response development for *Aeromonas salmonicida* vaccines at different immunisation temperatures (3, 12 and 18°C), by an enzyme-linked-immunosorbent assay (ELISA) 3, 6, 9 and 12 weeks post vaccination, and the correlation between antibody response and protection in cohabitation challenge experiments performed 6 and 12 weeks post vaccination.

Fish immunised with a vaccine containing full antigen dose had a significant increase in antibody response after 252 day degrees and the measured values correlated well with protection after 500 day degrees. Fish vaccinated with a reduced antigen dose showed a significant lower antibody response than fish vaccinated with the full dose vaccine at all samplings, and showed a similar low relative percent survival (RPS) in the challenges.

The results from this study indicate that an antibody ELISA can discriminate between vaccines of different antigen content and the method may replace challenge tests in batch potency testing of furunculosis vaccines in Atlantic salmon. An immunisation temperature of 12°C and sampling after 6-9 weeks, seemed to be the most appropriate time for using antibody responses to confirm batch potency.

Dolphin-killing virus reaches Florida, and is infecting whales, too
April 20, 2014
NBS News

The bottlenose dolphin die-off that began in 2013 has been traveling steadily south with migrating Atlantic herds, and now diseased and dead dolphins are turning up in Florida. The culprit, a measles-like morbillivirus, has claimed 753 dolphin victims and counting, making this the worst outbreak ever recorded. Recently, the bug has also been spotted in two species of whale. Three humpback whales and two pygmy whales, stranded and decaying, tested positive for the dolphin morbillivirus, preliminary sequencing has confirmed. NOAA researchers are doing more tests to find out if it was the virus, usually rare in these animals, that killed them.

"Most of them are very decomposed," Teri Rowles, of the NOAA Fishers Marine Mammal Stranding Response Program, told reporters on a teleconference call Friday. This has made observing the appearance of the disease in tissue samples harder, she said. "Slightly elevated" stranding numbers for whales have been recorded in New York and Delaware, but it is too early to say if there is an outbreak. Researchers have tested three other marine mammal species for the virus: Common dolphins, spotted dolphins and harp seals sampled in various locations off the East coast seem free of the infection so far.

Meanwhile, the virus continues to take its toll on bottlenose herds. The last great die-off — classified by NOAA as an Unusual Mortality Event — killed about 740 dolphins off the Atlantic coast between August 1987 and April 1988. If this year's outbreak follows the same pattern, "we are less than half way through the time frame" the disease will take to fizzle out, Rowles said, and the death toll has already crossed that historical mark.

Resident Florida bottlenose herds could catch the virus, which spreads through … … .

See the source (http://tinyurl.com/mjhs6eq) for the full story. A NOAA Fact Sheet on marine mammal Morbilliviruses is available at http://tinyurl.com/k2cfg3w.

Contributed by A. David Scarfe.

New European colleges for aquaculture and emergency care

Brussels, May 2014 - Veterinary specialists in aquaculture or in emergency and critical care now have their own European college. The European College of Aquatic Animal Health (ECCAH) and the European College of Emergency & Critical Care (ECECC) were provisionally accepted by the European Board of Veterinary Specialisation (EBVS) during its annual general meeting, held in Brussels on 11 and 12 April. This brings the total number of specialty Colleges to 25.

EBVS EUROPEAN BOARD OF VETERINARY SPECIALISATION

World Veterinary Association Report

The World Aquatic Veterinary Medical Association (WAVMA) launched the Fish Welfare Global Dialogue leading into the 1st International Fish Welfare Conference in September 2014. This webinar was held in celebration of World Veterinary Day and the beginning of a six-month international conversation (the “Fish Welfare Dialogue”) on numerous issues concerning the human-animal relationship with aquatic animals. It introduced current issues ranging from science and philosophy to implementation of the concept in practice, that affect how non-governmental organisations, governments, animal owners and society at large, might view and address the welfare of aquatic animals.

The aim of Fish Welfare Dialogue is to engage veterinarians, industries, regulators and other stakeholders, throughout the world, in discussions on ethical, practical and science-based alternatives to promote awareness of, and offer for realistic alternatives and approaches for optimal aquatic animal welfare that will benefit industries and society at large.

The free global webinar will be followed by 6 months of web-based discussions and periodic webinars on current thinking on identifiable welfare and other issues, and culminating in an International Fish and Aquatic Animal Welfare Conference (September 2014 in Munich, Germany) to present the current findings and workshops that outline optimal approaches and offer recommendations for implementing these around the world.
For newsletter, go to:
http://www.worldvet.org/library.php?item=329&cat=5&view=item

Farming salmon on land is possible, project suggests. Future of fisheries may not require fish to ever see the ocean.

By Evelyn Boychuk, CBC News
Posted: Jan 06, 2014 5:16 AM ET

Photo credit: Canadian Aquaculture Industry Alliance

As its name implies, the Atlantic salmon has always been seen as an ocean dweller. But the Canadian fishing industry is on the verge of being able to grow this saltwater fish anywhere – including, hypothetically, in the Prairie Provinces. The Namgis closed containment facility on Vancouver Island is the first salmon farm in North America to grow Atlantic salmon on a commercial scale in a completely land-based aquaculture system.

"It's no longer possible to say that recirculation aquaculture systems…are not possible for Atlantic salmon, because we're living proof that is [not] the case," says Jackie Hildering, community liaison for the Namgis closed-containment project.

The Canadian aquaculture industry has been around for a little over 30 years. It generates more than $2 billion annually and employs nearly 15,000 people from coastal and rural communities, says Ruth Salmon, executive director of the Canadian Aquaculture Industry Alliance.

Hildering says the Atlantic salmon is to fish-farming what the Holstein cow is to the dairy industry. "It's been bred for so many years to be the one that does well within a farmed situation — it's a larger fish, it has good fat content."

Traditionally, farmed Atlantic salmon are grown from an egg to a certain size in hatcheries on land. Then they're transferred to a floating net-pen just offshore on the east or west coast of Canada. Most Canadian net-pen fish farms are "certified by a third party to global [aquaculture] standards, or are well on their way to becoming certified," says Salmon.

For complete article see:
http://www.cbc.ca/news/technology/farming-salmon-

Report highlights growing role of fish in feeding the world

The most recent edition of FAO's "State of World Fisheries and Aquaculture" has just been released and reports that fish now accounts for almost 17 percent of the global population's intake of protein. More people than ever before rely on fisheries and aquaculture for food and as a source of income, but harmful practices and poor management threaten the sector's sustainability, says a new FAO report published today.

According to this latest edition, global fisheries and aquaculture production totaled 158 million tonnes in 2012 - around 10 million tonnes more than 2010. The rapid expansion of aquaculture, including the activities of small-scale farmers, is driving this growth in production.

Fish farming holds tremendous promise in responding to surging demand for food which is taking place due to global population growth, the report says. At the same time, the planet's oceans – if sustainably managed – have an important role to play in providing jobs and feeding the world, according to FAO's report.

"The health of our planet as well as our own health and future food security all hinge on how we treat the blue world," FAO Director-General José Graziano da Silva said. "We need to ensure that environmental well-being is compatible with human well-being in order to make long-term sustainable prosperity a reality for all. For this reason, FAO is committed to promoting 'Blue Growth,' which is based on the sustainable and responsible management of our aquatic resources."

See www.fao.org/news/story/en/item/231522/icode for the full FAO Press Release and access to the full 2014 FAO report.

Pioneering vets in the Keys try new treatment on green sea turtles blinded by tumors

By Cammy Clark—The Miami Herald
Posted on Saturday, 03.15.14
cclark@MiamiHerald.com

Ditka the dog didn't know what to make of the seven unfamiliar creatures he saw in tubs sprawled on the floor of a small examination room during a March visit to the Pinecrest Veterinary Hospital. Hook, Jack, Emerald, Chris, Augustus, Jared and Pe'e — all diseased green sea turtles named by their rescuers – had traveled 2½ hours in the Turtle Hospital ambulance to see veterinary ophthalmology specialist Dr. Lorraine Karpinski. The cold-blooded patients all were found with the same problem: fibropapilloma tumors around their eyes. The growths of varying sizes looked like decaying florets of cauliflower, blocking the turtles' vision like storm shutters on a window. Without vision, the sea turtles cannot find food in the wild.

The turtles didn't know it, but their lives were in the hands of the sandal-wearing vet who has worked for 42 years on animals' eyes — including those of Lolita the killer whale and thoroughbred Seattle Slew before he won the Triple Crown. Bette Zirkelbach, manager of the nonprofit Turtle Hospital in the Middle Keys' island town of Marathon, had contacted Karpinski a few months earlier "in desperation" to find a new treatment to help Hook and Jack avoid euthanization. As in the case of many turtles with the same condition, their eye tumors grew back about six weeks after being removed, a process that kept repeating itself.

"We can't release turtles back into the wild if they don't have vision in at least one eye," Zirkelbach said.

Karpinski came up with the idea of trying Fluorouracil, an anti-cancer medication used in humans. Karpinski already had found success using it on horses with skin cancer and on a Malayan tapir at Zoo Miami with eye tumors. Maybe, she thought, it would work on the endangered sea creatures. It also helped that the medication isn't expensive — $12 buys a bottle that can go a long way.

Fibropapilloma is a herpes-like virus first recorded in 1938 in a green sea turtle that had been captured around Key West and ended up in the New York Aquarium.

The disease occurs predominantly in green sea turtles in warmer regions including the Caribbean, Hawaii, Australia, Japan, the Indian River Lagoon and Florida Bay.

"We bought them a little more useful vision for a while, but we didn't make them any more releasable," Karpinski said. "We couldn't do surgery every six weeks or so to remove new tumors. We were just spinning our wheels."

Over the years, about one-third of the turtles brought to the Turtle Hospital with fibropapilloma have had to be euthanized. Nothing can be done if an endoscopy shows that a turtle has internal tumors. Since 1986, the Turtle Hospital has participated in fibropapilloma research projects with the University of Florida and Albert Einstein College of Medicine Institute for Animal Studies, but with little success in finding a cause or cure for a disease that infects between 50 and 70 percent of some populations of the turtles. Now, the hospital has partnered with the University of Georgia to try to learn more. But time was not on the side of Hook and Jack when Zirkelbach called Karpinski for help.

Hook had been undergoing treatment since July 2012, when he was found with a fishing hook lodged in his right flipper and signs of trauma on his left flipper, likely due to an old entanglement. At first he was taken to the Miami Seaquarium, where the hook and lesions were removed. But two months later, after the lesions grew back and were confirmed to be from the virus, Hook was transferred to the Turtle Hospital. There, Hook had eight surgeries, including five specifically to remove small tumors from his eyes. After those surgeries, Hook was tumor free except for a stubborn one around his left eye. He was facing euthanization.

It is impossible to remove every last virus cell. So, the surgery was followed by drops of the anti-cancer medication just on the surface of the eye, to prevent pumping the entire animal full of the chemotherapeutic drug. The drops are given twice a day. Some of the turtles are now receiving the medication as injections into the soft tissues of their eyes. They are good for three weeks. While preliminary results are promising, it's way too early to tell if the treatments will work in the long term.

Read the complete article here:
http://www.miamiherald.com/2014/03/15/3992579/pioneering-vets-in-the-keys-try.html#storylink=cpy

Scientists zero in on what's causing starfish die-offs

By Ashley Ahearn and Katie Campbell, Earthfix *June 17, 2014*
ORCAS ISLAND, Wash.

Starfish are dying by the millions up and down the West Coast, leading scientists to warn of the possibility of localized extinction of some species. As the disease spreads, researchers may be zeroing in on a link between warming waters and the rising starfish body count.

Drew Harvell peers into the nooks and crannies along the rocky shoreline of Eastsound on Orcas Island. Purple and orange starfish clutch the rocks, as if hanging on for dear life. In fact, they are.

"It's a lot worse than it was last week," said Harvell, a marine epidemiologist at Cornell University. She's been leading nationwide efforts to understand what is causing starfish to die by the millions up and down North America's Pacific shores and on the east coast as well. It's been called sea star wasting syndrome because of how quickly the sea stars become sick and deteriorate.

Scientists have been working for months to find out what's causing the massive die-off and now Harvell and others have evidence that an infectious disease caused by a bacteria or virus may be at the root of the problem. The disease, they say, could be compounded by warming waters, which put the sea stars under stress, making them more vulnerable to the pathogen.

Harvell has studied marine diseases for 20 years. She had thought that the syndrome might spare Washington's San Juan Islands. Until recently, pockets of cold water and swift currents seem to have protected the local sea star population from the epidemic. But with the arrival of summer, the waters around the San Juan archipelago have warmed. From what Harvell and her team see as they survey beaches, there's not much time for these starfish — or sea stars, as scientists prefer to call them since they're not fish.

"The whole arm is flat. It looks dried out, wasted, thin, deflated. Sea stars are not supposed to look like that," Harvell said. "My expectation is that within the next month all of the stars will die."

Harvell crouches in the sand and points at a withering orange pisaster ochraceus, or ochre star, one of the most common sea stars found in the intertidal zones of the West Coast. One arm is curled, another hangs by a thread of gnarled flesh.

The team checked this rocky patch last week and found 10 percent of the stars showed signs of the wasting syndrome. Today they estimate that number has increased to more than 40 percent. They've been monitoring sites around the San Juan Islands through this past winter and expect the percentage of infected stars to continue rising as the waters warm this season.

"Over this winter I surveyed here, and looked at every animal and there was no disease at all," said Morgan Eisenlord, a Ph.D. student in Harvell's lab at Cornell. "When we came back in the spring we found sick animals so it obviously spread as it started to get warmer."

Some scientists see a connection between rising water temperatures and the wasting syndrome. The waters around the San Juan Islands tend to be colder than the Washington outer coastline where dying starfish were first reported last summer. Since the arrival of warmer weather this season, the syndrome has spread rapidly to areas like the San Juan Islands that were previously untouched by the syndrome. Recent reports have also surfaced of die-offs along Oregon's coastline.

Looking out at the rising tide on Eastsound, Harvell said, "This area has some of the highest biodiversity of sea stars in the world. We're not just losing one keystone species, we're losing a whole guild of stars."

This report first appeared on EarthFix's website.
http://www.pbs.org/newshour/updates/scientists-zero-whats-causing-starfish-die-offs/

World Oceans Day

PROVIDENCE, RI –

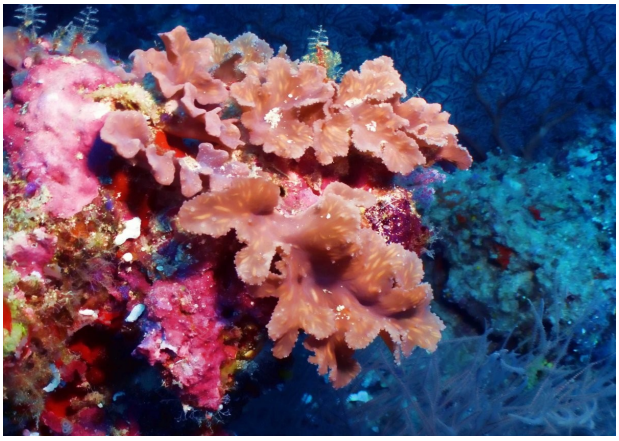
June 8 was designated as World Oceans Day by the United Nations in 2008. Oceans cover most of our planet. They provide much of the oxygen we need to survive, regulate weather and temperature, and are home to countless plants and animals. Yet, the oceans face continued threats from pollution, overfishing, and warming temperatures.

On June 8th 2014, people in communities around the globe will celebrate this year's World Oceans Day with the theme of *"Together we have the power to protect the ocean."* Hundreds of events are planned to help people get involved in solutions for a healthy ocean and society - by supporting clean energy choices, trash-free coasts and beaches, sustainable seafood, and more.

"In addition to events in dozens of countries, we invite everyone to take ocean conservation personally by making a commitment and then sharing a selfie for the sea," said World Oceans Day coordinator, Alyssa Isakower. "We can each do something to help protect our ocean!"

On World Oceans Day people around our blue planet celebrate and honor the ocean, which links us all. Be a part of this growing global celebration! Thanks to The Ocean Project and World Ocean Network for helping to promote and coordinate this event since 2002. Thank you to the United Nations for officially recognizing June 8th as World Oceans Day, since 2008.

Read more: http://www.businessinsider.com/world-oceans-days-photographs-2014-6#ixzz36RXr0Dio



Brassy leather coral in the Maldives. (Neville Wootton/Flickr)

An endangered manatee swims with a school of fish in Florida. (Ryan Hagerty, USFWS)

Sea Turtle (nicolas.voisin44/Shutterstock)

An octopus is photographed on the Caribbean reef. (Isabelle Kuehn/Shutterstock)

Read more: http://www.businessinsider.com/world-oceans-days-photographs-2014-6#ixzz36RcVnuAc

Free Webinar - Veterinary Feed Directives Regulations, FDA Guidance for Industry, Digital Documentation & the Aquaculture Industry

Free Important Webinar on VFD Regulations.
REGISTER NOW - space is limited!
When: Wednesday, August 06, 2014,
12:00 PM - 2:00 PM (CDT)
check your local time http://tinyurl.com/kprwhfa.

The National Institute for Animal Agriculture is hosting this webinar during which Richard Sellers, Senior Vice President of Legislative and Regulatory Affairs for the American Feed Industry Association, will outline the implications and impacts of emerging FDA regulations and guidance (GFI 209) and aquaculture.

Tailored for the aquaculture industry and veterinarians who provide services to the aquaculture producers, Richard Sellers will review the current Veterinary Feed Directives laws, regulations and guidance, processes for issuing VFDs, and challenges facing the aquaculture industries. He will explain how the regulations affect you and your business.

Registration is now open and is limited to the first 100 registrants. To register go to http://www.animalagriculture.org/event-1700570.

For more information on NIAA go to www.animalagriculture.org.

FDA VFD Information:
"Plain Language: The CVM VFD Regulation" -- http://tinyurl.com/k54bau2

"Drugs in Animal Feeds (Medicated Feeds) & VFDs" -- http://tinyurl.com/nhnhrep

Proposed New Regulations -- http://tinyurl.com/lkupnut

FAWC (UK) Opinion on the welfare of farmed fish when they are killed

On June 9, 2014 the Farm Animal Welfare Committee (FAWC) published its "Opinion on the Welfare of Farmed Fish at the Time of Killing." This considers the welfare of farmed fish once the decision has been taken to kill them, whether for harvest for human consumption, to reduce the population or for emergency purposes.

Peter Jinman, FAWC Chairman, said: “FAWC recognises that the aquaculture industry and others have addressed this subject seriously since FAWC’s last Report on the issue in 1996 and have made many improvements to the welfare of farmed fish at the time of killing.” The Chairman continued: “FAWC has assessed the scientific literature and consulted with the industry, the research community and other experts in order to reach conclusions on killing methods we consider should and should not be used and why, as well as making recommendations on management, husbandry, training and research issues.”

Peter Jinman concluded: “Farmed fish are currently not afforded the same regulatory protection as other farmed animals at the time of killing. This Opinion gives FAWC an opportunity to influence progress at European and domestic levels with well researched and clearly expressed advice.”

The FAWC Press Release and the full report is available from www.defra.gov.uk/fawc.

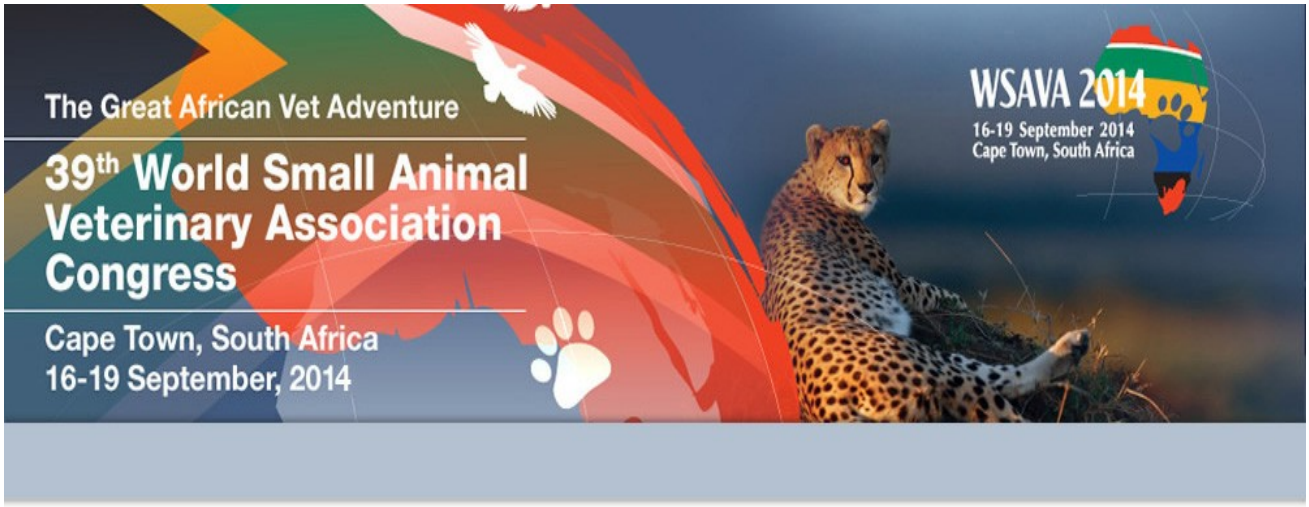
MEETINGS OF INTEREST TO AQUATIC VETERINARIANS

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

PLAN AHEAD FOR THESE GREAT MEETINGS!

WAVMA members will be presenting full days of Aquatic Veterinary Medicine lectures at the 2015 WSAVA Congress in Bangkok, Thailand. Plan ahead to attend this meeting.

WSAVA
Global Veterinary Community



39th WSAVA Congress
Cape Town, South Africa
September 16-19, 2014

http://www2.kenes.com/wsava/Pages/Home.aspx

40th WSAVA Congress
Bangkok, Thailand
May 15-18, 2015

http://www.wsava2015.com/congress-information/about-wsava

Aquatic Programs at the AVMA Convention
Denver, Colorado, USA
July 25-29, 2014

Alphabetical Listing:

A Run Through of Fish Pathogens Providing a Series of Clues Before Arriving at the Diagnosis (Parasite Case Studies) (16128)
Richmond Loh
Sunday | 02:00 PM - 02:50 PM

Aquatic Veterinary Education- What's Available, What's Evolving and Where to Go (16133)
A. David Scarfe
Monday | 10:00 AM - 10:50 AM

Aquatic Veterinary Medicine for the Private Practitioner (16131)
Nicholas Saint-Erne
Monday | 08:00 AM - 08:50 AM

Diagnosis of Diseases in Cultured Fish, Part I (16120)
Esteban Soto Martinez
Saturday | 02:00 PM - 02:50 PM

Diagnosis of Diseases in Cultured Fish, Part II (16121)
Esteban Soto Martinez
Saturday | 03:00 PM - 03:50 PM

Diagnostic Tissue Sampling (16122)
Thomas Waltzek
Saturday | 04:00 PM - 04:50 PM

Finfish Anatomy and Physiology, Part I (16115)
Roxanna Smolowitz
Saturday | 07:00 AM - 07:50 AM

Finfish Anatomy and Physiology, Part II (16116)
Roxanna Smolowitz
Saturday | 08:00 AM - 08:50 AM

Finfish Anatomy and Physiology, Part III (16117)
Roxanna Smolowitz
Saturday | 10:00 AM - 10:50 AM

Fish Histopathology (16127)
Roxanna Smolowitz
Sunday | 01:00 PM - 01:50 PM

Just the Facts, Ma'am! Educational Resources for Aquatic Animal Practitioners (16134)
Thomas Waltzek
Monday | 11:00 AM - 11:50 AM

Microbial Disease of Finfish (Bacterial and Fungal Case Studies) (16129)
Esteban Soto Martinez
Sunday | 04:00 PM - 04:50 PM

Non-infectious Diseases of Finfish (Case Studies) (16130)
Myron Kebus
Sunday | 05:00 PM - 05:50 PM

Surgery in Pet Fish (16124)
Nicholas Saint-Erne
Sunday | 09:00 AM - 09:50

The Fish Vet's Pharmacy: What an Aquatic Veterinarian Needs and What for (16125)
Richmond Loh
Sunday | 10:00 AM - 10:50 AM

Tranquilization, Anesthesia and Euthanasia in Pet Fish (16123)
Nicholas Saint-Erne
Sunday | 08:00 AM - 08:50

Treatment Protocols: The Art Behind the Choice of Drugs and Method of Administration (16126)
Richmond Loh
Sunday | 11:00 AM - 11:50 AM

Water Quality: Clean Air for Us and Clean Water for Them (16119)
Christian Keller
Saturday | 01:00 PM - 01:50 PM

Water, Water Everywhere and What that Means to an Animal Living in It…. (16118)
Christian Keller
Saturday | 11:00 AM - 11:50 AM

Wisconsin's Fish Regulatory Program: Economic Opportunities and Challenges for the Private Practice Veterinarians (16132)
Myron Kebus Monday | 09:00 AM - 09:50 AM

Aquatic Lectures are scheduled in the Colorado Convention Center: Room 504
Program subject to change.

2014 INTERNATIONAL SYMPOSIUM ON AQUATIC ANIMAL HEALTH

Aug 31 – Sept 4, 2014
Portland, Oregon, USA

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. Please visit the ISAAH-7 website for more information: http://microbiology.science.oregonstate.edu/content/isaah

Sealice 2014

August 31-September 3, 2014
Portland, Maine, USA

Hosted by University of Maine, Aquaculture Research Institute & University of Stirling. Holiday Inn By The Bay & Westin Portland Harborview Hotel in Portland, Maine, USA.

For more information visit:
http://sealice2014.businesscatalyst.com.

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.

9th Symposium on Diseases in Asian Aquaculture (DAA9)

November 24-28, 2014
Ho Chi Minh City, Vietnam

The Fish Health Section of the Asian Fisheries Society was founded in May 1989 with the goal to improve regional knowledge on fish health management and to support sustainable aquaculture development in Asia Pacific. FHS strives to promote interaction by bringing together fish health researchers to share their knowledge and experience. The FHS is credited with holding triennial symposia on "Diseases in Asian Aquaculture" (DAA) where members and aquatic animal health professionals meet to discuss broad issues and specific topics related to aquatic animal health. FHS has conducted earlier symposia in Bali, Indonesia (1990); Phuket, Thailand (1993); Bangkok, Thailand (1996); Cebu, The Philippines (1999); Gold Coast, Australia (2002); Colombo, Sri Lanka (2005); Taipei, Taiwan (2008) and Mangalore, India (2011). Each of these symposia brought together more than 300 aquatic animal health scientists, students, government researchers and industry personnel from over 30 countries to discuss issues pertaining to aquatic animal disease, their diagnosis, prevention and control. In keeping with the tradition of previous DAA symposia, DAA9 in Vietnam is going to be a unique experience that you don't want to miss. For more information on DAA9 and FHS, go to http://www.fhs-afs.net.

Association of Reptilian and Amphibian Veterinarians/Association of Exotic Mammal Veterinarians/American Association of Zoological Veterinarians Concurrent Annual Conferences
October 18-24, 2014
Walt Disney World/Orlando, Florida, USA

CALL FOR TITLES
The ARAV and the AEMV invite submissions of titles for their joint Annual Conference, concurrent with the AAZV Annual Conference. Proposals on all aspects of reptilian, amphibian, and exotic mammal medicine are welcome. These include results of original research, case reports, clinical studies, and review articles. Clinicians are particularly invited to submit papers for an "In My Experience" session.

SUBMISSION PROCESS
Proposals must be submitted online through the joint ARAV/AEMV submission site (http://precis2.preciscentral.com/Link.aspx?ID=D653D13C47D4E263). The link for the site can also be found at the ARAV website (www.arav.org) and the AEMV website (aemv.org). Please send a title, a short description, your preference for delivering an oral or poster presentation, and contact information for the primary author by April 4, 2014. All proposals should be submitted as word documents. All presentations will be reviewed by a scientific committee.
Authors will be informed whether their presentation has been accepted by May 1, 2014. Full abstracts will then be invited for submission online. Final submissions will be due by June 15, 2014.

All abstracts must be in English Proposals should be limited to 3-5 sentences.
More information online at www.arav.org.

International Conference on Avian, Herpetological and Exotic Mammal Medicine" (ICARE)
April 18 - 23, 2015
Paris, France

After a very successful and exciting "1st International Conference on Avian, Herpetological and Exotic Mammal Medicine" (1st ICARE) in Wiesbaden, Germany in 2013, all participating organisations have decided that this important veterinary symposia should continue every two years touring through Europe.

We are proud that the European Committee of the Association of Avian Veterinarians (EAAV), the Association of Exotic Mammal Veterinarians (AEMV), the Association of Reptilian and Amphibian Veterinarians (ARAV) and the European College of Zoological Medicine (ECZM) have decided that the 2nd International Conference on Avian, Herpetological and Exotic Mammal Medicine (2nd ICARE) will be held in 2015 in Paris, France (April 18 - 23, 2015). All organizations (EAAV, AEMV, ARAV, ECZM) are participating in a newly formed ICARE Steering Committee to select suitable locations and support the local organising committees for future conferences.

In preparation of the 3rd upcoming ICARE in 2017 the ICARE Steering Committee seeks proposals! If interested in organising ICARE 2017 please send your proposal before **31.03.2014** via email to Dominik.fischer@vetmed.uni-giessen.de.

On behalf of the ICARE Steering Committee,
Dominik Fisch

European Committee of the Association of Avian Veterinarians

Association of Exotic Mammal Veterinarians

Association of Reptilian and Amphibian Veterinarians

European College of Zoological Medicine

SeaWorld (3-4 weeks)

SeaWorld offers externships at each of its 3 locations. There is one common application where you rank each park. Externs get to work with the wild birds that are brought for rehabilitation, even surgery! You are required to give a small presentation to the veterinary staff on the last week of your rotation. Housing is not provided, but there are lots of hotels in the area, including an extended stay hotel with a small kitchenette for around $50/night.

The Marine Mammal Center (3-4 weeks)

Located in Sausalito, CA, the Marine Mammal Center is in the front-running for marine mammal rehabilitation and research. It is very seasonal, with more animals in the spring and summer. You will work with the veterinary staff 3-4 days per week, and then on crew, doing basic husbandry and feeding once or twice a week. Housing is provided with the veterinary intern and any other externs at one of the old fort houses nearby. It is highly recommended that you get a car for driving around. It is a beautiful area with lots of beach coast and hiking.

Mystic Aquarium

Mystic Aquarium in Mystic, CT, right near the coastal Rhode Island border, houses a large collection of marine mammals, fish and invertebrates. You work primarily with the veterinary intern, shadowing and assisting on procedures. You will also get very proficient in taking and processing analog radiographs. A presentation is required during this externship. No housing is provided, but you may want to ask if they know of anyone working at the aquarium who can provided you with a room for the time you are there. This is another rotation where you'll want a car to check out all the beaches nearby.

Georgia Aquarium

Georgia Aquarium is one of the newest aquariums in the US. It has a new procedure suite and one of the most outstanding tanks in the world. Housing is not provided. You may not need a car since the aquarium is located in downtown Atlanta, GA.

Navy Marine Mammal Program (4 weeks)

The US Navy trains marine mammals to perform tasks underwater that cannot be performed by humans. This is a high priority for those interested in marine mammal medicine. This program is based in San Diego, CA and is highly competitive.

Vancouver Aquarium (2-4 weeks)

Located in Stanley Park of Vancouver, Canada, Vancouver Aquarium takes externs to work with their collection of mammals, birds, amphibians, reptiles and fish. A literature review project is required. Housing is not provided but they provide a guide on their website. Make sure your passport is up to date!

Georgia Sea Turtle Center (2-6 weeks)

The Georgia Sea Turtle Center is located on Jekyll Island along the southern coast of Georgia. They rehabilitate both sea turtles and native land turtles at their center. If turtles are your interest, this is one of the best facilities to participate in the latest research and rehabilitation techniques. A research project is required for non-4th year students that is financed by funding through your school. Housing available based on seasonality. A car is recommended.

National Aquarium

Baltimore, MD (6-8 weeks)

National Aquarium is located in Baltimore, MD and houses a large collection of fish, mammals, amphibians/reptiles and birds. This rotation gives hands-on experience with fish, birds, reptiles and amphibians. There is some work with mammals and other critters, but it is largely observational. Applications are accepted year round. A small presentation is required. No housing is available but there are lots of hotels in the area.

New England Aquarium

Boston, MA (6-8 weeks)

Located in Boston, MA, the New England Aquarium hosts a large collection of fish , birds, marine mammals and turtles. Their chief veterinarian, Dr. Charles Innis, is one of the most knowledgeable about cold stun in turtles and has made a significant contribution to researching their rehabilitation. Externs are required to prepare a case report and research paper with presentations for both. No housing is available, but there are lots of options nearby.

Clinical Veterinarian Position (Exotic Animal Medicine) - NC State, College of Veterinary Medicine Teaching Hospital

Posting Number: 20111072EP -

This is a time-limited position with a duration of 1 year. This position will work with a team of clinicians within the exotic animal medicine service.

Salary: $70,000 - $80,000

Minimum Requirements:

DVM or equivalent degree.

Clinical expertise with birds, reptiles and exotic small mammals is required.

Position Responsibilities:

Provide high quality effective and efficient patient care for a variety of exotic animal species. Clinical responsibilities will entail all of the duties associated with case management (client and referral veterinarian communication, development of a diagnostic and treatment plan, interpretation of diagnostic findings, implementation of a treatment plan, surgery, post-operative care, development of a home care plan, fiscally responsible management).

The individual will participate in the emergency roster.

Provide clinical expertise with strong skills in exotic companion mammal medicine.

Participate in high quality clinical teaching for veterinary students and house officers.

For more information and to apply, go to:
https://jobs.ncsu.edu/postings/26460.

University of Arkansas at Pine Bluff
Aquaculture/Fisheries Center
Assistant/Associate Professor (Fish Pathology)

Appointment: Twelve month tenure track (55% extension, 35% research, and 10% teaching)
Qualifications: D.V.M. or Ph.D. in fish pathology or closely related field is required. Experience with U.S. commercial aquaculture production is preferred.
To Apply: Send letter of application, resume, official transcripts, & three letters of reference to:
Dr. Carole Engle, Director
Aquaculture/ Fisheries Center
University of Arkansas at Pine Bluff
1200 North University Drive; PO Box 4912;
Pine Bluff, AR 71601
Telephone: (870)575-8523; FAX: (870)575-4637;
e-mail: cengle@uaex.edu

University of Georgia Veterinary Teaching Hospital - Veterinary Technician Internship Program in Zoological Medicine.

This challenging internship offers an excellent opportunity for a graduated **veterinary technician** to be part of an exciting academic environment. The intern will be able to increase their skills and knowledge performing advanced techniques in zoological medicine while using state-of-the-art medical equipment. The caseload is approximately 80% exotic pets (mainly small mammals, reptiles, birds), and 20% zoo and wildlife including includes primates and venomous animals.

Veterinary Technician - One Year Internship Program in Zoological Medicine
Application Deadline: July 28, 2014.

The Veterinary Technician Internship program is a specialized internship for veterinary technicians wanting to focus on zoological medicine. Our program offers not only the opportunity for hands-on experience with a variety of species, but the ability to participate in UGA coursework in Zoo and Wildlife Medicine and Surgery, research and develop a presentation or case report, and receive guidance and support from a program mentor.

Questions about the program can be directed to Ms. Laura Light, ladam@uga.edu or call 706-542-3221

To Apply Please Send by July 28, 2014:
Resume, including education, date of graduation, GPA, professional memberships and any honors and/or publication if pertinent. The resume should also include previous employment with contact information.
Letter of interest; 2 professional references from a DVM, Credentialed Veterinary Technician or Practice Manager.
Documentation of credentials, and photocopy of diploma.
Photocopy of Rabies titers/vaccine and negative TB test.
Send completed application to;
Laura Light, RVT, LATg
Specialty Services Technician Supervisor
UGA College of Veterinary Medicine
501 DW Brooks Drive
Room H1111A,
Athens, GA 30602-7371

HOW TO REGISTER

Reserve your hotel before you register and save $25 on your convention registration fee!
Registration costs are currently $525 for AVMA Member Veterinarians. Click here for more registration types and fees.

Online

Click here to register online!
Fast and easy! View lab and event availability before you select. A credit card is required.
AVMA members, please use your member ID number to secure the lowest rates.

Phone/Fax/Mail

Call 877-303-0716 (U.S. and Canada) or 708-486-0716 (International).
Download the form. Then, fax printed forms to 708-344-4444.
Download the form. Then, mail to AVMA Registration/CompuSystems, Inc., P.O. Box 6271, Broadview, IL 60155-6271.

We invite you to join us for the 7th *International Symposium on Aquatic Animal Health* (ISAAH-7) in Portland, Oregon (August 31 – September 4, 2014). Stemming from its inauguration as the 'International Fish Health Conference' in Vancouver, BC (1988), the ISAAH has developed into a much anticipated gathering of international fish health professionals, occurring every 4 years.

Building on the resounding success of its predecessors, including Seattle (1994), Baltimore (1998), New Orleans (2002), San Francisco (2006), and Tampa (2010), the 2014 ISAAH promises to combine intellectual stimulation among international fish health professionals with the bustling culture and Pacific Northwest beauty of the 'Rose City'. You will not want to miss this iteration of the ISAAH, the preeminent meeting of international fish health professionals. *--2014 ISAAH Organization Committee*